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REPORTS, AWARDS, MEMBERSHIP, HERBICIDE LISTS, AND INDICES

BIOLOGICAL CONTROL OF CANADA THISTLE IN PASTURES AND PARKS: A CALL FOR COLLABORATORS ON SIMPLE FIELD TESTS.

D.K. Berner, USDA, ARS, FDWSRU, Ft. Detrick, MD and P.A. Backman, Dept of Plant Pathology, The Pennsylvania State Univ., University Park.

ABSTRACT

Canada thistle (*Cirsium arvense* (L.) Scop.) is one of the most noxious invasive weeds in North America. It occurs on millions of acres of pastures, agricultural land, and natural areas. It is difficult to control because it has an extensive root system and reproduces by seeds and root buds, the latter of which are multiplied and distributed by plowing. It can be controlled by intensive herbicide applications, but in pastures and natural areas this is economically prohibitive. Biological control may affordable and effective. The obligate rust fungus, *Puccinia punctiformis* (F. Strauss) Rohl., is perhaps the first plant pathogen proposed as a biological control agent for Canada thistle or any other weed. In 1893 a NJ farmer noticed diseased thistle patches virtually disappeared after a few years; he proposed that the rust should be widely disseminated for weed control. Successful biological control of Canada thistle using *P. punctiformis* is hindered due largely to a heterogeneous distribution of teliospores in the soil leading to low incidence of systemically infected (SI) shoots. Homogeneous distribution of teliospores over extended periods of time may overcome this problem.

In 2003-2005, we conducted experiments in two field sites naturally infested with Canada thistle and the rust. SI thistle shoots in each replicate in each field site were counted, and randomly selected plots were mowed while others remained unmowed. Our hypotheses were that a) mowing could remove apical dominance and result in emergence of more SI shoots within the current and subsequent growing seasons, and b) mowing could re-distribute teliospores from SI shoots and result in more homogeneous distribution and greater number of diseased shoots the following season. Mowing increased numbers of SI shoots within and between seasons compared to unmowed plots. Numbers of SI shoots in unmowed plots also increased, but not to the degree of the mowed plots. Results were consistent with a 1923 study, which indicated that in unplowed pastures, SI shoots increased exponentially. Predictions from both studies indicated that 100% disease incidence could be expected in mowed and unmowed plots within 2.7-5.2 yr of disease establishment. With greater initial disease (shoots), progression to 100% disease incidence might proceed more rapidly.

We propose to field-test, in multiple pasture and natural area sites, the ability of the rust to reduce healthy thistle density. We would produce SI seedlings in our facilities and place them in Canada thistle patches. This should provide prolonged production of teliospores and more homogeneous distribution of inoculum. We seek collaborators to help establish test sites and monitor disease progression and healthy thistle density. Our procedures for establishing disease and monitoring field sites will be presented.

INTEGRATING WEED CONTROL STRATEGIES IN STRAWBERRIES DURING THE ESTABLISHMENT YEAR. R.R. Bellinder and C.A. Benedict, Cornell Univ., Ithaca, NY.

ABSTRACT

Managing weeds during the establishment year is crucial to the long-term productivity of strawberries. Growers need to rely on a management system that can be maintained until the crop becomes established and competitive. Current practices that solely rely on herbicides, usually result in the need for large amounts of hand-labor and cultivation that dramatically increase operational costs. Recent research has shown that inter-seeding a cover crop or living mulch to suppress between-row weeds has some promise. In the spring of 2006, seven treatments were applied to plots having one row each of the varieties 'Earliglow' and ‘Jewel’. The treatments were: A.) Standard Broadcast Herbicide, B.) Standard Broadcast Herbicide + Fescue, C.) Banded Herbicide + Cultivation(Between+In-row), D.) Banded Herbicide + Fescue, E.) Fescue + In-row cultivation, F.) Between + In-row cultivation only, and G.) Hand-weeded Check. All applications were made using a CO_2 sprayer that delivered 34 GPA. In-row cultivation was done with a Buddingh Finger Weeder (Buddingh Weeder Co., Dutton MI) and a torsion weeder (Bezzerides Brothers, Orosoi, CA). An s-tine cultivator was used between rows. Data collection included weed counts and dry weights and runner production and number throughout the growing season. Total weed numbers were lowest in treatment C followed by B, F, D, A, E, and G, respectively. The banded herbicide+cultivation treatment had both the lowest number of in- and between-row weeds. Total and in-row weed dry weights were lowest in broadcast+fescue. Whereas, between+in-row cultivation was lowest in between-row weights. The similarity of in-row weights was due to a few, large weeds surviving. In fescue treatments, a decrease in the number of runners per plant can be attributed to the management of the fescue. Cultivation did not have a detrimental impact on runner production.

CONTROLLING 40 YEAR OLD KUDZU SITES IN PENNSYLVANIA. M. Bravo, The Pennsylvania State Univ., University Park.

ABSTRACT

Pennsylvania appears to be the first state in the U.S. to have received kudzu (*Pueraria montana* (Lour.) Merr.). In 1876 the Japanese pavilion of the Philadelphia Centennial Exposition displayed live kudzu. A herbarium specimen (Carnegie Museum) currently on loan to the PA Agriculture Museum in Harrisburg dates kudzu in West End Park, Pittsburgh to 1920. It is unknown if this is the same kudzu patch that was eradicated in West End Park by Pittsburgh Public Works employee Jim Foley in 2003. Current sites in PA are most often roadside banks, forest areas, quarries, slag mine deposits, homeowner property boundaries and rarely open space locations such as pipelines. Kudzu locations in PA have routinely been monitored since the early 1980's. Since the advent of soybean rust, renewed interest in limiting the spread of kudzu began in PA. During Summer 2006, the Department sought to confirm the known locations of kudzu in the state. As of October at least 71 known sites of kudzu are documented. At least 48 of these sites were actively producing vegetation. Seed production has been documented at many sites in the state since the 1980's and most of the untreated sites in 2006 were producing seed. Historical information and the physical data collected at each site suggests all current kudzu sites in PA are at least 30 years old and were purposely planted for soil stabilization or other recommended uses provided during the height of its promotion in the late 1930's. The current distribution range of kudzu in PA seems limited to Zone 6.

A pilot Kudzu Eradication Program began in 2000 with 5 locations treated. By the end of 2006, 18 more locations were enrolled. Herbicides used since 2000 include aminopyralid, clopyralid, metsulfuron and triclopyr. The goal of the program is to treat sites for 3 consecutive years to assist property owners in eradicating persisting sites of kudzu. Treatments at 6 sites in Lebanon County were used as a research plot to collect baseline data on clopyralid efficacy, rate and longevity. These sites were a combination of virgin sites, previously treated sites, roadside banks, forest areas and open space areas. Treatment applications included: high volume (HV) foliar, low volume (LV) broadcast and a 2% v/v cut stump application. Applications were monitored at 4, 7, 10, 11, 13 and 16 wk after treatment (WAT).

In summary, all May-cut stump, HV foliar and LV broadcast treatments were still preventing vegetative re-growth at 16 WAT. However, "missed" vegetation was common at every site and untreated vegetation was discovered at every site through July. A single HV foliar application followed by LV broadcast spot treatments successfully prevented vegetative re-growth of all open space and roadside bank infestations. Cut stump applications were critical to 100% control in all forest areas due to mature vines throughout the sites. Alarmingly, a cohort (> 50) of kudzu seedlings emerged in late July in a construction road that was cut through one of the virgin forest area sites in 2005. This indicates that seeds are viable and movement of soil may allow naturalized populations of kudzu to become established in PA.

GIANT HOGWEED ERADICATION IN PENNSYLVANIA AND SURROUNDING STATES. M.A. Bravo, Pennsylvania Department of Agriculture, Harrisburg.

ABSTRACT

Heracleum mantegazzianum introduction to Europe, from its native Caucasus Mountains, dates back to 1817. By the late 1840's reports of wild populations of giant hogweed were documented in the United Kingdom. Currently 21 European countries have reported wild populations of giant hogweed. In the United States an increase in reports of wild populations is also occurring. Giant hogweed was added to the federal noxious weed list in 1983. Giant Hogweed is in its element here in the temperate region of the Northeastern states. In the last decade, 16 states (WA, OR, MI, IA, IN, WI, OH, PA, NY, NH, ME, VT, MA, CT, NJ, MD) have confirmed finding giant hogweed. PA first discovered giant hogweed in 1985 in Erie County. A joint effort between PDA and USDA in 1998 established the Giant Hogweed Eradication Program. Currently, PA has less than 600 sites with viable hogweed populations in 12 counties. Federal support for the project has been strong and as a result of the PA efforts, many other States are actively searching for Giant Hogweed and conducting outreach programs. In the fall of 2005, the Program Review Committee for Giant Hogweed met in Pennsylvania and outlined the following goals for 2006. Goals for Pennsylvania and other States in the Region for 2006 were 1) eradicating persisting, but isolated populations in outlying counties 2) developing a standardized database to assist in evaluating the successful of the eradication programs 3) acquiring regional staffing and funding to implement control measures in adjoining states 4) emphasizing the risk of infestations becoming established in riparian areas and 5) encouraging local and regional research on the ecology an biology of giant hogweed to assist the eradication program in understanding the long term population dynamics of this invasive species. Like most invasive primers, giant hogweed's reproductive potential is enormous. Plants reproduce by seed and perenniating crown and rootbuds and have a high regeneration ability to set seed if seed heads are removed prior to maturity. A single plant is capable of yielding more than 100,000 seeds, primarily by out-crossing. Rosettes of giant hogweed can persist for as long as 12 years before flowering and understanding the biology of giant hogweed is critical to implementing a successful eradication program.

DOES POLYEMBRYONY CONFER GREATER COMPETITIVE ABILITY IN THE NON-NATIVE INVASIVE VINE, PALE SWALLOW-WORT?

M.L. Blanchard, A. DiTommaso, K.M. Averill, C.L. Mohler, and J.N. Barney, Cornell Univ., Ithaca, NY.

ABSTRACT

Pale swallow-wort (*Vincetoxicum rossicum* (Kleopow) Barbar) is a non-native invasive vine in the Asclepiadaceae that has colonized natural systems in many Northeastern States and several Canadian provinces. It is a twining herbaceous perennial vine that can spread vegetatively, but reproduces primarily by seeds, some of which exhibit polyembryony (i.e., a condition where a single seed can produce multiple seedlings). Polyembryony occurs in a significant percentage of pale swallow-wort seeds, and may allow the plant to more effectively colonize areas as well as outcompete other plants for resources. Little is known about how polyembryony in this invasive plant affects competitive outcomes. Thus, the effect of polyembryony in pale swallow-wort on intra- and inter-specific competition was evaluated in a greenhouse experiment using a modified replacement series design. Pale swallow-wort plants from three polyembryonic classes; singles, doubles, and triples (i.e., one, two, and three seedlings per seed, respectively) were grown with each other in all combinations and with the native species, Canada goldenrod (*Solidago canadensis* L.) and common milkweed (*Asclepias syriaca* L.). A total density of 2 plants per pot was used. The height and number of nodes (rosette width for goldenrod) were recorded for pale swallow-wort and milkweed plants every two weeks for 10 weeks, and then 4 weeks later at the end of the experiment. After this 14-wk period, all plants were harvested and above- and below-ground biomass determined. In general, pale swallow-wort plants consisting of one seedling (singles) had significantly lower total biomass when competing with pale swallow-wort plants having two or three seedlings and with goldenrod and milkweed than with other single-seedling swallow-wort plants. These reductions in growth of single-seedling plants were most evident for belowground biomass. There was no significant difference between goldenrod and milkweed in their negative effect on pale swallow-wort. These findings suggest that the production of more than one seedling via polyembryony in pale swallow-wort may be advantageous in competitive environments.

EFFECTS OF EMERGENCE PERIODICITY ON GROWTH AND FECUNDITY OF HORSEWEED. J.T. Dauer, The Pennsylvania State Univ., University Park, B.A. Scott and M.J. VanGessel, Univ. of Delaware, Georgetown, and D.A. Mortensen, The Pennsylvania State Univ., University Park.

ABSTRACT

The dispersal ability of winter annual and summer annual biotypes of horseweed (*Conyza canadensis*) was assessed along a 400 km latitudinal gradient between Pennsylvania and Delaware. Dispersal ability was defined by time of seed set, plant height and fecundity. Earlier seed set can result in greater opportunities for fall establishment and taller plants increase seed release height and impact dispersal distance. Greater fecundity increases the opportunities for populations to sample diverse environments and establish satellite populations. Sites were located in central and southeastern Pennsylvania, and central and southern Delaware with trials initiated in fall 2005 and replicated in fall 2006. Plots were arranged in a randomized complete block with four replications of two fall and two spring cohorts. Early and late cohorts were determined by germination before or after October 1st (fall) and April 15th (spring). Ten plants were randomly selected in each replicate, marked, and revisited biweekly to record plant height and percent flowering. Following seed release, final plant height was measured and capitula per plant were counted to estimate seed production. The late fall cohort was eliminated due to lack of overwintering success in Pennsylvania populations and data were averaged within a plot. In 2005-2006 seed set initiation progressed from south to north, however the next year, Pennsylvania populations set seed earlier than either Delaware location. Location and treatment significantly affected final plant height ($P<0.05$). Early fall germinating plants were significantly taller than late spring germinating plants, but not significantly different from early spring germinating plants. The fall cohort tended to set seed earlier and have a higher fecundity than either spring cohort. The important contributions of fall and early spring plants to the dispersal of the population by earlier seed set, higher fecundity, and greater plant height will play an important role in management of the resistant biotype. Early spring management of winter annual species may increase the success of reducing the continued spread of glyphosate-resistant biotypes.

COMPARISON OF INTEGRATED WEED MANAGEMENT STRATEGIES IN CHRISTMAS TREE PLANTATIONS.

M.W. Marshall, B.H. Zandstra, Michigan State Univ., East Lansing, and R.J. Richardson, North Carolina State Univ., Raleigh.

ABSTRACT

Since Christmas tree value is based mainly on their appearance, pests that reduce the visual quality of trees are intensively managed. Michigan Christmas tree growers rely heavily upon pesticides, including atrazine and simazine, to control these pests. However, atrazine and simazine have ground and surface water concerns. Field studies were conducted in 2005 and 2006 to determine integrated weed management programs utilizing alternatives to replace and/or reduce triazine use. The treatments were flumioxazin+glyphosate at 0.28 and 1.12 kg/ha broadcast or within the row, organic mulch, organic mulch+glyphosate at 0.84 kg/ha, hard fescue (*Festuca brevipila* 'Aurora Gold') groundcover, white clover (*Trifolium repens* L.) groundcover, mechanical control system, mechanical control+glyphosate at 0.84 kg/ha, and an untreated control. Organic mulch consisted of a coarsely ground pine bark and was applied as a 91 cm wide band in the tree rows. Hard fescue and white clover were broadcast seeded into plots in the fall of each year at rates of 250 and 7 lb/A, respectively. Mechanical control treatments were imposed using a hand-operated mower between and within the tree rows. Flumioxazin and glyphosate treatments were applied on April 19, 2005 and April 11, 2006. Glyphosate+mechanical treatments were imposed in June, July, and August of each year. Experimental design was a randomized complete block design with 4 replications. Conifer injury was evaluated 8, 12, and 16 wk after treatment (WAT) on a 0-100% scale (0 = no injury and 100 = crop death). In addition, plots were visually evaluated for % cover of each weed. Overall ground cover in the 2005 site was denser than in the 2006 site. In general, hard fescue established and provided a denser groundcover than white clover. In the hard rescue plots, other weed species did not thrive in the plots; however, quackgrass (*Elytrigia repens* (L.) Nevski.) was observed at a low percentage of the total groundcover (8%). This indicates that a living mulch, such as hard fescue inhibited light-dependent weed seed germination. The organic mulch provided excellent groundcover until weed seeds started germinating within the mulch layer. In the mulch+glyphosate treatment, glyphosate eliminated most of the weeds emerging between the rows and within the mulch layer. Plots receiving flumioxazin + glyphosate treatments, regardless of the broadcast or strip application, remained bare with the exception of a few weeds throughout the growing season. Conifer injury was virtually non-existent in all treatments. Similar to 2005, hard fescue provided greater than 65% groundcover throughout the growing season. Common milkweed (*Asclepias syriaca* L.) was observed in some of the hard fescue plots (less than 10%). The use of a living groundcover, such as hard fescue, is a beneficial cultural control because it minimizes herbicide use while providing suppression of light germinating weed species. For suppression of perennials, such as quackgrass and common milkweed, hard fescue is also tolerant to over-the-top applications of glyphosate.

PRODUCER AND PRODUCTION IMPACTS OF BIOTECHNOLOGY-DERIVED HERBICIDE-RESISTANT CROPS PLANTED IN 2005. S. Sankula, National Center for Food and Agricultural Policy, Washington, DC.

ABSTRACT

The United States continued to lead the world in the adoption of biotechnology-derived crops in 2005 with about 123 million acres or 55% of the total global planted area (Figure 1). Planted acreage in 2005 was mainly concentrated in three commercialized applications (virus-resistance, herbicide-resistance, and insect-resistance or Bt) and eight crops (alfalfa, canola, corn, cotton, papaya, soybean, squash, and sweet corn). Approximately 93, 52, 79, 55, 88, and 12% of the total acreage of canola, corn, cotton, papaya, soybean and squash, respectively, was planted to biotechnology-derived varieties in the United States in 2005. Biotechnology-derived alfalfa and sweet corn were planted on a very minor acreage (<1%) in 2005.

Three earlier reports by the National Center for Food and Agricultural Policy entitled “Plant Biotechnology: Current and Potential Impact for Improving Pest Management in US Agriculture”, “Impact on US Agriculture of Biotechnology-Derived Crops Planted in 2003”, and “Biotechnology-Derived Crops Planted in 2004 – Impacts on US Agriculture” documented clear-cut benefits to growers in terms of improved crop yields, reduced production costs and reduced pesticide use due to planting of biotechnology-derived crops. This paper, part of a follow-up study that evaluated the crops planted in 2005, reports the findings on herbicide-resistant crops.

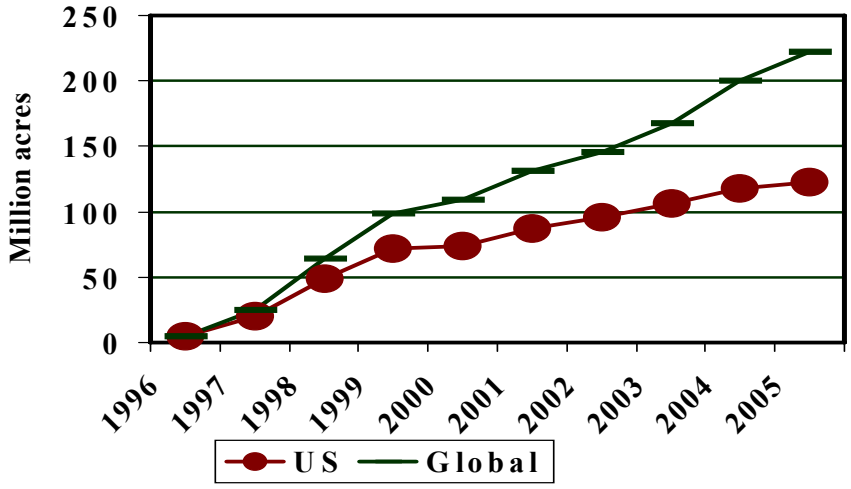
American growers planted five herbicide-resistant crops in 2005. They include alfalfa, canola, corn, cotton, and soybean. While soybean (88%), cotton (80%), and canola (93%) were most widely planted, herbicide-resistant corn (35%) has been adopted at a slightly slower pace. Herbicide-resistant alfalfa was planted on a minor acreage in 2005 due to low introductory seed supplies.

Herbicide-resistant crops led to greatest reduction in crop production costs and greatest increase in net economic impacts compared to insect/virus-resistant crops. Case studies of the 4 herbicide-resistant crops showed that growers saved $1.8 billion and reduced pesticide use by 55.4 million pounds in 2004. Preliminary data based on 2005 crop production information indicates that economic returns improved further coupled with further reduction in herbicide use.

Conservation tillage practices, no-till in particular, have increased significantly since the adoption of biotechnology-derived herbicide-tolerant crops. American growers planted 64, 20, and 371% more acres to no-till in soybean, corn, and cotton, respectively, in 2004, compared with years before their introduction.

American experience from the tenth year of planting biotechnology-derived herbicide-resistant crops revealed clear benefits to planting herbicide-resistant crops. American growers planted 105 million acres to biotechnology-derived herbicide-resistant crops in 2005 because improved weed control at lower cost improved their bottom lines.

Figure 1: Acreage planted to biotechnology-derived crops



A SIMPLE METHOD FOR CLEANING TUFTED WEED SEED. A. Senesac, Cornell Cooperative Extension, Riverhead, NY.

ABSTRACT

Weed scientists need supplies of clean weed seed to conduct efficacy studies. The seed must be clean for ease of overseeding and to remove debris harboring seed-eating insects and harmful diseases. There are several difficult to clean, yet important weed species that are tufted or pappus-bearing such as: common dandelion (*Taraxacum officinale*), common groundsel (*Senecio vulgaris*), northern willowherb (*Epilobium ciliatum*), American burnweed (*Erechtites hieracifolia*), and yellow goat's beard (*Tragopogon dubious*).

Three pieces of equipment are employed to remove the pappi from these seeds. Initially the seeds are placed in the 6-quart drum of an electric lapidary tumbler with 1 kilogram of common granite driveway gravel. The seeds are tumbled with the gravel for various periods depending on how tightly the pappi adhere to the seed. Careful attention is paid to the length of time that the seeds are tumbled to avoid damaging the seed. Several germinations tests have been performed on seed after cleaning indicating little or no loss of viability.

The seed is then sifted through a series of screens to remove as much detritus as possible. After this, the seed is passed through a small winnower based on a public domain design created by Allen Dong and Roger Edberg. The winnower is connected to a small variable-speed electric blower. The clean seed drops into a reservoir and the lighter chaff is blown upward and captured in a mesh container. The species with heavier seed such as dandelion and yellow goat's beard are more completely cleaned with this devise than the light seed of species like groundsel and willowherb.

INTERACTION OF BENSULIDE AND CARFENTRAZONE FOR MOSS CONTROL ON GOLF PUTTING GREENS. J.B. Willis, S.D. Askew, Virginia Tech, Blacksburg and J.S. McElroy, Univ. of Tennessee, Knoxville.

ABSTRACT

Carfentrazone was recently registered for moss control on creeping bentgrass (*Agrostis stolonifera*) putting greens. Previous results indicate that carfentrazone does not injure creeping bentgrass, however, reports from NC, TN, and VA blame carfentrazone for temporary injury to bentgrass putting greens. Putting greens had been previously treated with bensulide prior to carfentrazone treatment in several of these injury cases. Studies were conducted in Blacksburg, VA and Knoxville, TN to evaluate bensulide with carfentrazone applied in sequence to creeping bentgrass on USGA specification sand-based putting greens. The VA experiment is summarized below.

A split plot experimental design was used with three replications and a 3 by 8 factorial arrangement of treatments. Main plots were: bensulide at 6.25 lbs ai/A followed by bensulide at 6.25 lbs ai/A at a 14-day interval, bensulide at 12.5 lbs ai/A, and no bensulide. Subplots were carfentrazone applied 0, 1, 3, 7, 14, 21, and 28 days after bensulide (DAB), and no carfentrazone application. Bensulide applications were incorporated with irrigation immediately after application and all carfentrazone applications included 0.25% nonionic surfactant.

Although creeping bentgrass in plots treated with bensulide alone was not injured, bensulide increased severity and duration of creeping bentgrass injury when carfentrazone was applied at 0, 1, and 3 days later. For example, carfentrazone applied 0, 1, and 3 days after either rate of bensulide injured creeping bentgrass on average 80, 91, and 18%, respectively 3 days after carfentrazone treatment (DAT) and 74, 82, and 34%, respectively 7 DAT. Creeping bentgrass injury was not greater than 12% 14 DAT from any treatment except carfentrazone applied 0 and 1 DAB, which injured creeping bentgrass 22 and 20%, respectively. Carfentrazone applied beyond 3 DAB did not significantly injure creeping bentgrass. Thus, from this single experiment we can tentatively conclude that carfentrazone treatment should be separated from bensulide treatment by at least 7 days.

An unexpected result of this experiment was creeping bentgrass injury by carfentrazone alone. When applied at 0 and 1 d after bensulide was applied to other plots, carfentrazone alone injured creeping bentgrass 53 and 78%, respectively 3 DAT and 32 and 60%, respectively, 7 DAT. These treatments did not significantly injure creeping bentgrass at 14 DAT or beyond and no other timing of carfentrazone alone injured creeping bentgrass. The general trend of more injury earlier in the study is suspicious, especially since no previous researchers had observed significant injury to creeping bentgrass from carfentrazone alone. All injury in this experiment consisted of a rapid desiccation that is similar in appearance to sun scorch. A rain event of 0.75 inches occurred 3 days prior to the 0 DAB carfentrazone treatment and the green was irrigated to incorporate the bensulide treatment 4 hours prior to the 0 DAB carfentrazone treatment. Consequently, the root zone was more saturated than normal at the 0 and 1 DAB timings and days were clear and sunny. We plan to continue this work by evaluating moisture and creeping bentgrass cultivar influence on injury due to carfentrazone.

EMERGENCE AND PERFORMANCE OF TWO SWALLOW-WORT SPECIES ON SOILS OF VARYING pH AND ORIGIN. L.C. Magidow, A. DiTommaso, Cornell Univ., Ithaca, NY, L. Milbrath, USDA-ARS U.S. Plant, Soil and Nutrition Laboratory, Ithaca, NY, and C.L. Mohler, Cornell Univ., Ithaca, NY.

ABSTRACT

Two alien vines, pale swallow-wort, (*Vincetoxicum rossicum*) and black swallow-wort (*V. nigrum*), are increasingly problematic invaders in the Northeastern U.S. and Southeastern Canada. These herbaceous perennial species aggressively colonize and rapidly dominate forest understories, old fields, rare alvar (shallow limestone barren) communities, and other native ecosystems throughout the region. Swallow-worts have been difficult to control by mechanical and chemical methods. In 2004, a biological control program was initiated by the USDA-ARS to supplement these approaches. The program will introduce insects and/or pathogens from the plants' native European ranges in order to suppress these weedy vines. To biologically control swallow-wort most effectively, we must understand what factors affect their current and potential distributions within North America. This experiment examines how two edaphic factors that may play a part in swallow-wort distribution, pH and soil type, affect the performance of these species. In this microplot field experiment, soil and seeds were collected from two locations in NY State that were heavily infested with either pale swallow-wort (Benson-Wassaic silt loam) or black swallow-wort (Hollis sandy loam) and then subject to the same field conditions in Ithaca, NY. The Each soil type was amended to attain three pH levels (original level, 4.5, and 8.0). The soil was then placed into drained pots, and in late fall of 2005 and 2006 swallow-wort seeds were scattered on the surface of the treated soil. Seedling emergence was monitored, plants were thinned to six per pot, and pots were weeded throughout the season. Before the first hard frost, plants and roots were harvested to determine above- and below-ground biomass. Preliminary data indicate greater emergence and establishment of both swallow-wort species at the higher pH levels and for both soil types. Surprisingly, some plants produced mature follicles during the first growing season. Data from the 2006 cohort of seeds will be collected at the end of the 2007 growing season. These data will also be compared to soil pH levels of sites with established swallow-wort species throughout NY State.

FLAZASULFURON: A POTENTIAL SOLUTION FOR SELECTIVE PERENNIAL RYEGRASS CONTROL IN CREEPING BENTGRASS. M.J. Goddard, S.D. Askew, J.B. Willis, Virginia Tech, Blacksburg, and M.B. Grove, ISK BioSciences, Houston, TX.

ABSTRACT

Flazasulfuron is a product not yet registered in the US under evaluation for control of broadleaf and some grassy weeds in bermudagrass (*Cynodon dactylon*) and zoysiagrass (*Zoysia japonica*). Previous studies have shown flazasulfuron controls perennial ryegrass (*Lolium perenne*) and fescues (*Festuca* spp.) quicker and more effectively than other sulfonylurea herbicides currently on the market. A study conducted in 2004 at Virginia Tech to determine the effectiveness of flazasulfuron for controlling creeping bentgrass (*Agrostis stolonifera*) in Kentucky bluegrass (*Poa pratensis*) resulted in greater injury of Kentucky bluegrass than of creeping bentgrass. Since flazasulfuron effectively controls perennial ryegrass, even a relatively low use rates, it could become the first herbicide for selective perennial ryegrass control in creeping bentgrass.

The study was conducted at three locations on L93 creeping bentgrass at Virginia Tech's Glade Road Research Facility and the Turfgrass Research Center in Blacksburg, VA. Herbicides included foliar applications of flazasulfuron (Flazasulfuron 25DF, ISK Biosciences) at 1 or 2 g ai/ha applied 2 or 3 times, 4 g ai/ha applied twice, and 9 g ai/ha applied once, bispyribac-sodium (Velocity™, Valent Professional Products) at 74 g ai/ha applied twice, and sulfosulfuron (Certainty™, Monsanto Company) at 13 g ai/ha applied twice. Ratings included perennial ryegrass control and creeping bentgrass injury.

Flazasulfuron caused slight but acceptable injury (< 21%) to the creeping bentgrass, and resulted in 100% perennial ryegrass control at or before the second application, regardless of rate. Bispyribac sodium resulted in a 49 and 74% control after two applications with less than 14% injury. Sulfosulfuron controlled 60 and 80% perennial ryegrass after three applications, but caused significantly greater injury than flazasulfuron or bispyribac sodium treatments. Unacceptable injury (>30%) to creeping bentgrass resulted after the first application of sulfosulfuron in one of the three trials. Partial perennial ryegrass control by bispyribac sodium and sulfosulfuron was unexpected and may be attributed to creeping bentgrass competition following treatment.

Flazasulfuron proved to be a safe and effective control method for perennial ryegrass in creeping bentgrass. Effects of flazasulfuron on creeping bentgrass were equivalent to that of bispyribac sodium and sulfosulfuron. Further research to determine the best rates to reduce bentgrass injury and retain effectiveness is warranted.

CARFENTRAZONE AND QUINCLORAC FOR WEED CONTROL DURING TURFGRASS ESTABLISHMENT. B.W. Compton, J.B. Willis, and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Seeded bermudagrass varieties are currently used by fine turf managers on fairways, athletic fields, and home lawns. Yukon bermudagrass is one example of a seeded bermudagrass chosen primarily for its cold hardiness. As in any turfgrass establishment situation weeds are among the greatest limiting factors. Therefore, research is needed on weed control options during establishment of seeded bermudagrasses.

A study was conducted on Yukon bermudagrass at Virginia Tech's Glade Road Research Facility in Blacksburg, VA to evaluate weed control and bermudagrass seedling response to several herbicides applied before the first mowing. Treatments included bromoxynil (0.5 lb ai/A), bentazon (1 lb ai/A), carfentrazone (0.0156 lb ai/A), quinclorac (0.375 lb ai/A), MSMA (1.5 lb ai/A) followed by MSMA (1.5 lb ai/A), primisulfuron (0.0234 lb ai/A), triasulfuron (5 g ai/A), prosulfuron (10 g ai/A), metsulfuron (8.5 g ai/A), foramsulfuron (11.9 g ai/A), sulfosulfuron (13.6 g ai/A), halosulfuron (21.3 g ai/A), V-10142 (0.75 lb ai/A), sulfentrazone (0.25 lb ai/A), Q4™ (1.35 lb ai/A), carfentrazone (0.0156 lb ai/A) + quinclorac (0.375 lb ai/A), carfentrazone (0.0156 lb ai/A) + MSMA (1.5 lb ai/A) followed by carfentrazone (0.0156 lb ai/A) + MSMA (1.5 lb ai/A), sulfentrazone (0.545 lb ai/A), and a nontreated check. Ratings included bermudagrass cover, and visually estimated control of giant foxtail (*Setaria faberi*), yellow foxtail (*Setaria glauca*), Pennsylvania smartweed (*Polygonum pensylvanicum)*, eastern black nightshade (*Solanum ptycanthum)*, carpetweed (*Mollugo verticillata)*, common lambsquarters (*Chenopodium album)*, broadleaf dock (*Rumex crispus)*, hairy galinsoga (*Galinsoga ciliate)*, and large crabgrass (*Digitaria sanguinalis)* seedlings. Final ratings included an overall assessment of broadleaf and grassy weeds and bermudagrass cover. Treatments with carfentrazone + quinclorac and carfentrazone + MSMA controlled a broad spectrum of weeds and resulted in over 80% bermudagrass coverage, and less than 5% broadleaf weeds and 15% grassy weeds, 10 WAIT. MSMA, Q4™, and foramsulfuron single applications had 62, 77, and 65% bermudagrass cover, respectively, 10 WAIT. All other treatments resulted in less than 50% bermudagrass cover at the final rating, predominately due to weed infestation.

FENARIMOL TOLERANCE OF AN ANNUAL BLUEGRASS BIOTYPE. G.M. Henry, A.C. Hixson, and F.H. Yelverton, North Carolina State Univ., Raleigh.

ABSTRACT

Annual bluegrass (*Poa annua* L.) is one of the most problematic weed species in high maintenance turfgrass. Its lime green color contrasts that of desired turfgrass species, giving the turf a blotchy, mottled appearance and disrupting the overall color uniformity. Fenarimol (Rubigan™ A.S. Turf and Ornamental) is a highly effective locally systemic fungicide that is labeled for the control of a number of economically important turfgrass diseases. However, fenarimol is also labeled for the control of *Poa annua* in overseeded bermudagrass greens and tees, tall fescue, and Kentucky bluegrass. Annual bluegrass is adaptable to many environments. Its genetic diversity varies widely, differing in populations occurring over as little as a 3 m^2 area. Broad genetic diversity plus the selection pressure of a single herbicide family over time contribute to the potential for herbicide tolerance. A suspected tolerant *Poa annua* population had been treated with fenarimol during the onset of winter dormancy in bermudagrass for the past six consecutive years at the Desert Mountain Golf Club in Scottsdale, AR. After investigating application practices, application dates, and cultural methods, the suspected fenarimol tolerant *Poa annua* biotype was collected in the spring of 2004. Plants were obtained from the tees of several different holes and transplanted into the greenhouse and grown to maturity. Mature seeds were removed from the plants as they ripened and placed in storage. Dose-response experiments were conducted to determine the level of tolerance of the collected biotype and a susceptible biotype to fenarimol. Ten seedlings with a root length of at least 4 mm were placed on a Petri dish containing 25 ml of herbicide agar solution and incubated for 7 days in the growth chamber at 15/25 C on a 10-hr photoperiod. Fenarimol assay concentrations consisted of a non-treated check and 0.125, 0.25, 0.5, 1, 2, 4, 8, 16, and 32 mmol treatments. Each treatment was replicated four times and randomized in the growth chamber to account for confounding factors. Shoot and root length measurements (mm) were taken at 0, 3, and 7 days after seedling transfer to agar plates. Data were subjected to analysis of variance and tested for goodness of fit to linear and quadratic functions. Dose-response curves suggest that the tolerant *Poa annua* biotype was less sensitive to fenarimol than the susceptible biotype. A 4-6-fold increase in tolerance to fenarimol was observed when comparing *Poa annua* root growth to the susceptible biotype at the three highest fenarimol assay concentrations 3 and 7 days after seedling transfer to the agar plates. The presence of fenarimol tolerant *Poa annua*, in addition to previously documented biotypes tolerant to several herbicide classes, may indicate a need for the integration of resistance management into golf course management practices.

2006 NEWSS SUMMER WEED CONTEST RESULTS. P.L. Rardon, G.R. Armel, D.R. Vincent, L.F. Houck, and M.C. McComrick, DuPont Crop Protection, Newark, DE.

ABSTRACT

Results of the 2006 NEWSS Summer Weed Science contest are presented with highlights of the competition from the 11 graduate level and 5 undergraduate level teams. Photographs of the competitors and various problems are displayed.

COMPARING SELECTED HERBICIDES TO METHYL BROMIDE FOR WEED CONTROL IN THREE HERBACEOUS PERENNIALS.

D.A. Little, M.W. Marshall, Michigan State Univ., East Lansing, R.J. Richardson, North Carolina State Univ., Raleigh, and B.H. Zandstra, Michigan State Univ., East Lansing.

ABSTRACT

The methyl-bromide (MeBr) phase-out has reduced the ability of ornamental growers to adequately control weeds. In 2004 and 2005, a field study was conducted at the Michigan State University Southwest Research and Extension Center located near Benton Harbor to evaluate herbicides as alternatives to MeBr in nursery production. In early June 2004, a standard treatment of MeBr:chloropicrin (98:2) was applied at a rate of 392 kg/ha. Treatments tested were granular flumioxazin (0.28 kg/ha), granular oxadiazon (2.24 kg/ha), isoxaben (1.12 kg/ha), dithiopyr (0.28 kg/ha), metolachlor (1.68 kg/ha), granular pendimethalin (1.4 kg/ha) plus granular oxadiazon, isoxaben plus oryzalin, isoxaben plus dithiopyr, isoxaben plus metolachlor, and an untreated control. Herbicide treatments were applied in mid-June in 2004 and 2005. Perennials evaluated were bugleweed (*Ajuga reptans*), periwinkle (*Vinca minor*), and daylily (*Hemerocallis* spp.). Weeds present included common ragweed (*Ambrosia artemisiifolia*), common lambsquarters (*Chenopodium album*), large crabgrass (*Digitaria sanguinalis*), and carpetweed (*Mollugo verticillata*). Crop injury and weed control were visually rated on a 0-100% scale, with 0% equal to no crop injury or no weed control and 100% equal to complete crop death or weed control. Visual ratings were made monthly for up to four months. Perennial plant size measurements were collected at the end of each growing season. Flumioxazin and isoxaben plus oryzalin were the only treatments to provide better than 60% control of common ragweed, common lambsquarters, large crabgrass, and carpetweed. However, flumioxazin cause visual injury up to 30, 13, and 23% and plant size reductions of up to 67, 25, and 20% on bugleweed, periwinkle and daylily, respectively. Isoxaben plus oryzalin caused visual injury up to 35, 5 and 6% and plant size reductions of up to 44, 43, and 0% on bugleweed, periwinkle and daylily, respectively. Isoxaben plus dithiopyr was the only treatment not significantly different from MeBr across all rating dates for visual injury, plant size, and weed control.

INVASIVE AQUATIC WEEDS IN NORTH CAROLINA. R.J. Richardson, A.P. Gardner, S.T. Hoyle, and A.M. West, North Carolina State Univ., Raleigh, NC.

ABSTRACT

Several invasive aquatic weeds have become established in North Carolina. Notable species include hydrilla (*Hydrilla verticillata* (L.f.) Royle), Brazilian elodea (*Egeria densa* Planch.), Eurasian watermilfoil (*Myriophyllum spicatum* L.), brittle naiad (*Najas minor* All.), parrot feather (*Myriophyllum aquaticum* (Vell.) Verdc.), water hyacinth (*Eichhornia crassipes* (Mart.) Solms), water lettuce (*Pistia stratiotes* L.), giant salvinia (*Salvinia molesta* Mitchell), alligatorweed (*Alternanthera philoxeroides* (Mart.) Griseb.), and creeping water primrose ([*Ludwigia grandiflora* (M. Micheli) Greuter & Burdet). *Hydrilla* may be found in most piedmont counties, but is sporadic in tidewater and mountain counties. Approximately 4,000 acres of *Hydrilla* can be found in Lake Gaston alone. Brazilian elodea is distributed intermittently throughout the entire state. Eurasian watermilfoil can be found in Lake Gaston (VA and NC) and down the Roanoke River and adjacent counties to the Albemarle Sound. Brittle naiad is infrequently distributed among at least 13 counties. Parrot feather is widely distributed throughout much of the state. Water hyacinth is currently in 10 counties, mainly in southeastern North Carolina. Giant salvinia and water lettuce are limited to the Wilmington area and current infestations of both weeds are not believed to be more than 10 acres. Alligatorweed is widely distributed throughout eastern North Carolina and may be found sporadically in the piedmont.

WEED PROPAGATION TECHNIQUES FOR USE IN DISCOVERING NEW HERBICIDES FOR TURF. M.S. Casini, L.F. Houck, G.R. Armel, and P.L. Rardon, DuPont Crop Protection, Newark, DE.

ABSTRACT

Plant propagation techniques were investigated at the DuPont Stine-Haskell Research Center in Newark, DE over the past several years to establish a means for optimizing targeted plant species growth for herbicide screening on key turfgrass weed species. Highly reproducible propagation techniques for difficult to grow species have been integrated into our screening methods in an effort to enhance the quality of data generated via whole plant testing. Such methods aid in the elimination of plant growth variability, making it easier for the evaluating biologist to discern true differences in plant responses. Propagation techniques employed include seed soaks, chemical scarification and vegetative reproduction. Target species investigated included: wild violet (*Viola papilionacea* Pursh p.p.), wild garlic (*Allium vineale* L.), buckhorn plantain (*Plantago lanceolata* L.), ivyleaf speedwell (*Veronica hederifolia* L.), dollarweed (*Hydrocotyle umbellata* L.), torpedo grass (*Panicum repens* L.) and green kyllinga (*Kyllinga brevifolia* Rottb).

AMMONIUM PELARGONATE AS A BIOHERBICIDE FOR PEPPER ROW MIDDLES.

B.A. Scott and M.J. VanGessel, Univ. of Delaware, Georgetown.

ABSTRACT

Weed control in the area between rows of plastic is critical for maximum yield of fruit and vegetables in plasticulture. A non-selective herbicide plus residual herbicides are often used to control existing vegetation in "row middles". Since bioherbicides are non-selective, their utility in plasticulture for this use needs to be investigated. A study was established to determine the efficacy of ammonium pelargonate for weed control in peppers grown with black plastic and to determine the necessity of residual herbicides. This study was arranged as a randomized complete block with four replications. Treatments consisted of ammonium pelargonate or pelargonic acid applied alone or with residual herbicides (halosulfuron and metolachlor) applied 3 weeks after pepper transplant (WAPT). Ammonium pelargonate plus clethodim was also applied at 3 WAPT. Also, ammonium pelargonate was applied alone at 2, 3, or 4-week intervals. A treatment of paraquat applied at 3-week intervals, a weed free, and an untreated check were included for comparisons. Treatments were applied at 327 l/ha. Weed heights were measured prior to individual treatment applications, and pepper injury was evaluated after each application. Weed control ratings were noted at 4, 8, and 10 WAPT. Pepper harvest was based on the maturation of the weed-free check, and treatments were harvested at 8 and 11 WAPT.

Addition of residuals herbicides to a single application of ammonium pelargonate resulted in a significant improvement in weed control and increased yield as compared to a single application of ammonium pelargonate alone. Antagonism did not result from the addition of clethodim. Ammonium pelargonate applied at 2-week intervals resulted in increased broadleaf control and increased yield as compared to the 3 and 4-week interval treatments. Although overall weed control was greater with the 3-week interval paraquat treatment than the 2-week interval ammonium pelargonate treatment, yields did not differ.

Applications of ammonium pelargonate applied at 2-week intervals or a single application of ammonium pelargonate with residual herbicides is needed in order to provide effective weed control and prevent yield loss. Grass control with the bioherbicides alone is minimal unless multiple applications are used.

BROCCOLI AND EDAMAME RESPONSES TO VINEGAR APPLICATION FOR WEED MANAGEMENT. C.B. Coffman, J. Radhakrishnan, and J.R. Teasdale, USDA-ARS, Beltsville, MD.

ABSTRACT

Cole crops and brassicas are commonly grown by small conventional and organic farmers in the U. S. Broccoli (*Brassica oleracea* L. var. *italica*) is popular at farmers' markets and subscribers to CSAs, thus it is an important source of farm income. In the mid-Atlantic region, broccoli is usually grown as a spring or fall crop, and weeds are usually abundant and competitive unless successful management systems have been utilized. Edamame (*Glycine max* L.) is a summer field crop often grown using organic methods for weed management. Vinegar application has been investigated as a method for weed management in edamame for several years on an organic farm in Buckeystown, MD. Fall broccoli response to vinegar applications was investigated at the Beltsville Agricultural research Center in 2006. The objective of this project was to evaluate crop responses to basal applications of 20% acetic acid vinegar for within-row weed control. Edamame (var. 'Mooncake') was sown on 27 May 2006 at a rate of 170,000 seeds/A in 36-inch rows. Experimental plots consisted of three 20-foot rows with the center row being the treated portion of the plot. Treatments were (1) vinegar applications to within-row weeds at the base of the crop plants, (2) unweeded control, and (3) hand-weeded control. Treatments were replicated 4 times and were randomly placed throughout the field. Vinegar applications were made on 31 July 2006 using a hand sprayer. Vinegar was applied to weeds to achieve complete coverage until runoff. Crop plants were 21-31 inches high when treatments were applied. Weeds between rows were controlled by cultivation. Weeds in the hand-weeded control were removed two times during the growing season. Treatments were visually rated and harvested 25 September 2006. There were no significant differences in visual ratings among treatments. Total biomass and grain yields will be determined. Broccoli (var. 'Packman') transplants were placed 18 inches apart in 5-foot rows in a clean, cultivated field on 8 August 2006. Experimental plots consisted of three 20-foot rows with the center row being the treated portion of the plot. Treatments were the same as those in the edamame investigation. Treatments were replicated 4 times and randomly arranged in the field. Vinegar applications were made on 31 August 2006 to the basal portion of the crop plants. Broccoli plants treated with vinegar showed diminished leaf turgor compared to the non-vinegar treated plants within 30 min of application. Weeds between rows were removed via cultivation. Visual rating and crop harvest occurred on 3 October 2006. Heads were cut to a length of 7 inches and fresh weights recorded. Plants treated with vinegar did not differ in size from plants in the controls, although the lower leaves were chlorotic. Broccoli head counts were 8% higher than the unweeded controls and equivalent to the hand weeded treatment. However, total head weights and mean individual head weights were 25 and 30% lower for the vinegar treatments than for the hand weeded and unweeded controls, respectively.

TRINEXAPAC-ETHYL INFLUENCES EFFICACY AND FOLIAR ABSORPTION OF BISPYRIBAC-SODIUM. P. McCullough and S. Hart, Rutgers Univ., New Brunswick, NJ.

ABSTRACT

Bispyribac-sodium (BS) selectively controls annual bluegrass in cool-season turf but efficacy may be influenced by management practices, such as plant growth regulator (PGR) use. Experiments were conducted in New Jersey to investigate efficacy and absorption of BS applied with a PGR, trinexapac-ethyl (TE), for annual bluegrass control and creeping bentgrass tolerance. In laboratory experiments with annual bluegrass, creeping bentgrass, and perennial ryegrass, tank mixing TE with 14C-BS increased foliar absorption 43% from non-TE treated while absorption quadratically increased with TE rate. Differences in 14C-BS were not detected among emulsifiable concentration (EC), microencapsulated concentration (MC), and wettable powder (WP) TE formulations. In field experiments, two BS applications at 111 g ai/ha reduced annual bluegrass cover 93% from non-BS treated. TE applied before plus tank-mixed with BS averaged 67% greater annual bluegrass control than non-TE treated and reduced creeping bentgrass chlorosis up to 15% from BS alone. Tank mixing EC, MC, or WP TE formulations with BS provided similar annual bluegrass control and creeping bentgrass quality. Applications of BS reduced dollar spot (DS) cover 63% from non-BS treated over both years while TE reduced DS cover 50% from non-TE treated in 2005. Overall, regular TE use appears to have beneficial effects with BS for mitigating creeping bentgrass chlorosis, DS control, and improving efficacy for annual bluegrass by increasing foliar absorption.

DOES BT CORN BENEFIT FARMERS IN MAINE: A ONE-YEAR, TWO LOCATION EVALUATION. J.M. Jemison, Jr., L. Titus and M. Titus, Univ. of Maine, Orono.

ABSTRACT

In 1998, the Maine Board of Pesticides Control voted to not accept a petition to allow *Bacillus thuringiensis* (Bt) corn to be grown in Maine. Reasons for this decision included: 1) no insecticidal spraying was being done for corn borer control in silage corn; 2) concern over Bt resistance issues; and 3) lack of local data to support the need for these hybrids. With renewed interest from dairy producers and new Bt events coming into the market, we evaluated three hybrids (with and without the Bt gene) compared to a silage blend at two locations in Maine to provide growers and state decision makers with information on the cost and benefits of these new lines. One location was a field that had been in continuous corn for over ten years, and the other field had been in corn the previous year, but was regularly rotated with potatoes.

Study hybrids included Golden Harvest H6395 and H6466 CB/GT, Monsanto DK440 and DK4442Bt, Pioneer 38H67 and 38H64Bt, and a Pioneer silage blend (37D02). The Pioneer Bt line provided corn borer and cut worm control. The other two lines had corn borer control. No lines selected provided activity against root worms. Data collected included population, cutworm damage, insect damage (stalk, leaf, and tassle), yield, silage quality and mycotoxin levels in silage. Corn was planted at both sites on 31 May 2006. Harvest was taken on 18 September 2006 on the rotated field and 25 September 2006 on the continuous corn field.

Insect pressure at both locations was light to moderate. We found significantly higher cutworm (and apparent cutworm) activity in the continuous corn field compared to the field in rotation with potatoes. However, mortality in the most heavily impacted hybrids was less than 2.5 percent of that planted, and this damage did not affect yield. Across locations, there was significantly less insect feeding damage in the leaf or the stalk with the hybrids containing Bt (Table 1). We found leaf miner, northern corn root worm adults, and corn borer insects during our evaluations. There was significantly higher overall insect pressure in the rotated field compared to the continuous corn field.

Yields of Bt isolines across locations were not significantly higher that the non Bt isolines. Yields were significantly higher in the rotated corn field likely due to apparently higher fertility. Maturity of the Pioneer and DeKalb hybrids were significantly longer than the Golden Harvest hybrids which likely affected overall corn silage yield and quality. If Bt corn is approved for use in the state, Maine producers should consider lines that are shorter in maturity to match the typical growing season climate. Despite the significantly reduced insect pressure likely caused by the presence of Bt, we did not find silage with significantly reduced levels of vomitoxin. Grain corn growers have typically found yield benefit with Bt lines in years with significant corn borer pressure, but silage corn growers have seen less benefit (Ma and Subedi, 2005). A potential secondary benefit could be improved silage mycotoxin levels (Wu, 2006). However, we found no significant improvement in Bt isoline silage quality.

Table 1. Insect feeding damage, yield, and silage toxin levels as affected by hybrid.

Hybrid	CBL (#/1000 ft row)	CBS (#/1000 ft row)	CBT (#/1000 ft row)	Yield 30% DM	Vomitoxin
H6466cb/gt	7.2	0.9	0.6	19.8	0.5
H6395	12.8	3.5	0.5	19.2	0.6
DK4442bt	17.9	0.9	0.1	17.4	1.3
DK440	23.9	5.2	1.2	17.0	0.5
38H64bt	3.9	0.1	0.0	17.9	0.5
38H67	10.0	4.4	0.3	19.1	2.1
37D02	8.6	3.7	1.2	18.4	0.5
LSD (0.05)	3.8	3.6	NS	2.5	NS

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POSTEMERGENCE ANNUAL GRASS CONTROL IN CORN WITH HPPD INHIBITORS. R.R. Hahn and P.J. Stachowski, Cornell Univ., Ithaca, NY.

ABSTRACT

Postemergence (POST) activity of mesotrione, tembotrione, and topramezone was evaluated for giant foxtail (*Setaria faberi* Herrm.) and large crabgrass (*Digitaria sanguinalis* (L.) Scop.) control in corn (*Zea mays* L.). Previous research showed that mesotrione has significant POST activity on large crabgrass but little activity on giant foxtail. POST activity of topramezone on giant foxtail was observed in 2005 near Aurora, NY. Due to inadequate rainfall, giant foxtail was not controlled with preemergence (PRE) applications that were to be followed by POST applications of mesotrione or topramezone. PRE applications of 1.43 lb ai/A of metolachlor controlled only 60% of the giant foxtail. When PRE metolachlor applications were followed by POST applications of 0.094 lb ai/A of mesotrione or 0.016 lb ai/A of topramezone in combinations with 0.5 lb ai/A of atrazine and appropriate adjuvants, these POST applications controlled 87 and 99% of the giant foxtail respectively. These PRE followed by POST treatments averaged 130 bu/A of corn compared with 81 and 100 bu/A for the untreated check and PRE metolachlor treatment respectively. An experiment established in 2006 near Aurora compared POST applications of 0.094 lb/A of mesotrione, 0.123 lb ai/A of tembotrione, and 0.016 lb/A of topramezone with 0.56 oz ai/A of a nicosulfuron/rimsulfuron premix. Each of these POST treatments included 0.5 lb/A of atrazine plus appropriate adjuvants. Applications were made when giant foxtail was 3 inches tall. Tembotrione, topramezone, and nicosulfuron/rimsulfuron treatments each controlled >95% of the giant foxtail while mesotrione only controlled about 20%. Other treatments demonstrated the activity of tembotrione and topramezone for giant foxtail control in POST combinations with 1.43 lb ai/A of pendimethalin plus 1 lb/A of atrazine. When applied alone, pendimethalin plus atrazine controlled less than 20% of the giant foxtail. When the pendimethalin plus atrazine combination was tank mixed with tembotrione or topramezone, giant foxtail control was 99%. An experiment was also established in 2006 near Valatie, NY in a field with good large crabgrass pressure. Early postemergence (EPOST) applications were made when corn was in the V2 stage of development and large crabgrass was less than 0.5 inch tall. When the three HPPD inhibitor herbicides were applied following PRE application of 0.5X rate of metolachlor, large crabgrass control 3 and 9 weeks after treatment (WAT) averaged 98 and 90% respectively. These PRE followed by EPOST treatments produced an average of 120 bu/A of corn. When applied EPOST in combinations with 0.5 lb/A of atrazine and appropriate adjuvants, large crabgrass control 3 WAT was 97% with 0.094 lb/A of mesotrione or 0.123 lb/A of tembotrione, while 0.016 lb/A of topramezone controlled 90% of the crabgrass. Control declined to 60% with mesotrione and tembotrione, and to 45% with topramezone by 9 WAT. Large crabgrass control with 0.56 oz/A of nicosulfuron/rimsulfuron plus 0.5 lb/A of atrazine was 65% 9 WAT. These EPOST treatments produced an average of 120 bu/A of corn while the untreated check produced 80 bu/A.

WEED CONTROL WITH TOPRAMEZONE PROGRAMS IN CORN. W.B. O'Neal, R.M. Porter, P.D. Vaculin and J.E. Orr, AMVAC Chemical Corporation, Newport Beach, CA.

ABSTRACT

Topramezone is a 4-HPPD inhibitor herbicide for postemergence weed control in corn (*Zea mays* L.). Topramezone is effective against many broadleaf weed species, and also active against several grass weed species common to US and Canadian corn production. Field research trials were conducted to study tank mix combinations of topramezone with other postemergence herbicides in corn. Topramezone used in these studies was formulated in a 2.8 lb/gallon suspension concentrate. Combination programs were studied with products offering different modes of action including acetolactate synthase, EPSP synthase and photosystem II inhibitors. Topramezone was evaluated at rates of 0.011 to 0.016 lb/A with full and reduced rates of companion products. These trials have demonstrated practical utility of these combinations for enhancement of performance against a broader spectrum of weed species. By encompassing more than a single mode of action, these combination programs can also reduce selection pressure for resistant weed biotypes.

THE IMPACT OF CULTIVATION TIMING AND INCREASED PLANT POPULATION DENSITY ON WEED CONTROL IN ORGANIC SOYBEANS. S.C. Reberg-Horton, North Carolina State Univ., Raleigh.

ABSTRACT

Weed management remains one of the most challenging aspects of organic crop production. This study was undertaken with the help of organic soybean farmers to examine the effectiveness of the most common weed management tools on their farms: stale seed bedding, blind cultivation and increased seeding rates. In one experiment, soybean seeding rates of 187,500, 312,500, 437,500, and 562,500 were planted under organic and conventional weed management. Plots were arranged in a split-plot design with weed management systems serving as the main plot factor and seeding rate as the subplot factor with six replications. The largely grass weed community in Plymouth, North Carolina, did not show a significant response to soybean seeding rate in the organically managed plots. The pigweed dominated community in Goldsboro, North Carolina, however, showed a marked response. Pigweed densities decreased linearly with increased seeding rate from a high of 4.0 end-of-season plants m^{-2} to a low of 1.3 plants m^{-2}.

A second experiment combined stale seed bedding, accomplished with pre-plant passes of a rotary hoe, with post-plant use of a rotary hoe. The plots were arranged in a split-block design with six replications. Three levels of stale seed beds were implemented: four weeks, two weeks and zero weeks of pre-plant cultivation. Five levels of blind cultivation were used: zero, one, two, three and four passes with a rotary hoe after planting. In all treatments, rotary hoe frequency was approximately once every 5 days. Post-plant rotary hoe use was far more effective in reducing weed populations at both locations than pre-plant passes. No detectable differences among pre-plant treatments were present at Goldsboro. Post-plant cultivation frequency was inversely related to percent weed cover, ranging from a high of 30% to a low of 13%. In Plymouth, the pattern was similar with a high of 53% cover to a low of 2.9% cover. Pre-plant cultivations had an appreciable impact in Plymouth when no post-plant cultivations were used, but were considerably less effective than a single pass of the rotary hoe after planting. While increasing the number of cultivation passes resulted in better weed control, returns on investment decreased rapidly. Overall, increased seeding rates and multiple passes with a rotary hoe after planting exhibited the highest returns to farmers.

ROTARY HOE EFFICACY IN CORN: INFLUENCE OF SOIL TYPE AND MOISTURE.

M.G. Burton, C. Reberg-Horton, G.T. Place, and S.T. Hoyle, North Carolina State Univ., Raleigh.

ABSTRACT

Early season in-row (within 10 cm of crop row) weed control in corn was evaluated at two locations in 2006. Factors in the study included the different soil types (sand vs. loam) at the Sandhills (Jackson Springs, NC) and Cunningham (Kinston, NC) Research Stations, and moisture. The experiment was established in a stripped-plot design with irrigation level (none, 1.25 cm and 2.5 cm rainfall equivalent) in stripped plots and rotary hoe frequency in subplots. Rotary hoe frequency treatments included: None, 5, 5+12, 12+19, and 5+12+19 DAP. Three weeks after the conclusion of the 19 DAP rotary hoe treatment, counts of surviving weeds within 10 cm of the crop row were counted and identified by species (these weeds were considered likely to escape cultivator sweeps in subsequent cultivation passes with different equipment. The HADSS computer program was used to calculate potential yield loss using this species and density data. No interaction was observed between soil moisture and rotary hoe treatments at either location. Soil moisture level did not affect corn stand at either location. Corn stand was reduced (5%) by multiple rotary hoe passes only at the Cunningham farm. Weed density was affected by soil moisture only at the Sandhills location, where dry conditions resulted in lower weed emergence in the low moisture treatment ($p=0.02$). Weed density was reduced at both locations by multiple passes of the rotary hoe, and at the Sandhills location by a single pass (5 DAP) ($p<0.01$). Yield loss estimated by HADSS did not differ among treatments at the Sandhills farm ($p=0.88$) where weed density was very low. However, at the Cunningham farm weed densities were higher and multiple rotary hoe passes resulted in decreased estimated yield loss ($p=0.04$). Our results are consistent with common recommendations for multiple rotary hoe passes for maximum weed control.

EFFECTIVENESS OF A ROLLER/CRIMPER FOR CONTROL OF WINTER ANNUAL COVER CROPS. W. Curran, S. Mirsky, and M. Ryan, The Pennsylvania State Univ., University Park.

ABSTRACT

Cover crop roller/crimpers are increasing in popularity. In 2005, Penn State University constructed a roller/crimper designed after a Rodale Institute prototype. Over the last two years, several experiments have investigated the effectiveness of the roller/crimper for control of winter annual cover crops. Most of the efforts at Penn State have focused on cereal rye control as influenced by planting date in the fall and termination date in the spring. In 2006, additional trials examined reduced rates of herbicide in combination with the roller/crimper for control of both cereal rye (*Secale cereale*) and hairy vetch (*Vicia villosa*). Glyphosate was examined in cereal rye and 2,4-D was used in the hairy vetch trial. A third experiment in 2006 examined the effectiveness of the roller/crimper for control of winter rape (*Brassica napus*) alone and in combination with glyphosate. In the rape experiment, two application timings based on cover crop growth stage were examined. In all experiments, either Roundup Ready corn or soybean was no-till planted shortly after rolling the cover crops and glyphosate was used for in-season weed control.

The results of the cereal rye experiment showed that the roller treatment alone only provided about 50% control of the cover crop. The rye was just beginning to head and not yet susceptible to control with rolling alone. The combination of glyphosate applied at either 0.093 lb ae/A (1/8X) or 0.1875 lb/A (1/4X) with rolling provided 85% and 94% rye control, respectively 14 days after application. The reduced rates of glyphosate alone provided 67 and 89% control. In the hairy vetch trial, rolling alone provided about 75% control of the hairy vetch and the addition of 2,4-D LVE increased control to over 90%. Again, the hairy vetch was just beginning to flower and not completely susceptible to control from rolling alone. Hairy vetch is very susceptible to 2,4-D and application of 0.25 lb ae/A provided effective control regardless of the roller treatment. Finally, rolling winter rape alone at either the early or mid flowering stages of growth was not very effective for control and a full rate of glyphosate (0.75 lb/A) was necessary to achieve greater than 85% control. Glyphosate applied at 0.375 lb/A provided about 80% winter rape control.

The results of this research show that reduced rate herbicide programs combined with roller/crimper technology can be more effective for control of certain cover crops such as cereal rye than either tactic alone. For other cover crops such as hairy vetch and winter rape, the roller/crimper is less effective for control and will require alternative tactics or strategies for effective control prior to establishing a cash crop.

ALFALFA/GRASS FORAGE MIXTURES USING GLYPHOSATE-RESISTANT ALFALFA.

B.L. Dillehay, W.S. Curran, M.H. Hall, and D.A. Mortensen, The Pennsylvania State Univ., University Park.

ABSTRACT

Alfalfa/grass mixtures are popular forages that are well adapted to the cool climates of the northern United States. The addition of a grass to an alfalfa (*Medicago sativa* L.) crop in this region aids in weed management, winter survival, and forage yield, among other variables. During establishment, few herbicides are labeled for control of weeds in alfalfa/grass mixtures. Although some selective herbicides safely control broadleaf weeds in alfalfa/grass mixtures, choices are limited due to the lack of labeled products. In addition, nothing is available to control grassy weeds in seedling alfalfa/grass forage mixtures. Glyphosate-resistant Roundup Ready alfalfa became commercially available in late summer 2005. This technology offers unprecedented weed control and crop safety in pure alfalfa stands, but may benefit alfalfa/grass forage stands as well. The objective of this research was to evaluate the potential use of glyphosate for weed control in seedling Roundup Ready alfalfa/grass mixtures. By varying the planting date of the grass in relation to alfalfa planting and a glyphosate application, the potential for good weed control exists. In treatments that included herbicide application, glyphosate was applied 4 weeks after alfalfa planting. Orchardgrass (*Dactylis glomerata* L.) was seeded into the alfalfa at 3 different times; seeded with the alfalfa, seeded 4 weeks after alfalfa, and seeded 5 weeks after alfalfa. All of the treatments included an untreated check. In alfalfa/grass mixtures not treated with glyphosate, alfalfa and orchardgrass dry matter was lower, and weed dry matter was higher than the respective treatments that included a postemergence glyphosate application. Preliminary results suggest that the trends for increased alfalfa and orchardgrass, and decreased weed dry matter in the later seeded glyphosate applications appear to persist into the second year. Initial observations show that Roundup Ready alfalfa could be a successful addition to weed management for alfalfa/grass mixtures.

IMPROVING ELECTRONIC MANUSCRIPT REVIEW: NEW TECHNOLOGIES MAKE IT FASTER, EASIER, AND MORE BENEFICIAL. M.G. Burton and J.W. Wilcut, North Carolina State Univ., Raleigh.

ABSTRACT

Editors and reviewers alike have been frustrated in recent years by the increased time required to translate and type editorial remarks for web-based publication and editing systems. Not surprisingly, authors and associate editors frequently note that reviews are of reduced quality, and the consequential increase in the responsibility placed upon associate editors. Portable computer and software technologies have now advanced sufficiently to allow on-screen review and editing of manuscripts and galley proofs. "Tablet" personal notebook computers (Tablet PCs) and software systems (e.g. Windows Journal or Adobe Acrobat 7.0 or 8.0) allow a reviewer to make editorial corrections directly on the manuscript with a stylus (or by typing). Authors ultimately receive an electronically annotated version of their manuscript in a file type that can be viewed with a web-browser or other free software (e.g. Adobe Reader 7.0). The reviewer benefits from having the ability to make simple or complex editorial suggestions with the stroke of a “pen”, fewer forgotten comments during translation and typing remarks to the author, and from time savings. Authors and associate editors benefit from more complete reviewer remarks, which appear directly on the manuscript (as with “old school” pen and paper manuscript reviews). The publisher continues to benefit from reduced costs associated with postage and paper handling/storage. In summary, the new approach to manuscript and galley proof editing affords a continuation of all of the benefits of the current web-based system, and offers the opportunity to improve upon the speed, simplicity, and clarity of the reviewer's efforts on behalf of the author. Planned improvements to the web-based publication system will further simplify and improve the process.

CONTROL OF NEW WEED SPECIES IN THE NURSERY INDUSTRY. J.F. Derr, Virginia Tech, Virginia Beach, and J.C. Neal, North Carolina State Univ., Raleigh.

ABSTRACT

Several new weed species have appeared in the nursery industry. Transport of nursery stock will eventually lead to widespread infestations in nurseries and landscapes. Development of control programs will allow producers to manage these weed species before they become established. Studies were established in VA and NC to determine the effectiveness of preemergence herbicides currently used in container production. Experiments were conducted in 1-gal containers utilizing either 100% pine bark or pine bark+sand (8:1, v/v). The herbicides tested were: OH2, Rout, Regal O-O, Free 63, Ronstar, Broadstar, Snapshot TG, Gallery, Surflan, Barricade, Pendulum, Preen, Pennant Magnum and dimethenamid at maximum use rates. In addition, Snapshot and Ronstar were applied at 2.5 and 2.0 lb ai/A respectively.

In the VA trial at 4 weeks after treatment (WAT), OH2, Rout, and BroadStar controlled tasselflower (*Emilia* spp.), thickhead (*Crassocephalum crepidioides* (Benth.) S. Moores), chamberbitter (*Phyllanthus urinaria* L.), longstalk phyllanthus (*Phyllanthus tenellus* Roxb.), and mulberry weed (*Fatoua villosa* (Thunb.) Nakai). BroadStar, Pennant Magnum, and dimethenamid all gave excellent control of doveweed (*Murdannia nudiflora* (L.) Brenan), while all other treatments gave poor to no control. Weed control with Snapshot and Ronstar increased as the rate increased. Showcase at 5.0 lb ai/A gave very similar weed control as Snapshot at 5.0 lb ai/A. Surflan was the overall most effective dinitroaniline, with Preen the least effective. Generally similar weed control was seen with Pennant Magnum and dimethenamid. Gallery suppressed chamberbitter and longstalk phyllanthus but gave good to excellent control of the composite weeds. All treatments except Free 63 and Preen controlled mulberry weed.

In the NC trial at 4 WAT, Snapshot, Surflan, Gallery, and dimethenamid were the only treatments that controlled galinsoga (*Galinsoga ciliata* (Raf.) Blake). Marsh parsley (*Apium leptophyllum* (Pers.) Sprague ex Britt. and P. Wilson) was controlled well only by Broadstar, the high rate of Snapshot, Showcase, Surflan and dimethenamid. American Burnweed (*Erechtites hieraciifolia* (L.) Raf. Ex DC.), was controlled by Rout, Broadstar, Snapshot, Showcase, Surflan, Regal OO, Gallery, and dimethenamid. Petty spurge (*Euphorbia peplus* L.) was controlled by OH2, Rout, Broadstar, Regal OO, Showcase, Surflan, 4 lb a.i./A Ronstar, Gallery and Barricade. Petty spurge was generally equally susceptible to herbicides as spotted spurge, except for Snapshot, Pennant Magnum, and dimethenamid, which controlled spotted but not petty spurge. Marsh yellowcress (*Rorippa islandica* (Oeder) Borbás) was well controlled by most treatments except Pendulum AquaCap, Barricade, Preen and Pennant Magnum. Groundsel tree (*Baccharis halimifolia L.*) was well-controlled by all treatments except Free 63, Ronstar, Pendulum AquaCap and Preen. Willowherb was controlled by OH2, Rout, Broadstar, Regal OO, Ronstar, Surflan, Pennant Magnum and dimethenamid.

Some of the weeds, including doveweed and marsh parsley, were not well controlled by several combination herbicides. When new weeds are introduced into nurseries, herbicide selection will be a critical component of an integrated weed management program.

EVALUATION OF GRANULAR HERBICIDES IN CONTAINER-GROWN WOODY ORNAMENTALS.

S. Barolli, Imperial Nurseries, Granby, CT and J. Ahrens, Connecticut Agricultural Exp. Station, Windsor.

ABSTRACT

Seven granular herbicide products were evaluated in 2006 for efficacy and tolerance by seven woody ornamentals. The ornamentals included hydrangea (*Hydrangea macrophylla* 'Endless Summer'), dwarf burning bush (*Euonymus alatus* 'Compacta'), rose (*Rosa* 'Carefree Marvel), Snowstorm Spirea (*Spiraea hybr*. 'Snowstorm'), Tinkerbelle lilac (*Syringa* hybr. 'Bailbelle'), weigela (*Weigela florida* 'My Monet' and butterfly bush (*Buddleia davidii* 'Black Knight'). All plants were transplanted into 1-gallon pots on 6/19/06 with media consisting of 70% pine bark, 15% peat and 15% sand by volume, and were actively growing at treatment on 6/21/06. Three pots of each plant and six plantless pots were included in each plot and the herbicide treatments and untreated control were arranged in randomized complete blocks with four replications. Large crabgrass (*Digitaria sanguinalis* L. Scop) and common groundsel (*Senecio vulgaris* L.) were seeded only in the plantless pots on 6/21/06, and were pulled and counted on 7/19 and 8/18.

The herbicides included OHP-31906 at 100, 200 and 400 lb product/A, oxyfluorfen 2% + pendimethalin 1% (OH-2) at 100 lb/A, isoxaben 0.5% + trifluralin 2% (Snapshot 2.5TG) at 150 lb/A oxyfluorfen 2% + trifluralin 3.0% (Weedfree 75) at 100 and 200 lb/A, flumioxazin 0.25% (BroadStar) at 150 lb/A, trifluralin 2% + isoxaben 0.25% + oxyfluorfen 0.25% (Showcase) at 100 and 200 lb/A and oxadiazon 2% (Ronstar 2G) + napropamide 10% (Devrinol 10G) at 200 + 40 lb/A. The herbicides were applied with a calibrated auger-feed granular applicator on 6/21/06 over dry plant foliage and reapplied on 9/7/06. On 9/8/06 annual bluegrass (*Poa annua* L.) and common groundsel were seeded into the plantless pots. Overhead irrigation for 25 minutes was applied starting within 10 minutes of the last herbicide (oxadiazon).

Reduction in weed counts and % control based on numbers varied with herbicide and dosage (Table 1). Weed population were so high in controls on 7/19 (4WAT-1) that pulling and counting removed soil, as well as weed seeds, resulting in low populations in the controls thereafter.

Hydrangea was the only species injured, and the only species that trapped granules in whorls. All herbicide treatments injured the hydrangea (Table 1.) and this injury was reflected in plant vigor reductions. The lowest rate of Weedfree 75, Showcase and OH-2 caused the least injury. The Ronstar + Devrinol combination which has been the standard for hydrangea at this nursery, caused more injury than in practice, probably because in practice granules are brushed off the leaves before irrigation and this was not done in this experiment. Following the August ratings the ornamentals were pruned and retreated. None of the treatments injured the mature hydrangea foliage following the second application.

Table 1. Results of 2006 container experiment with granular herbicides. *

No.	Herbicide	lbs Prod per A	Weed counts/3 pots								Hydrangea macrophylla		
			4WAT-1,7/19/06				4WAT-2,10/11/06						
			crabgrass		groundsel		poa annua		groundsel		Injury (0-10)		Vigor (0-10)
			No	% control	No	% control	No	% control	No	% control	7/6/06	8/9/06	8/31/06
1	Untreated	-	719	0	250	0	502	0	18	0	0	0.7	9.3
2	OHP	100	126	82	30	88	48	91	0.3	99	2.5	2.2	7.6
3	31906	200	27	96	5	98	52	90	0.3	99	2.8	2.5	7.2
4		400	1	99+	0	100	8	98	0	100	3.5	4.7	5.7
5	OH-2	100	73	90	38	85	71	86	0	100	3.0	1.6	8.1
6	Snapshot	150	60	92	30	88	18	96	5.0	71	1.3	2.5	7.8
7	Weedfree	100	107	85	36	86	86	83	0.5	97	2.8	1.3	8.3
8	75	200	15	98	4	98	6	99	0	100	2.8	3.8	6.4
9	BroadStar	150	15	98	5	98	51	90	0	100	2.8	2.3	7.4
10	Showcase*	100	66	91	42	83	-	-	-	-	2.3	1.3	8.6
11	Showcase*	200	8	99	3	99	-	-	-	-	2.8	3.0	6.8
12	Ronstar 2G + Devrinol 10G	200 40	7	99	51	80	20	96	2.0	88	2.3	2.8	7.3

*Herbicides were applied on 6/21/06 and 9/7/06

SAFETY OF POSTEMERGENCE NUTSEDGE-CONTROL HERBICIDES ON ORNAMENTALS. J.C. Neal, North Carolina State Univ., Raleigh, J.F. Derr, Virginia Tech, Virginia Beach, and A.F. Senesac, Cornell Cooperative Ext., Riverhead, NY.

ABSTRACT

Several herbicides are labeled for control of nutsedge in turfgrass and other crops; yet limited options are available for selective postemergence control of yellow nutsedge and dicot weeds in landscape ornamentals. In cooperation with other researchers through the USDA IR-4 program, halosulfuron, sulfentrazone and V-10142 were evaluated for safety on landscape ornamentals. In NC, on 18 April 2006 nine species of ornamentals were potted into 3-gallon (~12 liter) pots using a pine bark + sand (7:1, v/v) substrate amended with an industry standard slow-release fertilizer with micronutrients. Plants in the study were *Ilex vomitoria nana*, *Ilex cornuta burfordii nana*, *Viburnum tinus compacta, Liriope muscari variegate*, *Cotoneaster horizontalis*, *Spiraea japonica* ' Little Princess', *Rhododendron x* 'Pink Gumpo' (azalea), *Abelia x grandiflora* 'John Creech', and *Lagerstroemia x* Tuscarora. Plants were allowed to establish about 8 weeks before experimental treatments were applied on 28 June and 24 July 2006. In VA, ornamentals were potted on 8 June 2006 into one-gallon (3-liter) pots. Species included: *Spiraea* X *Bumalda* 'Gold Mound', *Delosperma cooperi*, *Salvia elegans* 'Tangerine', *Ophiopogon japonicus variegata*, *Cuphea allyson*, *Pentas lanceolata* 'Ruby Red', *Gardenia augustofolia radicans*, *Liriope muscari* 'Aztec' and *Lantana camara* 'Miss Huff'. Treatments were applied on June 13th and July 11th, 2006. In NY, rooted cuttings of *Gypsophila paniculata* 'Pink Fairy' (qt container), *Rhododendron* X 'Crete' (gallon container), and *Rosa* x 'Sea Foam' (gallon container) were transplanted into a commercial soilless media on 8 May, 2006. *Spiraea decumbens* (gallon container) was transplanted in April 2006. Treatments were applied on 8 May, 2006 and repeated on 5 June, 2006. In each study, treatments were applied in randomized complete block designs with 3 pots of each species per plot and 4 replicates. Halosulfuron DF, sulfentrazone DF (NC only) and V-10142 were applied over the top of all species using a CO_2 pressurized sprayer equipped with two flat fan nozzles and calibrated to deliver 30 GPA. Nonionic surfactant (0.25% v/v) was added to halosulfuron and V-10142 treatments. Sulfentrazone GR was applied using a hand held shaker jar. Each herbicide was applied at 1x, 2x and 4x the labeled or suggested use-rate. Halosulfuron caused no injury to *Ilex*, *Azalea*, and *Gardenia*, but chlorosis and stunting was observed in *Spiraea*, *Liriope*, *Cotoneaster*, and *Viburnum*. Significant injury was caused by halosulfuron on *Gypsophilia* and *Rosa*, and *Liriope* (NC study). Sulfentrazone 4F was safe on *Gypsophila* but injured *Azalea*, *Spiraea*, *Lagerstroemia*, *Viburnum*, *Liriope*, *Cotoneaster* and *Rosa*, although all plants except *Liriope* recovered. *Spiraea* had moderate to slight injury which, by 4WAT of the second timing, was slight at low rates and moderate at the highest rate. Granular sulfentrazone was safe on all woody species but injured ice plant and *Liriope*. V-10142 caused significant injury to *Liriope*, *Spiraea*, *Abelia*, *Cotoneaster*, *Salvia*, ice plant, Mexican heather and *Lantana*, but not *Ilex* or *Gardenia*. *Rhododendron* was not injured in NC but was injured by all rates in the NY study following the second application. These data suggest that the granular formulation of sulfentrazone has potential for safety to a diversity of woody ornamentals.

TOLERANCES OF ORNAMENTAL SHRUBS TO HALOSULFURON, SULFENTRAZONE AND V-10142. T.L. Mervosh and J.F. Ahrens, Connecticut Agricultural Experiment Station, Windsor.

ABSTRACT

We conducted research as part of the IR-4 Ornamental Horticulture Program to evaluate herbicide tolerances of four woody ornamental plants. The shrubs were planted in 1-gallon containers (6-in diameter) on May 1, 2006. Plants were 'Emerald Green' arborvitae (*Thuja occidentalis* 'Smargd'), 'P.J.M.' rhododendron (*Rhododendron* 'P.J.M.'), bridal-wreath spiraea (*Spiraea x bumalda* 'Goldflame') and dwarf burning-bush (*Euonymus alatus* 'Compactus'). Each plot contained three plants of each species. Treatments, including an untreated check, were replicated four times in a randomized complete block design. Herbicide treatments were applied over the top of plants at normal (1X), twice normal (2X) and four times normal (4X) dosages on May 4 and again on July 7, 2006. Treatments consisted of sulfentrazone 0.2G (0.125, 0.25 and 0.5 lb ai/A), sulfentrazone 4F (0.125, 0.25 and 0.5 lb ai/A) and V-10142 75WG (0.5, 1.0 and 2.0 lb ai/A). Halosulfuron 75DF treatments (0.047, 0.094 and 0.188 lb ai/A) were applied over *Spiraea* spp. only.

Herbicide sprays were applied in a volume of 30 gal/A using a CO_2-pressurized sprayer with two 8003VS nozzle tips. Treatments were sprayed over the top of pre-wetted plants. Ten minutes later, plants were watered by overhead irrigation for 20 min. After foliage had dried, granular treatments were applied. Sulfentrazone 0.2G granules (amount per 10 ft^2) and sieved sand of like size were mixed in a shaker jar and applied uniformly over a plot of plants within a 10-ft^2 frame. Irrigation followed for 20 min.

Evaluations of plant injury (0 = no injury; 10 = dead) or plant vigor (10 = most vigorous; 0 = dead) were recorded several times after each treatment application. Halosulfuron at all doses caused severe stunting and chlorosis of *Spiraea* spp. Some recovery occurred late in the season for *Spiraea* treated with the 1X dose of halosulfuron, but plant vigor (< 7.3) was still not acceptable. The first application of sulfentrazone 0.2G treatments injured *Spiraea* only (injury ratings of 1.2 to 2.7). However, *Spiraea* vigor was excellent at 9 weeks after the first treatment (9 WAT-1), and injury was insignificant following the second application of sulfentrazone 0.2G. The first application of sulfentrazone 4F treatments caused initial injury to *Spiraea* (2.5 to 5.5), rhododendron (1.3 to 2.0) and burning-bush (0.8 to 2.8). By 9 WAT-1, plant vigor was excellent (>9) except for *Spiraea* treated with sulfentrazone 4F at 2X and 4X doses (vigor of 8.9 and 7.3, respectively). *Spiraea* was the only species injured by the second application of sulfentrazone 4F. At 4 WAT-1 following V-10142 treatments, severe injury occurred on *Spiraea* (7.6 to 8.3) and burning-bush (5.1 to 7.6), and lesser injury on *Arborvitae* spp. (1.3 to 3.3) and *Rhododendron* (0.7 to 2.3). The second application of V-10142 caused additional injury to all plants. By the final evaluation on October 4 (12 WAT-2), plant vigor ratings were lowest for *Spiraea* (1.3 to 0.2) and highest for arborvitae (9.6 to 6.9).

No weeds were present in containers on the herbicide application dates. Herbicidal efficacy of halosulfuron was not evaluated. Neither sulfentrazone nor V-10142 treatments were effective at preventing horseweed (*Conyza canadensis*). Sulfentrazone treatments did not prevent smallflowered bittercress (*Cardamine parviflora*) or northern willowherb (*Epilobium ciliatum*).

UPDATE ON 2006 WEED SCIENCE RESEARCH IN THE IR-4 ORNAMENTAL HORTICULTURE PROGRAM. C.L. Palmer and J. Baron, IR-4 Project, Rutgers Univ., Princeton, NJ.

ABSTRACT

The 2006 IR-4 Ornamental Horticulture Research Program sponsored crop safety testing on four different products (SedgeHammer, Sulfentrazone 0.2G, Sulfentrazone 4F, and V-10142) for over-the-top applications on various ornamental species. The program also sponsored research for applications of SureGuard on select ornamental species prior to breaking dormancy. Thirty-six different species were tested with SedgeHammer; preliminary results indicate 19 of these exhibited some level of negative impact with over-the-top applications. Sulfentrazone 0.2G was applied to 41 ornamental species with 7 exhibiting some phytotoxicity. Sulfentrazone 4F was compared with Sulfentrazone 0.2G on 30 species with 11 crops showing phytotoxicity in preliminary results. Forty-four species were examined for injury with over-the-top applications of V-10142; 25 exhibited phytotoxicity. SureGuard was applied as a dormant over-the-top application to 19 ornamental species and was injurious on seven. The results from this research will aid in the development of the labels for these products and will help growers and landscape care professionals make more informed product choices.

2006 WEED MANAGEMENT TRIALS IN CHRISTMAS TREES. J.F. Ahrens, Connecticut Agric. Experiment Sta., Windsor.

ABSTRACT

Several field experiments were conducted with older and new herbicides in attempts to improve our knowledge of weed management options in Christmas tree plantings. Trees were sprayed over the top at 30 gal/A. Randomized complete block designs with four replications and three to six plants per plot were standard.

The 2006 season in CT was characterized by an extremely wet May and June and a dry July which resulted in a major summer outbreak of annual weeds regardless of early spring preemergence treatments. For the fourth season, we evaluated Westar, a 1:10 ratio of sulfometuron methyl and hexazinone, as well as a 1:20 ratio. Westar at 8 oz/A (sulfometuron 0.5 oz ai/A and hexazinone 5.4 oz ai/A) gave excellent control of quackgrass (*Elytrigia repens* L.) and at 12 oz/A caused no injury to established Douglas fir (*Pseudotsuga menziesii*). Comparisons of fall versus April applications of sulfometuron plus hexazinone confirmed that fall applications give poor control of summer annual weeds. Adding non-ionic surfactant or glyphosate (Roundup Original) at 1 pt/A to dormant applications did not affect injury to Fraser fir (*Abies fraseri*). Control of large crabgrass (*Digitaria sanguinalis* (L.) Scop) was improved by increasing the rate of hexazinone in the mix to 7.5 oz ai/A, but, in 2006, crabgrass control in late season was poor at all rates. Westar alone or plus added hexazinone is a good option for Christmas tree plantations but we will suggest it primarily for conifers established one or more seasons in the field.

In another experiment, asulam at 4, 6, or 8 lb ai/A, on June 30, controlled emerged large crabgrass with no injury to actively growing Fraser fir. Asulam could be useful for postemergence control in transplant beds or in the field.

V-10142 75 WG (Valent U.S.A. Corp.) at 0.5 to 2.0 lb ai/A, halosulfuron 75 WG at 0.75 to 3.0 oz ai/A and sulfentrazone 4F at 0.125 to 0.5 lb ai/A were evaluated for phytotoxicity in Douglas fir and Fraser fir plantations in IR-4 trials. None injured the dormant conifers in April, but when reapplied over actively growing trees in June, 8 weeks later, halosulfuron injured Douglas fir, and V-10142 and halosulfuron injured Fraser fir. Sulfentrazone, in June, caused little injury at 0.125 lb ai/A but did not control crabgrass or common ragweed (*Artemisia artemisifolia* L.).

GROUND COVER SUPPRESSION IN NORTH CAROLINA FRASER FIR PRODUCTION. D. Hundley, Avery County Cooperative Extension Center, Newland, NC and J.C. Neal, North Carolina State Univ., Raleigh.

ABSTRACT

Approximately one half of Fraser fir growers in Western NC are using a practice called "chemical mowing" for ground cover management. The practice has resulted in widespread groundcover dominated by native white clover, nimblewill, and a variety of low-growing forbs that effectively suppress undesirable weed species. In most cases two applications of glyphosate per year are adequate once the native groundcover has developed. Economic benefit has been substantial. At less than $4/A per application for glyphosate and an average labor cost of $10 -$12/A, the overall cost has been reduced greatly from previous weed control strategies. The groundcover establishment has provided many advantages including soil stabilization and beneficial insect habitat in Fraser fir production.

One of the challenges is the need for glyphosate applications during the season of active growth, when Fraser fir trees are most sensitive to glyphosate. Therefore, beginning in the spring of 2001 and continuing through the fall of 2003, an on-farm research project was undertaken to determine the tolerance of Fraser fir to low rates of glyphosate applied during the growing season, and to identify the minimum glyphosate doses required for effective ground cover suppression.

On-farm tests were conducted on 10 grower sites over 3 yr. During the first year, 4-12 oz glyphosate/A (Roundup Original) were tested. Weekly applications were initiated ~ April 15th and continued to August 1st. Herbicides were applied with a backpack sprayer equipped with a Teejet 8004 nozzle (17 GPA), applied as a directed spray contacting the lower 12-24 inches of the tree foliage. After 2001, research focused on lower rates (4-8 oz/A) during May 1- July 15. The number of tree growers and acreage included in the study increased substantially. The project was continued in the 2003 with the addition of new tools to increase the accuracy of the backpack application, reduce spray volume, and fine tune other features of the applications. Tree damage was rated on a subjective scale using tree grower participation. Weed suppression ratings were also documented using a subjective scale involving tree grower participation.

Rates of Roundup Original at 4-8 oz/A were found to provide effective vegetation suppression without significant damage, with new growth present throughout the period. Eight oz/A provided the best control and could be used without damage except during a 6 week period of time that begins two weeks after budbreak begins, about May 15th and continuing until July 1st. During this period a 4 oz/A rate is required to avoid damage.

Final equipment choice has resulted in Roundup Original or generic equivalent applied with a TQ15004 or a TK-2 with the addition of a 14 psi flow regulator (yellow). At various worker comfort levels the calibrated application will range from usually from 8 - 12 GPA, applied as a broadcast spray contacting the lower 6-12 inches of the tree foliage and full groundcover coverage.

THE RESPONSE OF FIELD AND CONTAINER GROWN ORNAMENTALS TO SULFENTRAZONE AND FLUMIOXAZIN. M.W. Marshall and B.H. Zandstra, Michigan State University, East Lansing.

ABSTRACT

Field studies were conducted in 2006 to evaluate tolerance of container and field grown ornamentals to various rates of sulfentrazone and flumioxazin. Treatments included sulfentrazone at 0.14, 0.28, and 0.56 kg/ha and flumioxazin at 0.28, 0.56, and 1.02 kg/ha. An untreated control was included for comparison. Container grown ornamental species included periwinkle (*Vinca minor* L.), butterfly bush (*Buddleia davidii* 'Adonis Blue'), inkberry holly (*Ilex glabra* 'Ivory Queen'), orange coneflower (*Rudbeckia fulgida* var. *fulgida* 'Meadowbrite'), and boxwood (*Buxus microphylla* 'Green Mountain'). Field grown ornamental species included burning bush (*Euonymus alatus compactus*), azalea (*Azalea* 'Cannon's Double'), boxwood, daylily (*Hemerocallis* 'Evelyn Claar'), coral bells (*Heuchera micrantha* 'Palace Purple'), hosta (*Hosta fortunei* 'Gold Standard'), and shasta daisy (*Leucanthemum* x *superbum* 'Snowcap'). In the container study, sulfentrazone was applied on July 15, 2006 and August 22, 2006. In the field study, sulfentrazone was applied on June 22, 2006 and July 24, 2006 and flumioxazin was applied on June 22, 2006. Experimental design was a randomized complete block design with 3 replications. Individual plot sizes were 0.6 by 0.9 m and 5.4 by 10.6 m in the container study and field study, respectively. Plant injury ratings were evaluated 7, 14, and 28 days after treatment (DAT) on a 0 to 9 scale with 0 indicating no injury and 9 equal to crop death. Herbicides were applied in water over-the-top of newly transplanted ornamentals at a carrier volume of 187 L/ha with a pressure of 207 KPa. Boxwood grown in container and the field showed very little injury to sulfentrazone and flumioxazin, regardless of the rate. Plants most sensitive to sulfentrazone included butterfly bush, orange coneflower, coral bell and daylily. In addition, daylily, *Hosta*, and Shasta daisy were sensitive to over-the-top applications of flumioxazin, especially at 1.02 kg/ha. Sulfentrazone injury, regardless of species, included browning of the leaves where the spray intercepted the leaf. New growth at the base of the plant did not exhibit these symptoms. Butterfly bush showed moderate injury at the 0.28 and 0.56 kg/ha sulfentrazone rate 7 DAT. By 28 DAT, injury was only apparent at the 0.56 kg/ha rate. In the field study, boxwood, *Azalea*, and burning bush exhibited very little response to flumioxazin and sulfentrazone, regardless of rate. At 14 and 28 DAT, daylily, *Hosta*, and Shasta daisy injury at 0.56 kg/ha ranged from 5.7 to 8.7, with the *Hosta* being the most sensitive. By the end of the trial; however, these plants had regrown and recovered to sizes not significantly different from the untreated control. In general, sulfentrazone and flumioxazin were generally safe on the container and field grown woody ornamental plants. Sulfentrazone at 0.28 and 0.56 kg/ha should be used with caution on container and field grown orange coneflower, butterfly bush, *Hosta*, and daylily. Since both formulations were liquids, a granular formulation maybe safer on these sensitive species.

THE EFFICACY AND CROP TOLERANCE OF PRE AND POSTEMERGENCE APPLICATIONS OF HALOSULFURON TO CHRISTMAS TREES. L.J. Kuhns and T.L. Harpster, The Pennsylvania State Univ., University Park.

ABSTRACT

Over a two-year period, pre and postemergence applications of halosulfuron were made to three conifer species on five sites in Pennsylvania. At 0.33 lb ai/A, when combined with oryzalin for preemergence grass control, halosulfuron provided excellent broad-spectrum weed control. At 0.041 to 0.167 lb ai/A, when combined with oryzalin, it provided good to adequate control at three of the sites but was weak at two others. Applied prior to budbreak, there was little to no injury. Applied after budbreak, halosulfuron caused serious contact injury to the plants. However, no plants were killed and plants injured in 2005 grew well in 2006.

THE EFFICACY AND CROP TOLERANCE OF PREEMERGENCE APPLICATIONS OF SULFOMETURON PLUS HEXAZINONE TO CHRISTMAS TREES. L.J. Kuhns and T.L. Harpster, The Pennsylvania State Univ., University Park.

ABSTRACT

Weed control and the tolerance of Douglas fir (*Pseudotsuga menzesii* (Mirb) Franco) Christmas trees to two ratios of sulfometuron and hexazinone were evaluated. Westar is a commercially formulated combination of sulfometuron and hexazinone in a 1:10 ratio, respectively. The same products were mixed in a 1:20 ratio to compare the weed control and crop tolerance of the two combinations. The rates listed in Table 1 were applied on April 20, 2006, around trees at Unangst Tree Farm, Northampton County; and Elizabeth Farms, Lancaster County; Pennsylvania. The trees at the two farms were 4-5 and 3-4 feet tall, respectively. The buds were beginning to swell and show some color at both sites. All applications were direct sprayed with a CO_2 test plot sprayer, at 30 PSI in 24 GPA. An OC-02 nozzle was used and both sides of each row were sprayed, with the lower 6-12 inches of all trees intentionally contacted. The air and soil temperatures were 70-81 and 60 F, respectively. Each treatment was replicated four times with eight to ten trees per replication. Weed control and plant quality were rated on May 31 and July 18, 6 and 13 weeks after treatment (WAT).

Because glyphosate and simazine had been applied to the field the previous fall, the Unangst site had very few weeds, even in the untreated plots. The predominant weeds in the control plots were common lambsquarters (*Chenopodium album* L.), ox-eye daisy (*Chrysanthemum leucanthemum* L.), redroot pigweed (*Amaranthus retroflexus* L.), and yellow foxtail (*Setaria glauca* (L.) Beauv.). At Elizabeth Farms established perennial weeds and weed seedlings were present at the time of the first application. The predominant weeds were common dandelion (*Taraxacum officinale* Weber in Wiggers), Canada thistle (*Cirsium arvense* (L.) Scop.), common ragweed (*Ambrosia artemisiifolia* L.), redroot pigweed, yellow foxtail, yellow nutsedge (*Cyperus esculentus* L.), and downy brome (*Bromus tectorum* L.).

Six WAT all treated plots at both farms exhibited almost total weed control, except those treated with sulfometuron plus hexazinone at 0.023 and 0.469 (Table 1). At 13 WAT, the treated plots at Unangst Farm were still almost totally weed free, with only a few foxtails and Johnsongrass breaking through. At Elizabeth Farms weed control ratings were lower and less consistent. The two higher rates of both ratios provided good control, but the lower rates provided marginally acceptable control. Both broadleaf and grass seedlings were emerging in all treated plots. The higher rates effectively controlled common ragweed, yellow woodsorrel, white clover, common dandelion, ox-eye daisy, redroot pigweed, and velvetleaf.

Plant quality at both farms was uniformly good to excellent (Table2). Only the high rate of the 1:20 ratio, at Elizabeth Farms, significantly reduced the quality of trees. Injury consisted of some needle stunting and yellowing new growth. At Unangst Farm, tree quality improved between the first and second evaluations, suggesting some of the injury noted may have been from the fall glyphosate treatment. In conclusion, the commercially formulated mix of sulfometuron and hexazinone at the 1:10 ratio provided excellent weed control with minimal reduction to plant quality on Douglas fir.

Table 1. Weed control ratings on Douglas Fir at Elizabeth and Unangst Farms on May 31 and July 18, 6 and 13 weeks after treatment. Treatments were direct sprayed on April 20, 2006. Weed control ratings are on a scale of 1 to 10, with 1 = no control and 10 = total control.

		Elizabeth Farm		Unangst Farm	
Treatment	Lb a.i./A	May 31	July 18	May 31	July 18 1/
Untreated	-	3.3 c	1.0 f	6.1 b	8.6 b
Sulfometuron Hexazinone Surfactant	0.023 0.469 0.25% v/v	6.4 b	6.2 d	10.0 a	10.0 a
Sulfometuron Hexazinone Surfactant	0.035 0.70 0.25% v/v	9.6 a	8.4 a	10.0 a	9.9 a
Sulfometuron Hexazinone Surfactant	0.047 0.938 0.25% v/v	9.7 a	8.5 a	10.0 a	9.9 a
Westar 75.1WG Surfactant	0.28 0.25% v/v	9.7 a	7.5 bc	10.0 a	9.9 a
Westar 75.1WG Surfactant	0.375 0.25% v/v	9.6 a	6.9 cd	10.0 a	9.9 a
Westar 75.1WG Surfactant	0.469 0.25% v/v	9.6 a	8.1 ab	10.0 a	9.9 a
Westar 75.1WG Surfactant	0.562 0.25% v/v	9.7 a	8.1 ab	10.0 a	10.0 a
Flumioxazin Glyphosate Oryzalin	0.25 0.0625 2.0	9.2 a	4.7 e	9.8 a	10.0 a

1/ Means within columns for each species, followed by the same letter, do not differ at the 5% level of significance (DMRT)

Table 2. Plant quality ratings on Douglas Fir at Elizabeth and Unangst Farms on May 31 and July 18, 6 and 13 weeks after treatment. Treatments were direct sprayed on April 20, 2006. Plant quality ratings are on a scale of 1-10 with 1 = dead and 10 = highest quality plant.

		Elizabeth Farm		Unangst Farm	
Treatment	Lb a.i./A	May 31	July 18	May 31	July 18 [1/]
Untreated	-	9.8 a	9.7 ab	8.9 ab	9.8 a
Sulfometuron	0.023	9.3 bc	9.4 bc	8.8 ab	9.7 a
Hexazinone	0.469				
Surfactant	0.25% v/v				
Sulfometuron	0.035	9.8 a	9.6 ab	8.8 ab	9.7 a
Hexazinone	0.70				
Surfactant	0.25% v/v				
Sulfometuron	0.047	9.0 c	9.1 c	8.8 ab	9.8 a
Hexazinone	0.938				
Surfactant	0.25% v/v				
Westar 75.1WG	0.28	9.8 a	9.8 ab	8.9 ab	9.9 a
Surfactant	0.25% v/v				
Westar 75.1WG	0.375	9.5 ab	9.7 ab	8.7 ab	9.8 a
Surfactant	0.25% v/v				
Westar 75.1WG	0.469	9.8 a	10.0 a	8.6 b	9.9 a
Surfactant	0.25% v/v				
Westar 75.1WG	0.562	9.5 ab	9.8 ab	8.9 ab	9.7 a
Surfactant	0.25% v/v				
Flumioxazin	0.25	9.8 a	9.8 ab	9.2 a	9.7 a
Glyphosate	0.0625				
Oryzalin	2.0				

[1/] Means within columns for each species, followed by the same letter, do not differ at the 5% level of significance (DMRT)

HERBICIDES AS ALTERNATIVES TO METHYL BROMIDE FOR WEED CONTROL IN CONIFER SEEDLING BEDS. D.A. Little, M.W. Marshall, Michigan State Univ., East Lansing, R.J. Richardson, North Carolina State Univ., Raleigh, and B.H. Zandstra, Michigan State Univ., East Lansing.

ABSTRACT

The removal of methyl-bromide (MeBr) from the market has left some Christmas tree growers looking for alternatives for weed control. In 2004 and 2005, a field study was conducted at the Michigan State University Southwest Research and Extension Center located near Benton Harbor to evaluate herbicides as alternatives to MeBr for weed control in conifer seedling production. In early June 2004, a standard treatment of MeBr:chloropicrin (98:2) was applied at a rate of 392 kg/ha. Treatments tested were flumioxazin (0.28 kg/ha), granular oxadiazon (2.24 kg/ha), oxyfluorfen (1.12 kg/ha), oxyfluorfen plus dithiopyr (0.28 kg/ha), oxyfluorfen plus metolachlor (1.68 kg/ha), mesotrione (0.28 kg/ha), metolachlor plus mesotrione, metolachlor plus trifloxysulfuron(0.008 kg/ha), metolachlor plus rimsulfuron (0.03 kg/ha), and an untreated control. Herbicide treatments were applied over top two-year old Fraser fir (*Abies fraseri*) and eastern white pine (*Pinus strobus*) in mid-June of 2004 and 2005. Weeds present included common ragweed (*Ambrosia artemisiifolia*), common lambsquarters (*Chenopodium album*), large crabgrass (*Digitaria sanguinalis*), and carpetweed (*Mollugo verticillata*). Crop injury and weed control were visually rated on a 0-100% scale, with 0% equal to no crop injury or no weed control and 100% equal to complete crop death or weed control. Visual ratings were made monthly for four months after treatments. Tree height measurements were collected at the end of each growing season. Weed control was similar in all treatments including MeBr, except granular oxadiazon and metolachlor plus rimsulfuron which failed to control large crabgrass and carpetweed, respectively. In 2004, significant visual injury was observed on eastern white pine, one and three months after treatments containing metolachlor were applied, and in 2005, metolachlor and mesotrione significantly reduced eastern white pine height. In 2005, flumioxazin, metolachlor plus trifloxysulfuron and metolachlor plus mesotrione caused significant visual injury was seen on Fraser fir three months after treatment; however, treatments did not significantly impact tree heights.

EVALUATION OF PROLINE-LINKED PENTOSE PHOSPHATE PATHWAY IN CREEPING BENTGRASS. D. Sarkar, P. Bhowmik, Y.I. Kwon, and K. Shetty, Univ. of Massachusetts, Amherst.

ABSTRACT

Creeping bentgrass (*Agrostis palustris* Huds.) is an important cool-season turfgrass species in North America. It is used widely in putting greens, tees, bowling greens, and in grass tennis courts. Abiotic and biotic stresses are major hindrances for normal performance of the cool-season turfgrass. Under stress conditions plants produce reactive oxygen intermediates (singlet oxygen, etc.) within cells. Antioxidant defense systems scavenge reactive oxygen species and protect cells against oxidative stress injury. Plant phenolics play important role in this defense mechanism by providing UV protection, antifungal, antiviral, antibacterial, antifeedant and antimitotic activity. Phenolic antioxidants can either trap the free radicals or scavenge them through series of coupled antioxidant enzyme defense system. Proline plays a significant role in plant under stress condition by regulating redox and hydride ion-mediated stimulation of pentose phosphate pathway. Shetty (1997) proposed a role for proline-linked pentose phosphate pathway (PLPPP) in stimulating phenolic metabolites in plants. Proline is synthesized from glutamate through series of reduction reactions, and in this process pyrroline-5-carboxylate (P5C) and proline function as a redox couple and are known to be metabolic regulators. The proline, through reactions of proline dehydrogenase (PDH), can enter mitochondria and support oxidative phosphorylation (instead of NADH). The reduction of P5C provides NADP+, which is the co-factor for glucose-6-phosphate dehydrogenase (G6PDH), an enzyme that catalyzes the rate-limiting step of the pentose phosphate pathway. Proline-linked pentose phosphate pathway can stimulate both shikimate and phenylpropanoid pathways. Since, genetic heterogeneity in cross pollinated plant causes inconsistency in phenolic profiles, and related antioxidant enzyme response, screening of single seeded clonal lines is important to select an elite clonal line with superior phenolic profile and protective response. The objectives of this study are i) to understand the role of proline-linked pentose phosphate pathway for phenolic antioxidant production in creeping bentgrass, and ii) to evaluate overall antioxidant response system of creeping bentgrass. Single seeded creeping bentgrass plants (20 lines) were grown in 4.5 cm plastic pots with sand based soils and kept in growth chamber at 27 C (day/night), and 12-h photoperiod conditions. Turf was watered daily, mowed, and fertilized weekly. Shoots were collected and analyzed repeatedly for G6PDH, PDH, SDH (succinate dehydrogenase), CAT (catalase), GPX (guaiacol peroxidase), SOD (superoxide dismutase), DPPH (antioxidant activity), total phenolic, total protein, and chlorophyll. HPLC analyses of proline and phenolic profile were also undertaken. Results showed significant differences in PLPPP related enzymes such as G6PDH, and PDH among twenty creeping bentgrass lines. Similar trends were observed in case of antioxidant enzymes, like SOD, and GPX. Antioxidant activity (DPPH), and chlorophyll content also varied, but total phenolic, SDH, and CAT showed similar results in all twenty lines. Differences in activity of G6PDH, PDH, SOD, and GPX among the clonal lines provide clues to the significance of proline-linked pentose phosphate pathway in selected creeping bentgrass clonal lines.

GENERIC PLANT GROWTH REGULATORS AND HERBICIDES IN TURF: HOW DO THEY COMPARE? T.W. Gannon and F.H. Yelverton, North Carolina State Univ., Raleigh.

ABSTRACT

Recently, several generic herbicide and plant growth regulators have been formulated and have been or will likely be registered for use in turfgrass environments. Minimal research has been completed looking at the efficacy of these herbicides and plant growth regulators compared to proprietary products. Therefore, some concern exists if these products perform similarly or if differences exist.

Research trials were initiated to evaluate several generic herbicide and plant growth regulator formulations to determine if they performed similarly to proprietary products. Generic formulations of prodiamine, oxadiazon, and oryzalin were evaluated for preemergence control of smooth crabgrass (*Digitaria ischaemum*), while dithiopyr and quinclorac were evaluated for early postemergence control of smooth crabgrass. Additionally, generic formulations of trinexapac-ethyl were evaluated for foliar suppression of 'Tifsport' bermudagrass. All generic products were compared to proprietary labeled herbicides or plant growth regulators.

Data collected from these trials indicates evaluated generic herbicides and plant growth regulators performed similarly to proprietary products as no differences existed within evaluated parameters. Throughout each of the research trials, no significant reductions in smooth crabgrass control were observed. Likewise, bermudagrass foliar suppression was consistent with each formulation of trinexapac-ethyl. These data indicate generic herbicides and plant growth regulators may offer a viable solution in select turfgrass environments.

ANNUAL BLUEGRASS AND DOLLAR SPOT CONTROL AS INFLUENCED BY HERBICIDES AND PLANT GROWTH REGULATORS. S.J. McDonald, Turfgrass Disease Solutions LLC, Pottstown, PA, M.A. Fidanza, The Pennsylvania State Univ., Reading, and J. Fanok, Brookside Country Club, Pottstown, PA.

ABSTRACT

Bispyribac-sodium was released in 2004 and labeled for control of *Poa annua* (L.) and *Poa trivialis* (L.) in creeping bentgrass (*Agrostis stolonifera* L.) and perennial ryegrass (*Lolium perenne* L.) fairway turf. Research has shown that bispyribac-sodium has the potential for *Poa annua* and Poa trivialis management and that optimal time C. to apply this product may be when the average ambient air temperatures is 18 Golf course superintendents frequently apply other herbicides and plant growth regulators prior to this optimal time and information regarding possible interactions of these chemicals with bispyribac-sodium is warranted. This study was conducted on a fairway maintained at 1.3 cm height, located in southeastern Pennsylvania, and comprised of approximately 92 to 96% creeping bentgrass and 4 to 8% *Poa annua*. Treatments include: dithiopyr alone (0.425 kg ai/ha), dithiopyr (0.425 kg ai/ha) followed by bispyribac-sodium (0.075 kg ai/ha) at 38 and 51 days later, trinexapac-ethyl alone (0.047 kg ai/ha), trinexapac-ethyl (0.047 kg ai/ha) followed by bispyribac-sodium (0.075 kg ai/ha) at 13 and 26 days later, paclobutrazol (0.105 kg ai/A) alone, and paclobutrazol (0.105 kg ai/A) followed by bispyribac-sodium (0.075 kg ai/ha) at 13 and 26 days later. Treatments were applied using a CO_2-powered backpack sprayer calibrated to deliver 408 gal water per hectare at 250 kPa. Data were subjected to analysis of variance and significantly different means were separated using Fisher's least significance different test at $P \leq 0.05$.

Plots were rated for percent plot area covered by *Poa annua*, treatment-induced injury to creeping bentgrass and *Poa annua*, overall turfgrass quality, and dollar spot (*Sclerotinia homoeocarpa* F.T. Bennett) severity. No statistically significant differences were observed with *Poa annua* control or injury when examined among plots treated with a plant growth regulator or herbicide followed by bispyribac-sodium. Plots treated with dithopyr alone, trinexapac-ethyl alone, or paclobutrazol alone had little effect on *Poa annua* population, however, all plots treated with bispyribac-sodium exhibited a statistically significant reduction in *Poa annua*. Also, consistently less dollar spot severity was observed in those plots treated with bispyribac-sodium. However, a slight decrease in dollar spot severity was observed in plots treated with the paclobutrazol or trinexapac-ethyl followed by bispyribac-sodium when compared to plots treated with bispyribac-sodium alone.

Data from this field study indicates there were no negative effects from pre-treating a mixed stand of creeping bentgrass and *Poa annua* with dithiopyr, trinexapac-ethyl or paclobutrazol when followed by bispyribac-sodium. All bispyribac-sodium treatments effectively controlled *Poa annua* and little injury was observed to the creeping bentgrass.

AUTUMN PREEMERGENCE AND SPRING POSTEMERGENCE CONTROL OF MOUSEEAR CHICKWEED AND CRABGRASS IN TURF. P.H. Dernoeden and J. Fu, Univ. of Maryland, College Park.

ABSTRACT

Mouseear chickweed (*Cerastium vulgatum*) and smooth crabgrass (*Digitaria ischaemum*) are common problematic weeds in Maryland lawns. Preemergence herbicides were evaluated for control of both weeds in tall fescue (*Festuca arundinacea*) and involved single herbicide applications on either 4 November 2005 or 31 March 2006. A postemergence trial also was conducted in April 2006 and targeted primarily mouseear chickweed, however, there was some corn speedwell (*Veronica arvensis*) evenly distributed throughout the study area. In both studies, plots were 5 ft by 5 ft and arranged in a randomized complete block with four replications. Weed cover was assessed visually on a 0 to 100% linear scale. Data were subjected to analysis of variance and significantly different means were separated using Fisher's LSD at $P \leq 0.05$. Soil was a Keyport silt loam with a pH of 5.7 to 6.0. Sprayable herbicides were applied in 50 GPA using a CO_2 pressurized (35 psi) backpack sprayer. Granulars were applied by shaker bottle. In the preemergence study, mouseear chickweed was controlled effectively by sprayable formulations of prodiamine 65WG, dithiopyr 40WP and pendimethalin 3.8CS applied on 4 November (Table 1). Dithiopyr 0.21 G (0.5 lb ai/A) and prodiamine 0.25G (0.75 lb ai/A) applied 4 November appeared to reduce mouseear chickweed levels (4.0 to 4.8%) versus the untreated control (10%), but the difference was not significant. Treatments applied in the spring had little or no effect since mouseear chickweed had emerged prior to 31 March. Smooth crabgrass pressure was low and all treatments reduced crabgrass levels significantly when plots were evaluated 8 September 2006 (Table 1). Highly effective crabgrass control (≤ 2% crabgrass cover) was provided by dithiopyr 0.21G (0.5 lb ai/A) and prodiamine 65WG (0.75 lb ai/A) applied 4 November 2005 and dithiopyr 0.21G (0.5 lb ai/A), prodiamine 0.20G (0.5 and 0.75 lb ai/A) and prodiamine 65WG (0.75 lb ai/A) applied 31 March 2006. There were few significant differences in the level of crabgrass control among herbicide treatments. In the postemergence broadleaf study, the following herbicides were applied 13 April 2006 to an immature stand of Kentucky bluegrass (*Poa pratensis*): quinclorac (0.75 lb ai/A + 1% MSO); 2.4-D + triclopyr (1.5 lb ai/A); triclopyr ester (1.0 lb ai/A); quinclorac + triclopyr ester (0.5 + 0.5 lb ai/A+1% MSO); and 2.4-D + MCPP + dicamba + carfentrazone (1.1 lb ai/A; Speedzone). Speedzone exhibited rapid and effective control of both corn speedwell and mouseear chickweed. All other treatments were ineffective. Corn speedwell and mouseear chickweed naturally declined and nearly all plants in untreated plots were dead by 22 May.

Table 1. Autumn 2005 versus spring 2006 applied preemergence herbicides for smooth crabgrass and mouseear chickweed control in turf.

	Rate		Cover	
			Mouseear chickweed	Crabgrass
Treatments[y]	Lb ai/A	Timing	14 Apr.	8 Sept.
			%	
Dithiopyr 0.21G	0.38	4 Nov	8.5 cde[z]	5.8 b
Dithiopyr 0.21G	0.50	4 Nov	4.0 ef	1.3 cd
Prodiamine 0.20G	0.50	4 Nov	4.8 def	2.3 cd
Prodiamine 0.43G	0.75	4 Nov	10.3 b-e	2.3 cd
Prodiamine 65WG	0.75	4 Nov	0.0 f	1.0 cd
Pendimethalin 3.8CS	3.0	4 Nov	0.3 f	4.3 bc
Dithiopyr 40WP	0.5	4 Nov	0.1 f	6.0 b
Dithiopyr 0.21G	0.38	31 Mar	20.0 a	2.9 bcd
Dithiopyr 0.21G	0.50	31 Mar	11.8 bcd	0.8 cd
Prodiamine 0.20G	0.50	31 Mar	16.3 ab	1.0 cd
Prodiamine 0.43G	0.75	31 Mar	13.0 abc	0.6 d
Prodiamine 65WG	0.75	31 Mar	12.3 bcd	1.3 cd
Pendimethalin 3.8CS	3.0	31 Mar	8.3 cde	2.3 cd
Dithiopyr 40WP	0.5	31 Mar	7.3 cdef	2.8 bcd
Untreated	--	--	10.0 b-e	20.3 a

[y] Treatments were applied on either November 4, 2005 or March 31, 2006.
[z] Means in a column followed by the same letters are not significantly different according to Fisher's LSD test ($P \leq 0.05$).

THREE-WAY HERBICIDE COMBINATION CONTAINING FLUROXYPYR FOR POSTEMERGENT BROADLEAF WEED CONTROL IN TURF. D.L. Loughner, J.M. Breuninger and M.W. Melichar, Dow AgroSciences, Indianapolis, IN.

ABSTRACT

The development of formulated liquid herbicide mixtures containing fluroxypyr (1-methylheptyl (4-amino-3-5-dichloro-6-fluoro-2-pyridyloxyl) acetate) was initiated when the residential use registration was removed for all clopyralid (3,6-dichloro-2-pyridinecarboxylic acid, triethylamine salt) containing mixtures. Mixtures containing fluroxypyr must provide commercial control of white clover (*Trifolium repens*) and other key driver weeds such as dandelion (*Taraxacum officinale*) and plantain species (*Plantago* spp.) to be accepted by lawn care companies.

Results from 2002 - 2004 confirmed effective broadspectrum broadleaf weed control with the 0.25 lb ae/A rate of fluroxypyr in combination with 2,4-D, triclopyr and /or dicamba. Control was comparable to commercial standards Triplet® SF, (2,4-D + dicamba + MCPP-p) and Confront® (triclopyr + clopyralid). Field studies conducted during 2005 evaluated at 0.13 lb ae/A of fluroxypyr in combination with 2,4-D and dicamba (Escalade® 2). Performance was compared to Triplet, Chaser (2,4-D + triclopyr), Millennium Ultra® (2,4-D+dicamba+clopyralid) and a tank mix of 2,4-D ester + triclopyr ester + dicamba.

Field protocols were designed to simulate a typical lawn care application program for postemergence broadleaf weed control in turf. Key program features evaluated included early season use of ester herbicide formulations changing to amines as temperatures increased and the use of high water volumes of approximately 2 gal/1000ft^2.

The results from 2005 field studies demonstrated that Escalade 2 effectively controlled key driver weeds such as white clover, dandelion, plantain spp. and mouseear chickweed equal to, and in some cases better than, the comparative standards. The data also demonstrated that environmental conditions and weed development stage did not significantly affect Escalade 2 performance.

A PRELIMINARY STUDY OF THE NON-NATIVE VASCULAR FLORA OF THREE COASTAL DELAWARE STATE PARKS.

R. Stalter, E. Lamont, G. Grigoryan, and N. Faqeer, St. John's University, NY.

ABSTRACT

The objective of the present preliminary study was to document non-native vascular flora at the three coastal Delaware State Parks: Cape Henlopen, Delaware Seashore and Fenwick Island. Monthly trips were made to the parks during the growing season of 2006 beginning in April, terminating in October. Over 450 specimens were collected. These were mounted on herbarium paper and will eventually be housed in the Batson Herbarium, University of South Carolina. The preliminary list of non-native vascular flora includes 73 species, 22% of the three parks flora. Three hundred thirty five vascular plant species have been identified as of October 15, 2006. Families with the greatest number of non-native vascular plant species were the *Poaceae* and *Asteraceae* with 13 and 11 species respectively. Plant families composed exclusively on non-native species were the *Commelinaceae*, *Elaeagnaceae*, *Liliaceae*, *Molluginaceae* and *Oleaceae.*

INTRODUCTION

Cape Henlopen State Park (CHSP) Delaware Seashore State Park (DSSP) and Fenwick Island State Park (FISP) extend from mid coastal Delaware south along the Delaware coast to the Delaware Maryland state line. Cape Henlopen State Park is separated from the mainland by the Lewes and Rehoboth Canal on its western border. Rehoboth Bay separates Delaware Seashore State Park from the mainland while an Assawomen Bay on the west separates Fenwick Island State Park from the mainland.

Delaware Seashore and Fenwick Island state parks are narrow spits of land approximately 300 meters wide. From the western bay boundary east to Route 1 the topography is relatively flat with an elevation of 1 to 2 meters above mean sea level. East of Route 1, beach dunes range from approximately 5 to 10 meters in height. Inland island central dune fields at Cape Henlopen range in height from 9 m to 15 m in the central portion of the park. Route 1 dissects Delaware Seashore and Fenwick Island; disturbance i.e., mowing and roadside maintenance provides excellent habitat for aggressive weedy alien species.

PLANT COMMUNITIES

Six naturally occurring plant communities occur at the three state parks. These include the dune-grass dominated primary dune community, the pine oak community on stable old dunes, a transitional shrub community, an extensive-salt marsh community, an extensive brackish marsh community, and a sedge-forb dominated community on moist interdunal swales. Most non-native species occupy disturbed sites including maintained roadsides and gardens around habitations.

CLIMATE

The climate of Coastal Delaware is milder than that of sites directly northward or inland. Detailed climatological data for Lewes, Delaware where Cape Henlopen is located found in the monthly publication of the National Oceanic and Atmospheric Administration[1]. Mean annual temperature at Lewes is 56.1°F (13.3°C), and the annual precipitation is about 44.9 inches (1140 mm). The average length of the frost-free period at the coastal parks exceeds 200 days. Nor'easters may occur from late fall to mid spring. Though not as potentially severe as hurricanes, nor'easters may cause dune damage from strong northeast or east winds. Strong winds may account for unusually high tides that produce severe dune erosion. Drought is frequent and may be especially injurious to vegetation if it is prolonged and occurs during the growing season. Fenwick island has the states' highest minimum temperature, 31°F (-0.4°C), and the state's lowest annual snowfall, 4.01 inches (101.9 mm).

METHODS

Collecting trips were made to the study areas approximately once a month during the growing seasons from April 2006 through October 2006. Objectives for each trip included the collection of voucher specimens and accumulation of information on abundance and apparent habitat preference for each species. Classification and determination of non-native status of vascular plant species were according to Gleason and Cronquist[2] and Bailey[3].

RESULTS AND DISCUSSION

The flora of Delaware is composed of 2,175 species of which 610 are not native[4]. Dicots, 1,411 taxa, are more numerous than monocots (669 species). The *Asteraceae*, *Poaceae* and *Cyperaceae* are the largest families in the flora with 238, 237 and 237 species respectively. The percentage of non-native species, 22 percent, of the parks' flora, was slightly less than the states' as a whole. Grasses (*Poaceae*) and composites (*Asteraceae*) contain the greatest number of species at the state parks, which is similar to the state's largest plant families.

Seventy three non-native vascular plant species have been identified at the three coastal Delaware state parks. Dicots (55 species) were more numerous than monocots (17 species). The total number of vascular plant species collected from April through October 15, 2006 includes 335 species in 183 genera in 92 families. Non-native species composed 22 percent of the flora.

The greatest number of non-native species were found in the *Poaceae* (n= 13) and the *Asteraceae* (n= 11) (Table 2). Five families were composed exclusively of non-native taxa: *Commelinaceae* (1/1), *Elaeagnaceae* (2/2), *Liliaceae* (3/3), *Molluginaceae* (1/1), and *Oleaceae* (1/1).

Several alien taxa, *Celastrus orbiculatus*, *Eragrostis curvula*, and *Phragmites australis,* pose a threat to native vascular plants. *Celastrus* may grow up and over

native species, covering and smothering them. *Eragrosits curvula* has become well established along sandy roadsides, especially at Cape Henlopen where it out competes native species and forms nearly pure stands. *Phragmites australis* was well established at wet sites, especially along the shores of Assawomen Bay. University of Maryland scientists have identified 5 non-native varieties of *Phragmites*. These are more aggressive than the single native North American variety. Additional aggressive non-native species are *Carex kobomugi, Elaeagnus angustifolia, E. umbellata,* and *Lythrum salicaria*.

Carex kobomugi is well established locally on coastal dunes, especially on the ocean-facing primary dune where wind deposits salt on vegetation. When conditions are favorable *C. kobomugi* forms nearly pure stands. *Carex kobomugi* has been reported in the coastal dunes at Sandy Hook, New Jersey, by Stalter in l975. In his l980 publication, Stalter presented historical invasion information of *C. kobomugi* on the Untied States east coast. *Carex kobomugi* may have been present at Island Beach State park, New Jersey in the l920's. It was reported at Virginia Beach, Virginia in l949, and at the public beach at Norfolk in 1966. It was also reported at Cedar Island, Virginia in l979 and at Fisherman Island, Virginia in the l970's. Stalter and Lamont (unpublished) have observed *C. kobomugi* on the ocean - facing side of the primary dunes at Back Bay National Wildlife Refuge and False Cape State Park in southeast Virginia in the l990's.

Elaeagnus spp., Russian Olive, generally occupies grassy fields. *Elaeagnus angustifolia* is common at Cape Henlopen State Park.. Selective cutting followed by the application of herbicide to cut stems should kill *Elaeagnus* and may prevent this shrub from dominating fields at Delaware's coastal parks.

Lythrum salicaria was present in small numbers at the moist interdunal swales at Fenwick Island, State Park. Populations of *L. salicaria* should be treated with herbicide and eradicated. If not treated, *L. salicaria* may become more abundant at moist habitats in the future, and pose a threat to the native vascular plant species that grow there.

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Table 1. A preliminary summary of the native and non-native vascular plant species at 3 coastal Delaware State Parks.

	Feen Allies	Ferns	Gymnosperms	Dicots	Monocots	Total
Families	1	6	2	70	13	92
Genera	1	6	2	155	56	220
Species	1	7	5	213	109	335
Introduced Species	0	0	1	55	17	73
Native-Species	1	7	4	158	92	263

Table 2. Plant families with large numbers of non-native vascular plant species and families exclusively composed of non-native species.

Family	Number of Alien Taxa	Percent Alien Taxa
Asteraceae	11/39	28
Commelinaceae	1/1	100
Elaeagnaceae	2/2	100
Liliaceae	3/3	100
Molluginaceae	1/1	100
Oleaceae	1/1	100
Poaceae	13/43	30

Table 3. A list of aggression or potentially aggressive non-native vascular plant species at 3 coastal Delaware state parks: Cape Henlopen, Delaware Seashore and Fenwick Island.

Species
Carex kobomugi
Celastrus orbiculatus
Elaeagnus species
Eragrustis curvula
Lythrum salicaria
Phragmites australis

EFFECTS OF BUCKWHEAT RESIDUE ON EMERGENCE AND EARLY GROWTH OF EIGHT WEED SPECIES.

V. Kumar, D.C. Brainard, and R.R. Bellinder, Cornell University, Ithaca, NY.

ABSTRACT

Cover crops and their residues improve soil health and suppress weeds. Buckwheat is a rapidly growing, summer annual cover crop that is widely grown by organic farmers in the Northeast, but little is known about the effects of buckwheat residue on weed suppression. The objectives of this research were (1) to evaluate the effects of buckwheat residue on emergence and early growth of eight weeds, and (2) to evaluate the possible role of nitrogen and allelochemicals in the suppression of sensitive weed species by buckwheat residue. To achieve these objectives, both field and growth chamber experiments were conducted in 2005 and 2006. For growth chamber trials, field-grown buckwheat was mowed and incorporated 40 days after planting. Soil was taken from plots with and without buckwheat residue 0 and 15 days after incorporation. Seeds of four summer annuals: Powell amaranth (PA); hairy galinsoga (HG); barnyardgrass (BYG); and common purslane (CP), and four winter annuals: yellow rocket (YR); corn chamomile (CCM); common chickweed (CK); and shepherd's purse (SP) were sown in pots and both emergence and growth were monitored daily for 20 days. The possible role of nitrogen in suppression of three sensitive species (PA. CCM, and SP) was tested by applying 0, 40, 80, and 160 kg/ha N to both buckwheat and bare ground pots. To determine the possible role of allelochemicals in weed suppression, a separate growth chamber study was conducted in which activated carbon (50ml/l) was applied to weeds grown in both buckwheat (greenhouse grown) and bare soil pots. In 2005, fresh buckwheat residues significantly reduced the emergence (36 to 74%) and biomass (36 to 90%) of all weed species except barnyardgrass. After 15 days, only PA suppression occurred. In 2006, fresh buckwheat residues suppressed emergence of only three species (PA, CP, CK) either had no effect or enhanced early growth of all eight weed species. Addition of N overcame the suppression of emergence and growth of CCM and SP but not that of PA. For PA, buckwheat residue suppressed emergence in the absence of activated carbon ($p=0.053$), but had no effect on emergence in the presence of activated carbon ($p=0.46$). In field trials conducted in 2006, PA, BYG, CK, and SP were sown in bare soil and buckwheat plots, immediately after buckwheat incorporation. Emergence of PA, CK, and BYG was reduced under buckwheat plots compared to bare soil by 72, 45, and 20%, respectively, but had no significant effect on SP. The preliminary results suggest that CCM and SP are suppressed by buckwheat residue due to lack of available nitrogen, whereas allelopathy may play an important role in suppressing PA emergence. Ongoing research will examine (i) nitrogen dynamics following buckwheat incorporation to further elucidate the role of nitrogen in weed suppression and (ii) the potential role of fungal pathogens in suppression of emergence of sensitive species.

EVALUATION OF VARIOUS TRICLOPYR, CARFENTRAZONE-ETHYL, AND GLYPHOSATE COMBINATIONS POST-APPLIED ON JAPANESE KNOTWEED, INCLUDING THE EXPERIMENTAL HERBICIDE F-4113. A.Z. Skibo and M.A. Isaacs, Univ. of Delaware, Newark.

ABSTRACT

A field study was conducted over 2005-2006 to evaluate the single season efficacy of selected POST-applied triclopyr, carfentrazone-ethyl, and glyphosate combinations on Japanese knotweed (*Polygonum cuspidatum* syn *fallopia japonica* syn *reynoutria japonica*). Data collected included percent visual control (0-100%) at 7, 14, 21, and 28 DAT, fresh weights consisting of all above ground biomass, taken as three m2 sub-samples per plot, were collected 28 DAT and 218 DAT (30 DAE) and weighed, then dried to a constant moisture and dry weights were recorded. Data were subjected to generalized linear model (GLM). Treatment means were separated using Duncan's multiple range test at the 0.05 level of significance. There was no significant difference between the herbicide treatments of triclopyr plus carfentrazone-ethyl with COC (0.56 and 0.28, 0.093 kg ai/ha, 1% v/v respectively), 91% and 88% control 28 DAT respectively, the combinations of triclopyr plus carfentrazone-ethyl plus mesotrione with COC (0.14, 0.093, 0.105 kg ai/ha, 1% v/v respectively), 81% control 28 DAT, and the prepackaged mixture of glyphosate and carfentrazone-ethyl with COC (5.6, 0.22 kg ai/ha, 1% v/v, respectively), 73% control 28 DAT. Slightly less control was obtained when applying triclopyr alone with COC (0.56 Kg ai/ha, 1% v/v respectively).

The treatments providing the best control 218 DAT/30 DAE were the combinations of glyphosate plus carfentrazone-ethyl with COC (5.6, 0.22 kg ai/ha, 1% v/v) and all three glyphosate treatments (1.85, 3.1, 3.65 kg ai/ha). There was no significant difference between rates of glyphosate applied alone suggesting that the lowest rate, 1.85 kg ai/ha, is adequate for the control of Japanese knotweed. All of the other treatments were relatively ineffective in controlling Japanese knotweed regrowth the following season (2006).

Japanese knotweed control 28 DAT and biomass reductions 28 DAT and 218 DAT/ 30 DAE. 2005-2006.[1, 2]

Herbicide treatment	Rate	Japanese knotweed control[1] 28 DAT	Japanese knotweed dry weights[1] 28 DAT	30 DAE
	-kg ai/ha-	-%-	-kg/plot-	-kg/plot-
Triclopyr	0.56			
+ carfentrazone-ethyl[6]	0.093	88.0a	0.116e	0.262b
Triclopyr	0.28			
+ carfentrazone-ethyl[6]	0.093	90.7a	0.120de	0.348b
Triclopyr	0.56			
+ carfentrazone	0.093			
+ mesotrione[6]	0.106	80.7ab	0.181bcd	0.307b
F-4113	5.8	73.7abc	0.137cde	0.00c
Carfentrazone-ethyl	0.22			
+ glyphosate[1]	5.68	69.0abc	0.162cde	0.00c
Triclopyr[1]	0.56	71.3abc	0.189bc	0.269b
Triclopyr	0.56			
+ mesotrione[6]	0.106	70.7abc	0.172bcde	0.246b
Glyphosate	3.1	51.3bcd	0.192bc	0.00c
Triclopyr	0.28			
+ mesotrione[6]	0.106	43.3cde	0.261a	0.2530b
Glyphosate	3.65	35.0de	0.188bc	0.00c
Glyphosate	1.85	20.0ef	0.195bc	0.00c
Untreated Control	---	0.0f	0.235ab	0.636a
$LSD_{0.05}$	---	30.7	0.06527	0.2279

[1] Abbreviations: DAT, days after treatment, DAE, days after emergence (07 MAY 2006)
[2] Means followed by the same letter are not significantly different according to Duncan's multiple range test at the 0.05 level of significance
[3] Japanese knotweed control was estimated visually 7, 14, 21, and 28 DAT.
[4] Japanese knotweed biomass, taken as three 1meter^2 sub-samples per plot, were collected 28 DAT and 218 DAT/ 30 DAE. Biomass dry weights were representative of percent reduction when compared to the control.
[5] Treatments included a non-ionic surfactant at 2.5% v/v
[6] Treatments included crop oil concentrate at 1% v/v

HURRICANES, AGING FORESTS, AND OVERABUNDANT WHITE-TAILED DEER: FACILITATORS OF INCREASED EXOTIC PLANT INVASION. J.L. Snitzer, H.M. McNett, K.L.A. Caraher, J. Bailey, Hood College, Frederick, MD, K.L. Kyde, Maryland Dept. of Natural Resources, Annapolis, and D.H. Boucher, Hood College, Frederick, MD.

ABSTRACT

Based on results in Eastern deciduous forests in Central Maryland damaged by hurricanes Isabel, Ivan and Katrina, the following observations were made:

1. Forests in the Mid-Atlantic States are becoming increasingly susceptible to windthrow as they age and as tree size increases.
2. Exotic invasive plants are favored by the canopy gaps and soil disturbance created by windthrow.
3. Browse by white-tailed deer reduces the percent cover of native plants and increases the percent cover of exotic plants following storm damage.

The combination of selective deer browse and extensive colonization of storm-damaged forest by exotic plants may be altering forest regeneration.

ENHANCED TOLERANCE TO WEED COMPETITION: EFFECTS OF CROP AND SOIL MANAGEMENT IN A LONG-TERM CROPPING SYSTEMS TRIAL.

M.R. Ryan, The Pennsylvania State Univ., University Park and The Rodale Institute, Kutztown, PA, D.A. Mortensen, S.B. Mirsky, The Pennsylvania State Univ., University Park, D.O. Wilson, R.M. Seidel, and P.R. Hepperly, The Rodale Institute, Kutztown, PA.

ABSTRACT

Long-term cropping systems trials systems provide unique opportunities to explore the effect of crop and soil management on crop-weed competition. The Farming Systems Trial (FST) was initiated in 1981 and compares a conventional management system with a corn-soybean rotation to two organic management systems. One organic system represents a dairy operation with a corn, soybean, wheat, and hay rotation, and uses manure as a nitrogen source for corn. The other organic management system represents a cash corn, soybean, wheat system without livestock, and uses legumes as a nitrogen source.

Over the 26 year history of the FST, the conventional and organic-livestock systems produced similar corn and soybean yields while the organic-legume system averaged approximately 10% lower yield (corn yields: 7460, 6718, and 7439 kg ha^{-1}; soybean yields: 2332, 2213, 2434 kg ha^{-1} for the organic-livestock, organic-legume, and conventional systems respectively). At the same time the two organic systems averaged 4-5 times greater weed biomass than the conventional system.

To explore the apparent increased weed tolerance in the organic systems, an experiment was conducted to determine if differences exist in crop-weed competition relationships in corn and soybean across systems. Density of mixed weed species was manipulated to achieve four levels ranging from weed free to a heavy infestation. Weed density and biomass at peak accumulation was used as a measure of weed infestation. The rectangular hyperbola model was fitted to data from each system. Crop yield loss as a function of mixed weed density was higher in the conventional system.

Descriptive models of weed competition on crop yield were fit using best subsets multiple regression to determine the competition effect of individual weed species to corn and soybean yield across systems. The rectangular hyperbola model was manipulated to explore the intensity of competition of individual weed species across systems. Preliminary analysis indicates that crop and soil management system differentially influences the competitive ability of weed species. Other mechanisms responsible for overall difference in crop yield loss as a function of weed density are perceived to be soil mediated crop production capacity.

THE ECOLOGY AND SPREAD OF INVASIVE SWALLOW-WORT SPECIES ACROSS NY STATE: DO ALLELOPATHY AND GENOTYPE PLAY A ROLE? C.H. Douglass and L.A. Weston, Cornell Univ., Ithaca, NY.

ABSTRACT

Pale swallow-wort (*Vincetoxicum rossicum* (Kleopow) Barbar.) and black swallow-wort (*V. nigrum* (L.) Moench) are herbaceous perennial vines introduced to the Northeastern U.S. from their native ranges in Eastern Europe and the Iberian Peninsula, respectively. While black swallow-wort can be found throughout the Northeast, from Long Island to Maine and west to St. Lawrence County in New York State, pale swallow-wort is most common in southern Ontario, Canada and Central N.Y. State, especially in the Finger Lakes region. Both species invade forest understories in unmanaged natural areas, but are becoming increasingly problematic in tree nurseries, fallow fields, and no-till cropping systems. Published reports have identified the potential allelopathic ability of these two swallow-wort species as possibly playing a significant role in their invasibility and increased competitiveness. Furthermore, numerous secondary metabolites (primarily alkaloids) with potent fungicidal or cytotoxic effects in mammalian systems have been extracted from swallow-wort foliar tissues. In order to test whether the two swallow-worts are indeed allelopathic, we designed a number of laboratory bioassays to examine the source and activity of bioactive secondary products in each species. Preliminary findings indicate up to a thirty percent decrease in root elongation of large crabgrass (*Digitaria sanguinalis*) seedlings when grown in the presence of seedlings of both swallow-wort species.

Both swallow-wort species display a high degree of phenotypic plasticity in natural settings, particularly with respect to leaf size, shape and surface characteristics, which may be related to their ability to adapt to diverse settings. Given that the swallow-worts are prolific cross pollinators and seed producers, it is likely that introduced populations exhibit some degree of genetic diversity. We are currently examining inter- and intra-population phenotypic plasticity as well as genetic diversity in populations collected across NY, in an attempt to examine factors likely associated with invasibility.

By comparing standard measures of phenotype (leaf shape index, flowering time, flower color, node number) and genetic distance between and within swallow-wort populations, we can further characterize the NY populations of both species of swallow-wort. Characterization will allow us to examine the recent spread of both species and their potential species similarities and differences, including reproductive success, which may involve successful hybridization of the two species in increasingly overlapping ranges.

EFFECTS OF PLANTING AND TERMINATION DATE ON COVER CROP BIOMASS AND SUBSEQUENT WEED SUPPRESSION USING ROLLER/CRIMPER TECHNOLOGY. S.B. Mirsky, W.S. Curran, and M.R. Ryan, The Pennsylvania State Univ., University Park.

ABSTRACT

Mechanical weed control with high tillage and cultivation frequency are typical weed management strategies for reduced pesticide or organic producers. Improving soil quality, namely increasing soil organic matter levels, is a goal that is frequently highlighted by producers. However, despite greater return of organic matter to the soil, the increased number of disturbances inherent to these cropping systems often results in a zero net gain or loss of soil organic matter. Rolling/crimping cover crops, as opposed to residue incorporation, has been suggested as a means of reducing tillage, weed populations, and herbicides used to control the cover crops. The objective of this experiment was to test the effects of planting and termination dates on rye (*Secale cereale*) cover crop biomass production and ensuing weed control. Efficacy of mechanical control of rye at different developmental growth stages was also tested. Planting of rye cultivars were seeded 10 days apart from August 25-October 15 (six planting dates and a control with no rye planting). Spring termination of cover crops occurred on 5/1, 5/10, 5/20, and 5/30. Rye biomass was sampled prior to each termination date, and weed population size was measured four and eight weeks after each termination date. Rye biomass increased with each 10 day delay in termination, and decreased with progressively later planting dates. Cover crop biomass ranged from 2150 to 11,025 kg ha^{-1}. Weed populations densities decreased with increasing delay in cover crop termination date. Complete weed control was achieved at the May 30 termination date 8 weeks after cover crop rolling in the 2005 field site. A comprehensive characterization of the relationship between cover crop biomass accumulation, growing degree days, and subsequent weed suppression will enhance success and adoption of cover crop technology.

EFFECTS OF FLOATING ROW COVER ON WEED EMERGENCE AND STALE SEED BED PERFORMANCE. D.C. Brainard, R.R. Bellinder and V. Kumar, Cornell Univ., Ithaca, NY.

ABSTRACT

Floating row covers can be valuable for season extension and for protecting crops from insects such as flea beetles. However, row covers complicate weed management since they improve conditions for germination and growth of weeds, and require removal for cultivation or herbicide applications. The objectives of this research were to (i) assess the effect of floating row covers on soil temperature and weed emergence, and (ii) to evaluate whether a stale seed bed used either alone or in combination with row cover before crop planting could reduce weed emergence after crop planting. Four field trials were conducted in central NY beginning in either late May or early July, 2005 and 2006. No crops were grown, but crop planting was simulated using a Monosem seeder. Each trial consisted of a total of six treatments arranged in RCBD. After simulated crop planting, plots were either left bare, or covered with floating row cover (Agribon 19). For each of these post-planting treatments, three pre-planting treatments were examined: (i) a conventional (CONV) treatment in which plots were harrowed immediately before simulated crop planting, (ii) a stale seed bed (SSB) treatment in which beds were prepared 2-3 wk in advance, and emerged weeds killed with Roundup (0.05 lbs ai/A) immediately before simulated crop planting, and (iii) a stale seed bed with row cover (SSB+RC) treatment, which was the same as the SSB treatment, except that plots were covered with floating row cover before simulated crop planting. Average soil temperatures (at 3 cm depth over a two wk interval) ranged from 0 to 3.5 C higher under the floating row cover compared to bare soil, with an average difference of 2.2 C. Temperature differences were highest in mid afternoon and on sunny days, reaching as much as 12 C. Higher temperatures under row covers resulted in 2- to 200-fold increases in weed emergence before simulated crop planting compared to bare soil, depending on trial and weed species. Averaged over all trials, weed emergence two wk after simulated crop planting was reduced 38% in SSB treatments, and 61% in SSB+RC treatments compared to CONV treatments. In two trials, SSB+RC treatments resulted in greater than 90% reduction in weed emergence compared to CONV controls. Our results demonstrate that (i) when used after crop planting, floating row covers can exacerbate weed management problems through stimulation of weed emergence, but that (ii) when used before crop planting, floating row covers can enhance the performance of stale seed beds and reduce emergence of weeds with the crop.

A UNIFYING FRAMEWORK FOR SPECIES INTRODUCTIONS: THE STATE FACTOR MODEL.

J.N. Barney, Cornell Univ., Ithaca and T.H. Whitlow, Cornell Univ., Ithaca, NY.

ABSTRACT

Synthetic quantitative models are valuable aids for predicting the behavior of complex ecosystems. Hans Jenny formed the first such model in the 1940s to describe any quantifiable soil property (s) as a function of five simple state factors: climate (cl), organisms (o), relief (r), parent material (p), and time (t). This simple 'clorpt' model allowed researchers to examine the effect of each state factor independently on any quantifiable soil property. Jack Major later adapted the ‘clorpt’ model to describe entire plant communities (V), and any property of vegetation (v). These state factor models are simple, generalizable, and amenable to empirical investigation. We have taken the concept of the state factor model and applied it to the study of incipient species introductions. The model contains five independent state factors that determine if an incipient introduction will become established, and subsequently, properties of the introduction once established. The state factors are invader autoecology (i), source habitat (s), introduced habitat (h), propagule pressure (p), and time elapsed since introduction (t). This novel model can be used to understand the enigma of introduced population success or failure in any habitat and time frame. Additionally, through manipulation of state factor variance this model can be used as a framework to explore any quantifiable property of a population (or meta-population) at any scale. We will discuss each state factor in detail, demonstrate independence among state factors, and explore uses.

GERMINATION PATTERNS OF SWAMP DODDER SEEDS PLANTED NEAR A COMMERCIAL CRANBERRY FARM. H.A. Sandler and K. Ghantous, Univ. of Massachusetts-Amherst Cranberry Station, East Wareham.

ABSTRACT

Dodder (*Cuscuta gronovii*) is a serious weed pest in commercial cranberry that is typically controlled with preemergence herbicides, such as Casoron (dichlobenil) or Kerb (pronamide). Successful management is tied to proper timing of herbicide to recently germinated seedlings. This study was initiated to gather information on the germination patterns of dodder to facilitate timely applications.

Utilizing a simple system of simulated bogs constructed in plastic containers, the germination pattern of MA dodder seed has been monitored for 9 years. In 1997, 8 cm of peat was placed in the bottom of a 5-gallon container, covered by 10 cm of sand, which was then covered with 13 cm of 50:50 sand:peat mix. In the fall of 1997 and 1998, one set of 10 containers was prepared in this fashion. On 8 Dec. 1997, 150 cc of unscarified dodder seed was placed on the top layer and incorporated into the top 1 cm of mixture. The containers were randomly arranged outside near a greenhouse, approximately 15 m from the cranberry production area. Based on the large number of germinated seedlings generated from this initial set, the seed amount was reduced to 15 cc for inoculation of the second set. The second set of containers was inoculated on 7 Dec. 1998. Pots were monitored twice weekly starting in early April until the first seedling germinated. Seedlings were counted and removed daily and less frequently during high and low germination periods, respectively. The containers were watered and weeded as needed.

In 1998, over 50,000 seedlings germinated from the first set of containers, with a peak 2-week period in early May (Julian date 121-134) that generated an average of approximately 1,700 seedlings per container each wk. A second peak occurred in mid-June (Julian date 163-169) that tallied an average of 372 seedlings per container. Even in early July (Julian date 184-190), an average of 30 seedlings were germinating per container. Germination was still robust for the next 3 yr, (44-66% of Year 1). By 2006, germination was ~10% of Year 1, (3,700 seedlings). Numbers were lower in the second set, but followed a similar trend.

Dodder seeds apparently have a definitive peak of germination in the initial year after planting. Peaks can still be seen in subsequent years, but they are less definitive and much lower in absolute numbers. Over the course of this 9-year study, the peak germination period occurred later each year. The delay of peak germination may contribute to the difficulties growers have in managing dodder. As new seed is introduced into the system each year, its peak germination period may be different from dodder germinating from the seedbank. Since most herbicides targeting dodder can only be efficacious for a specific window of time, a portion of the population may always escape preemergence control and provide enough viable seedlings to cause substantial infestations in the vine canopy.

BIOLOGY OF MULTIFLORA ROSE: AN INVASIVE SPECIES. P. Bhowmik, D. Sarkar, and N. Tharayil, Univ. of Massachusetts, Amherst.

ABSTRACT

Multiflora rose (*Rosa multiflora* Thunberg ex. Murray), a member of Rosaceae, is a stout, thorny, perennial shrub with arching stems. It is native to Japan, Korea, and eastern China, and has been introduced into the east coast of North America, via Japan, as an ornamental plant. During 1940-1960, this species was widely planted in the eastern US as a wildlife plant for erosion control and as a living fence. It is widely distributed throughout the US with the exception of the Rocky Mountains, the southern Coastal Plain and the desert of CA and NV (Fig. 1). Multiflora rose infests more than 45 million acres throughout the eastern US, ranging from northern TX, AK, MI, AL, and GA in the south, to the New England coast, central NY in the north, and southern MI, WI and MN. It is able to invade a large number of habitats, from hillside pastures, fence rows, right-of-ways, and roadside to forest edges and the margins of swamps and marshes. Multiflora rose can tolerate a wide range of soils and environmental conditions. It forms dense impenetrable thickets or completely takes over the pasture. It has been classified as a noxious weed in IL, KS, MD, MO, OH, PA, VA, WI, and WV.

Multiflora rose primarily reproduces by seeds, but it also can sprout, and form root at the tips of arching canes that contact the ground. Mature plants may reach 3 m height and 6.5 m diameter. Stems are reddish to green, 1.5 cm in diameter and bear numerous, recurved thorns. Leaves are pinnately compound with 5 to 11 sharply toothed, ovate to oblong leaflets. Petioles are 1 to 1.3 cm long with finely dissected, usually glandular stipules. Flowers appear in large, showy, densely to sparsely flowered panicles at the ends of the branches in late May or early June. The five petals are white to pinkish, obvate and truncate. Fruit is an achene, and achenes are flattened, oval to obvoid, yellowish to tan in color and enclosed in a smooth reddish hypanthium. Each cane/stem on a large plant may contain 40 to 50 panicles, and each panicle can contain as many as 100 hypanthia or hips, and each hip, an average of seven seeds. Thus each large cane can produce 17,500 seeds, and those seeds can remain viable in soil for as long as 20 years. Birds are the primary disperser of the multiflora rose seeds, and passing through the digestive tract of birds enhances seed germination. Germination is also enhanced by stratification. Seedlings begin to appear within 60 d if the soil surface remains warm.

Mechanical and chemical control methods are most widely used for multiflora rose. Repeated mowings for several years are necessary to clean heavily infested areas. July is the best time for mowing. Bulldozing, chaining, or brush hogging is often effective to knock down the large established plants. European rose chalcid (seed wasp) (*Magastigmus aculeatus* var. *nigroflavus* Hoffmeyer) and rose-rosette disease (*Phyllocoptes fructiphilus* Keifer), which is spread by tiny native mite are the promising biocontrol agents. Effective control of multiflora rose can be achieved by several herbicides. Glyphosate at 1 to 2% (V/V), when applied in June-July gave 95 to 100% control. Triclopyr, tebuthiuron, dicamba, picloram, and metsulfuron also gave good control of multiflora rose. Continued monitoring of this species for its new habitats, development of IWM strategies, and adoption of management options are important steps to restrict this invasive weed.

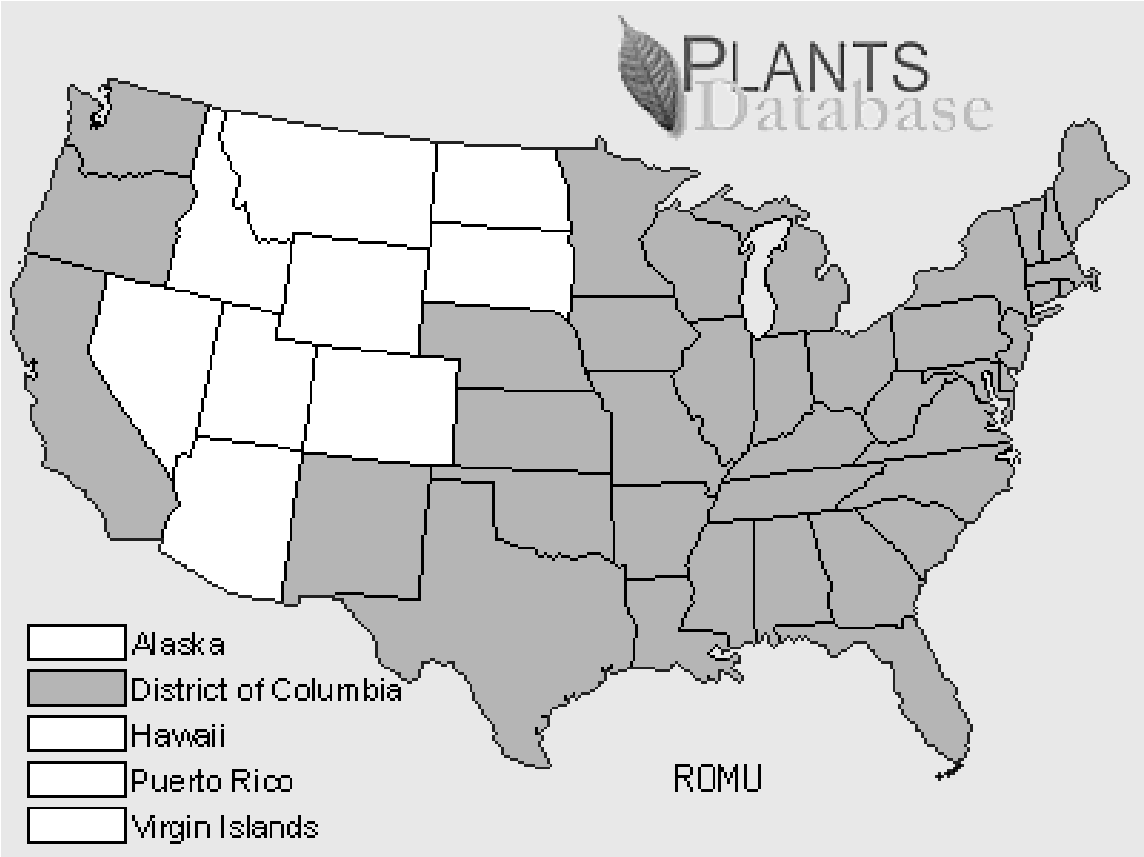

Figure 1. Distribution of multiflora rose in USA.
Source- http://plants.usda.gov

AN OUNCE OF PREVENTION. M.J. VanGessel, Univ. of Delaware, Georgetown, D. Doohan, Ohio State Univ., Wooster, P.J. Christoffoleti, S.J.P. de Carvalho, and M. Nicolai, Univ. of São Paulo, Piracicaba, São Paulo, Brazil.

ABSTRACT

Prevention has been a cornerstone of weed management throughout history and arguably is the most cost-effective approach that a grower can take. However, preventive management is complex, involving integration of a group of practices and policies that avoids introduction, infestation, or dispersion of certain weed species to areas free of those species or biotypes. At the agro-ecosystem level, seed or propagule dispersion from field to field and from farm to farm needs to be recognized as an important factor that affects the whole agricultural system and should be included in comprehensive weed management planning.

In the absence of human activity weeds rely upon the same natural processes for dissemination as do other plants; dispersal by wind and water, adhesion to fur or feathers, and through food webs. However, farming, trade, and human migration usually amplify the impact of these dispersal adaptations.

Dispersal of weeds by human activities include plant introductions, use of infested crop seeds, movement with machinery and equipment, movement with harvested plant parts, movement with soil, animals and associated manure, and use of infested irrigation water. Manure application, irrigation water, use of plant material as organic matter (although not quantified in the literature), and use of weed seed contaminated crop seed all contributed thousands to hundred of thousands of seeds per hectare. Additional management practices (i.e., composting, addition of screens, etc.) can have dramatic impacts on reducing the number of viable seeds; however, seldom is the loss of viability 100%.

The focus of a prevention program is two-fold, to eliminate the introduction of new species (or biotype) as well as reducing the number of seeds in the weed seed bank. Once a species is introduced and is allowed to emerge, become established, and produce seed, there is potential to become a significant portion of the weed seed bank in a relatively short period.

RESPONSE OF PALE SWALLOW-WORT TO TRICLOPYR APPLICATION AND CLIPPING. K.M. Averill, A. DiTommaso, and S.H. Morris, Cornell Univ., Ithaca, NY.

ABSTRACT

Pale swallow-wort (*Vincetoxicum rossicum* (Kleopow) Barbar.) is an invasive alien vine in natural areas in many Northeastern U.S. States and Provinces of Ontario and Quebec. Since effective control of this herbaceous perennial has been previously difficult, we conducted a two-year (2005-2006) triclopyr and clipping field study in Chaumont, NY. We compared the effects of a single season (mid-June 2005) foliar application of triclopyr at the labeled rate of 1.9 kg a.e. ha^{-1}, alone and in combination with clipping of aboveground tissue (mid-July), and the effects of clipping once (mid-June) and twice (mid-June and mid-July) during the first and second seasons on pale swallow-wort stem and seedling density and percentage cover. By the end of September 2005, pale swallow-wort stem densities were significantly lower in triclopyr-treated plots (0.43 to 13 stems m^{-2}) than in clipped-only (181 to 206 stems m^{-2}) and unmanaged control (167 stems m^{-2}) plots. Similarly, the percentage cover of pale swallow-wort was significantly lower in plots treated with triclopyr (6 to 13%) compared with plots subjected to clipping only treatments (76-85%) or unmanaged control plots (78%). By the end of September 2005, the percentage cover of other plant species was significantly higher in triclopyr treatments (66 to 67%) than in the clipping only treatments (11-16%) and in the unmanaged control (11%). The same differences in stem density and percentage cover were observed through August 2006. Seedling densities of pale swallow-wort varied by year and treatment. Densities were significantly greater in the clipping only and control treatments in 2005 (964 to 1207 seedlings m^{-2}) than the same treatments in 2006 (414 to 493 seedlings m^{-2}), but they were not significantly different in the triclopyr treatments between 2005 (114 to 207 seedlings m^{-2}) and 2006 (111 to 254 seedlings m^{-2}). By the end of both the 2005 and 2006 growing seasons, in clipping only plots mature follicles were produced, however in triclopyr-treated plots no follicles were produced. Thus, the clipping only treatments, regardless of frequency, were not effective in reducing pale swallow-wort aboveground biomass, cover, or follicle production. The timing of clipping may be critical in reducing follicle production and, although further assessments are necessary, a later-season (August) clipping may be more effective. Although in this study a single application of triclopyr provided considerable control of pale swallow-wort even after two growing seasons, it is likely that repeat applications of triclopyr during multiple years would be required to achieve effective control, especially in heavily infested areas.

HERBICIDE COMPARISON IN WET BLADE APPLICATIONS FOR SWEET GUM, TULIP POPLAR, AND RED MAPLE CONTROL. A.R. Post and J.C. Neal, North Carolina State Univ., Raleigh, and C.A. Judge, BASF, Research Triangle Park, NC.

ABSTRACT

Roadside and right-of-way vegetation must be managed to maintain motorist visibility and safety, and to prevent vegetation from interfering with utility lines. Traditionally, the department of transportation has used mowing or broadcast sprays of broad-spectrum herbicides to control woody vegetation on roadsides and right-of-ways. Mowing provides only temporary suppression and must be repeated every one to three years. Broadcast sprays are undesirable on right-of-ways due to the potential for off-target impacts. An alternative herbicide application strategy is the treatment of cut stems using "wet blade" application systems such as the Diamond Wet Blade. However, little research has been conducted to compare the effectiveness of wet-blade herbicide applications on woody vegetation. This study compared the efficacy of wet blade applications of four herbicides at five concentrations each on three common, roadside woody weeds -- sweet gum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), and red maple (*Acer rubrum*). The treatments included triclopyr (Garlon 3A), metsulfuron (Escort), and glyphosate (Rodeo) at 50%, 25%, 10%, 5%, and 1% and imazapyr (Arsenal) at 10%, 5%, 2.5%, 1%, and 0.5% by volume in water. Trees were plantation-grown for this study to ensure uniform age at application. Five ml of each treatment solution was applied to the cutting blade of lopping shears and stems were cut approximately 10 cm above the ground. Treatments were applied November 30, 2005 in a randomized complete block design with 4 replications of each species. Re-growth was measured August 30, 2006. No treatment resulted in 100% mortality of all species. Sweet gum was 100% controlled by 50% triclopyr and 10% imazapyr; 25% triclopyr and 1% imazapyr each provided >90% on sweet gum. Red maple was controlled 100% by 10%, 2.5% and 1% imazapyr; and >90% by 0.5% imazapyr. No treatment provided 100% mortality of tulip poplar. Greatest tulip poplar control was observed with 2.5 to 10% imazapyr, and 10% to 50% glyphosate. Triclopyr did not control tulip poplar. This study suggests that combination treatments may be required to achieve broad-spectrum woody vegetation control with wet blade applications.

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EVALUATION OF HERBICIDES FOR CONTROL OF MORROW'S HONEYSUCKLE USING FOLIAR TREATMENTS. J.M. Johnson, A.E. Gover, and L.J. Kuhns, The Pennsylvania State Univ., University Park.

ABSTRACT

As part of an ongoing research project funded by the Pennsylvania Department of Transportation, a study was established to investigate the effectiveness of several herbicides and tank mixes for controlling Morrow's honeysuckle (*Lonicera morrowii* Gray, LONMO).

This trial was established in a pasture near University Park, PA. Fifty shrubs were tagged and measured to determine average canopy width. The treatment volume for each shrub was derived using the calculated basal area and an application volume of 935 l/ha.

The study was arranged in a completely randomized design with ten treatments and five replications. Each shrub represented a single replicate. Treatments were applied as a foliar application on June 29, 2005 using a CO_2-powered sprayer equipped with a spray wand with a single XR8008VS tip. Herbicide treatments (kg ae/ha) included metsulfuron at 0.042, 0.084, or 0.13; fosamine at 4.0 or 8.1; fosamine at 4.0 plus imazapyr at 0.070; glyphosate (isopropylamine) at 3.4, alone or in combination with imazapyr at 0.07; and metsulfuron at 0.042 with the premix of dicamba at 0.28 plus diflufenzopyr at 0.11. A non-ionic surfactant[1] was added to all treatments at 0.25 percent, v/v, except those containing the surfactant-loaded glyphosate.

Visual ratings of percent canopy reduction were taken September 1, 2005, and July 10, 2006, 9 and 51 weeks after treatment (WAT). At 9 WAT, all treatments containing metsulfuron resulted in almost complete canopy reduction with values ranging from 97 to 100 percent. Glyphosate combinations were rated from 82 to 93 percent canopy reduction. Treatments that included fosamine were rated between 33 and 57 percent canopy reduction.

At 51 WAT, LONMO treated with all rates of metsulfuron, the glyphosate combinations, and the 8.1 kg ae/ha rate of fosamine were rated between 80 and 100 percent canopy reduction. Fosamine at 4.0 kg ae/ha, alone or with imazapyr at 0.07 kg ae/ha was rated at 48 and 52 percent reduction.

[1] Activator 90, Loveland Industries Inc., Greeley, CO.

Table 1. Morrow's honeysuckle (*Lonicera morrowii*, LONMO) was treated with foliar herbicide applications on June 29, 2005. Visual ratings of percent canopy reduction were taken September 1, 2005 and July 10, 2006, 9 and 51 weeks after treatment (WAT). Each value is the mean of five replications. One shrub was not located during the rating at 51 WAT. Means for 51 WAT followed by the same letter are not significantly different according to Fisher's Protected LSD at p=0.05.

Treatment	Application rate	LONMO canopy reduction 9 WAT	51 WAT	
	kg ae/ha	---------- %	----------	
untreated	---	0	0	c
metsulfuron	0.042	97	80	a
metsulfuron	0.084	100	98	a
metsulfuron	0.13	100	100	a
fosamine	4.0	33	48	b
fosamine	8.1	57	84	a
fosamine imazapyr	4.0 0.07	40	52	b
glyphosate	3.4	82	93	a
glyphosate imazapyr	3.4 0.07	93	99	a
metsulfuron dicamba + diflufenzopyr	0.042 0.28 0.11	100	96	a
Protected LSD (p=0.05)		20	---	

EFFICACY OF GLYPHOSATE, IMAZAPYR AND TRICLOPYR FOR PHRAGMITES MANAGEMENT IN A CONNECTICUT MARSH. T.L. Mervosh, Connecticut Agricultural Experiment Station, Windsor; and D.P. Roach, All Habitat Services LLC, Madison, CT.

ABSTRACT

Common reed or phragmites (*Phragmites australis* (Cav.) Trin.) is an invasive grass that dominates many wetland areas, including freshwater and brackish marshes throughout the Northeast. This extremely tall, rhizomatous perennial displaces cattails (*Typha* spp.) and other native plants. The efficacy of three herbicides was evaluated in a study in a tidal marsh along the lower Connecticut River in Old Saybrook. The area was mowed in March 2005 to cut down dry standing stalks of *Phragmites*. Plots were arranged in a RCB design with three replicates per treatment. Plot dimensions were 20 ft x 20 ft, and untreated alleyways (10 ft) surrounded each plot.

Herbicide products with aquatic use registrations were evaluated. Isopropylamine salt of glyphosate, isopropylamine salt of imazapyr, and/or triethylamine salt of triclopyr were sprayed over the top of *Phragmites*-dominated plots at one of three timings in 2005: June 2 ('A'), June 24 ('B'), or September 14 ('C'). Herbicide treatments were prepared in 2-L bottles. Based on calibration tests before each application, bottles were filled with CO_2 to a specific pressure. For the 'A' timing, *Phragmites* was an average of 4 ft tall, and herbicides were applied using a hand-held, four-nozzle spray boom with TeeJet 8003VS tips. Spray volume was 25 gallons/A. For the 'B' and 'C' timings, *Phragmites* was an average of 8 ft and 11 ft tall, respectively. Herbicides were applied from an elevated platform mounted on an amphibious all-terrain vehicle driven in the alleyways. Treatments were sprayed with a Hypro XT-043 boomless nozzle in two passes from opposite ends of each plot. Spray volume was 50 gallons/A.

In addition to an untreated check, the following treatments were applied at all three application timings: triclopyr at 1.5, 2.25 or 3 lb ai/A; glyphosate at 2 lb ai/A; glyphosate + triclopyr (1 + 1.5 lb ai/A, or 2 + 0.75 lb ai/A); imazapyr at 0.5 lb ai/A; imazapyr + triclopyr (0.125 + 1.5 lb ai/A, or 0.125 + 2.25 lb ai/A). For the 'A' and 'B' timings, two additional treatments were included in which triclopyr at 1.5 or 2.25 lb ai/A was applied a second time to the same plots on September 9, 2005. All treatments included a non-ionic surfactant (1 qt/A) in the spray solution.

Plots were evaluated periodically through September 2006 for height, relative number of stems, vigor, injury symptoms, and effects on other plants. Most treatments were more effective when applied in September 2005 ('C') than when applied in June 2005 ('A' or 'B'). Treatments containing glyphosate and/or imazapyr were better than treatments containing only triclopyr at reducing growth in 2006. Although triclopyr suppressed *Phragmites* following 2005 applications, *Phragmites* growth the next year was reduced substantially only when glyphosate or imazapyr was combined with triclopyr. The imazapyr (0.5 lb ai/A) treatment and those containing glyphosate at 2 lb ai/A provided the best control of *Phragmites* in 2006. Plots will be evaluated in 2007 for *Phragmites* and for other plant species that emerge.

Triclopyr did not perform as well in this experiment as it has in large-scale *Phragmites* management projects conducted by D. Roach. Application parameters such as timing, spray volume and coverage are factors that likely influence triclopyr efficacy.

EVALUATION OF HERBICIDES FOR CONTROL OF JAPANESE KNOTWEED. J.M. Johnson, A.E. Gover, and L.J. Kuhns, The Pennsylvania State Univ., University Park.

ABSTRACT

As part of an ongoing research project funded by the Pennsylvania Department of Transportation, a study was established to investigate the effectiveness of several herbicides and tank mixes for controlling Japanese knotweed (*Polygonum cuspidatum* Sieb & Zucc., POLCU).

This trial was established on a well-established stand of Japanese knotweed located on an island of the Susquehanna River within Milton State Park, Milton, PA. POLCU ranging from 2.4 to 3.7 m was mowed to the ground on June 8, 2005, and 2.7 by 7.6 m. plots were laid out in a randomized complete block design with three replications. POLCU regrowth height averaged 0.8 m, and average cover ranged from 37 to 89 percent when sprayed on August 17, 2005. Treatments were applied as a foliar spray using a CO_2-powered, hand-held, fixed-width boom equipped with TeeJet XR8004 VS tips delivering 281 l/ha at 172 Kpa. Herbicide treatments (kg ae/ha) included fluroxypyr at 0.31; a premix of dicamba plus diflufenzopyr at 0.14 plus 0.056, 0.21 plus 0.084, or 0.28 plus 0.11; fluroxypyr at 0.31 plus the premix of dicamba plus diflufenzopyr at 0.21 plus 0.084; dicamba (diglycolamine) at 2.2; dicamba at 1.1 and the premix of dicamba plus diflufenzopyr at 0.28 plus 0.11; glyphosate at 3.4; and fosamine at 6.0 alone or with imazapyr at 0.070. A methylated seed oil[1/] was added to all treatments at 2.3 l/ha, except those containing fosamine, which included a non-ionic surfactant[2/] at 0.25 percent, v/v.

Visual ratings of percent initial cover by POLCU and percent POLCU injury were taken August 17 and September 23, 2005, 0 and 5 weeks after treatment (WAT), respectively. Percent POLCU cover and biomass reduction were evaluated July 24, 2006, 49 WAT. These data were subjected to analysis of variance, and means were compared using Fisher's Protected LSD (p=0.05) (Table 1).

At 5 WAT, percent injury ranged from 33 to 99 percent. Dicamba alone at 2.2 (kg ae/ha), or at 1.1 with the premix of dicamba plus diflufenzopyr at 0.28 plus 0.11; and glyphosate at 3.4 provided the greatest initial injury with values from 93 to 99 percent.

At 49 WAT, the best-rated treatment was glyphosate at 3.4 (kg ae/ha), with percent POLCU cover and reduction ratings of 1 and 99 percent. Dicamba plus diflufenzopyr at 0.14 plus 0.056, or 0.21 plus 0.084 alone or in combination with fluroxypyr at 0.31 were the only treatments rated significantly different, with average POLCU cover values ranging from 44 to 70 percent, and percent POLCU reduction ranging from 57 to 67 percent. All other treatments averaged 4 to 38 percent POLCU cover and 80 to 96 percent POLCU reduction.

[1/] Meth Oil, BASF, Research Triangle Park, NC
[2/] Activator 90, Loveland Industries Inc., Greeley, CO.

Table 1. Japanese knotweed (*Polygonum cuspidatum*, POLCU) was mowed June 8, 2005, and treated with herbicides on August 17, 2005. Visual ratings of percent POLCU injury were taken September 23, 2005, 5 weeks after treatment (WAT). Percent POLCU cover and biomass reduction were evaluated July 24, 2006, 49 WAT. Each value is the mean of three replications.

treatment	application rate	POLCU injury 5 WAT	POLCU cover 49 WAT	POLCU reduction 49 WAT
	kg ae/ha	---------- % ----------		
fluroxypyr	0.31	80	21	88
dicamba + diflufenzopyr	0.14 0.056	60	70	57
dicamba + diflufenzopyr	0.21 0.084	62	52	67
dicamba + diflufenzopyr	0.28 0.11	70	38	90
fluroxypyr dicamba + diflufenzopyr	0.31 0.21 0.084	83	44	63
dicamba	2.2	99	20	93
dicamba dicamba + diflufenzopyr	1.1 0.28 0.11	97	34	80
glyphosate	3.4	93	1	99
fosamine	6.0	33	11	95
fosamine imazapyr	6.0 0.070	67	4	96
Protected LSD (p=0.05)		15	39	28

EVALUATION OF HERBICIDES FOR CONTROL OF AUTUMN OLIVE USING FOLIAR TREATMENTS. J.M. Johnson, A.E. Gover, and L.J. Kuhns, The Pennsylvania State Univ., University Park.

ABSTRACT

As part of an ongoing research project funded by the Pennsylvania Department of Transportation, a study was established to investigate the effectiveness of several herbicides and tank mixes for controlling autumn olive (*Elaeagnus umbellata* Thunb., ELGUM).

This trial was established in a pasture near University Park, PA. Sixty ELGUM were tagged and measured to determine crown diameter and height. The treatment volume for each shrub was derived using the calculated crown profile area (average diameter by height) and a targeted application volume of 935 l/ha. Target plant height ranged from 1.7 to 3 m.

The study was arranged in a randomized complete block design with twelve treatments and five replications, with each plant serving as a replicate. Treatments were foliar applied on July 7, 2005 using a CO_2-powered sprayer equipped with a spray wand and single TeeJet XR8008VS tip. Herbicide treatments, in kg ae/ha, included metsulfuron at 0.042, alone or in combination with a premix of dicamba at 0.28 plus diflufenzopyr at 0.11; metsulfuron at 0.084 plus triclopyr (triethylamine) at 2.5; metsulfuron at 0.13 combined with either imazapyr at 0.56, fosamine at 12.1, picloram at 0.56, or fosamine at 12.1 plus imazapyr at 0.56; imazapyr at 1.1; glyphosate (isopropylamine) at 3.4; triclopyr at 3.4; and fosamine at 4.0 plus imazapyr at 0.07. A nonionic surfactant[1] was added to all treatments at 0.25 percent v/v, except those containing the surfactant-loaded glyphosate. Percent canopy reduction was visually rated on September 1, 2005 and July 10, 2006, 8 and 50 weeks after treatment (WAT).

At 8 WAT, ELGUM treated with triclopyr alone or in combination with metsulfuron was completely defoliated. ELGUM treated with metsulfuron plus fosamine and metsulfuron plus picloram was rated at 79 to 93 percent canopy reduction.

When rated 50 WAT, ELGUM treated with metsulfuron at rates (kg ae/ha) of 0.084 or higher, imazapyr alone at 1.1, or triclopyr alone at 3.4 had average canopy reduction ratings of 91 to 100 percent. Reduction ratings for fosamine plus imazapyr were significantly lower than the best rated treatments at 70 percent. Treatments including metsulfuron at 0.042, or glyphosate alone at 3.4 were ineffective at controlling autumn olive.

[1] ChemSurf 90, Chemorse Ltd., Des Moines, IA.

Table 1: Foliar herbicide treatments were applied to autumn olive (*Elaeagnus umbellata,* ELGUM) on July 7, 2005. Ratings were taken September 1, 2005 and July 10, 2006, 8 and 50 weeks after treatment (WAT). Each value is the mean of five replications. Four shrubs were not located during the rating conducted at 50 WAT. Means for the 50 WAT evaluation followed by the same letter are not significantly different according to Fisher's Protected LSD at p=0.05.

treatment	application rate	ELGUM canopy reduction 8 WAT	50 WAT	
	kg ae/ha	----------%----------		
untreated	---	0	0	e
metsulfuron	0.042	51	45	cd
metsulfuron dicamba + diflufenzopyr	0.042 0.28 0.11	35	23	de
metsulfuron triclopyr	0.084 2.5	100	100	a
metsulfuron imazapyr	0.13 0.56	51	98	a
metsulfuron fosamine	0.13 12.1	79	93	ab
metsulfuron picloram	0.13 0.56	93	91	ab
metsulfuron fosamine imazapyr	0.13 12.1 0.56	90	100	a
imazapyr	1.1	54	100	a
glyphosate	3.4	27	14	e
triclopyr	3.4	100	100	a
fosamine imazapyr	4.0 0.07	32	70	bc
Protected LSD (p=0.05)		26	---	

HOT WATER SYSTEMS FOR VEGETATION MANAGEMENT. R.G. Prostak and A.V. Barker, Univ. of Massachusetts, Amherst.

ABSTRACT

In recent years, the requests from the general public for non-chemical weed management strategies have increased. Two experiments were conducted at University of Massachusetts Crop Research and Education Center in Deerfield, MA to evaluate and compare two hot-water, weed-control systems.

The AQUACIDE™ Environmental Weed Control System Model 665 by E.C.O. Systems Inc. delivers 5.6 gpm of super-heated hot water on demand at an operating temperature from 232 to 253 ^{o}F. Four types of wand-end applicators are available. The Waipuna Organic Hot Foam Weed Control System by Waipuna Systems Ltd of Auckland, New Zealand delivers 3.1 to 3.6 gpm of hot foam at an operating temperature from 203 to 208 ^{o}F. A plant sugar extract from corn and coconut is mixed with water at 0.4% v/v to produce the foam. Three types of wand-end applicators are available for the Waipuna. Both systems heat water with a number 2 oil burner.

Experiment 1 was treated was treated on June 13, 2006. Four by twenty foot plots were treated with each machine at 1, 2, 3, or 4 minutes. Control of vegetation was assessed at 2, 17, 30, and 43 days after treatment (DAT). Experiment 2 was treated on July 11, 2006. Four by twenty foot plots were treated with each machine at 3, 3.5, 4.5, 5.25, 6, or 7 minutes. Control was assessed taken at 2, 15, 20, 35, and 52 DAT. The test site was a mixed stand of tall fescue (*Festuca arundinacea* Schreb.), quackgrass (*Elytrigia repens* Nevski), sweet vernalgrass (*Anthoxanthum odoratum* L.), orchardgrass (*Dactylis glomerata* L.), and timothy (*Phleum pretense* L.).

The Aquacide and Waipuna machines provided similar levels of control at a given time interval treatment in each experiment. In experiment 1, Aquacide or Waipuna treatments at 2, 3, or 4 minutes resulted in mean control of 88% at 2 DAT, and the 1 minute treatment provided 69% control. At 43 DAT, mean control decreased to 10% at 1-minute time of treatment, 14% at 2 minutes, 24% at 3 minutes, and 42% at 4 minutes. In experiment 2, all treatments resulted in a mean of 98% control at 2 DAT and 80% control at 20 DAT. Percent control decreased to 41% at 35 DAT and 3% at 52 DAT. Control of vegetation by hot-water treatment lasts for about 5 weeks, and choice of implement may be based on convenience and costs of operation.

RAPID RESPONSE TO THE INVASIVE VINE, BUSHKILLER, IN NORTH CAROLINA.

R.J. Richardson, A.M. West, and A.P. Gardner, North Carolina State Univ., Raleigh, NC.

ABSTRACT

Bushkiller (*Cayratia japonica* (Thunb.) Gagnep.) is an aggressive, perennial vine in the grape family (Vitaceae). Prior to 2005, this exotic species was only known to occur in North America in the Texas to Mississippi area. Bushkiller is somewhat similar in appearance to Virginia creeper (*Parthenocissus quinquefolia* (L.) Planch.). Both species bear leaves of five leaflets with serrated margins. However, bushkiller is herbaceous with a terminal leaflet larger than the other four leaflets providing a distinct appearance. Tendrils are opposite from leaves and do not have adhesive discs like Virginia creeper. The flowers are small yellow clusters and have not produced viable seed in North Carolina. In August 2005, an unknown weed sample was submitted to North Carolina State University for identification. This plant sample was soon recognized as bushkiller (*Cayratia japonica* (Thunb.) Gagnep.) and confirmed by herbaria samples. Local extension agents and homeowners were immediately contacted to arrange a site visit. By September, scientists from NCSU, APHIS, and USGS had visited the site in Winston-Salem, NC, to assess the situation. A small task force was then created to develop and execute an eradication plan. The task force obtained limited funding to begin eradication procedures in 2006. The plan consisted of foliar applications, cut-stem treatments, and handweeding of the infested site. Greenhouse trials indicated that triclopyr was the most efficacious herbicide on bushkiller with adequate selectivity for use on the infested site. NCSU personnel, county extension agents, and local volunteers participated in the eradication efforts with support of the affected homeowners. While vigor and density of the bushkiller population has been reduced, treatments will need to be continued at least through 2007 before complete eradication could be possible. Extension agents and the general public have not reported this species at any other sites in North Carolina.

SEEDHEAD SUPPRESSION OF ANNUAL BLUEGRASS ON A PUTTING GREEN IN 2006. M.B. Naedel and J.A. Borger, The Pennsylvania State Univ., University Park.

ABSTRACT

This study was conducted on a mixed stand of 'Pencross' creeping bentgrass (*Agrostis stolonifera*) and annual bluegrass (*Poa annua*) at the Penn State Blue Golf Course in State College, PA. The objective of the study was to evaluate selected growth regulators, with and without adjuvants, for the seedhead suppression of annual bluegrass. This study was a randomized complete block design with three replications, and a plot size of 21 ft^2. Treatments were applied on April 6 (PRIOR), April 13 (BOOT), and May 6 (3 WAT), 2006, respectively, using a three-foot CO_2 powered boom sprayer calibrated to deliver 40 gpa using one 11004E even tip/flat fan nozzle at 40 psi. Boot stage of the annual bluegrass was observed April 16, 2006. Non treated test areas within the test site revealed approximately 100% coverage of annual bluegrass seedheads. The site was maintained using cultural practices for irrigation, mowing, and fertilization that would be typical for a putting green. The test area was mowed twice with a Toro Triplex, bench set to 0.115", before the April 6, 2006 application of selected materials. During the study the site was fertilized with a Nature Safe 8-3-5 fertilizer at a rate of 1 lb N/1000 ft^2 on May 1, 2006. Turfgrass phytotoxicity was rated five times during the study. The turfgrass phytotoxicity was variable and in some cases lasted for several weeks. On the first rating date, April 24, 2005, turfgrass treated with Embark at 40 oz/A, Embark at 40 oz/A plus MacroSorb Foliar at any rate, Embark at 20 oz/A plus Primo and Proxy applies twice, Embark at 40 oz/A plus ECO-N, Proxy plus Primo plus Trimmit with or without ECO-N (BOOT), any combination of Trimmit and Embark, and Primo (PRIOR) plus Embark at 40 oz/A (BOOT) plus Ferromec (BOOT) was rated less than acceptable for phytotoxicity 7.0. Annual bluegrass seedhead suppression was rated three times during the study. On the last rating date, May 26, 2006, turfgrass treated with Embark at 40 oz/A with and without Ferromec, Embark at 40 oz/A plus MacroSorb Foliar at 8 oz/1000 ft^2, Embark at 40 oz/A plus MacroSorb Foliar at 4 oz/1000 ft^2, plus Ferromec, Proxy plus Primo plus ECO-N (BOOT/3 WAT), Embark at 20 oz/A (BOOT) plus Primo plus Proxy (BOOT/3 WAT), Embark at 40 oz/A plus ECO-N, Proxy plus Primo plus Trimmit plus ECO-N, Primo plus Trimmit plus Embark at 40 oz/A with and without ECO-N, Trimmit plus Embark at 40 oz/A with and without ECO-N, Proxy (PRIOR) plus Embark at 40 oz/A plus Ferromec (BOOT), Primo (PRIOR) plus Embark at 40 oz/A plus Ferromec (BOOT), ECO-N (PRIOR) plus Embark at 40 oz/A plus Ferromec (BOOT), and Embark at 40 oz/A plus Signature plus Ferromec had significantly fewer annual bluegrass seedheads than untreated turfgrass and had at least 75% reduction of the seedheads.

THE EFFECTS OF FERTILIZER ON THE TOLERANCE OF KENTUCKY BLUEGRASS TO BISPYRIBAC-SODIUM HERBICIDE.

R.R. Shortell, S.A. Bonos, and S.E. Hart, Rutgers Univ., New Brunswick, NJ.

ABSTRACT

Kentucky bluegrass *(Poa pratensis* L.) is a diverse grass species used for turf that has been shown to exhibit a variable response to bispyribac-sodium herbicide, which is commonly used in other cool season turfgrasses for grassy weed control. The objective of this study was to evaluate the effects of nitrogen fertility on the tolerance of Kentucky bluegrass to this herbicide. Two trials were seeded in 2004 and 2005, respectively, at the Rutgers University Plant Science Research Center in Adelphia, NJ. Six cultivars were chosen as exemplars to represent the full range of response to this herbicide. 'Avalanche' and 'Washington' were used to represent the susceptible grouping with injury in excess of 80 percent, 'Midnight' and 'Boutique' were used to represent the moderate grouping with injury of 34 and 38 percent, respectively, and 'Lakeshore' and 'SR 2284' were chosen for their tolerance to this herbicide showing less then 25 percent injury. Nitrogen treatments were broken into plus or minus one pound nitrogen per 1,000 ft^2 using a homogenous 16-4-8 formulation, applied 4 days before initial herbicide applications. Bispyribac-sodium was applied at two rates (30 g a.i./A followed by 30 g a.i./A, and 60 g a.i./A followed by 60 g a.i./A) using a sequential application spaced 21 days apart in late June. Percent turfgrass injury was rated on a weekly basis and percent ground cover was noted at the completion of the study. Based on the results of this study it appears that the injury of tolerant cultivars is masked by the nitrogen application, injury in moderate cultivars is not significantly affected by the nitrogen application, and injury in the susceptible cultivars is actually increased by the application of nitrogen. The potential exists to safely use bispyribac-sodium herbicide on some Kentucky bluegrass cultivars; however future research to determine the mechanisms of this response is warranted.

ROUGHSTALK BLUEGRASS CONTROL WITH BISPYRIBAC-SODIUM AND SULFOSULFURON. P. McCullough and S. Hart, Rutgers Univ., New Brunswick, NJ.

ABSTRACT

Bispyribac-sodium and sulfosulfuron are new ALS-inhibiting herbicides registered for use in creeping bentgrass fairways for selective roughstalk bluegrass control but limited comprehensive investigations have been conducted to evaluate efficacy for long-term management. Field experiments were conducted from June 2005 to October 2006 (Study 1) and from June 2006 to October 2006 (Study 2) on a fairway at New Jersey National Golf Club in Basking Ridge, NJ. Bispyribac-sodium was applied twice at 37, 74, or 111 g a.i./ha or thrice at 37 or 74 g/ha. Sulfosulfuron was applied twice or thrice at 6.5, 13, or 26 g a.i./ha or once at 26 g/ha. Initial applications were made June 10, 2005 and June 1, 2006 and sequential applications were made at three week intervals. Applications were made at 220 l/ha and a non-ionic surfactant was included at 0.25% v/v for sulfosulfuron treatments. Creeping bentgrass chlorosis from herbicides was acceptable (< 20%) by 2 to 3 weeks after applications while all treatments provided substantial reductions in roughstalk bluegrass cover (>90%) by late July. However, roughstalk bluegrass had regrown by October in both years suggesting herbicide applications visually eliminated foliage but did not control vegetative reproductive structures. Since roughstalk bluegrass has a wide genetic diversity, further investigations are needed to determine if these results are correlated with biotype tolerance to herbicide applications or from ineffective herbicide translocation. Overall, bispyribac-sodium and sulfosulfuron effectively eliminated roughstalk bluegrass ground cover in summer months but regrowth during fall months prevented successful long-term control.

CRITICAL WEED-FREE PERIOD FOR OVERSEEDED BERMUDAGRASS IN NORTHERN CLIMATES. B.W. Compton and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

In the transition zone, it is common to overseed warm season bermudagrass (BG) (*Cynodon dactylon*) with cool season perennial ryegrass (PRG) (*Lolium perenne*) to improve winter aesthetics on golf courses. Most golf revenue is generated during spring and early summer due to ideal weather conditions. PRG is needed to provide desirable quality and playing conditions for fairway turf but competitively injures BG during this period. BG has the ability to recover from PRG competition given enough time during the summer. It has been suggested that healthy BG needs 100 days of weed-free growth in summer, yet research has not been conducted to validate or test this claim. "Healthy" BG is a subjective term that is usually based on biomass accumulation, total nonstructural carbohydrate (TNC), and ability of plants to survive stresses such as cold, heat, or UV light. Our objective is to measure how duration of PRG competition influences BG health.

Studies were conducted in Blacksburg, VA on Patriot BG at VA Tech's Glade Road Research Facility and on Midiron BG at the Turfgrass Research Center. Foramsulfuron (Revolver) at 17 oz/A, was applied at weekly intervals for 24 weeks between April 4 and August 29, 2006. To assess BG "health", BG and PRG cover was visually evaluated on September 29 and 80cm^2 plugs of turf were collected from each plot on October 15 to assess dry biomass, TNC, and electrolyte leakage (following cold stress). Electrolyte leakage and TNC data are still being collected and will be discussed later. Data were subjected to analysis of variance using a repeated measures technique and regressions were used to describe effects of BG weed-free period on measured responses.

Green shoots were evident on Patriot and Midiron BG on March 25 and April 6, respectively, and both cultivars stopped growing at first frost on October 1. Therefore, the greatest possible growing season was 178 to 190 days, depending on cultivar. However, growing degree days at base 65 (GDD_{65}), the typical growth model for BG, were only accumulated between May 26 and September 24, a period of 121 days. PRG left to compete with BG beyond July 25 (less than 68 weed-free days) reduced BG visual cover 10 to 20% and 13 to 35% in Patriot and Midiron BG, respectively. As the duration of weed-free growth increased, BG above-ground dry biomass increased from 777 to 1322g/m^2 for Patriot and 350 to 525g/m^2 for Midiron. Patriot dry biomass increased linearly at a rate of 3g/m^2 for each additional day of weed-free growth while Midiron biomass exhibited a hyperbolic response with an asymptote at approximately 89 days. This differential biomass accumulation indicates that Patriot continues to compete with ryegrass and grow during the entire season while Midiron does not. Thus, Midiron has a higher requirement for weed free period than Patriot. The 89-day asymptote for Midiron biomass accumulation represents 309 GDD_{65} out of a total of 621 GDD_{65} for the entire season. Although the TNC and electrolyte leakage data yet to be collected represent the most important indicators of BG health, we can tentatively conclude that 100 days of growth is a safe assumption for less competitive cultivars like Midiron but may be overly conservative for cultivars like Patriot.

EFFECT OF DEW AND GRANULAR FORMULATION ON MESOTRIONE EFFICACY FOR LAWN WEED CONTROL.

M.J. Goddard, S.D. Askew, J.B. Willis, Virginia Tech, Blacksburg, R.J. Keese, Syngenta Crop Protection, Carmel, IN, and J.R. James, Syngenta Crop Protection, Greensboro, NC.

ABSTRACT

Lawn weed control is typically achieved with granular herbicides. Scotts™ Turf Builder™ Plus 2™ (28-3-3 fertilizer plus 1.21% 2, 4-D, and 0.605% MCPP), the most common granular herbicide for lawns, requires dew on leaf foliage for best results. With dew present, granules stick to leaves instead of falling through the turf canopy. Granular formulations of mesotrione are being developed for both consumer and professional markets. Since mesotrione is absorbed though both foliage and roots, it may be less dependent on dew than industry standards for consumer markets. Studies were conducted at two sites in Blacksburg, VA to evaluate granular combination products of mesotrione and fertilizer, compared to 2,4-D plus MCPP for consumer lawn care. Our objective was to determine the effects of granular formulation and dew on efficacy of mesotrione and 2,4-D plus MCPP for control of common lawn weeds.

We evaluated three mesotrione granular products including a 29-3-4 fertilizer similar to Scotts™ Turfbuilder™ that contains mesotrione at 0.2% (EXC853), the same fertilizer with mesotrione at 0.2% and prodiamine at 0.4% (EXC856), and a 29-3-4 fertilizer similar to Vigaro™ that contains mesotrione at 0.25% (EXC950). These mesotrione products were compared to a commercial 28-3-3 fertilizer with 1.21% 2,4-D and 0.61% MCPP (Scotts™ Turfbuilder™ Plus 2™). All products were applied at 140 kg/ha. The study areas consisted of Kentucky bluegrass (*Poa pratensis*) containing dandelion (*Taraxacum officinale*), corn speedwell (CSP) (*Veronica arvensis*), and white clover (*Trifolium repens*). The four granular herbicides were applied in early AM while foliage was still wet with natural dew and in the afternoon of the same day to dry turf. All treatments received 0.4 cm irrigation within 48 h.

The presence of dew did not influence dandelion and white clover control by mesotrione while dew increased CSP control by mesotrione with one of the three granular products. Mesotrione on the fertilizer carrier similar to Vigaro™ did not control dandelion, CSP or white clover as well as mesotrione on the fertilizer carrier similar to Scotts™. For example, Mesotrione controlled dandelion 90, 86, and 58% and white clover 90, 87, and 67% as EXC 856, EXC 853, and EXC 950, respectively 28 days after treatment (DAT) regardless of dew presence. In contrast, 2,4-D + MCPP controlled dandelion and white clover 88% when applied to wet foliage and 33 and 18%, respectively, when applied to dry foliage. EXC 856 controlled CSP 88%, regardless of dew while EXC 853 controlled CSP equivalently when dew was present but less (65%) when leaves were dry. In contrast, EXC 950 controlled CSP 43% when dew was present and more (58%) when leaves were dry. 2,4-D plus MCPP did not control CSP, regardless of dew. In this study, mesotrione controlled weeds equivalent or superior to the commercial standard and could be a viable product for consumer markets.

ABSORPTION, TRANSLOCATION, AND METABOLISM OF FORAMSULFURON IN DALLISGRASS. G.M. Henry, J.D. Burton, and F.H. Yelverton, North Carolina State Univ., Raleigh.

ABSTRACT

Dallisgrass (*Paspalum dilatatum* Poir.) is a rhizomatous perennial warm-season grass that commonly infests managed turfgrass systems. The sulfonylurea herbicide foramsulfuron was recently registered (2003) for use in turfgrass for the postemergence control of several cool-season grasses, goosegrass, and henbit present within warm-season turf. Preliminary analysis of this herbicide has shown it to be a potential alternative to MSMA and glyphosate for the control of dallisgrass. Previous research was conducted to determine the efficacy of foramsulfuron applied alone or in combination with MSMA at various rates and timings. Foramsulfuron applied alone only provided < 5% control of dallisgrass 1 year after initial treatment (YAIT), while treatments containing the application of MSMA followed by foramsulfuron provided > 30% control 1 YAIT. Therefore, the objective of our research was to examine the effect of pre applications of MSMA on the absorption, translocation, and metabolism of ^{14}C-foramsulfuron when foliar applied to mature dallisgrass. Naturally occurring populations of dallisgrass were obtained locally and propagated in the greenhouse. Foliar absorption of ^{14}C-foramsulfuron was measured during a 48-h period. Herbicide treatments were prepared using 2-pyrimidyl ^{14}C-foramsulfuron (4.51 MBq mg^{-1} specific activity, 98% purity). Treatments consisted of foramsulfuron (0.075 kg/ha) followed by followed by foramsulfuron 2 weeks after initial treatment (WAIT), MSMA (1.25 kg/ha) followed by foramsulfuron 2 WAIT, and no pre-treatment followed by foramsulfuron 2 WAIT. Radiolabeled material was applied during the second application of each treatment. Mature dallisgrass plants (20 cm in height) were selected to receive ^{14}C-foramsulfuron treatments. Herbicide absorption was quantified at 0, 2, 4, 8, 24, and 48 h after treatment. At the appropriate harvest interval, the treated leaf was excised and rinsed in 50:50 methanol–water solution to remove unabsorbed ^{14}C. After the methanol wash, the treated leaf was frozen. Each methanol leaf wash vial received 10 ml scintillation cocktail. Treated leaves were combusted in a biological sample oxidizer using a mixture of carbon dioxide absorbent and scintillation fluid to trap evolved $^{14}CO_2$. All samples were then quantified by liquid scintillation spectroscopy. Data from this experiment are currently being analyzed.

USE OF TRICLOPYR TO REDUCE ANTICHROMATIC EFFECTS OF MESOTRIONE IN TURFGRASS. J.B. Willis and S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

Chromatic is defined as all colors other than white, black, and pure gray. When p-hydroxyphenylpyruvate dioxygenase inhibitors (HPPD) are applied to susceptible plants, leaves turn white. This response can be described as antichromatic. Mesotrione is an HPPD inhibitor that is currently being evaluated for use in turfgrass. Many turfgrass managers have indicated that their clientele will be unpleased with discoloration caused by mesotrione. Previous research at Virginia Tech evaluated all combinations of mesotrione, triclopyr, and fenoxaprop-P for common bermudagrass control. An interesting result was that plots treated with combinations of mesotrione and triclopyr had higher turf color than plots treated with mesotrione alone. Therefore, we speculate that triclopyr is an effective tank-mix partner for reducing antichromatic effects of mesotrione and improving efficacy towards perennial broadleaf weeds. Our objective is to evaluate mesotrione plus triclopyr for effects on turfgrass and weed color and control.

Studies were conducted at two low-maintenance lawn locations and used a 2 by 4 factorial treatment arrangement. The first factor was single or sequential treatment and the second factor was the following herbicide treatment combinations: mesotrione at 0.125 lb ai/A, triclopyr at 1 lb ai/A, mesotrione + triclopyr, and an industry standard for broadleaf weeds, SpeedZone® at 4 pt/A. Fenoxaprop-P at 0.12 lb ai/A applied twice and a nontreated check were included as comparison treatments. Sequential applications were made at 3-wk intervals. Turf color was visually estimated (9 = ideal green; 1 = no green) based on an assessment of both desirable turfgrass and weeds.

Tank-mixing mesotrione and triclopyr improves turf color compared to mesotrione alone. Turf color was reduced by mesotrione alone mostly due to whitened nimblewill (NW) and white clover, the predominant weed species accounting for 40-60% of initial ground cover. Results from previous research with mesotrione indicate that single applications do not effectively control NW, and adding triclopyr in the current trial did not improve NW control with single applications. However, triclopyr does not decrease NW control by mesotrione although it greatly increase turf color by eliminating antichromatic effects of mesotrione on NW. NW control 60 DAT was equivalent between sequential applications of mesotrione alone and mesotrione plus triclopyr and averaged 65% at one location and 78% at another location while no other treatment controlled NW. Sequential applications of mesotrione and single applications of triclopyr effectively control ground ivy. Tank mixing mesotrione and triclopyr with one application improved ground ivy control to 97% compared to 0 and 70% control by single applications of mesotrione and triclopyr, respectively with similar effects on broadleaf plantain. PowerZone® controlled broadleaf plantain and not ground ivy. Mesotrione controlled white clover only when mixed with triclopyr. The combination of mesotrione and triclopyr both reduces the antichromatic response of susceptible species and adds control of perennial broadleaf weeds that mesotrione alone does not control. Ongoing research is evaluating mesotrione plus triclopyr compared to each product alone for injury to Kentucky bluegrass, perennial ryegrass, bermudagrass, tall fescue, and fine fescue.

METHODS TO ASSESS ENVIRONMENTAL INFLUENCE ON TURFGRASS RESPONSE TO MESOTRIONE. S.D. Askew, M.J. Goddard and J.B. Willis, Virginia Tech, Blacksburg.

Mesotrione is expected to be available for turfgrass markets Spring 2008. Of several turfgrass species known to tolerate mesotrione treatment, perennial ryegrass (PRG)(*Lolium perenne*) and fine fescue (*Festuca* spp.) are among the most sensitive. The visual manifestation of turfgrass injury from mesotrione is striking and ranges from a dull yellow to bright white. It is hard to predict when turfgrass will be discolored by mesotrione. In several field trials since 2001, we have observed turfgrass responses to mesotrione 4 SC at 0.14 to 0.28 kg ai/ha range from no effect to completely white foliage. Studies were conducted in 2006 at three field locations and in growth chambers in Blacksburg, VA to evaluate the influence of various environmental conditions on PRG and hard fescue (*Festuca longifolia*) response to mesotrione.

In growth chamber studies, mesotrione was applied at 0, 0.14, 0.21, and 0.28 kg ai/ha to PRG maintained at daytime and nighttime temperatures of 13 and 7, 18 and 13, 24 and 18, and 30 and 24 C, respectively. PRG was placed in 15 cm x 15 cm pots and maintained at 2.5 cm in height. Chlorophyll b and a + b levels decreased by 750 µg g^{-1} fresh weight and 2970 µg g^{-1} fresh weight, respectively, for each 100g increase in herbicide rate. Carotenoid levels were strongly temperature dependent and followed a quadratic response with peak carotenoid production (820 µg g^{-1} fresh weight) occurring near 25 C, the plants growth optimum.

In field trials, weather stations (Spectrum Technologies) were installed at each site to monitor soil moisture, soil temperature, air temperature, dew period, solar radiation, and photosynthetically active radiation every 30 minutes. Mesotrione was applied at 0.14 kg ai/ha each week between March 8, 2006 and September 4, 2006. A sample of leaf tissue was collected just prior to treatments, 5 days after treatment (DAT) and 10 DAT. At each evaluation timing, leaf tissue was assayed for cuticle wax weight, carotenoids, and chlorophyll a and b. Plots were also evaluated for color both visually and with digital image analysis. Principle component analysis (PCA) techniques and regressions were used to determine correlations between measured environmental conditions and observed treatment responses. The PCA analysis indicates some correlation between carotenoids and several environmental conditions. However, correlation between visual injury responses due to mesotrione and environmental conditions will likely be complicated.

As with other carotenoid synthesis inhibitors, the greatest amount of white tissue occurs during maximum plant growth, as white tissue is typically evident on new leaves. Several factors, however, can influence plant growth including a combination of abiotic factors or even biotic factors such as disease. Thus, turfgrass injury response will be difficult to predict based on environmental conditions before and after treatment. Turfgrass growth rate will likely be the best predictor of injury responses, with increase growth resulting in increased chances for white foliage. Preliminary studies also indicate that conditions that promote foliar absorption of mesotrione, such as high humidity, will also contribute to turfgrass injury. Our future work will evaluate absorption as a contributing factor.

YELLOW NUTSEDGE CONTROL WITH SULFENTRAZONE, SULFOSULFURON AND MESOTRIONE. P.H. Dernoeden, J. Fu, and S.J. McDonald, Univ. Maryland, College Park.

ABSTRACT

Yellow nutsedge (*Cyperus esculentus*, CYPES) is a common problematic weed in turfgrasses. Three field studies were conducted in 2005 and 2006. Study I involved a single application of six rates of sulfosulfuron (0.012, 0.024, 0.036, 0.047, 0.059 and 0.070 lb ai/A) and halosulfuron (0.06 lb ai/A) on 17 August 2005. Study II was a preemergence study in which mesotrione was applied once or sequentially (0.25 and 0.125 + 0.125 lb ai/A) and sulfosulfuron (0.05 lb ai/A) was applied only once beginning on 21 April 2006. Study III compared the effectiveness of single and sequential postemergence applications of sulfentrazone (0.125, 0.250, 0.375 and 0.125 + 0.125, 0.250 + 0.250, 0.375 + 0.375 lb ai/A); mesotrione (0.250 and 0.125 + 0.125 lb ai/A); and sulfosulfuron (0.05 lb ai/A) beginning on 26 May and the sequential treatments were applied 16 June 2006. In Studies I and III, plots were 5 ft by 5 ft and were arranged in a randomized complete block with four replications. In Study II, plots were 5 ft by 10 ft with two replicates. Herbicides were applied in 50 GPA using a CO_2 pressurized (35 psi) sprayer equipped with an 8004E flat fan nozzle. Postemergence treatments were applied to 2.5-3.0 inch tall CYPES plants. Injury and weed cover data were subjected to analyses of variance and significantly different means were separated using Fisher's least significant difference test at $P \leq 0.05$. Mesotrione and sulfosulfuron, but not sulfentrazone, were tank-mixed with a non-ionic surfactant at 0.25% v/v. In Study I, sulfosulfuron treatments were applied 17 August and all treatments provided an equal level of burndown or browning of CYPES leaves by 13 Sep. 2005. Numerous plants treated at the lower two rates had some green leaf tissue and may have recovered. The plots were not monitored thereafter and potential recovery of CYPES plants from tubers was not determined. In Study II and III, the site was treated with glyphosate in early April and diskseeded with perennial ryegrass (*Lolium perenne*) on 19 April 2006. In Study II, treatments were applied preemergence on 21 April and the sequential mesotrione treatment was applied 18 May 2006. CYPES began to emerge from tubers on 24 April.

Mesotrione did not affect perennial ryegrass emergence or vigor, but sulfosulfuron reduced germination and seedlings vigor in May. Perennial ryegrass cover, however, was equal among herbicide-treated plots by 13 July (78 to 88%), which was statistically greater than was observed in untreated plots (55%). Sulfosulfuron and mesotrione-treated plots (0.25 lb ai/A) had 11 to 16% CYPES cover, while mesotrione (0.125 + 0.125 lb ai/A)-treated plots had 2% CYPES cover on 13 July. Plots were evaluated for CYPES recovery from tubers on 15 September. CYPES in sulfosulfuron-treated plots had recovered (34% CYPES cover) and levels were statistically equivalent to untreated plots (45% CYPES cover). Mesotrione (0.125 + 0.125 lb ai/A)-treated plots had only 4% CYPES cover on 15 Sep. In Study III, sulfentrazone (0.375 lb ai/A, and all sequentials) had provided excellent CYPES control (0 to1% CYPES cover); mesotrione provided fair control (8 to 13% CYPES cover), and sulfosulfuron (39% CYPES cover) provided no control, when compared to untreated plots (32% CYPES cover) on 15 Sep. 2006.

PRELIMINARY STUDY AT FOUR LOCATIONS ON USING GROWING DEGREE-DAYS TO APPLY A PREMERGENCE HERBICIDE.

M.A. Fidanza, The Pennsylvania State Univ., Reading, J.A. Borger and M.B. Naedel, The Pennsylvania State Univ., University Park, C.A. Bigelow, Purdue Univ., West Lafayette, IN, and P.C. Bhowmik, Univ. of Massachusetts, Amherst.

ABSTRACT

Crabgrass (*Digitaria* spp.) is a troublesome and problematic annual grass weed in cultured turfgrass. Preemergence herbicides are often used for the control of crabgrass in lawns, however, in some years the level of control is considered marginal or not commercially acceptable. The issue of poor or unacceptable crabgrass control from preemergence herbicides in lawns may involve the early-to-mid spring application timing of these kinds of products. Therefore, the objective of this research was to attempt to determine optimum application timing for a commonly used preemergence herbicide for the control of crabgrass in cool-season turfgrass maintained as a lawn. The same field study was conducted during March through September, 2006, on a mixed stand of cool-season turfgrass at four locations: (1) Bellewood Golf Course, North Coventry, PA, (2) Pennsylvania State University, University Park, PA, (3) Purdue University, West Lafayette, IN, and (4) University of Massachusetts, Amherst, MA. The preemergence herbicide prodiamine (trade name = Barricade 65WG) was applied at 0.55 kg ai/ha (0.75 lbs product/A) over a range of 15 different cumulative growing degree-day accumulations, as follows: 0 - 10, 11 – 20, 21 – 30, 31 – 40, 41 – 50, 51 – 60, 61 – 70, 71 – 80, 81 – 90, 91 – 100, 101 – 120, 121 – 140, 141 – 160, 161 – 180, and 181 – 200. A base temperature of 10 C (50 °F) was used to calculate cumulative degree-days from soil temperatures derived from each location via satellite weather data. An untreated check was also included in the treatments, which were arranged in a randomized complete block design with three or four replications depending on the study location. Also, individual plot size varied according to study location, and mowing height ranged from 5.0 to 7.5 cm (2 to 3 inches). At each location, the treatments were applied from flat-fan nozzles with a CO_2-powered backpack sprayer through an average of about 408 gal water carrier per ha (1 gal water per 1000 sq ft) at 250 kPa (35 psi). Preliminary analysis revealed that crabgrass control varied among the application timings at all four locations. Also, preliminary analysis of the data from all four locations indicated a need for improved accuracy with accessing soil temperature-based cumulative growing degree-day information.

PRE AND POST EMERGENT ANNUAL BLUEGRASS CONTROL. J.A. Borger, M.B. Naedel, M.D. Soika and T.L. Watschke, The Pennsylvania State Univ., University Park.

ABSTRACT

This study was conducted on a mature stand of 'Penneagle' creeping bentgrass (*Agrostis stolonifera*) and annual bluegrass (*Poa annua*) at the Valentine Turfgrass Research Center, Penn State University, University Park. The objective of the study was to determine if selected materials could reduce the annual bluegrass population under simulated fairway conditions. This study was a randomized complete block design with three replications. Treatments were applied on several dates using a three foot CO_2 powered boom sprayer calibrated to deliver 40 gpa and Betasan was applied at 80 gpa using two, flat fan, 11004 nozzles at 40 psi. The test area was maintained to simulate a golf course fairway. The test site consisted of approximately 45 percent creeping bentgrass and 55 percent annual bluegrass at the initiation of the study. Turfgrass discoloration was rated five times during the study. Only turfgrass treated with Velocity, alone or in combination with other materials, was rated below acceptable (7.0) at some time in the study. Turfgrass quality was rated five times during the study. Turfgrass quality was never rated below acceptable (7.0) on any rating date. Turfgrass spring color was rated twice during the study. On the April 13, 2006 rating date only turfgrass treated with Prograss, alone or in combination with other materials, was rated below 6.0. By the May 9, 2006 rating date, all turfgrass spring color was rated 9.0. The annual bluegrass population change was rated on May 9, 2006. Turfgrass treated with Trimmit plus Rubigan at 0.75 oz/1,000 ft^2 with or without an 18-3-1 fertilizer applied at the June, 28, 56, 112, and 140 DAT timings, Trimmit plus Rubigan at 1.5 oz/1,000 ft^2 applied at the June, 28, 56, 112, and 140 DAT timings, Velocity at 60 g ai/A June and 14 DAT plus Rubigan at 0.75 oz/1,000 ft^2 June 14, 42, 70, and 98 DAT, Trimmit with or without Rubigan at 0.75 oz/M plus an 18-3-1 fertilizer applied at the June, 28, 56, 112, and 140 DAT timings with or without Betasan at 5.6 oz/1,000 ft^2 applied at June, and 56 DAT timings, Trimmit plus Signature at 8 oz/1,000 ft^2 plus an 18-3-1 fertilizer applied at the June, 28, 56, 112, and 140 DAT timings with or without Betasan at 5.6 oz/1,000 ft^2 applied at June, and 56 DAT timings, Trimmit applied at the June, 28, 56, 112, and 140 DAT timings plus Rubigan at 0.75 oz/1,000 ft^2 applied at the June, 14, 28, 42, 56, 70, 84, 98, 112, and 140 DAT timings, Prograss alone or in combination with Trimmit at any rate, and Trimmit plus Signature applied at the June, 28, 56, 112, and 140 DAT timings reduced the annual bluegrass population by 70% or more, significantly more reduction than untreated. It appears that annual bluegrass populations can be reduced in a mixed sward of creeping bentgrass/annual bluegrass using Trimmit, Velocity, and Prograss alone or in combination with a fertilizer, fungicides, and a preemergence.

APPLICATOR EXPOSURE AND DRIFT OF LAWN CHEMICALS WITH A WET BLADE MOWER AND THREE FOLIAR SPRAY METHODS. S.D. Askew, Virginia Tech, Blacksburg.

ABSTRACT

In the home lawn environment, applicators, residents, and surrounding vegetation are all at risk of pesticide exposure. Herbicides such as 2,4-D have been shown to dislodge from treated lawns and be deposited inside the home on various surfaces. Thus, limiting applicator exposure, reentry exposure, and drift are all valuable attributes to any application method. The wet blade mower delivers chemicals and nutrients to plants by wiping liquid product onto the cut plant surface. This liquid delivery method has several potential benefits compared to conventional spray techniques. Our objective was to evaluate applicator exposure, reentry exposure, and drift of liquids applied with the wet blade mower (WB), a rear-mounted boom-type sprayer (BS), a backpack sprayer with hand wand (BP), and a commercial “spray gun” type sprayer (SG).

A spray pattern indicator, Brazon (1% solution), was used in this study. Mixed tall fescue and Kentucky bluegrass turf maintained at 2.5 inch were divided into 500 ft^2 plots. These plots were treated with 2.5 gal of Brazon/A at a delivery rate of 43.6 gal/A for foliar spray methods and 2.5 gal/A for the WB. Filter papers were placed at regular intervals leading away from the sprayer’s first pass in each plot. A wind source was positioned to supply a sustained wind speed of 5 to 7 mph. The first pass of the applicator was upwind of the evenly spaced filter papers; papers were immediately collected after the applicator passed. Filter papers were affixed to the applicator’s spray suit to test exposure at different areas on the body. These papers were collected after each treated plot and analyzed. In addition, papers were affixed to the bottom, front, and top of the right shoe and plots were traversed twice at 10 min and 24 hr after treatment. Each of the four application methods were replicated three times in a RCB and the study was conducted on October 27, 2005, October 3 and 4, 2006 at three different sites.

Substantial drift occurred from all foliar spray application methods but not from the WB. When actual dye values were converted, the foliar spray application methods deposited 77 to 86% of a full rate on bare ground while the WB deposited 22% of a full rate to bare ground. Thus, the WB does not apply as much chemical to areas that are void of vegetation. The small amount of chemical deposited by the mower is attributed to “shatter” effect as the wet undersurface of the mower blade contacts grass leaf blades at high velocity and propels small droplets onto neighboring areas under the mower deck. As much as 58 to 81% of a full application rate was extracted from the shoe front 10 min after treatment with foliar spray methods and 35% was extracted 10 min after WB application. After 24 hr, all application methods resulted in 2 to 7% of the full rate dislodged by filter paper and were statistically equivalent. WB and rear boom application methods did not expose the applicator to any chemical while SG and pump sprayer methods exposed the worker to between 6.1 and 8.9 μl of dye. In some locations on the body (e.g., shoes), the applicator was exposed to nearly a full chemical rate. The WB method reduced drift, applicator and early reentry exposure to chemical dye in all studies.

PUMPKIN RESPONSE TO HALOSUFSULFURON, FOMESAFEN, AND TERBACIL.

R.B. Batts, North Caroline State Univ., Raleigh, A.W. MacRae, University of Georgia, Tifton, and J.B. Beam, North Carolina Cooperative Ext. Service, Lincolnton.

ABSTRACT

Pumpkin trials were conducted in Iron Station and Edenton, NC and Blairsville, GA in 2006 to determine crop tolerance and yield response of 'Magic Lantern' and 'Appalachian' pumpkin to halosulfuron (Sandea 75 DF), fomesafen (Reflex 2 SC) and terbacil (Sinbar 80 WP). Sandea was applied preemergence (PRE), postemergence (POST) or post-directed (P-DIR) at 0.5, 0.75, or 1.0 oz/A. Reflex and Sinbar was applied PRE at 1 or 2 pt/A and 3 or 6 oz/A, respectively. For comparison purposes, a hand-weeded control was included.

Injury data were combined across cultivars at all locations and across both North Carolina sites. Compared to the hand-weeded control, Sandea applied PRE, POST, and P-DIR injured pumpkin 37-51, 33-37, and 18-20%, respectively, in North Carolina 2 wks after treatment (WAT). In contrast, injury seen in Georgia ranged from 5-7%, 19-32%, and 0% when applied PRE, POST, and P-DIR, respectively. Optimum growing conditions were prevalent in Georgia for the duration of the growing season, limiting injury from herbicide application. Similar results were observed with Reflex and Sinbar applications in North Carolina causing 26-56 and 84-98% injury, respectively, while in Georgia these applications only caused 4-13 and 16-65% injury. Severe injury from Sinbar applications resulted in a reduction in pumpkin stand. Sandea P-DIR had the least amount of injury at all locations, while the PRE timing was most injurious in North Carolina and POST was most injurious in Georgia. PRE injury was expressed as crop stunting, while POST and P-DIR injury appeared as discoloration in the terminals of the plants.

As with injury, yield data were combined across cultivar at all sites and across both North Carolina locations. When compared to the hand-weeded control in North Carolina, yield reduction (total weight) from Sandea treatments ranged from 10 to 25% with no trend for rate or timing of application. Yield reduction from the high rate of Reflex and both rates of Sinbar were greater than any other treatment in North Carolina. Similarly, these three were the only treatments to have greater plant stand reduction compared to the nontreated control. In Georgia, the two Sinbar treatments were the only treatments with reduction in yield compared to the nontreated control. The only reduction in plant stand was with the high rate of Sinbar.

Based on these data, Sandea appears to be relatively safe to pumpkins, especially in heavy weed situations where some injury is acceptable. However, Sinbar appears to be too injurious, especially if heavy or excessive rainfall follows a PRE application.

ASSESSMENT OF THE COMBINED EFFECTS OF MESOTRIONE AND HEXAZINONE ON WEEDS IN WILD MAINE BLUEBERRIES. D.E. Yarborough and K.F.L. Guiseppe, University of Maine, Orono.

ABSTRACT

Hexazinone has been the principle herbicide used in Maine wild blueberry (*Vaccinium angustifolium)* fields for over twenty years. There is evidence that reliance on hexazinone without other alternative herbicides has resulted in increased populations of grasses and other herbaceous weeds. There is a need for herbicides with different modes of action for herbicide rotations in wild blueberry fields. In order to evaluate the herbicide mesotrione with and without hexazinone a split block design was established on six wild blueberry fields throughout the state to obtain a diversity of soil types and weed species. A block was established in the Maine towns of Union, Belfast, Penobscot, Orland, Township 19 and at the Blueberry Hill Experimental Farm in Jonesboro. A 16 x 20 m block was comprised of 4 x 16 m treatment plots including an untreated control, mesotrione at 444 ml/ha preemergence, 222 ml/ha preemergence and 222 ml/ha postemergence on the same plot, and 222 ml/ha postemergence. At right angles on an 8 x 20 m plot of either an untreated control or a hexazinone treatment at 1 kg/ha was applied to give a total of eight combinations. Pre-emergence treatments were sprayed on 8-11 May. Postemergence treatments were sprayed on 6-9 June. Treatment effects were assessed for broadleaf, fern and grass weed cover using a Daubenmire cover scale and wild blueberry phytotoxicity as percent injury from four 1m square subplots within each treatment. The first weed cover evaluation was on June 19 and 23 and the second was on August 14 and 23, 2006. Grass cover (Figure 1) was highest in the control, postemergence at 222 ml/ha and preemergence at 444 ml/ha treatments for both evaluations. Hexazinone combined with the 222 ml/ha postemergence or 3 oz/a pre and 3 oz/a postemergence mesotrione had the best control of grass cover in both evaluations. The 222 ml/ha pre and postemergence mesotrione treatment without hexazinone on the second evaluation date was statistically the same as with hexazinone. Broadleaf weed cover (Figure 2) was highest in the untreated control and the 222 ml/ha preemergence mesotrione treatment. The combinations of hexazinone with mesotrione resulted in the lowest broadleaf cover ratings as did the 222 ml/ha pre and postemergence combination treatment. The mesotrione applications at the higher rate preemergence or at the low rate pre and post emergence gave equivalent control to the hexazinone application. When these applications were combined with hexazinone additional suppression of both grasses and broadleaf weeds was obtained.

Figure 1. Grass cover following herbicide treatment, 2006

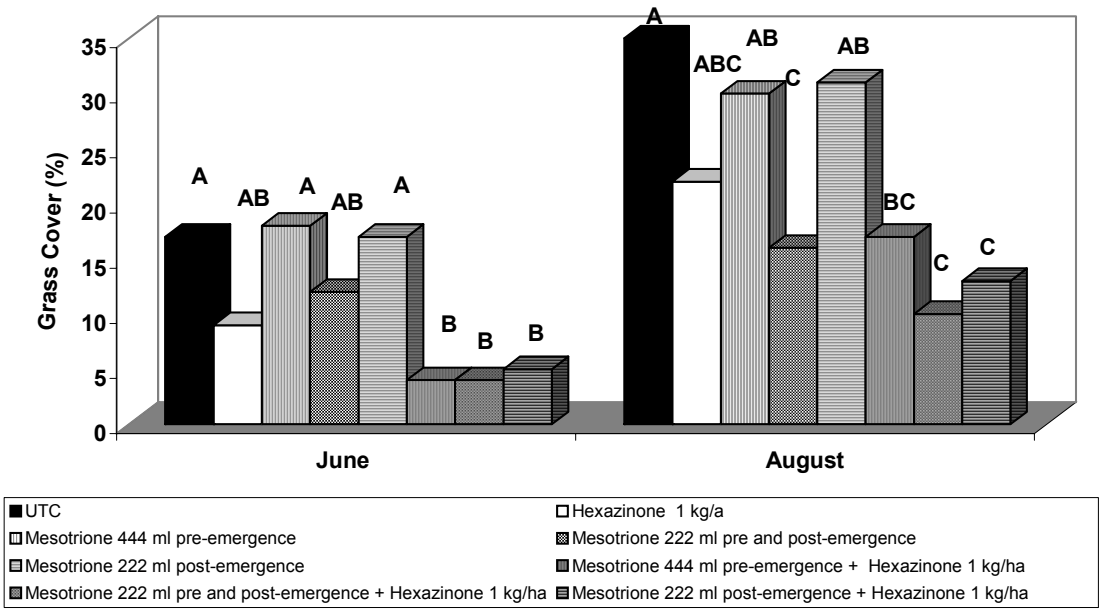
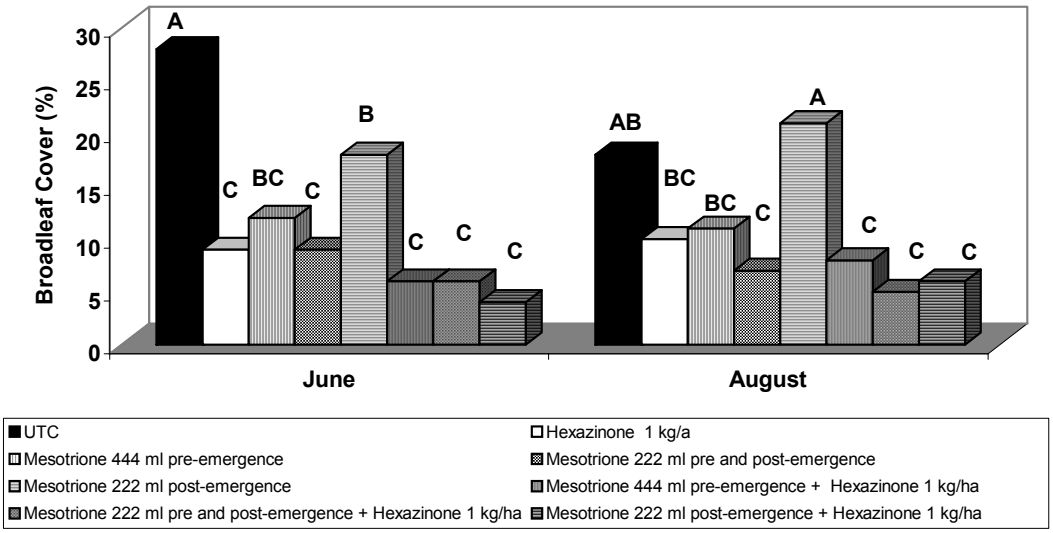


Figure 2. Broadleaf weed cover following herbicide treatment, 2006



THE ADVANTAGES OF QUINCLORAC OR MESOTRIONE USE IN CRANBERRY BOG ESTABLISHMENT. B.A. Majek, Rutgers Univ., Bridgeton, NJ.

ABSTRACT

Cranberry bog renovation and establishment in New Jersey is a long term commitment. Currently, some bogs that were established more than seventy five years ago remain in production today. Renovation of a cranberry bog begins at least a year prior to planting. Existing vegetation, including cranberries and weeds are killed, excess peat removed, irrigation mains installed, a uniform sandy soil must be leveled to improve drainage, and dikes, ditches and sluices gates installed. After the bog is prepared, unrooted cranberry cuttings are spread on the bog and sliced into the soil lightly with a disk and irrigated regularly. The cuttings root in two to three weeks. Growers are reluctant to use herbicides during the establishment year, fearing an adverse affect on the crop. Studies were established in bogs planted with cranberry 'Stevens' cuttings in April of 2003 and 2004. Herbicides were applied in late spring, about four weeks after planting, or in the summer, two to three months after planting. Weed growth was heavy in both establishment years, creating a canopy over the cranberry vines by mid summer. The most prevalent weeds were false nutsedge, slender rush, blackgrass, marsh St. Johnswort, large crabgrass, and meadow beauty. When applied four weeks after planting, napropamide suppressed or controlled false nutsedge, slender rush, and large crabgrass, but did not control blackgrass or meadow beauty. The experimental herbicides, quinclorac, chlorimuron, and mesotrione, applied with nonionic surfactant, controlled all the weeds except marsh St. Johnswort when applied four weeks after planting, but were less effective when applied two to three months after planting. The studies were/will be treated annually for three years, until a measurable yield could be harvested from at least some treatments. Napropamide, quinclorac, and mesotrione did not injure the cranberries. The chlorimuron treatment applied annually in late spring appeared to cause slight temporary stunting, and caused some shoot tip chlorosis in 2004. The bog planted in 2003 was harvested in 2005 and in 2006. The bog planted in 2004 was harvested in 2006. All the herbicides applied improved cranberry growth and vigor. The highest yields were observed in cranberries treated annually for three years with quinclorac and mesotrione at 0.5 and 0.2 lb ai/A respectively.

CHEMICAL CONTROL OF APPLE ROOT SUCKERS WITH COMMERCIAL APPLICATION EQUIPMENT. W.H. Palmer, Reality Research, Williamson, NY.

ABSTRACT

Controlling root suckers is important to prevent fire blight from entering the apple (*Malus domestica*) rootstock as well as preventing growth of the suckers up into the tree. Previous results with hand boom applications did not match the results that were being obtained with commercial application equipment. Commercial herbicide application equipment will be described. The trial used commercial equipment to apply treatments of paraquat, glyphosate, 2,4-D, glufosinate, carfentrazone, and a glyphosate/2,4-D premix as 1 or 2 sprays with adjuvants. Results will be presented for sucker control achieved with each treatment. The potential problems of sucker treatments to young fruit trees will also be addressed. Results of the treatments for general weed control will also be presented.

CHEMICAL CONTROL IN ORCHARDS WITH COMMERCIAL APPLICATION EQUIPMENT.

W.H. Palmer, Reality Research; Williamson, NY, and D.I. Breth, Cornell Cooperative Extension, Albion, NY.

ABSTRACT

Controlling weeds in commercial apple orchards is not a major concern for many New York apple growers. This potentially leads to over-use of herbicides, weed resistance, weed problems at harvest, and negative effects on yields. Previous results with hand boom applications did not match the results that were being obtained with commercial application equipment. Commercial herbicide application equipment will be described. The trial used commercial equipment to apply treatments of several "knock-down" herbicides (paraquat, glyphosate, 2,4-D, glufosinate, carfentrazone, and a glyphosate/2,4-D premix) as 1 or 2 sprays with adjuvants. The trial also includes applications of the “knock-down” herbicides with residual herbicides (simazine, diuron, pendimethalin and flumioxazin. Results will be presented as season-long weed evaluations with each treatment. Other reasons for good orchard weed control will be presented, along with one grower's ideal control program that includes leaving some “friendly” weeds in the orchard.

STRAWBERRY PLANTING YEAR WEED CONTROL: THE NEED FOR ADDITIONAL HERBICIDES. C.A. Benedict and R.R. Bellinder, Cornell Univ., Ithaca, NY.

ABSTRACT

Weed control in the year of planting is a major issue facing strawberry growers. In a recent survey, growers placed weeds as the highest of their concerns during the establishment year. Planting year weed control is essential to both minimize weed competition and to maximize yield in the fruiting years. With few herbicides registered for strawberries in the planting year, reliance on costly hand-weeding can become a serious economic drain. Field and greenhouse studies were initiated to determine compatibility of new herbicides. In the greenhouse, herbicides were applied using an Allen Track Sprayer (Midland, MI) at 25 GPA. In these trials, over 15 herbicides were evaluated postemergence (POST), pretransplant (PRETP), or for impact on runner development/rooting. Injury was observed PRETP with fomesafen (0.626 lb ai/A) and s-metolachlor (1.3, 2.6 lb). Injury PSTTP was observed with oxyfluorfen (2XL 0.5, 4F 0.5 lb), flumioxazin (0.03, 0.06 lb), halosulfuron (0.092 lb), and in combinations of s-metolachlor (0.094 lb) + flumioxazin (0.03 lb) and KIH-485 (0.113 lb) + oxyfluorfen (4F 0.375 lb). Runner injury, root development, and dry wt reduction were observed with s-metolachlor (1.3 lb) and KIH-485 (0.226 lb). In a field trial, 'Earliglow' and ‘Jewel’ were utilized to evaluate ten products either PRETP or PSTTP. All applications were made using a CO_2 backpack sprayer set to deliver 34 GPA. Oxyfluorfen (4F 0.375 lb) caused initial injury on ‘Earliglow’. Other notable injury occurred in KIH-485 (0.226 lb PSTTP) and flumioxazin (0.03 lb PRETP). Runner production decreased with flumioxazin (0.03 lb PRETP), penoxsulam (0.026 lb PSTTP), and V-10142 (0.1 lb PSTTP) treatments.

BEING HEARD BY THE IR-4 PROJECT. E. Lurvey, Northeast Region IR-4 Project, Cornell NYSAES, Geneva, NY.

ABSTRACT

The mission of IR-4 is to support the registration of pest management tools for specialty crops such as fruits, vegetables and ornamental horticulture. Pest management tools include conventional pesticides as well as biological control agents (biopesticides). The IR-4 research process is dependent on the active participation of growers, researchers, extension personnel, and other client groups. First, only clients without vested interests can submit a Project Clearance Request Form (PCR), either through the IR-4 Northeast Region Field Coordinator (RFC), Edith Lurvey, the IR-4 website (http://ir4.rutgers.edu/) or the appropriate IR-4 State Liaison Representative. The PCR is the first step in the process to get the pest management use on the IR-4 agenda for consideration. Only Par's that have been agreed to by the product registrant will be eligible for consideration at the IR-4 Priority Setting Workshops in September and October. Prior to either workshop, the IR-4 Northeast Region Field Coordinator solicits input on the important needs from growers and researchers in the region. No project is given a high priority without a regional champion. Priorities are as follows: A priorities will have research started in the following growing season: B priorities may be researched as funds allow; C priorities are kept on the researchable project list for future consideration.

Food Use prioritization: An additional step was added to the Food Use process this year. All projects to be discussed in a given year must now be nominated prior to the workshop in September. This entails going to the IR-4 website a few weeks prior to the workshop and selecting chemical/crop uses from the researchable projects list. Any project not nominated for three years in a row will be dropped from the IR-4 active list, and would need a new PCR to be reactivated. Growers, researchers, extension workers, etc., need to contact the RFC directly for any project needing a high priority (A or B Priority).

Ornamental Horticulture prioritization: A, B and C priorities are established focusing on a specific pest or production need. These priorities are arrived at by consensus among the participants from the four IR-4 regions, with some attention is paid to projects of regional importance. For example, the 2007 national weed science priority is phytotoxicity of several herbicides in perennial nursery plants, with a regional priority (southern and western) for efficacy in the control of sedges in nursery production.

Please note that the Northeast region solicits input via email on regional priorities prior to the workshop. Final selection of regional A priorities is made via a teleconference, if needed. If you would like to be added to the list serve for these calls for input, please contact the RFC, Edith Lurvey (ell10@cornell.edu). Biopesticide projects continue to be selected as competitive grants for proposals.

WEED CONTROL IN NO-TILL PUMPKINS. D.H. Johnson, The Pennsylvania State Univ., Manheim and D.D. Lingenfelter, The Pennsylvania State Univ., University Park.

ABSTRACT

Weed control and pumpkin (*Cucurbita maxima*) injury from several products were tested in no-till production at two locations in Pennsylvania. Pumpkins (cv. 'Spirit' and 'Sugar or Pie') were planted no-till into previously killed (glyphosate) and rolled rye in Lancaster (Landisville) and Centre (Rock Springs) Counties, respectively, in mid June. Several herbicides were applied preemergence just after planting, followed by postemergence herbicides approximately one month later. Most herbicides tested are not currently labeled for pumpkin production. These were flumioxazin (0.08 lb ai/A), imazamox (0.03 lb ai/A), rimsulfuron (0.047 lb ai/A), and fomesafen (0.375 lb ai/A), all applied preemergence in A tank mix with dimethenamid-P (0.75 lb ai/A), KIH-485 (0.16 lb ai/A) applied preemergence alone, or imazamox (0.03 lb ai/A) applied postemergence. Additional treatments included standards: clomazone (0.49 lb ai/A) + ethalfluralin (0.75 lb ai/A) + halosulfuron-methyl (0.035 lb ai/A) applied pre, halosulfuron-methyl pre followed by clethodim (0.125 lb ai/A) postemergence, or halosulfuron-methyl + clethodim post. Weed control, crop injury, and pumpkin yield were determined. Studies were arranged in a randomized complete block design with three replications.

Flumioxazin and rimsulfuron (both tank mixed with dimethenamid-P) caused high pumpkin injury (up to 78%) and yield loss at Landisville. Injury was lower (45%) at Rock Springs, and yield was not significantly reduced. The other products did not cause significant crop injury.

Weed control at Rock Springs was generally better than at Landisville. At Rock Springs, the standards clomazone + ethalfluralin + halosulfuron-methyl gave 90% or better velvetleaf (*Abutilon theophrasti*), common ragweed (*Ambrosia artemisiifolia*), yellow nutsedge (*Cyperus esculentus*), and giant foxtail (*Setaria faberi*) control. The combinations of newer herbicides plus dimethenamid-P and KIH-485 applied alone gave similar control for all of these except yellow nutsedge. Imazamox + dimethenamid-P was also weak on common ragweed.

At Landisville, clomazone + ethalfluralin + halosulfuron-methyl gave only 45 and 77% common lambsquarters (*Chenopodium album*) and fall panicum (*Panicum dichotomiflorum*) control, respectively. Most combinations of newer herbicides with dimethenamid-P gave better control.

These results show dimethenamid-P, imazamox, fomesafen, and KIH-485 have potential for weed control in pumpkins with good crop safety. More testing on other pumpkin varieties and in other climates and soils would need to be done to ensure adequate crop safety.

EVALUATING TRIKETONES IN SWEET CORN. R.R. Bellinder and C.A. Benedict, Cornell Univ., Ithaca, NY.

ABSTRACT

Effective postemergence (POST) weed control is essential when preemergence (PRE) herbicides fail. New triketone herbicides for use POST are available, but their effectiveness has not been thoroughly tested. In 2006, five field trials evaluated weed control and varietal tolerance to mesotrione, tembotrione, and topramezone. Weed pressure at the time of application was heavy and highly uneven across trials. Broadleaf weed control was variable based on product and surfactants. Broadleaf weed control decreased with all three triketones (1X rate) when they were applied without atrazine. At the 1X rate, tembotrione and topramezone provided adequate control of redroot pigweed (*Amaranthus retroflexus* L.), common lambsquarters (*Chenopodium album* L.), and common ragweed (*Ambrosia artemisiifolia* L.). Tembotrione at the 2X rate provided better broadleaf control than did 2X rates of mesotrione and topramezone. Foxtail species (*Setaria* spp.) were common in all trials, but large crabgrass (*Digitaria sanguinalis* (L.) Scop.) populations were variable. Mesotrione inadequately controlled crabgrass in one trial; however control increased with rate and addition of atrazine. Due to their large size (8-12 in.) at the time of application *Setaria* spp. control was inadequate regardless of rate. Weed control was better when MSO was used with atrazine, topramezone, and UAN than when a non-ionic surfactant was used. Tembotrione controlled crabgrass adequately at 6 DAT, but control broke at 21 however, adding atrazine increased control with the 1X rate substantially. A field trial evaluated ten varieties for crop tolerance. Two varieties, 'Argent' and ‘Silverking’ showed initial sensitivity to all three of the triketones, but outgrew this injury. There was no reduction in weight in any of these varieties. In another trial, there was a decrease in ear number and total weight with a 2X rate of mesotrione. Ongoing greenhouse trials are taking a closer look at the application timing of these herbicides for control of annual broadleaves and grasses. Preliminary results suggest that timing is crucial to the effectiveness of these herbicides.

NATURAL PRODUCT POTENTIAL FOR WEED CONTROL IN POTATO. G.J. Evans and R.R. Bellinder, Cornell Univ., Ithaca NY.

ABSTRACT

Weed management in organic potato production relies heavily on cultivation and hilling. Excessive cultivation can have negative impacts on soil structure, encourage new flushes of weeds, and require high fossil fuel consumption. Our objective is to evaluate the potential use of acetic acid (vinegar) and Matran II (clove oil) with regard to how product volume, concentration, and application timing effect weed control and crop response. Two trials were conducted in 2006 at the Thompson Research Farm in Freeville, NY. Treatments included: 20 and 30% acetic acid applications at 34 GPA, 15 and 20% acetic acid applications at 68 GPA, a 10% dilution of Matran II in water, and a 5% dilution of Matran II in 20% acetic acid. Acetic acid treatments included yucca extract at 0.1% V/V, and Matran II treatments contained 2.5% humasol. Both trials included a handweeded control and a weedy check. Treatments were broadcast at either an early (10 cm) or late (30 cm) timing. Late timing plots were cultivated once 19 days before treatment. Applications were applied with a CO_2 backpack sprayer. Weed species common to all plots of a given trial were marked prior to spraying, and aboveground biomass was harvested 12-15 DAT, dried and weighed. Ratings were taken for weed control, weed regrowth, crop injury, and yield. The 15% acetic acid treatment caused 83 and 39% injury with the early and late timing applications, respectively. However, by 30 DAT visual injury was outgrown in all treatments except 20% acetic acid (68 GPA), regardless of application timing. Yield reductions relative to handweeded treatments occurred in both trials, and were significant with late applications of acetic acid applied at 68 GPA, and the 5% Matran in 20% acetic acid. Treatment yields with 20% acetic acid at 34 GPA were reduced by an average of 11%, while yields with 20% acetic acid at 68 GPA were reduced by 21%. Weed control varied by species, weed size, and treatment. When rated 1 DAT, 15% acetic acid (68 GPA) provided between 53 and 99% control of common lambsquarters (*Chenopodium album*), common chickweed (*Stellaria media*), wild buckwheat (*Polygonum convolvulus*), redroot pigweed (*Amaranthus retroflexus*), hairy galinsoga (*Galinsoga ciliata*) and large crabgrass (*Digitaria sanguinalis*). Peak weed control, 84 and 99%, occurred with the smallest size species, redroot pigweed (4 leaves) and hairy galinsoga (2 leaves), respectively. By 14 DAT, there was no appreciable biomass reduction of large crabgrass when treated at 2-3 leaves. Overall product effectiveness depends on the severity of weed pressure and weed species composition, with smaller broadleaf species most susceptible to control. Although Matran II was much less injurious to potato, it is more costly and less effective at controlling weeds compared to acetic acid. Yield reductions may be acceptable with some treatments, particularly if these can be offset by reduced weed management costs or the higher returns expected for organically grown potatoes.

WEED CONTROL IN NO-TILL SWEET CORN. D.D. Lingenfelter, The Pennsylvania State Univ., University Park and D.H. Johnson, The Pennsylvania State Univ., Manheim.

ABSTRACT

Field studies were conducted in 2006 at two locations in PA to evaluate annual and perennial weed control in no-till sweet corn (*Zea mays* L., succharata var. 'Attribute'). Atrazine (1.24 lb ai/A) and s-metolachlor (0.96 lb ai/A) were applied PRE to most of the treatments followed by a POST application of one or a combination of the following herbicides: 2,4-D (0.25 to 0.5 lb ai/A), atrazine (0.25 to 0.5 lb ai/A), bentazon (0.52 lb ai/A), mesotrione (0.094 lb ai/A), topramezone (0.0164 lb ai/A), tembotrione (0.12 lb ai/A), carfentrazone (0.012 lb ai/A), clopyralid (0.19 lb ai/A), halosulfuron (0.032 lb ai/A), foramsulfuron (0.033 lb ai/A), glufosinate (0.4 lb ai/A), and KIH-485 (0.18 lb ai/A). Adjuvants were included in the POST spray mixtures.

In general, herbicide treatments provided >90% control of annual weeds including, giant foxtail (*Setaria faberi*), fall panicum (*Panicum dichotomiflorum*), common lambsquarters (*Chenopodium album*), and velvetleaf (*Abutilon theophrasti*). Canada thistle (*Cirsium arvense*) was the only perennial weed species that was common at both locations. Clopyralid, mesotrione plus atrazine, and glufosinate plus atrazine provided 80 to 85% control of Canada thistle. Other treatments that provided >80% control of Canada thistle included, tembotrione plus atrazine (92%) at Rock Springs and topramezone plus atrazine (83%) at Landisville. At Landisville, field bindweed (*Convolvulus arvensis*) control ranged from 82 to 92% control with treatments containing 2,4-D, clopyralid, and glufosinate plus atrazine, while the other treatments only provided 45 to 77% control. At Rock Springs, tembotrione plus atrazine, halosulfuron plus 2,4-D, and foramsulfuron provided between 70 and 81% control of hemp dogbane (*Apocynum cannabinum*) and common milkweed (*Asclepias syriaca*). Glufosinate plus atrazine also provided adequate suppression (80%) of hemp dogbane. Aside from carfentrazone, clopyralid, and KIH-485, most of the other POST treatments provided 77 to 95% control of common pokeweed (*Phytolacca americana*).

No crop injury occurred from any of the treatments at Landisville. At Rock Springs, negligible crop injury was noted on most treatments except for halosulfuron plus 2,4-D and foramsulfuron which ranged from 15 to 20%. Sweet corn yields at Rock Springs were generally better than at Landisville. At Rock Springs, sweet corn in the untreated check yielded about 5,300 lb/A compared to the other treatments which ranged from 9,100 to 13,000 lb/A. The one exception was the halosulfuron plus 2,4-D treatment which reduced the yield to about 5,800 lb/A. At Landisville, sweet corn yields also benefited from better weed control in the herbicide treated plots and ranged from about 5,800 to 9,000 lb/A compared to the untreated check (2,700 lb/A).

In summary, production of no-till sweet corn can be enhanced by newer herbicide options. Compared to a decade ago, PRE and POST annual weed control in sweet corn has greatly improved. Perennial weed control can still be challenging for sweet corn producers, especially in no-till settings. However, with the introduction of some newer herbicide chemistries, these can complement other product choices to provide better weed management.

THE IR-4 PROJECT: UPDATE ON HERBICIDE REGISTRATION. M. Arsenovic, F.P. Salzman, D.L. Kunkel, and J.J. Baron, IR-4 Project, Rutgers, The State Univ. of New Jersey. Princeton.

ABSTRACT

The IR-4 Project is a publicly funded effort to support the registration of pest control products on specialty crops. The IR-4 Project continues to meet grower's needs for weed control options, primarily with mature-market herbicides since the adequate selectivity of specialty crops to many of the recently introduced herbicides remains a challenge. The Pesticide Registration Improvement Act (PRIA) continues to effect IR-4 submissions and EPA review of packages. IR-4 submitted herbicide petitions to the EPA from October 2005 to September 2006 for: desmedipham on garden beet and spinach; foramsulfuron + isoxadifen-ethyl on sweet corn and popcorn; mesotrione on cranberry; pronamide on chicory, Belgian endive, dandelion, and berry group; and s-metolachlor on winter squash and pumpkin. From October 2005 through September 2006, EPA has published Notices of Filing in the Federal Register for: bentazon on peach and nectarine; clethodim on leafy greens subgroup, cilantro, legume vegetable group, herb subgroup, asparagus, flax, hops, safflower, and sesame; desmedipham on garden beet and spinach; dimethenamid on leek, green onion, Welsh onion, shallot (fresh leaves), grass (forage, fodder, and hay) group; diuron on prickly pear cactus and mint; ethofumesate on carrot (use in Washington and Oregon), garden beet, dry bulb onion, garlic, shallot (bulb and fresh leaves); fluroxypyr on dry bulb onion, shallot (bulb), and garlic; fomesafen on dry bean and snap bean; glyphosate on safflower, sunflower, Indian mulberry, and legume vegetable (except soybean) group; lactofen on fruiting vegetable group and okra (Southeast only); mesotrione on cranberry; pendimethalin on green onion, leek, Welsh onion, shallot (fresh leaves), fruiting vegetable group, pome fruit group, stone fruit group, juneberry, pomegranate, and strawberry (perennial); phenmedipham on spinach; sethoxydim on root vegetable (except sugar beet) subgroup, radish tops, turnip tops, buckwheat, borage, dill, and okra; and s-metolachlor on pumpkin and winter squash. EPA established tolerances from October 2005 though September 2006 for: dimethenamid on green onion, leek, Welsh onion, and shallot (fresh leaves); ethofumesate on carrot (use in Washington and Oregon), garden beet, dry bulb onion, garlic, shallot (bulb and fresh leaves); fomesafen on dry bean and snap bean; flumioxazin on strawberry; paraquat on cucurbit vegetable, dry bulb onion, ginger, and okra; pendimethalin on carrot, citrus fruit group, tree nut group, pistachio, mint, green onion, leek, Welsh onion, shallot (fresh leaves), fruiting vegetable group, pome fruit group, juneberry, pomegranate, and strawberry (perennial); s-metolachlor on pumpkin and winter squash; and terbacil on watermelon.

ORNAMENTAL WORKSHOP 2007. J. Altland, Moderator, Oregon State Univ., North Willamette Research and Education Center, Aurora.

ABSTRACT

A workshop format will be used in discussing the topic of "Research Methods for Weed Management in Container Crops". Participants have been in invited to introduce and help lead a discussion on three areas of interest by researchers working in weed control in ornamentals. Following the introduction by the group moderator all workshop participants will have an opportunity to provide ideas and examples of their methods used when conducting trials. The workshop is for the benefit of participants and it is planned that a "Notes on Research Methodologies in Ornamental Weed Science' will be summarized and distributed to all that attend.

Topics to be discussed – come prepared to share resources and ideas:

1. Methods for collecting, cleaning, drying and storing weed seed. Handling those hard to find seeds. Conducting bioassays.
2. How do you inoculate or "seed" pots with weeds? What methods have worked better? Should pots have both weed population and ornamental plant placed for evaluation in the same pot? What types of statistical designs are used? Maintaining weed populations for the length of study. What are the best methods to evaluate residual control from a preemergmence application?
3. What evaluations are best used for weed control and for plant safety? What parameters are best used to examine plant tolerance; what observations best describe the plant phytotoxicity that is identified? What size plant do you use and when do you make your application; directly after transplanting, etc? Does requiring multiple applications add to information on plant safety? How does working with trees or field-grown plants change your application methods, age of plant or other parameters in plant safety trials?

Discussions may use specific weed species like creeping woodsorrel or liverwort or other emerging nursery weed problems as examples in the discussions. Also, in the discussions on looking at plant tolerance examples of plants that are recognized as more "chemical sensitive" vs. those species where plant injury is seldom seen may be used as examples in the discussions. Each topic will have at least 3 participants who have come prepared to share their information on that topic. Two industry spokespeople will share briefly their viewpoint on executing ornamental research trials and company expectations from the data generated. However, participation from the audience is being encouraged for all topics.

PEDIGREE OF A PESTICIDE. D.R. Spak and N.M. Hamon, Bayer Environmental Science, Research Triangle Park, Raleigh, NC.

ABSTRACT

This presentation takes the audience through a 10 to 20-year journey from the discovery through to the commercialization and growth of a new agrochemical. It attempts to explain the dramatic consolidation in the industry, addressing costs, competition, the challenging regulatory environment, patents and intellectual property and the influence of biotechnology on the market. The presentation shows the science and complexity of identifying a new active ingredient and the exhaustive testing required to get it to the market place. Also addressed is the innovation required to keep older chemistry competitive.

HOW GOLF COURSE SUPERINTENDENTS VIEW NEW HERBICIDE COMPOUNDS.

S. Zontek, United States Golf Association, Glen Mills, PA.

ABSTRACT

One of the basic prerequisites of a good golf course is a weed-free turf. It is basic. The game of golf is played on grass, not weeds. Golfers (usually) cannot distinguish between most weed grasses growing in the desired turfgrass stand. They can distinguish between weeds like crabgrass (*Digitaria sanguinalis (L.)* Scop.), goosegrass (*Eleusine indica* (L.) Gaetn), dandelions (*Taraxacum officinale* Weber), dallisgrass (*Paspalum dilatatum* Poir*)* and *Poa annua*, during the period of the year when it produces seedheads. Therefore, golf course superintendents are interested in controlling the weeds. Golf course superintendents tend to embrace new herbicide chemistries. They understand that a well conditioned golf course is a positive reflection on their work and their programs. The reverse is also true. No golf course superintendent likes complaints as in not being able to find a golf ball that lands in the rough due to a thick mat of clover or the seed pods from dandelions. Also, grassy weeds present uniformity as well as playability issues in roughs. Right or wrong, today's golfers desire roughs which are consistent. Weeds in rough present a stand of grass that can (and is) inconsistent both in terms of appearance and playability. Therefore, controlling weeds is a priority for golf course superintendents for practical as well as perceptive reasons. A well presented golf course, free of weeds with a healthy stand of turfgrass, is pleasing to most golfers. Equally, the reverse is true. This presentation will be an attempt to discuss the latest herbicide chemistries on how they are being used by golf course superintendents in the Eastern Transition Zone and Mid-Atlantic Region of the United States. Herbicide compounds to be discussed are the latest suggested usage for the older chemistries of broadleaf and annual grassy weed controls as well as how superintendents are using the latest chemistries of weeds including the ALS inhibitors.

SEEDHEAD SUPPRESSION OF ANNUAL BLUEGRASS. J.A. Borger and M.B. Naedel, The Pennsylvania State Univ., University Park.

ABSTRACT

Annual bluegrass is commonly found on golf courses today. Many turfgrass managers choose to maintain annual bluegrass while others try to eliminate it. Annual bluegrass can produce many seedheads in the spring, regardless of mowing height. Seedhead production can create an undesirable sward for a variety of reasons. First, seedheads can be aesthetically displeasing resulting from an off white color during the peak production period. This production of annual bluegrass seedheads may result in a decrease of plant health. Additional stress, such as traffic or lack of moisture, may lead to an undesirable sward. Second, annual bluegrass seedheads may adversely affect turfgrass playability, especially in regards to a golf course putting green. Ball roll and smoothness are often compromised by annual bluegrass seedheads. Chemical applications of plant growth regulators and other materials have been used for the suppression of annual bluegrass seedheads. The correct timing of the application of these materials are imperative. If applications are made too early and temperatures are not optimal for growing conditions, plant health may be an issue. If materials are applied too late in the season, seedhead suppression may not be accomplished. Material application timings can differ. A common material application timing is when the annual bluegrass is in the boot stage of development. The boot stage should be monitored by sampling annual bluegrass plants in different areas of the overall sward. Many studies have been conducted to evaluate various plant growth regulators for the suppression of annual bluegrass seedheads. For example, Embark T&O is a growth regulator which provides excellent suppression when applied at the correct rate and timing. Other options include a tank mix of Primo Maxx and Proxy. This tank mix has shown good suppression in several studies. Researchers continue to evaluate new products, product combinations, and application timings to better suppress annual bluegrass seedheads.

BISPYRIBAC-SODIUM (VELOCITY) USE ON GOLF COURSES FOR ANNUAL BLUEGRASS AND ROUGHSTALK BLUEGRASS CONTROL. S.E. Hart and P.E. McCullough, Rutgers, The State University of New Jersey, New Brunswick.

ABSTRACT

Bispyribac-sodium (hereafter referred to as bispyribac) herbicide represents on of the most significant advancements for the selective control of annual bluegrass in cool-season turfgrass. Studies conducted at Rutgers University have determined that late-spring/early summer is the timing for bispyribac application for optimum annual bluegrass control and creeping bentgrass safety. Applications in cool weather conditions provided significantly less annual bluegrass control with marginal creeping bentgrass safety.

Studies have also been conducted on the response of other cool-season turfgrass species to bispyribac which demonstrated the potential to severely injure Kentucky bluegrass. Kentucky bluegrass may not adequately tolerate bispyribac at rates necessary for annual bluegrass control. Perennial ryegrass, tall fescue, and fine fescue may show initial symptoms of injury, but levels are less severe and persistent than those exhibited by Kentucky bluegrass. Bispyribac should be safe to use on perennial ryegrass, tall fescue, and fine fescue for annual bluegrass control.

Additional studies have also determined that all cool-season turfgrass species, including creeping bentgrass, can be rapidly reseeded (within 10-14 days) into areas treated with bispyribac. This should allow for the potential use of bispyribac in fairway renovation to convert mixed annual bluegrass/creeping bentgrass fairways to predominately creeping bentgrass.

Lastly we have been conducting studies on the long-term control of roughstalk bluegrass with bispyribac. Initial activity is high, however we have observed substantial regrowth of roughstalk bluegrass the following year.

We are also currently conducting studies evaluating the influence of golf course management practices on the efficacy and safety of bispyribac as well as its potential use on bentgrass putting greens.

APPLICATIONS FOR SULFENTRAZONE USE ON GOLF TURFS. S.J. McDonald, Turfgrass Disease Solutions, Pottstown, PA and P.H. Dernoeden, Univ. of Maryland, College Park.

ABSTRACT

Sulfentrazone was labeled for use on turfgrasses in 2006 and is sold under the trade name of Dismiss®. According to the label, creeping bentgrass (*Agrostis stolonifera*), red fescue (*Festuca rubra*), tall fescue (*Festuca arundinacea*), perennial ryegrass (*Lolium perenne*), Kentucky bluegrass (*Poa pratensis*), bermudagrass (*Cynodon dactylon*) and zoysiagrass (*Zoysia japonica*) are tolerant of sulfentrazone. The label, however, does not specify different rates based on turfgrass species. The herbicide's primary use in turf is for postemergence control of yellow and purple nutsedge (*Cyperus* spp.), and green and false green Kyllinga (*Kyllinga* spp.). Numerous broadleaf weed species are listed as being controlled or suppressed. To our knowledge, this herbicide has not been formally evaluated for use on turfgrasses in the Philadelphia to Washington D.C. corridor. Initial studies in College Park, MD, showed that sulfentrazone (0.375 lb ai/A) applied in May 2006 was highly effective in controlling yellow nutsedge (*C. esculentus*) in perennial ryegrass maintained to a height of 2.5 inches. On creeping bentgrass golf course fairways maintained to a height of 0.5 inches in Lothian, MD a single application of sulfentrazone in July killed exposed leaves, but the yellow nutsedge recovered either from stems or tubers. The aforementioned observation suggests that under low mowing insufficient leaf area is exposed, which may result in less herbicide uptake and therefore inadequate translocation of active ingredient to stems and tubers. Sulfentrazone (0.125, 0.250, and 0.375 lb ai/A) was applied once in August 2006 to "Crenshaw' creeping bentgrass and Tufcote bermudagrass maintained at 0.5 inches in College Park and no injury was observed. The same rates applied to 'Zenith' zoysiagrass maintained at 0.5 inches elicited an objectionable level of injury for about two weeks, especially the high rate. Sulfentrazone (0.125, 0.250, and 0.375 lb ai/A) was applied either once or twice to a golf course fairway in Pottstown, PA beginning on 17 August and sequential treatments were applied 31 August 2006. The fairway consisted of approximately 45% creeping bentgrass, 30% perennial ryegrass, 5% annual bluegrass (*Poa annua*) and 20% goosegrass (*Eleusine indica*). The 6 to 8 tiller, seedhead bearing goosegrass was severely injured, but even at the highest rate (0.375 + 0.375 lb ai/A) only 42% control was achieved. Sulfentrazone elicited unacceptable injury to the perennial ryegrass following the sequential application at the highest two rates. Injury to creeping bentgrass was slightly objectionable following the sequential application of the high rate. While the level of goosegrass control was poor, data and observations suggest that an earlier sulfentrazone application to less mature goosegrass may be effective. More research also is needed to elucidate the impact of mowing height and application timing on sulfentrazone performance and the influence of air temperature on the sensitivity of mid-Atlantic turfgrasses to this herbicide.

SELECTIVE REMOVAL OF CREEPING BENTGRASS WITH MESOTRIONE. J.E. Kaminski, Univ. of Connecticut, Storrs.

ABSTRACT

Creeping bentgrass (*Agrostis stolonifera* L.) is a major weed problem in home lawns, athletic fields, and golf course roughs. The influence of mesotrione and triclopyr were assessed for their ability to selectively remove creeping bentgrass from Kentucky bluegrass (*Poa pratensis* L.). This study was conducted at the University of Connecticut Plant Science Research and Education Facility located in Storrs, CT. An average of 39% creeping bentgrass was present when the study was initiated. Triclopyr and mesotrione each were applied at two rates on a 14-day interval for a total of two, three or four applications. All treatments were applied using a CO_2 pressurized sprayer calibrated to deliver 467 l/ha water. Regardless of herbicide rate, all plots treated with triclopyr and mesotrione exhibited significant injury with 4 and 7 days following treatment, respectively. Three months after the initial treatment (19 September), creeping bentgrass populations within all herbicide-treated plots were reduced when compared to the untreated control. On most rating dates, excellent control (≤ 5% bentgrass) was achieved within plots receiving ≥ 3 applications of mesotrione (0.125 and 0.187 lb ai/A) and three (1.0 lb ai/A) or four (0.5 and 1.0 lb ai/A) applications of triclopyr. Plots treated with two applications of mesotrione (0.187 lb ai/A) resulted in moderate levels of creeping bentgrass control. On the final rating date, there were no differences in creeping bentgrass cover among plots treated with two (0.5 and 1.0 lb ai/A) or three (0.5 lb ai/A) applications of triclopyr or two applications of mesotrione (0.125 oz lb ai/A) and the untreated control. Unlike triclopyr, mesotrione did not appear to inhibit regrowth of Kentucky bluegrass into areas void of turf.

HORSEWEED: FROM OBSCURITY TO THE LIMELIGHT. M.J. VanGessel, Univ. of Delaware, Georgetown.

ABSTRACT

Horseweed (*Conyza canadensis*) is a ubiquitous plant species found in temperate climates world-wide. It infests crops grown under no-tillage production and in perennial crops. In 2000, plants found in Delaware were identified as resistant to glyphosate. It was the first report of a broadleaf weed resistant to glyphosate. Since that time, a number of research programs have had an interest in studying this species. Based on electronic databases of scientific journals, well over half of the studies listing horseweed in the title or as a keyword (~60%) were published since 2001. While this recent interest in horseweed is not exclusive to the presence of glyphosate-resistant biotypes, most of the ecology and biology based studies of this species cite resistance as a justification for conducting the trials. Horseweed research since 2001 has become more expansive and often focuses on horseweed, rather than identifying horseweed as one of the species present at the experimental site

HOW THE SPATIAL SCALE OF DISPERSAL MODELING HAS INCREASED WITH GLYPHOSATE-RESISTANT HORSEWEED. J.T. Dauer, D.A. Mortensen, The Pennsylvania State Univ., University Park, E.C. Luschei, Univ. of Wisconsin, Madison, M.J. VanGessel, Univ. of Delaware, Georgetown, and E.S. Shields, Cornell Univ., Ithaca, NY.

ABSTRACT

Population dynamics modeling of species spread often assume no vector assisted movement and can be represented using cellular automata models where a population contributes genes, seeds or pollen, to nearest neighboring cells. In the simplest sense, these models can be adjusted to include vectored movement by increasing the probability of seed landing at long distances. This method ignores the underlying mechanisms of vectored movement and fails to accurately simulate long-distance dispersal. The importance of glyphosate-resistant horseweed has generated interest in quantifying the likelihood that seed are being distributed to nearest neighbor fields versus long-distance dispersal. Instead of a cellular approach, we defined the landscape by a series of polygons outlining actual fields in a 10 km x 9 km aerial photo of Pennsylvania cropland. Polygons were assigned initial crop type, corn or soybean, which were rotated yearly and impacted the survivorship of seed that arrived in the previous time step. A 2-dimensional 2-parameter dispersal model dependent on distance from the source and source strength was applied to seed movement in the landscape. Dispersal was normalized by area to determine seed arrival in every field in the landscape. Survivorship varied from zero percent (best management with alternative herbicides, tillage) to 100 percent (glyphosate only). Simulations conducted thus far have not included a directional wind vector but will be included as the model advances. Spread from randomly initiated source fields was slow for three years, increasing source strength but spreading less than 1 km per year. In the fourth and fifth years after initiation, seed dispersal and establishment reached fields at the extent of the described landscape (at least 5 km). Continued manipulation of the model will explore the importance of field size and quantify the necessary efficacy to reduce spread to less than 1 km per year. The ability of horseweed seed to disperse long distances has enlarged the scale at which resistance management can have an impact. Focusing on a single field or a small region will not prevent spread of this biotype to neighboring farms. As more species develop resistance to glyphosate, questions about how to reduce the impact will require predictive models created on the correct spatial scale.

RECENT FINDINGS ON THE FIELD BEHAVIOR, GENETICS, AND MECHANISM OF GLYPHOSATE-RESISTANCE IN HORSEWEED. D.I. Gustafson, M.T. Faletti, G.R. Heck, R.D. Sammons, and M.B. Spaur, Monsanto Company, St. Louis, MO.

ABSTRACT

We have undertaken a series of investigations to help understand the field behavior, genetics, and mechanism of glyphosate-resistance in horseweed (*Conyza canadensis*). Our on-going field studies are focused on the long-term impact of various agronomic practices on horseweed populations, such as crop rotation, use of co-herbicides, and tillage. We have also studied the relative fitness of resistant and sensitive biotypes under field conditions.

Our genetics studies show that glyphosate-resistance in horseweed is inherited through a single nuclear gene, one that is either wholly or partially dominant. We have further investigated whether target site mutation can be implicated as a mechanism for glyphosate resistance in horseweed. Three EPSPS (5-enol-pyruvylshikimate-3-phosphate synthase) genes were found in the species and identical amino acid sequences were determined for the corresponding genes in both sensitive and resistant biotypes. Expression of these genes was comparable in response to glyphosate and in gross organ distribution across the biotypes, leading to the conclusion that glyphosate resistance in horseweed is not due to EPSPS target site mutation, overexpression or gene amplification.

Instead, our mechanism research shows that translocation of glyphosate in the resistant biotype is reduced, relative to the sensitive biotype. The biomolecular process responsible for this phenomenon is the subject of current research, both at Monsanto and at other institutions. A number of potential hypotheses have been investigated and will be discussed.

Taken together, our findings have many practical implications for growers attempting to manage this important weed. In particular, our results suggest that timely applications of glyphosate and auxin-type herbicides at sufficient rates should be extremely effective in reducing populations of the resistant biotype.

HORSEWEED EMERGENCE, SURVIVAL, AND SEEDBANK DYNAMICS IN SOUTHEASTERN INDIANA AGROECOSYSTEMS.

W.G. Johnson, V.M. Davis, and K.D. Gibson, Purdue Univ., West Lafayette, IN.

ABSTRACT

Horseweed (*Conyza canadensis*) is an increasingly common and problematic weed in no-till soybean production in the eastern cornbelt due to the frequent occurrence of biotypes resistant to glyphosate. The objective of this study was to determine the influence of crop rotation, winter wheat cover crops (WWCC), residual non-glyphosate herbicides, and burndown application timing on the population dynamics of glyphosate resistant (GR) horseweed and crop yield. A field study was conducted from 2003 to 2005 in a no-till field located at a site that contained a moderate infestation of GR horseweed (approximately 1 plant m^{-2}). The experiment was a split-plot design with crop rotation (soybean-corn or soybean-soybean) as main plots and management systems as subplots. Management systems were evaluated by quantifying in-field horseweed plant density, seedbank density, and crop yield. Horseweed densities were collected at one month after spring applied burndown herbicides (MAB), one month after postemergence applications (MAP), and at the time of crop harvest or 4 MAP. Viable seedbank densities were also evaluated from soil samples collected in the spring prior to germination, in the summer prior to seed rain, and in the fall following seed rain. Crop rotation did not influence in-field horseweed or seedbank densities at any data census timing. Burndown herbicides applied in the spring were more effective at reducing horseweed plant densities than when applied in the previous fall. Spring-applied, residual herbicide systems were the most effective at reducing season long in-field horseweed densities and protecting crop yields since horseweed in this region behaves primarily as a spring emerging summer annual weed. Horseweed seedbank densities declined rapidly in the soil by an average of 76% for all systems over the first ten months prior to new seed rain. Despite rapid decline in total seedbank density, seed for GR biotypes remained in the seedbank for at least two years. Therefore, to reduce the presence of GR horseweed biotypes in a local no-till weed flora, integrated weed management (IWM) systems should be developed to reduce total horseweed populations based on the knowledge that seed for GR biotypes are as persistent in the seed bank as GS biotypes.

HORSEWEED RESPONSE TO NO-TILL PRODUCTION SYSTEMS. M.J. VanGessel, B.A. Scott, Q.R. Johnson and S.E. White, Univ. of Delaware, Georgetown.

ABSTRACT

Horseweed (*Conyza canadensis*) has been a common weed in no-tillage production systems in Delaware since the adoption of no-till. In 2000, horseweed plants from multiple fields in DE were identified as resistant to glyphosate. Since then glyphosate-resistant biotypes have become wide-spread and have forced farmers to find an alternative to glyphosate for its control. Fields planted with no-till corn in DE are often treated with paraquat and simazine during the early spring and this provides effective control. Thus, research has focused on horseweed management in soybeans. A series of studies were conducted at the University of Delaware to examine horseweed response to various management practices and the environmental impacts on horseweed growth and development.

Horseweed plants at three stages of growth (seedling, large rosettes, and bolting) were treated in the greenhouse with various rates of glyphosate. Glyphosate-susceptible plants were effectively controlled, regardless of stage of growth, while a growth stage by glyphosate interaction was observed with the glyphosate-resistant biotype. Plants in the large rosette stage were not as sensitive to glyphosate as the other two stages of growth.

Horseweed seed buried at 1 or 10 cm of depth in the field did not respond the same way at two locations. However, in general, seed viability was greater over a 36 month period at the 10 cm depth than at the 1 cm depth.

Seeding a rye (*Secale cereale*) cover crop in the fall reduced the size and density of horseweed plants when evaluate the following spring, but not to commercially acceptable levels. In addition, although the individual horseweed plants were smaller, their susceptibility to paraquat and 2,4-D was not different from larger horseweed plants grown without the rye competition.

Research to date at the University of Delaware has shown little to no biological or ecological differences between glyphosate-resistant and glyphosate-susceptible horseweed biotypes. Future research needs to focus on management practices that reduce the selection pressure for development of multiple-resistant biotypes. Continued research on horseweed ecology and biology is critical to lessen this resistance pressure.

DO ECOLOGICAL INSIGHTS INFORM CONYZA MANAGEMENT? D.A. Mortensen, J.T. Dauer, W.S. Curran, The Pennsylvania State Univ., University Park, and M.J. VanGessel, Univ. of Delaware, Georgetown.

ABSTRACT

Over the past four plus years we have conducted numerous life history, dispersal, and simulation studies and on-farm surveys to understand the nexus of glyphosate resistant horseweed (*Conyza canadensis*) population dynamics and management. During that time the spatial extent of this invasive genotype increased approximately five fold. This rapid invasion speed can be explained by long-distance propagule dispersal and high recruitment success. In fact, we have observed seeds reaching the atmospheric boundary layer. Aerial sampling has detected *Conyza* seed at altitudes in excess of 100 meters above the ground surface. The implications of such findings are profound, once aloft at such altitudes it is likely that seed could travel tens of kilometers in a single day. Given that seed are released over a period of some six weeks, there is ample opportunity for very long-distance seed movement. The practical implication of these findings is that fields and farmsteads are far more highly interconnected than previously thought. Effectively, a grower could inherit the downside consequences of poor management from a neighbor many kilometers away. Another implication of these findings is that buffer distances between "invaded" and “uninvaded” farmsteads must be sufficiently large to limit the possibility of resistant horseweed gaining a foothold in new farms or farming regions. Finally, real costs have been incurred by this resistance outbreak. In the region where the on-farm surveys are being conducted, the cost of weed control has increased significantly as the efficacy of glyphosate has decreased. It is clear that successful approaches at minimizing the spread of the plant will require an area-wide approach. It may also be the case that such an approach will be required once a local growing region has been invaded.

THE MASSACHUSETTS EXAMPLE: ONE STREAM BANK, MULTIPLE JURISDICTIONS. R.G. Prostak and D.J. Picking, Univ. of Massachusetts, Amherst.

ABSTRACT

In MA, individuals wishing to control or eradicate invasive plants in riparian areas face many regulations that are unique to the commonwealth. These regulations pre-date invasive plant recognition and consciousness to the degree that it exists today.

In 1972, the Commonwealth of MA passed the Wetlands Protection Act (WPA), MA General Laws Chapter 131 section 40. The Act defines areas subject to protection, including Bordering Vegetative Wetlands (BVW), stream banks, and lands subject to flooding. The Act protects not only BVW but identifies a 100 foot buffer zone beyond the wetland edge. The Act requires that a permit be obtained for nearly all activities within the BVW. Activities in the wetland buffer zone may or may not require a permit depending on the likelihood of the activity adversely impacting the resource area. In 1996, MA passed the Rivers Protection Act (RPA) that further amended the WPA. RPA establishes a 200 foot resource area along all perennial rivers and streams. This is a regulated resource area and may or may not overlap a BVW and its associated buffer zone. Almost all activities within this area will require a permit.

The WPA is administered by a local Conservation Commission in each municipality with oversight and final authority from the MA Department of Environmental Protection (DEP). Under "home rule" in MA, municipalities may pass local wetland by-laws that are more stringent than those of the commonwealth. For example, some municipalities have imposed 'no build' and /or ‘no disturb’ zones adjacent to wetland resource areas that prohibit all activities within these locally defined zones. Decisions made based on the WPA by municipal conservation commissions may be appealed to the DEP, but decisions made based on local by-laws can not be appealed.

Local conservation commissioners serve voluntarily once appointed by local town officials. Training programs are offered by the MA Association of Conservation Commissioners but attendance at these programs is not mandatory. The make-up of commissions varies significantly from town to town due to the professional background and experience of the commissioners, therefore, decisions and interpretations of regulation can also vary. The importance of invasive plant management is recognized by most (if not all) local conservation commissions, however, conservation commission differ widely in their views on the use of herbicides in or near wetlands.

Another set of regulations that may impact ones ability to manage invasive plants in riparian zones is the MA Endangered Species Act, MA General Law Chapter 131 A. The Act is administered by Natural Heritage Endangered Species Program (NHESP) within the MA Department of Fish and Game and reviews all proposed activities in estimated rare or endangered species habitat, as delineated on the NHESP database.

With the exception of utility right-of-ways, the WPA and RPA do not address the use of herbicides. The exclusive authority for the regulation of the labeling, distribution, sale, storage, transportation, use and application, and disposal of pesticides in the commonwealth is determined by the MA Pesticide Control Act, MA General Law Chapter 132B administered by the MA Department of Agricultural Resources.

Supplement

to the

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Hilary A. Sandler, Editor
University of Massachusetts-Amherst Cranberry Station
East Wareham, MA

Supplemental NEWSS Abstracts

(presented in alphabetical order, by author)

THE EFFECTS OF CULTURAL PRACTICES ON WEED ESTABLISHMENT IN CONTAINERS. J. Altland, Oregon State University, Corvallis.

ABSTRACT

Cultural management practices in nurseries influence weed establishment and growth in containers. The three cultural practices that have the most impact on container weed management are substrate particle size selection, fertilizer management, and irrigation management. Seeds of most container weeds are small. Small seeds must germinate on or near the substrate surface because they do not have sufficient stored energy to survive deep germination. Water within in a container is not constant from the surface to the bottom. Due to matric potential of substrates, there is a gradient of available water from high to low in the container bottom up to the surface. Coarse substrates do not have sufficient water holding capacity to support seed germination, particularly on the substrate surface where weed seeds germinate. For example, within the range of bark grades used by nurseries, coarser grades reduce pearlwort (*Sagina procumbens*) growth compared to finer grades. Water holding capacity is an important physical property of container substrates, and also dictates the amount of water available to the ornamental crop. Moderation in selecting coarse substrates is important.

Fertilizers can be used to impact weed growth. Bark substrates, including those amended with peat, pumice, sand, or choir, have little or no available nitrogen (N). N is required by weeds for successful germination and growth. Placement of controlled release fertilizers (CRFs) below the substrate surface, commonly called dibbling, results in no available N on the substrate surface and thus poor weed establishment. Topdressing CRFs or injecting fertilizer through the irrigation system supplies abundant N to the substrate surface and improves weed establishment. Incorporating composts with high levels of available N into the substrate will also favor weed growth.

If nursery conditions dictate that fertilizers must be injected through the irrigation system, N form can also influence weed growth. N in water soluble fertilizers is supplied in the form of nitrate, ammonium, urea, or in combination. Fertilizers that supply N solely in the form of nitrate, as opposed to either urea or ammonium plus nitrate, reduce weed growth and flowering. Differences in weed growth due to N form are subtle; however, reduced flower and seed numbers can result in significantly reduced weed pressure.

Irrigation is the most difficult cultural practice to manage. Over-watering reduces herbicide effectiveness and improves weed establishment and growth. Irrigation monitoring can be used to better manage irrigation rates, especially with micro-irrigated crops. However, overhead irrigation systems lack uniformity. Non-uniform irrigation with overhead sprinklers is the greatest limitation to strict management of irrigation rates. Strict management of cultural practices alone will not eliminate weeds; however, it will reduce weed vigor and improve overall weed control. The most effective weed management program for nursery containers integrates sanitation, management of cultural practices, and proper use of preemergence herbicides.

AMINOPYRALID: A NEW HERBICIDE FOR BROADLEAF WEED CONTROL IN PASTURE, ROADSIDE, AND NATURAL AREAS. P.L. Burch, Dow AgroSciences, Christiansburg, VA and E.S. Hagood, VPI and SU, Blacksburg.

ABSTRACT

Aminopyralid is a new systemic herbicide developed by Dow AgroSciences specifically for use on rangeland, pasture, rights-of-way, such as roadsides for vegetation management, Conservation Reserve Program acres, non-cropland, and natural areas in the United States and Canada. The herbicide is formulated as a liquid containing, 240 g ae/liter of aminopyralid as a salt. The herbicide has postemergence activity on established broadleaf plants and provides residual control of germinating seeds of susceptible plants. Field research has shown aminopyralid to be effective at rates between 52.5 and 120 g ae/ha, which is about 1/4 to 1/20 less than use rates of currently registered rangeland and pasture herbicides with the same mode of action including, clopyralid, 2,4-D, dicamba, picloram, and triclopyr. Aminopyralid controls over 40 species of annual, biennial, and perennial broadleaf weeds including *Acroptilon repens, Artemisia absinthium*, *Carduus acanthoides*, *Carduus nutans*, *Centaurea diffusa, Centaurea maculosa*, *Centaurea solstitialis, Chrysanthemum leucantheum*, *Cirsium arvense, Cirsium vulgare*, *Lamium amplexicaule*, *Matricaria inodora*, *Ranunculus bulbosus, Rumex crispus, Solanum carolinense, Solanum viarum,* and *Xanthium strumarium.* Most warm- and cool-season rangeland and pasture grasses are tolerant of aminopyralid applications at proposed rates. Research continues to determine the efficacy of aminopyralid on other key invasive weeds and on the role of aminopyralid in facilitating plant community improvement in land management programs.

ABSTRACTS AND BIOGRAPHIES FOR PRESENTATIONS

AT THE

7TH ANNUAL CONFERENCE

OF THE

NORTHEAST AQUATIC PLANT MANAGEMENT SOCIETY

4-5 JANUARY 2006

WESTIN PROVIDENCE

PROVIDENCE, RHODE ISLAND

Abstracts and biographies are listed in order of presentation at the conference.

EVALUATION OF REGISTERED AND EUP HERBICIDES FOR CONTROL OF VARIABLE MILFOIL. M.D. Netherland, U.S. Army Engineer Research and Development Center, Univ. of Florida Center for Aquatic and Invasive Plants, Gainesville.

ABSTRACT

Variable milfoil (*Myriophyllum heterophyllum* Michx.) is considered invasive in the Northeast US, and resource managers have expressed an interest in determining the aquatic herbicides that are most effective in controlling both pioneer and established infestations of the plant. We have initiated laboratory and mesocosm evaluations of 7 registered active ingredients (carfentrazone, copper, diquat, endothall, fluridone, triclopyr, and 2,4-D), and two acetolactate synthase (ALS) inhibitors that have recently received Experimental Use Permits in aquatics (imazamox and penoxsulam). Contact herbicide evaluations have focused on developing concentration and exposure time (CET) relationships, evaluations of 2,4-D and triclopyr have focused on CET relationships, response to formulation, and minimum rates required to achieve plant control. Fluridone and the ALS inhibitors have been evaluated to determine the minimum concentrations necessary to inhibit growth and pigment production. Preliminary results suggest that low doses (100 to 400 ppb) and extended exposures (7 to 21 days) of 2,4-D and triclopyr can be highly effective for control of variable milfoil. These treatments proved more effective than high dose (2 to 3 ppm) and shorter-term exposures (6 to 18 hours). Variable milfoil also tends to be quite susceptible to fluridone and the ALS inhibitors at rates in the range of 8 to 20 ppb. As with other nuisance plants, extended exposures of 60 to 100+ days to these concentrations will be necessary to provide control. In addition, studies suggest the phenology of variable milfoil will require that these treatments be applied early in the season prior to or just as the plants start to come out of winter dormancy. Contact herbicide evaluations are ongoing and will be reported at the meeting.

Mike Netherland is a Research Biologist for the US Army Engineer Research and Development Center. He is located at the University of Florida Center for Aquatic and Invasive Plants and is a courtesy Associate Professor in the Department of Agronomy. Dr. Netherland received an M.S. in Botany and Plant Pathology from Purdue University and his Ph.D. in Agronomy from the University of Florida. His dissertation topic evaluated the response of hydrilla tubers to various forms of management. From 1998 to 2003 Mike was employed by the SePRO Corporation as the Research Director for Aquatics. Both public and private sector research has focused on the response of exotic and native submersed plants to experimental and EPA registered herbicides. Dr. Netherland has worked with *Myriophyllum* spp. since 1988, and has conducted extensive research at the laboratory, mesocosm, and field-scale evaluating various control methods.

EVALUATION OF AN HERBICIDE APPLICATION ON VEGETATED HABITAT AND THE STRUCTURE OF A FISH AND MACROINVERTEBRATE COMMUNITY IN MINNESOTA LAKES. J.G. Slade and E.D. Dibble, Department of Wildlife and Fisheries, Mississippi State Univ.

ABSTRACT

Macrophytes provide important habitat complexity mediating structure of aquatic communities in lakes. We investigate the hypothesis that removal of exotic, invasive macrophytes because of changes in this complexity will alter fish and macroinvertebrate populations. A four lake experiment was conducted in the Minneapolis, Minnesota metropolitan area (June 2003-September 2004) to measure herbicide effects on the structure of the aquatic community. A BACI (before–after/control–impact) sampling design was used to evaluate change in structural habitat (stem frequency) by removing two exotic plant species (*Myriophyllum spicatum* and *Potamogeton crispus*) and its effect on the abundance and richness of fish and macroinvertebrates. As an experimental treatment, a low-dose, species-specific herbicide application was made to remove the two species in two of the lakes. Pre- and post-treatment fish and macroinvertebrate population data were collected, and the treatment effect was evaluated using repeated measures two-way analysis of variance. A multi-sampling approach using popnets, boat-mounted electrofishing, and seining was deployed to ensure accuracy in fish data. Our data documented significant loss of the two exotic species however no treatment effect was noted on macrophyte stem frequency, or abundance and richness of the fish and macroinvertebrate community. No change in stem frequency was noted due to the immediate replacement by native macrophytes. Temporal (seasonal) effect in the abundance and richness of macrophyte, fish, and macroinvertebrate communities was noted. We conclude that there was no immediate effect of removing the habitat complexity on the fish and macroinvertebrate community by using an herbicide to remove two exotic macrophytes in the four Minnesota Lakes.

Jeremy Slade is a recent graduate from the Department of Wildlife and Fisheries, Mississippi State University (MSU). Completed degree August 2005: Master's of Wildlife and Fisheries Science. Performed Master's work on fish-plant relationships pre- and post- herbicide application in four Minnesota lakes. Currently employed by the Department of Wildlife and Fisheries, MSU as a Research Associate and contracted (work) for United States Army Corps of Engineers, US Army Research and Development Center (ERDC), Vicksburg, MS. Married June 4, 2005 in Quito, Ecuador to wife Cristina.

USE OF THE AQUATIC HERBICIDE RENOVATE™ (TRICLOPYR) IN *PHRAGMITES AUSTRALIS* CONTROL PROGRAMS. D. Roach, All Habitat Services, LLC, S. Hyde, SePRO Corporation, and S. Living, All Habitat Services, LLC.

ABSTRACT

SePRO Corporation, in cooperation with All Habitat Services, LLC, has conducted experimental trials to evaluate the effectiveness of the aquatic herbicide Renovate (triclopyr TEA) to control the invasive species *Phragmites australis.* Renovate is a proven systemic aquatic herbicide used for selective control of broadleaf (dicots) and woody plants. Field development work from 2003-2005 has demonstrated a significant ability to control invasive *Phragmites* (monocot) populations. The effectiveness of Renovate early in the growing season and the opportunity of rapid recovery of desirable grass (monocot) species provide a new and valuable tool in the management of *Phragmites australis*. Important benefits include; an expanded management window, release of desirable monocot species, reduced biomass, compressed restoration timelines, and perennial rhizome suppression. The presentation will include a discussion of current *Phragmites* control programs, pre-treatment and post-treatment observations from Renovate field evaluation projects, as well as information on the future potential of Renovate prescriptions in *Phragmites* management programs.

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David Roach is the General Manager of All Habitat Services, LLC, an innovator in the field of wetland and upland habitat management. He holds commercial supervisory pesticide applicator licenses for categories of Aquatic Pest, Right of Way, Bird, Mosquitoes and Biting Flies, and Public Health in Connecticut and Aquatic Pest and Public Health in New York. David works collaboratively with manufacturers and government scientists to develop highly effective, wise use prescriptions. He has 10 years experience in both vegetation management and public health mosquito management programs.

ALUMINUM TREATMENT FOR PHOSPHORUS AND ALGAE CONTROL: WHAT, WHY, WHERE AND WHEN. K.J. Wagner, ENSR, International.

ABSTRACT

The use of aluminum compounds as coagulants has long been practiced in the water and wastewater industries, so use of aluminum is neither novel nor new. Their use to bind up phosphorus in lakes dates back about 35 years, with many more treatments in the last decade or two and considerable lessons learned. Multiple factors must be evaluated when developing an aluminum dosing program, including the target location of phosphorus (incoming water, standing lake water, sediment reserves), the amount of phosphorus to be inactivated, existing water chemistry (especially pH and alkalinity), and potentially sensitive receptor populations in the aquatic environment. In general, the aluminum dose to effectively inactivate phosphorus in the target location will be 10 to 100 times the available phosphorus concentration, with several methods used to determine available phosphorus. Longevity of results depends upon the length of time it takes for inactivated phosphorus to be replaced. Where internal recycling is the primary source of phosphorus, reduced levels are expected for more than a decade and have lasted for over 20 years in real cases. Where external inputs are dominant, improvement can be expected for 3 to 5 times the detention time of the system, which may be as short as a season. While aluminum can be toxic to aquatic fauna in its reactive form, reactions occur quickly and result in non-toxic forms that bind phosphorus and some other contaminants in a largely permanent manner. Approaches for minimizing toxicity include keeping the pH between 6.0 and 8.0 SU, with a strong preference for pH levels between 6.5 to 7.5 SU, keeping the applied aluminum level <5 mg/L over the depth of mixing in the water column and applying sequential doses over several weeks where higher doses are needed, treating in a spatial patchwork pattern that provides horizontal refuges, and treating at greater depth to provide a surficial refuge. Program development and execution will be illustrated with actual example cases.

Dr. Wagner holds a B.A. in Environmental Biology from Dartmouth College and M.S. and Ph.D. degrees in Natural Resource Management from Cornell University. He had four years of experience with the New Jersey Department of Environmental Protection between his undergraduate and graduate degree programs, working primarily with the Division of Water Resources in lake and stream assessment and management. He has since gained 20 years of experience with northeastern US consulting firms, working on a variety of water resources assessment and management projects. Many lake assessment and management projects have been completed under his direction, including a wide variety of plant and algae management projects. Dr. Wagner is an Adjunct Professor at Springfield College, edited the final version of the Generic Environmental Impact Report for Lake Management in Massachusetts and prepared a user-friendly companion guide for use by laypersons and Conservation Commissions. Dr. Wagner is a Certified Lake Manager through NALMS and is also a member of the Editorial Board of the Journal of Lake and Reservoir Management.

INTEGRATED AQUATIC WEED MANAGEMENT IN TURFGRASS AREAS. J. Whetstone, Clemson Univ., Clemson, South Carolina.

ABSTRACT

This presentation will focus on integrated aquatic weed control methods for ponds located in turfgrass areas, such as golf courses. Proper methods for controlling aquatic weeds when ponds are being used as irrigation sources will be detailed. Chemical and non-chemical control strategies will be discussed.

Jack Whetstone is an Associate Professor in the Department of Forestry and Natural Resources at Clemson University. He is also affiliated with the South Carolina Sea Grant Extension Program and works in a cooperative program with the South Carolina Department of Natural Resources. Jack is a Past-President and Past Member of the Year of the South Carolina Aquatic Plant Management Society. He coordinates and develops continuing education programs for certified aquatic applicators in South Carolina and is the coauthor of “Applying Aquatic Herbicides in South Carolina: A Training Manual for Aquatic Applicators”. In 2004 Jack received the Distinguished Public Service Award from the Cooperative Extension Service in South Carolina and in 2005 he received the Superior Outreach Award for Sea Grant Extension Programs.

BIOLOGICAL CONTROL OF AQUATIC WEEDS 1959-2005. J.F. Shearer, US Army Corps of Engineers Research and Development Center, Vicksburg, MS.

ABSTRACT

In 1959 the US Army Corps of Engineers (USACE) and the USDA initiated a joint effort to find classical biological control agents for aquatic weeds. Five years later a host specific insect, the alligatorweed flea beetle, was approved for release. Over the next approximate 30-year period, 11 additional insect agents were approved for release for management of alligatorweed, water hyacinth, water lettuce, and hydrilla. Very limited overseas pathogen surveys have been conducted and while a few potential agents have been identified no releases have been made. Overseas projects on water chestnut and Eurasian watermilfoil although initiated were suspended. Since 1995 USACE funding for overseas research has not been forthcoming forcing the agency to curtail searches for any new classical agents for aquatic weeds. To a very limited extent the USDA has continued to look for agents for hydrilla and Brazilian elodea. One other introduced agent, the grass carp, has been utilized in several states since 1963, primarily for management of hydrilla.

Native and naturalized insects and pathogens have been researched as augmentative and inundative biocontrol agents for aquatic weeds. Most notable among the insect agents are the native weevil, *Euhrychiopsis lecontei*, and the naturalized moth, *Acentria ephemerella*, on Eurasian watermilfoil and the naturalized weevil, *Cyrtobagous salviniae* on giant salvinia. Starting in the 1960's several indigenous and naturalized fungi have been studied for potential development into mycoherbicides for management of aquatic plants. Among the most promising of these agents is the fungal pathogen, *Mycoleptodiscus terrestris*, used alone or with a number of herbicides in an integrated approach for management of hydrilla and Eurasian watermilfoil.

Present position: Research plant pathologist for the US Army Corps of Engineers Research and Development Center (USACE-ERDC), Vicksburg, MS. Research interests are biological control of aquatic weeds using plant pathogens, endophytic fungi of aquatic macrophytes, and developing invasive species information systems.

Presently working on developing a bioherbicide for management of hydrilla. It is a cooperative venture between USACE, Agricultural Research Service- United States Department of Agriculture- National Center for Agriculture Utilization Research (ARS-USDA-NCAUR) in Peoria, IL, and SePRO Inc. of Carmel, IN.

Aquatic market with the launch of Habitat® herbicide providing the opportunity to develop new business in the aquatic marketplace.

THE SUCCESSFUL CONTROL OF JAPANESE KNOTWEED IN A RIPARIAN SETTING. A. Gover, The Pennsylvania State Univ., University Park, K. Budd, Nature Conservancy, Erwinna, PA, J.M. Lentz, Arborchem Products, Inc., Mechanicsburg, PA, R.R. Johnson, Waldrum Specialties, Doylestown, PA.

ABSTRACT

Tinicum Creek, a PA DEP 'Exceptional Value' waterway in Bucks County, PA, and its tributary Swamp Creek, were infested with Japanese knotweed (*Polygonum cuspidatum* Sieb. and Zucc.). Japanese knotweed is a rhizomatous perennial of Asian origin that commonly infests riparian corridors, as well most almost any other setting where it is introduced. Knotweed can exceed 3 m in height, and grows in dense, clonal stands that approach monoculture. Preexisting plant communities are disturbed or eliminated and access to the stream is impaired, if not prevented.

An exclusively volunteer effort, including education and outreach, mechanical clearance, and backpack-based applications of the herbicides glyphosate and imazapyr to knotweed regrowth resulted in near-elimination of the knotweed in 12 miles of privately owned stream bank after applications in 2001 and 2002. Subsequent annual follow-up monitoring applications have reduced surviving remnants and prevented re-establishment.

Art Gover is a Research Support Associate with the Roadside Vegetation Management Research Project, of the Department of Horticulture at the Penn State University. Roadside Project initiatives include management of specific weed species, such as tree-of-heaven, Japanese knotweed, and Canada thistle; evaluation of alternative plant materials for roadside conservation plantings; and comparisons of equipment, herbicides, and procedures. The Research Project also conducts two annual educational conferences, and provides continuing education training for PennDOT's personnel and contractors, as well as applicators in non-crop settings through industry and Cooperative Extension forums. Art is a member of the PA Invasive & Noxious Plant Working Group; a past-president of the Mid-Atlantic Exotic Pest Plant Council; and served on the Executive Committee of the Northeastern Weed Science Society.

THE 2002 FARM BILL AND ITS EFFECT ON INVASIVE PLANT MANAGEMENT IN NEW ENGLAND. A. Lipsky, USDA/NRCS, Warwick, RI.

ABSTRACT

The U.S Department of Agriculture Natural Resources Conservation Service (NRCS) works with private landowners and state and local land managers to address invasive plant species problems by providing technical and financial assistance throughout the New England States. NRCS plays a direct role in managing and controlling invasive plant species by working with landowners to restore damaged fish and wildlife habitats as well as implementing invasive plant controls as part of agronomic activities, such as pasture improvement. Many of the Farm Bill programs, such as the Wildlife Habitat Incentive Program and Environmental Quality Incentive Program among others, provide significant resources to private landowners and land managers to control invasive plant outbreaks in the context of stated program and conservation management goals. Case studies of how Farm Bill programs can be used to manage invasive species from individual New England states will be presented. Case studies will highlight the type of conservation practices implemented by landowner, the effectiveness of the treatment if known, and how invasive species control fits into the overall project and Farm Bill program goals.

Andy Lipsky received a BS University of Vermont; and an MS University of Rhode Island-Environmental Science-He has worked in Southwestern U.S in a range of positions—Fisheries biologist and riparian specialist for the Arizona Game & Fish Department. He has also served as a rangeland specialist in AZ, forest technician in Oregon, and conducted EA's and T&E surveys for Navajo and Hopi Nations. In 1996 Andy decided to switch his focus from the dried up estuaries of the arid southwest to the watery bays of the Northeast. He served as restoration ecologist for Save The Bay – Narragansett Bay RI for seven years working to develop state, regional and national estuarine restoration programs. He joined USDA-Natural Resources Conservation Service in 2001. As the state biologist, Andy is responsible for providing technical assistance to USDA clients and field staff engaged in the conservation of freshwater and marine aquatic habitats and terrestrial systems (early successional habitats) in RI and the northeast states. Andy has particular skills and over a decade of experience in the restoration ecology of coastal wetlands-diadromous fish passage- and submerged aquatic vegetation. Andy serves on the USDA National Employment Development Center Teachers cadre of NRCS's *Fish and Wildlife Habitat Conservation* course. Andy is particularly interested in measuring performance of conservation practices on fish and wildlife communities through creative use of farm bill programs and encourages the use of farm bill programs to restore coastal/estuarine habitats.

THE IR-4 PROJECT: NEW OPPORTUNITY FOR AQUATIC HERBICIDE REGISTRATION IN THE U.S.

M. Arsenovic, R.E. Holm, J.J. Baron, D.L. Kunkel, IR-4 Project, Rutgers Univ., Princeton, NJ, K.D. Getsinger, U.S. Army Corps of Engineers Research and Development Center, Vicksburg, MS, W.T. Haller, Univ. of Florida, Center for Aquatic and Invasive Plants, Gainesville, L.W. Anderson, USDA/ARS, Davis, CA, and D.R. Stubbs, US EPA/OPP, Washington, DC.

ABSTRACT

The IR-4 Project is a publicly funded effort to support the registration of pest control products on minor or specialty crops. Its historic mission has been to provide pest management solutions to the growers of vegetables, fruits, ornamentals and herbs.

Concerned about increasing invasive aquatic weeds problems, experts from the USEPA, the US Department of Agriculture, the US Army Corps of Engineers, land grant universities, scientific groups and IR-4 joined together to form the Aquatic Herbicide Working Group. A white paper entitled “New Missions for the IR-4 Project-Weed Control in Aquatic Sites and Irrigation Canals” was completed and approved by the IR-4 Project Management Committee. Stakeholder support for the concept was obtained in February 2005 at IR-4 Strategic Planning Conference. If resources are made available from sources outside current program funding, IR-4 will work with stakeholders to obtain registration of herbicides for use in irrigation canals and water bodies that supply irrigation water for production agriculture. Opportunity for collaborative project will be review and discuss.

Marija Arsenovic is a research scientist at the IR-4 Project/Rutgers University, NJ. Currently, she coordinates herbicide registration studies in specialty crops (fruit & vegetables, and herbs & spices). In addition, Marija was recently appointed to manage new IR-4 Aquatic Herbicide Registration Program. Since late 1970’s her research was focused on aquatic weed management and herbicide evaluation in field and vegetable crops. Marija has B.S. and M. Sc. in Plant Protection from the University of Novi Sad, Serbia & Montenegro, and PhD in Weed Science/Aquatic Weed Management from the University of Osijek, Croatia.

LAND USE PRACTICE IMPACTS ON NORTHEAST AQUATIC PLANT MANAGEMENT. P.H. Lord and R.L. Johnson, Cornell Univ. Research Ponds, Ithaca, NY.

ABSTRACT

Aquatic plant managers need to be able to advise clients on long term corrections for problems fostering noxious aquatic plants. Land use impacts on aquatic plant management extend well beyond the obvious implications of nutrient availability uphill from water bodies. We discuss recent and past published research, our observations, and our research regarding sediments, ice salting, impervious surfaces, lawn care practices, and seawall construction impacts on northeast aquatic plant management particularly Eurasian watermilfoil (*Myriophyllum spicatum*) growth and algae blooms. Additionally, we examine and contrast patterns of Eurasian watermilfoil growth in Europe and in the northeast. Resources for mitigating land use impacts are identified and discussed and a CD with lakeside land use technique publications will be offered.

Paul Lord is a Cornell researcher employed to perform research on the biocontrol of Eurasian watermilfoil. He holds an MS in operations research from the Naval Postgraduate School, Monterey, CA and an MA in biology from SUNY-Oneonta. He is also a retired U.S. Marine lieutenant colonel and a 20-year SCUBA instructor. Lord serves on the board of directors for the Otsego Lake Association, on the board of directors for the Northeast Aquatic Plant Management Association, is the vice-chairman for the Town of Otsego planning board, and is a regular presenter at annual New York State Federation of Lakes conference. He has performed aquatic macrophyte surveys across New York State but the bulk of his research, dealing with interferences in the biocontrol of Eurasian watermilfoil, has taken place in Madison County, NY. He has written many technical reports summarizing his surveys of aquatic plants and their herbivores and other papers of more general interest: “Threats to the biodiversity of northeastern North American lakes: Aquariums and garden ponds”; “A preliminary examination of the contents of commercial aquatic microbial algae suppressing formulations”; and “Physiological mechanisms of selective aquatic herbicides”. Lord cares strongly about mitigating our impacts on the lakes we love.

WATER QUALITY AFFECTS DUE TO A CONTINUOUS LAKE WIDE MILFOIL CANOPY IN A SHALLOW CT LAKE. G.W. Knoecklein, Northeast Aquatic Research, Mansfield, CT.

ABSTRACT

Lake of Isles, an 88 acre lake with maximum depth of 10 feet in North Stonington, CT., has a dense cover of hybrid variable leaved milfoil (*Myriophyllum heterophyllum x pinnatum*). In water shallower than about 5 feet the milfoil reaches the surface and produces aerial inflorescence. In water deeper than 5 feet the milfoil forms a canopy between 1 and 3 feet below the surface. Typically, water above the canopy is clear giving the impression that that the lake is nutrient poor. Water quality monitoring, started in 2001, initially did not include bottom water samples collected below the canopy. However, temperature and oxygen profile measurements showed that water below the canopy became anoxic and that temperature gradients existed in the canopy suggesting that that canopy prevented mixing of waters below the canopy.

Beginning in 2003 samples were collected from above, and below, the canopy with testing including total phosphorus, total dissolved phosphorus, nitrate/nitrite, ammonium, organic N, and total iron. Results revealed that P levels were generally <10 ppb above the canopy and >10 ppb, (maximum 39 ppb) below the canopy, and that total nitrogen was <800 ppb above the canopy but averaged 1,400 ppb (maximum 3,900 ppb) below the canopy. In 2004 two small, (2.2 and 3.8 acres) areas of milfoil were treated with 2, 4-D in order to test its effectiveness against the milfoil and to observe the water quality affects of removing a limited section of the milfoil canopy. Water testing in 2004 and 2005 including stations located within the two treatment beds.

The results of 2004 testing indicated that concentrations of phosphorus and nitrogen in bottom water remained high in both treatment areas even after the removal of the canopy in those areas. Oxygen profiles showed similar anoxic conditions in the treatment areas as observed in the control sites.

Preliminary assessment of the 2005 results indicate that bottom water nutrient levels were again higher than surface water levels at all sites and that similar anoxic conditions existed in the treatment areas despite the lack of a milfoil canopy. The paper will discuss the 5 years of water quality monitoring at Lake of Isles and the milfoil response to the 2, 4-D treatment.

George W. Knoecklein is currently founder and principal of Northeast Aquatic Research a limnological research company located in Mansfield, CT. George obtained his PhD from University of Connecticut in 1997 and his MS Degree from Michigan State University. In 1985, George moved to CT to join Ecosystem Consulting Service, Inc., as a limnologist in its research division. At ECS, Inc. he directed limnological studies at over 50 recreational lakes and ponds and 20 drinking water supply reservoirs, in the CT-NY-NJ-MA area. Studies were initiated to determine the causes of eutrophication, and evaluate the feasibility of restoration methodologies. Specific studies focused on in-lake processes such as oxygen loss, nutrient regeneration, and blue-green algae population dynamics.

A NEW STANDARD FOR DEFINING AQUATIC PLANT COMMUNITY COMPOSITION IN NEW YORK. S.A. Kishbaugh, New York State Dept. of Environmental Conservation Division of Water, Albany, P.H. Lord, and R.L. Johnson, Cornell University Research Ponds, Ithaca, NY.

ABSTRACT

Various traditional and a number of nontraditional survey methods are being used in New York State to define aquatic plant communities. Tradeoffs have been inherent in the choice of method with a general consensus that the better results require a greater investment in time although some methods are used specifically because they "fit" a particular water body better than other methods. The plethora of methods frustrates comparisons between studies and stymies good management. We have expanded upon the USACE rake toss methodology and believe it provides much greater information than other methods requiring similar effort and that it is a reasonable method for all water bodies. We are currently defining a three-tier system of use for this point intercept rake toss relative abundance method (PITRAM) in managing New York State lakes. An overview of the method and results obtained with its use will be depicted and a draft three tiered system for implementation of the method will be described.

Scott Kishbaugh is an Environmental Engineer in the Lake Services Section in the Division of Water in the NYS Department of Environmental Conservation. Since 1985, he has been the Director of the NY Citizens Statewide Lake Assessment Program, the states primary volunteer lake monitoring program. He also directs the Division of Water's lake and aquatic plant monitoring efforts, and provides technical advice for lake residents, lake associations, consultants, and other government agencies in lake and aquatic plant management. He is the senior author of Diet for a Small Lake: A New Yorkers Guide to Lake Management, and will be the senior author for the updated version of this book due for publication in early 2006. Scott serves on advisory panels for the Adirondack Park Invasive Plant Program, the NYS Federation of Lake Associations, and the USEPA Nutrient Criteria Development program, and is a past Board member of this Society. He received his bachelors and masters degrees in environmental engineering from Cornell University.

MUSKRAT HOUSE ABUNDANCE, WATER LEVEL MANAGEMENT, AND CATTAIL CONTROL WITHIN UPPER ST. LAWRENCE RIVER TRIBUTARY WETLANDS. J. Toner, J. Farrell, and J. Mead, SUNY Environmental Science and Forestry, Syracuse.

ABSTRACT

Wetlands containing a diversity of habitat types (submersed aquatic vegetation, floating emergent vegetation, robust emergent vegetation, and sedge meadow habitat) are desirable from both an ecological and economic perspective. Each of these habitats provides necessary resources for a wide array of wetland species and the loss of habitat types along the wetland gradient can have notable effects. Lake Ontario and the St. Lawrence River wetland vegetation communities are currently dominated by *Typha* spp. Water level management, via the series of dams that create the Seaway, annually encourages *Typha* spp. growth and domination by maintaining favorable water depths. Concurrently, fall through winter water levels prohibit significant establishment of an important *Typha* spp. consumer, the muskrat (*Ondatra zibethicus*). Muskrats act as ecosystem engineers and create heterogeneous habitat through the use of *Typha* spp., both for lodge construction and for subsistence. These behaviors often result in open water habitat utilized by a number of wetland species. One species that historically preferred shallow sedge meadow habitats for spawning, *Esox lucius* (northern pike), has declined. This decline is partially attributed to reduced access to preferred habitat and resulting increased deep water spawning (in depths exceeding 3 meters) over submersed aquatic vegetation. Numerous wetland species would benefit from water level management practices, such as water control structures, that reduce *Typha* spp. abundance. We present an assessment of muskrat populations, *Typha* spp. consumption estimates, and water level analyses resulting from current efforts to create and maintain habitat diversity by managing St. Lawrence River tributary water levels.

Jason Toner was born, raised, and educated in New York State. Graduated from Paul Smiths College with an Associate in Applied Science in 1994. Graduated from Cornell University with a Bachelor of Science (with a fisheries and aquatic science concentration) in 1997. Jason is in the process of completing a Master of Science program at SUNY Environmental Science and Forestry with Dr. John Farrell. He is also in a Masters program at LeMoyne College to become certified to teach high school Biology. He currently works part-time for Bob Johnson at the Cornell Research Ponds and does substitute teaching.

PORTRAIT OF THE HEALTH STATUS OF LAKES: C. Rivard-Sirois, RAPPEL, Quebec, Canada.

ABSTRACT

Following the request made by several resident associations, since 2004, RAPPEL, has developed a new protocol for diagnosing the condition of the lakes in the Eastern Townships (Quebec), primarily Lake Memphremagog. The project consists of building a realistic portrait of the lakes' health status and identifying their problem areas. Two of the critical symptoms of accelerated eutrophication; silting up and sea weed invasion (both macrophyte and periphyton), are analyzed in combination with physiochemical analyses reports of the quality of water collected in recent years. Through the introduction of this study, RAPPEL hopes to educate the locals on the importance of keeping Lake Memphremagog healthy, as an important ecological, economic and social interest for the Eastern Townships.

Camille Rivard-Sirois is a Biologist from Sherbrooke University in Quebec, Canada. She is currently the Quality Assurance Coordinator for lakes and waterways with RAPPEL, which is a Collective Association for the Environment, Lakes, and Waterways of Eastern Townships and the Upper St. Francois Basin.

BIOLOGICAL CONTROL OF EURASIAN WATERMILFOIL BY THE MOTH AND WEEVIL: FACT AND FICTION. R.L. Johnson, P.H. Lord, and J.M. Riggs, Cornell University Research Ponds, Ithaca, NY.

ABSTRACT

The control of excessive growth of the submersed aquatic invasive Eurasian watermilfoil (*Myriophyllum spicatum*) by indigenous insect herbivores is well documented in Canadian, North Eastern and North Central US lakes. Two insects, a pyralid moth (*Acentria ephemerella*) and a weevil (*Euhrychiopsis lecontei*) are most often associated with severe herbivore damage to this plant pest. Control studies in Vermont, Minnesota and New York using laboratory containers and field enclosures show significant decreases in the growth of watermilfoil caused by herbivory. Our analysis of long-term field monitoring of Eurasian watermilfoil growth in Sterling Pond, Cayuga, Chautauqua and Dryden Lakes continues to implicate moth and weevil herbivory as the major reason for seasonal and long-term plant damage limiting watermilfoil growth. The importance of a potential robust native plant community able to compete with damaged watermilfoil appears to be a requirement in documented natural declines of Eurasian watermilfoil in Vermont, Minnesota and New York. These findings contributed to attempts to rear and use specific life stages of these two insects to augment and consequently increase their in-lake populations. Populations feeding on watermilfoil need to be enormous, at greater that 0.6 moth life stages and 2.0 weevil life stages on each apical meristem to cause substantial watermilfoil damage. We will present several examples of moth and weevil augmentations and analyze potential for success or failure. A lack of understanding of the biological control agent's biology appears to be a major factor in failed population increases. We will explore these misconceptions and suggest new facts.

Robert L. Johnson is the Manager of the Cornell University Research Ponds that support research, teaching and Cornell Cooperative Extension activities in Aquatic Ecology. Personal research utilizes the Research Ponds and numerous lakes throughout New York State to concentrate on investigating factors that influence aquatic plant growth. Current studies focus on the aquatic plant pest, Eurasian watermilfoil, and assess the effects that insect herbivores have on its growth in New York Lakes. In addition, since 1966, a major task is to provide aquatic plant information through outreach programs in New York State to Cornell Cooperative Extension, New York Department of Environmental Conservation, lake associations, soil and water conservation districts and watershed groups.

TEN YEARS OF VARIABLE WATER MILFOIL CONTROL IN BASHAN LAKE. WHAT HAVE WE LEARNED. G. Bugbee, Connecticut Agricultural Exp. Station, New Haven.

ABSTRACT

Variable water milfoil is an invasive aquatic plant that can restrict the recreational use of lakes and eliminate desirable native aquatic plants. It is found in all northeastern states except Vermont. Since 1994, the CT Agricultural Experiment Station (CAES) has been monitoring the milfoil problem in Bashan Lake, East Haddam, CT, and testing management options. The goal is to rid the lake of variable milfoil and allow native plants to repopulate. The Connecticut Department of Environmental Protection (CTDEP), the U.S. Department of Agriculture, the town of East Haddam and the Bashan Lake Association have supplied CAES with grants to study the use of the herbicide 2,4-D. This herbicide has the advantage of being a granular product suitable for spot treating milfoil while not harming many native plants. In 2000, CAES procured a USEPA experimental use permit (EUP) to test the use of the ester formulation of 2,4-D in Bashan Lake. The EUP required notification of those irrigating with lake water to not use the water until tests showed 2,4-D levels were below 100 ppb. The success of this protocol contributed to the permanent change in the labeling for product containing 2,4-D ester (Navigate and AquaKleen). From 2000-05 areas of Bashan Lake were treated with 2,4-D (2,4-D ester). Late summer application of 2,4-D are likely as effective as the traditional spring treatments and rates can be reduced to 75 – 100 lbs/A. Most treated areas stay nearly milfoil free for at least 2 yr. Certain shallow areas with mucky bottoms can show regrowth within 1 yr. Because these areas are often in coves that collect floating plant fragments from untreated portions of the lake, more permanent control will require eliminating all remaining milfoil. Regrowth is also possible from uncontrolled roots or seeds. New GIS linked underwater video equipment is allowing more accurate assessments of milfoil. In 2004, large areas not known to contain milfoil were discovered with the video equipment in water 3 – 6 meters deep. This milfoil could be the source of plant fragments. In Sept 2004 2,4-D was applied to a large deep-water area of milfoil in the eastern portion of the lake and little regrowth was apparent the following year. In Sept 2005, a similar treatment was performed in the northern portion. Lake water has been tested for 2,4-D following treatments. Typically highest 2,4-D concentrations occur near the bottom in the treatment areas and levels are above the irrigation limit of 100 ppb for less than 3 wk. Yearly tests on nearby groundwater wells have not detected 2,4-D.

Greg Bugbee has been employed since 1979 in the Dept. of Soil and Water at the CAES in New Haven. Currently an assistant scientist researching techniques for managing nuisance aquatic vegetation with emphasis on targeted herbicides applications. Research includes successful control of variable water milfoil with 2,4-D and procurement of EUP to allow 2,4-D use in lakes when irrigation is restricted. PI in CAES Invasive Aquatic Plant Program that is currently surveying aquatic vegetation in CT lakes and ponds, correlating with water quality and making information available to the public via web page (www.caes.state.ct.us/AquaticPlants).

A UNIQUE COMBINATION OF AGENCIES AND COMPANIES WORKING TOWARDS SUCCESSFUL MANAGEMENT OF INVASIVE PLANTS. L. Lyman, Lycott Environmental, Inc., Southbridge, MA.

ABSTRACT

For a number of years the residents and community of Halifax, MA have struggled with the invasive plants fanwort (*Cabomba caroliniana*) and variable milfoil (*Myriphyllum spicatum*) in the eastern basins of Monponsett Ponds. After years of studying and implementing various management techniques, it was decided that the most effective means of solving the problem would be to conduct a treatment with the herbicide Sonar AS.

A number of hurdles had to be overcome, including a denial by the Conservation Commission in the Town for treatment that was overruled by a superceding Order of Conditions from the Department of Environmental Protection in Lakeville.

Additionally, Natural Heritage Endangered Species Program (NHESP) determined there were endangered and threatened species in the water bodies, both dragonfly and fresh water mussels. With a unique cooperation and assistance from a second consultant, Baystate Environmental Consultants, Inc. (BEC), and an expert recognized by NHESP, a program was put together for the two endangered species by the cooperative efforts of these organizations including Lycott Environmental, Inc. Studies were conducted on the fresh water mussels before, during and after the treatment and for the dragonfly nymphs that were collected and exposed to various concentrations of Sonar. This unique combination of private and public entities working together has proven to be very successful in treating and managing milfoil and fanwort in the eastern section of Monponsett Pond without detrimental impacts to the non-target organisms.

Lee Lyman is president and founder of Lycott Environmental Incorporated, which provides lake and pond management services. Lee majored in Biology at American International College in Springfield, Massachusetts and began his career as an aquatic biologist with the Massachusetts Division of Fisheries and Wildlife, subsequently becoming its director of the pesticide research laboratory. Lee has published several articles on pesticides, herbicides and lake management techniques.

Northeastern Weed Science Society
60th Annual Meeting

January 4, 2006
The Westin, Providence, Rhode Island

PRESIDENTIAL ADDRESS

Timothy E. Dutt
Agricultural Consultant
Fogelsville, PA

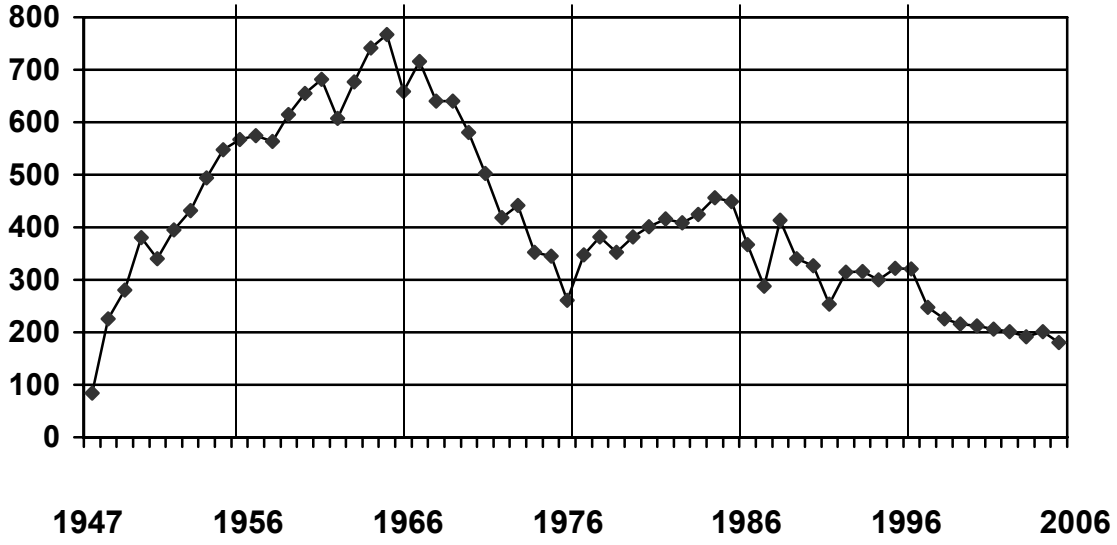
GOING FORWARD

I want to welcome everybody to the 60th annual meeting of our society. Providence is a new meeting location for us, and I want to thank Dr. Michael Sullivan for his remarks welcoming us to the area. We are meeting jointly with the Northeast Aquatic Plant Management Society (NEAPMS). This organization was formed in 1999 and has about 140 members composed of people from industry, applicators, state regulators, and university researchers mostly from the New York and New England area. Our organizations have much in common since we work on weed management issues, have interest in invasive species, and meet during January. Renee Keese, our Vice President and program chair, has worked with the aquatics people to develop a joint symposium this afternoon to be followed by a weed ID workshop and a joint social. You will notice some changes to our traditional meeting format so that we can take advantage of our meeting together and provide for interaction. I also want to congratulate all of our award winners for their contributions and dedication to our society and weed science.

With this being our 60th annual meeting, we have reached another milestone in our history. Figure 1 shows membership numbers over the 60-year history of our society. Although our society is getting smaller, we are still a very active and relevant organization. Today, I want to focus my remarks on our society's initiatives and progress since our 50th anniversary meeting in 1996, and announce a new initiative going forward into the next decade of our history.

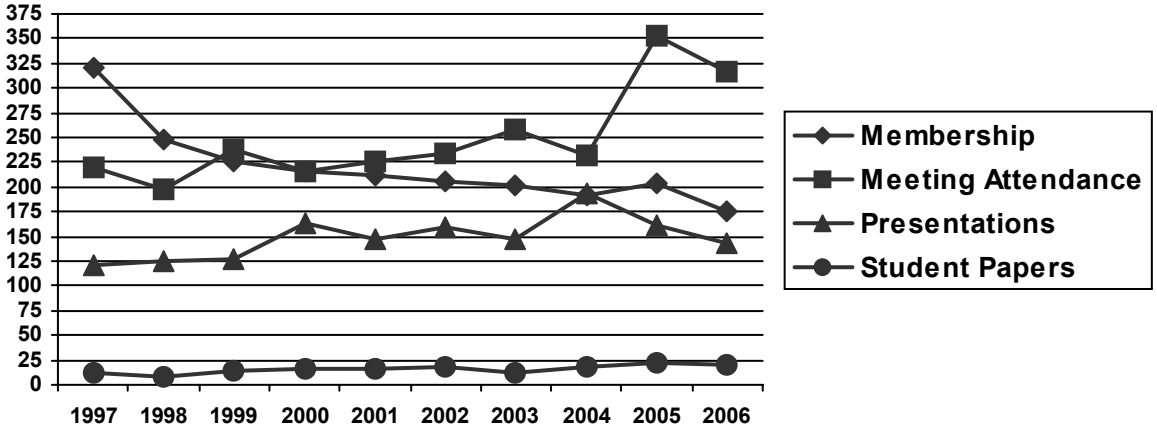
Major initiatives of our society over the past 10 years began with the Education Committee in 1997. The committee was chaired by Nate Hartwig and looked at what our society's mission should be around outreach and education. To a great extent, this initiative set the framework that Executive Committees and our society followed over the last 10 years. It established direction for many of our meeting program activities that we do today, launched increased efforts with invasive species, and initiated the development of our website. The NEWSS website was launched in late 1999 and has gone through many phases of development over the past 5 years. It has provided much efficiency by moving us towards electronic communication with our membership. Our organization has provided leadership among the other regional societies and WSSA on legislative initiatives, with Rich Bonanno as chairman of the WSSA Washington Liaison Committee and Rob Hedberg as Director of Science Policy. We

Figure 1. NEWSS membership numbers.



have been meeting jointly with other regional organizations and various invasive plant groups since 1999. We continue to explore opportunities with other regional societies with who we share common interests and could benefit by meeting together. The Committee on Change, chaired by Joe Neal, was initiated in 2001 to further look at the direction of our organization and what changes may be necessary to best serve our membership and provide value as a society. This resulted in a resolution by the membership to encourage more interaction with other societies having common interests. This initiative led to our joint meeting this year with NEAPMS.

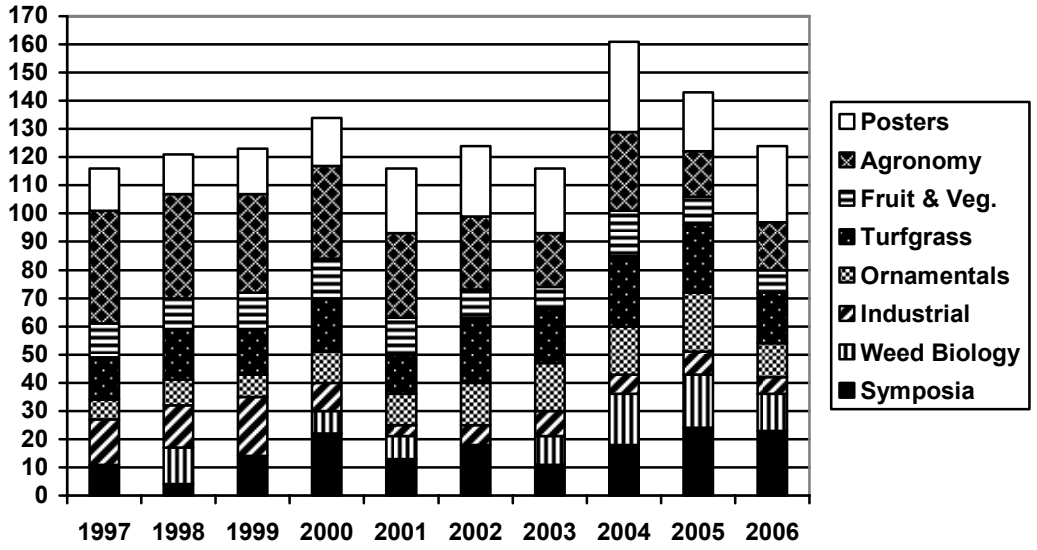
Figure 2. Membership and meeting numbers over the last 10 years.



The initiatives taken over the last 10 years have resulted in much progress as an organization. Although membership numbers have dropped by more than 33% since 1996, our

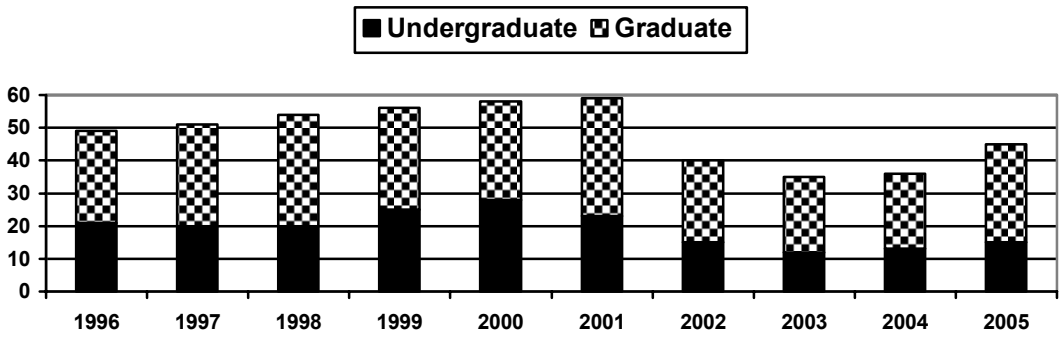
meeting attendance numbers have increased because of outreach initiatives and joint meetings with other organizations (Figure 2). This was particularly evident last year where we had two very successful symposiums that brought in over 100 non-members to our 2005 annual meeting. The total number of presentations at our annual meetings has also increased since 1996 showing that we are still a very active organization. Posters and symposiums have become increasingly important in our program. Papers in turfgrass and ornamental sections have increased, whereas they have decreased in agronomy, fruits and vegetables, and industrial sections. Also, the weed biology and ecology section has become a more important part of our overall program, especially with students participating in the poster and paper contest (Figure 3).

Figure 3. Number of poster and paper presentations broken out by section.



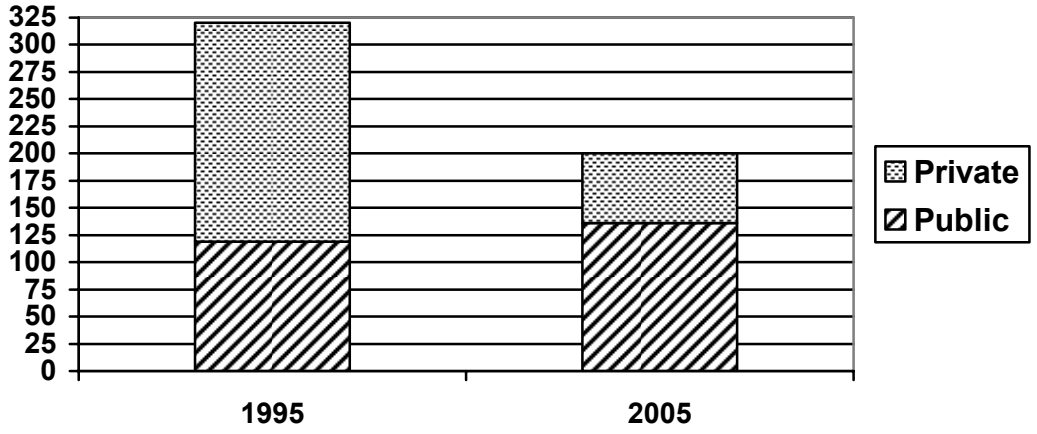
Student activities have been a major thrust of our society's efforts. Student participation in the poster and paper contests has remained relatively constant over the last 10 years (Figure 2). Student participation in Collegiate Weed Contests has dropped somewhat since 1996, mainly because fewer schools are sending teams or individuals to the event (Figure 4). Dave Johnson hosted a very successful event this past summer at the Penn State Research and Education Center in Lancaster County, Pennsylvania. Dave also led efforts by the Weed Contest Committee to make changes in the contest rules to broaden the scope of the event for our more diverse students.

Figure 4. Student participation in Weed Contests.



A major change in the last 10 years has been in the society's sector membership (Figure 5). Ten years ago, 63% of the membership worked in the private sector (mostly industry) and 37% worked in the public sector (universities, federal, and state). Our membership is now about the opposite with 68% working in the public sector and 32% working in the private sector. The reduction in membership numbers over these years has been due almost exclusively to a drop in industry participation because of consolidation or industry representatives no longer attend the meetings. Along with this, our sustaining member companies have decreased by more than a third. With this drop in membership numbers and reduced support, it has become increasingly difficult in recent years for our Executive Committees to operate from a balanced budget while still providing a cost effective meeting in a larger metropolitan area for our members to attend. Joint meetings with other organizations and outreach activities have helped with balancing the budget. Importantly, the face of our society has changed over the last 10 years, and we need to continue to evaluate who our society serves and what things we should do to provide value and remain relevant as an organization.

Figure 5. NEWSS sector membership numbers



Going forward, I am announcing a new initiative with the Executive Committee appointing a committee on the Future of NEWSS. Rich Bonanno has agreed to chair this committee with other members who represent the various interests of the society. The committee will be getting together for the first time at this meeting to begin looking at future direction of our society, who we serve, and what should be our continued mission going forward. Over the next couple of days, please express your views and suggestions with these committee

members or to members of the Executive Committee. Rich will speak more about the activities of the committee at our annual business meeting.

Finally, I want to thank the membership for the opportunity to serve as President. It has been an enjoyable and rewarding experience that I would recommend to anybody in our organization. As we go forward, let us continue to identify those challenges, opportunities, and trends that will affect weed management in the next 5-10 years that are critical for us to be engaged.

Minutes for the 60th Annual Business Meeting of the NORTHEASTERN WEED SCIENCE SOCIETY Westin Providence, Providence, RI January 5, 2006

1) Call to order

President Tim Dutt called the annual business meeting to order at 4:30 pm on January 5, 2006.

2) Approval of Minutes

Scott Glenn moved that we accept the minutes of the 59th annual business meeting. Dave Yarborough seconded the motion, and without further discussion, the motion passed unanimously.

3) Necrology Report

Brian Manley reported that there were no deaths during 2005 of associates reported prior to or during the meeting. Brian asked for names from the floor of any associates that had passed during 2005. No names were mentioned and the necrology report was closed.

4) Executive Committee Reports

All of the executive committee reports were compiled and available to the membership.

a) President's Comments – Tim Dutt

Tim thanked the society for the opportunity to serve as President, and indicated it was an enjoyable experience. Tim covered accomplishments during 2005 by the Executive Committee (EC). Tim mentioned the many changes and fixes that were made to our website, and the difficult challenges in working with our web-hosting company, Host Depot. Tim asked for comments on the website from the floor, but there were none. He mentioned the hard work by Hilary Sandler and Brent Lackey on improving the functionality of the website, and indicated that the board was looking at other hosting options given the difficulty in working with Host Depot. Tim next mentioned the weed contest and thanked Dave Johnson for hosting a very successful contest. Tim commented on the annual meeting indicating there were some difficulties in working with the hotel since it was a new hotel for the NEWSS. The hotel made some late concessions on the drinks for the social mixer, which would significantly help the financial situation for the society. Tim then commented that the meeting had gone very well so far, and thanked the program committee for putting together an excellent program. He also thanked the EC for their hard work during the year. Tim then called Brian Manley to the podium to give the Secretary/Treasurer Report.

b) Secretary / Treasurer Report – Brian Manley

Brian reported that 151 had pre-registered for the meeting, and that meeting attendance was 196 including 171 NEWSS members, 3 invited speakers, 7 attending only the Aquatics workshop, and 14 attending only the ornamentals workshop. Brian reported that the expenses for 2005 were $38,227.24, which was up significantly from 2004. The

primary areas that had increased were hotel expenses for the Capital Hilton, insurance, student room reimbursement and the website. Our income was also up compared to 2004 with increases in meeting registrations individual membership, proceedings, and sustaining membership. The outreach workshops on Invasive Species and Turfgrass in Washington were also quite successful. There was a net loss of $1,333.32 for 2005. Our current net worth is $45,684.98, which is up from $45,684.98 in 2004. Brian then presented a plaque and gift of $100 for Diane Keil, his former administrative assistant in Hudson, NY. Following Brian's relocation to Switzerland, Diane's support of the society's activities was instrumental in allowing Brian to fulfill the Secretary/Treasurer duties during 2005.

c) Audit Committee Report – Brian Manley

Brian reported that members Russell Hahn and David Yarborough audited the books and signed the financial statement. Dave then confirmed that he had conducted the audit, and that the books were accurate and the financial statement was correct.

d) Transfer of Secretary/Treasurer Duties – Tim Dutt

Tim Dutt then called Brian back to the podium. Tim presented a plaque to and thanked Brian Manley for his service to the society as Secretary/Treasurer. Brian then thanked the society for the opportunity to serve. He indicated that he had really enjoyed the interactions with the EC, and thanked the EC for their hard work. Finally, he encouraged the society members to volunteer and support the society. Tim then indicated that because of Brian's inability to complete his term, following his relocation to Switzerland, the EC acted according to the Society Constitution in nominating Chris Becker as the new Secretary/Treasurer to complete Brian's term. Tim then introduced Chris to the society.

e) Archives Committee – Jerry Baron (on behalf of Dan Kunkel)

Jerry reported that the archives of the NEWSS are safely stored in the basement at IR-4 headquarters in New Brunswick. He further indicated that the archives would be moving to a new, state of the art, storage location during 2006.

f) Awards Committee – Scott Glenn (on behalf of Robin Bellinder)

Scott mentioned that the Awards Committee consists of the five most recent Past Presidents. He thanked those that had nominated their colleagues for these awards. Scott reported that the following awards were presented during the General Session.

i) Distinguished members – Scott announced that Drs. Richard Bonanno and Thomas Vrabel were awarded the Distinguished Member Award.
ii) Award of Merit – Scott announced that Mr. Stephan Dennis, with Syngenta Crop Protection, received the Award of Merit.
iii) Outstanding Educator – Scott announced that Dr. Russell Hahn, with Cornell University, received the Outstanding Educator Award.
iv) Outstanding Researcher – Scott announced that Dr. Grant Jordan, with ACDS Research, was awarded the Outstanding Researcher Award.
v) Collegiate Weed Contest Winners – Scott announced the winners of the 2005 Collegiate Weed Contest. Scott thanked all of those involved including participants, organizers and volunteers. The winners are listed below

Graduate Division:

Teams:

First:	North Carolina State University – team A
	Walter Thomas, Whitnee Barker, Wesley Everman
Second:	Clemson University – team A
	Mayak Malik, Prashant Jha, Marcos Oliveria
Third:	Virginia Tech
	David McCall, John Willis

Individuals:

First:	John Willis, Virginia Tech
Second:	Wesley Everman, NCSU
Third:	Prashant Jha, Clemson

Undergraduate Division:

Teams:

First:	University of Guelph – team B
	Andrew Chisholm, Brian Gowan, Chrissie Schill
Second:	University of Guelph – team A
	Phil Aitkin, Gerald Pynenborg, Jim Burns
Third:	Cornell University
	Kristine Averill, Cameron Douglass

Individuals:

First:	Gerald Pynenborg, Univ. of Guelph - A
Second:	Jim Burns, Univ. of Guelph - A
Third:	Brian Gowan, Univ. of Guelph - B

vi) Graduate Student Presentation Awards – Jeffrey Derr

Jeff acknowledged the other judges: David Mayonado, Scott Glenn, Lee Van Wychen, and Bradley Majek. Jeff also commented on the quality of the presentations and thanked the students for their efforts, but indicated that there were some similar areas identified for improvement across the presentations. Jeff offered the following suggestions for students to improve the quality of their presentations:

- ✓ Don't put too much data in the presentation – only use critical data
- ✓ Be sure to preview your slides – know what is on them and fix mistakes
- ✓ Consider a traditional order for the presentation
- ✓ Give a research based presentation – not too much background information
- ✓ Watch the time of the presentation
- ✓ List the recommendations for next steps in the research

Jeff thanked BASF for once again sponsoring the awards, and asked Kathy Kalmowitz to help present the awards. Jeff also recognized Jacob Barney for an excellent presentation, but indicated that he was not eligible for an award. Robert Shortell and Steven Mirsky tied for first place and Bryan Dillehay placed second, all with excellent presentations.

1st place:
Evaluation of Kentucky Bluegrass (Poa pratensis L.) Germplasm for Bispyribac-Sodium Tolerance. Robert Shortell, S. Hart and S. Bonos, Rutgers University, New Brunswick, NJ.

1st place:
Effect of Planting and Termination Date on Mechanical Control of Cereal Rye and Hairy Vetch: First Year's Results. Steven Mirsky, W. Curran, and M. Ryan, Pennsylvania State Univ., University Park.

2nd place:
Glyphosate-resistant alfalfa systems in Pennsylvania: Yield, Quality, and Economics. Bryan Dillehay, W. Curran, M. Hall, D. Mortensen, and J. Hyde, Pennsylvania State Univ., University Park.

vii) Research Poster Contest – Paul Stachowski

There were five student posters in the contest. Paul thanked the rest of the judging committee, which included Thomas Hines, Peter Porpiglia, Dave Johnson, and Barbara Scott. Paul offered two suggestions for improving quality of the posters in future including: 1) don't overcrowd the posters – especially with photos and 2) authors were not always present at their poster, which is a requirement for the contest. The second place winner was John Willis, and the first place winner was Dan Ricker. Paul congratulated the winners.

1st place:
Mesotrione for Preemergence Broadleaf Weed Control in Turfgrass. Dan Ricker, J. Willis, S. Askew, Virginia Tech, Blacksburg, and R. Keese, Syngenta Crop Protection, Inc., Carmel, IN.

2nd place:
Using a Wet Blade Mower for Pest Control, Fertility, and Growth Retardation in Fine Turfgrass. John Willis, and S. Askew, Virginia Tech, Blacksburg.

viii) Photo Contest – Greg Armel

Greg thanked the remainder of the judging committee, which included Ben Coffman and Toni DiTommaso. He mentioned that there 30 photographs submitted by 5 contestants. Greg displayed the electronic photos during the presentation of the winners.

1st place:
Cocklebur seed pod. **Randy Prostak**, University of Massachusetts.

2nd place:
Eastern Tiger Swallowtail on a common milkweed seedhead. **Joanna Hebberger**, Pennsylvania State University.

3rd place:
Timothy seedhead in flower. **Shawn Askew**, Virginia Tech.

Scott Glenn then asked all of the award winners to come forward for photographs after the business meeting.

5) Old Business – Tim Dutt

a) Tim asked Mark Van Gessel to provide a summary of and the results of the vote on the Herbicide Resistance Policy and Resolution. Mark reviewed the lively debate over the resolution at the 2005 business meeting and the decision to send the resolution back to the committee for revision. The policy was originally limited to glyphosate, and following the feedback at the 2005 business meeting the policy was broadened and modified significantly to include recommendations for managing resistance to all herbicides. After revisions based on the feedback at the 2005 business meeting, the committee posted the revised policy on the website for further comment. The policy was further revised based on this feedback, and the final version again posted on the website. Mark thanked the other members of the committee; including Henry Wilson, Russ Hahn, Dave Mayonado, Brian Olsen, Dave Vitolo, and Dan Kunkel; for their hard work on the policy. Additionally, the final versions of the policy and resolution were handed out at the registration desk along with a paper ballot. All members were requested to turn their ballot into the registration desk at the meeting for the official vote. Mark indicated that the resolution (and policy statement) had passed with 47 yeah votes vs. 2 no votes. Steve Hart commented that the low voter response should be a concern. After some discussion on this point, Tim Dutt commented that the proper process had been followed; that everyone had the opportunity to comment on the policy and vote, and that the vote was final.

b) Tim then thanked the EC for all of their hard work and support during the year. He mentioned and gave a special thanks to those members rotating off of the board including Brent Lackey and Jeff Derr.

6) Officer Changeover and Presentation of the Gavel

Tim Dutt then called William Curran up to the podium. Tim handed the gavel over to Bill, and wished him well as President. Bill Curran then called Tim back to the podium, and presented a plaque to Tim in recognition for his service to the society and thanked him for a job well done.

7) New Business – William Curran

a) Resolutions Committee – Russell Hahn: Russ reported that there were no new resolutions submitted prior to the meeting. He also asked if there any resolutions from the floor, and there were none.

b) Nominating Committee – Greg Armel (for Dave Mortensen): Greg presented Jerry Baron as the only candidate for the vice president position. Jeff Derr then moved to close the nominations, and Scott Glenn seconded the motion. After a brief discussion, a vote was called for and Jerry was approved unanimously as the new VP of the NEWSS.

c) Appointment (2) and Election (3) of the 2006 Nominating Committee: Bill Curran appointed Russ Hahn, Stephen Hart, and Ryan Lins as new members of the Nominating Committee; all of whom accepted the appointments. Dave Mortensen (chair) and Greg Armel will continue as members of the committee. Jeff Derr moved to close the nominations and Scott Glenn seconded the motion. The motion passed unanimously.

d) **Resolutions Committee Appointments**: Bill then appointed Paul Stachowski (as chair), Melissa Bravo, and Ryan Lins as members of the resolutions committee. All accepted the appointments.

e) **2006 Weed Contest**: Bill announced that DuPont would host the 2006 weed contest at the Stine-Haskell Research Center in Wilmington, DE. The contest would be held on August 1, 2006 with July 31 as the travel day. Greg Armel will coordinate the efforts for DuPont, but will need some help to pull off a successful contest.

f) **Meeting Site for 2007**: Bill announced that 2007 annual meeting would be held at the Renaissance Haborplace Hotel in Baltimore on January 2-5, 2007. He pointed out that NEASHS would meet on their own, but the Mid-Atlantic Pest Council would join us for our meeting.

g) **Other Business**: Bill introduced Rich Bonanno, who will be chairing a new strategic planning committee to assess the future of the NEWSS. Rich made some comments to the society about the objectives of the committee, which included: what should the make up of the EC look like?, what are the projected income and revenue over the next 5-10 years?, who are our customers?, where should we be meeting?, what should the meeting format be?, and what will or should our membership make up look like?. Rich commented that the membership should expect to hear from the committee during the first half of the year to get their feedback on some of these and other questions as the committee formulates its vision. Bill then introduced Lee Van Wychen, who was hired during 2005 as the new WSSA Director of Science Policy. Bill then asked if there was any additional new business. Joe Neal proposed that the annual meeting be held on Jan 7-10 in 2008 since Jan 1 falls on a Tuesday. This proposal is in line with the NEWSS MOP guidelines.

h) **Presentation of the 2006 Executive Committee**

The 2006 Executive Committee was presented by President Bill Curran.
President Elect, Renee Keese
Vice President, Jerry Baron
Secretary/Treasurer, Chris Becker
Past President, Tim Dutt
CAST representative, Robert Sweet
Editor, Hilary Sandler
Graduate Student representative, Jacob Barney
Legislative representative, Dan Kunkel
Public relations, Dwight Lingenfelter
Research & Education, Kathie Kalmowitz
Sustaining membership, David Spak
WSSA representative, Toni DiTomasso

i) **Adjourn**

Jeff Derr moved to close the meeting and Scott Glenn seconded the motion. The meeting was closed at 6:05 pm.

Executive Committee Report of the NORTHEASTERN WEED SCIENCE SOCIETY

Presented at the 60th Annual Meeting The Westin Providence, Rhode Island January 5, 2006

PRESIDENT
Timothy E. Dutt

The society started 2005 with a very successful annual meeting in Washington DC. Robin Bellinder and Brian Manley did a great job working with the hotel, and Bill Curran put together an excellent program. Total meeting attendance was up significantly from previous years due to successful outreach efforts by member volunteers on invasive species and with the turfgrass industry. These efforts produced two excellent symposiums that brought in over 100 non-members to the meeting. We also met jointly for the seventh consecutive year with the Northeast Branch of the American Society of Horticultural Science.

During the annual business meeting in 2005, a resolution and policy statement on glyphosate stewardship was brought forth by the Herbicide Resistant Plant Committee. After much discussion, a motion was adopted to send the resolution and policy statement back to the committee for revision. Mark VanGessel and the committee worked during the year to revise the policy statement to address concerns and comments by the membership. Members had the opportunity to comment on the policy statement via the society website. This resulted in a dramatically changed herbicide resistance stewardship policy statement and resolution to be voted on at the 2006 annual business meeting.

After the annual business meeting in 2005, the new Executive Committee (EC) began work on major objectives of organizing a successful joint meeting with the Northeast Aquatic Plant Management Society (NEAPMS) in 2006, making necessary changes for a successful summer Weed Contest in 2005, and addressing problems for an improved website for our membership. New members to the EC were Renee Keese, Vice President and Program Chair, and Kathie Kalmowitz, Research and Education Coordinator. Member changes also had to occur during the year due to company transfers. Dave Spak was appointed to Sustaining Membership Chair when Susan Rick was transferred to the Midwest with DuPont early in the year. Also, Brian Manley, Secretary-Treasurer since 2004, was transferred with Syngenta to an international assignment, and as a result would be unable to serve his full elected term of office. Acting according to the articles of the NEWSS constitution, the EC appointed Chris Becker to work with Brian during the year to transition into the Secretary-Treasurer role at the annual meeting in 2006. Chris attended EC meetings during the year as a non-voting member, and Brian continued his dedicated service to the society while working out of Switzerland.

Functional problems with our website needed to be addressed with our new server, Host Depot. The renovated NEWSS website launched in March 2004 was developed by Host Depot. Difficulties working with Host Depot on development of the website rendered it inoperable for title and abstract submissions during 2004. Although difficulties continued with Host Depot in

2005, Hilary Sandler and Brent Lackey finally gained the ability to edit the site and get it up and running by mid year. Abstract and title submissions worked on the website in 2005, but there were still problems largely due to password and access issues. With the Host Depot contract ending in January 2006, the EC is considering options for making server and webmaster changes.

The Collegiate Weed Contest was hosted by Dave Johnson at the Penn State Southeast Research and Extension Center in Lancaster County on July 26, 2005. The Weed Contest Committee, chaired by Bill Curran, made several changes in the rules to broaden the scope of the contest and to enhance the students experience across all contest events. More than 40 volunteers helped to make the contest a rewarding experience for the 45 students who participated. I would like to thank Dave Johnson and all the event coordinators, volunteers, coaches, and students who made this event a great success.

Planning discussions were held with NEAPMS board members throughout the year on the joint meeting in 2006. The NEAPMS organization formed in 1999 and includes about 140 members. The group primarily comes from areas in New York and New England and is composed of industry, applicators, state regulators, and university researchers. Many of their members have attended NEWSS meetings. NEWSS has much in common with NEAPMS in that we both work on weed management issues, invasive species, and meet during January. A joint meeting is a good fit given our common interests. A conference call was held in February, we met at The Westin Providence in June, and again in October to discuss details about the joint meeting. Renee Keese worked with NEAPMS members to organize a joint symposium and a weed ID workshop. A joint social was planned, and changes to our traditional meeting format were made to facilitate a good interactive meeting between both organizations. Working with both NEAPMS members and The Westin Providence meeting coordinators was a pleasant and productive experience.

WSSA requested that all regional weed societies prepare a history poster for the 50th Anniversary Celebration to be held in New York City in February. I worked with Bob Sweet and Jeff Derr to prepare the "*History of the Northeastern Weed Science Society (1947-2006)*" poster which will be presented at both NEWSS and WSSA meetings in 2006.

A last initiative in 2005 was to form an ad hoc committee on "*The Future of NEWSS*." Rich Bonanno agreed to chair the committee which will first meet during the 2006 annual meeting to begin evaluating the future direction and strategic planning initiatives for our society.

Finally, I want to express my thanks to the Executive Committee members who worked hard on society affairs and activities during the year. I also want to thank the society for the opportunity to serve as President. It has been a very enjoyable and rewarding experience.

PRESIDENT-ELECT
William S. Curran

Collegiate Weed Contest: Dave Johnson from Penn State University at the PA SE Research and Extension Center near Landisville hosted the 2005 collegiate contest on July 25 - 26, 2005. Dave and the Weed Contest Committee revised the contest guidelines expanding some activities and reducing others. A major focus was to integrate more weed biology and ecology into the contest. Most participants of the 2005 contest were pleased with the changes. Dupont has agreed to host the Collegiate Weed Contest in 2006. Greg Armel has agreed to coordinate

the contest which will be held at Chesapeake Bay Farms near Chestertown, MD. The Dupont team will undoubtedly require some membership assistance to help them pull off a successful event and I encourage your participation.

2007 Annual Meeting: We have signed a contract with Renaissance Harbor Place Baltimore for our 2007 meeting. Specific highlights include:

- $115 room rate (can charge $120 for $5 rebate if necessary)
- 1 comp room for every 50
- Complimentary Meeting Space
- Complimentary One Bedroom Presidential Suite from 1/1 – 1/5/2007
- Complimentary One Bedroom Suite from 1/1 – 1/5/2007
- Complimentary One & Half Hours Reception wine, beer, soda, cheese & crackers for 40 people.
- Complimentary One & Half Hours Reception wine, beer, soda, cheese & crackers for 250 people.
- Complimentary podiums and lavaliere microphones in all meeting rooms for duration of conference.
- Thirteen (13) Complimentary Parking Passes
- Guaranteed Reduced Parking $13.00 per 24 hours.
- Thirteen (13) upgrades to Club or Harbor View at the group rate
- 25% discount on Audio Visual
- Executive Board Meeting in October 2006 at the Convention room rate.
- Forty Complimentary easels
- Meeting Room for the October 2006 Board Meeting will be Complimentary
- Thirteen (13) discounted Parking Passes for October 2006 at $13.00 per 24 hours
- If guestroom numbers increase above the allocated numbers, the complimentary reception attendee numbers will increase proportionately.
- 70% room night guarantee (315 rooms instead of 360)
- Reservation deadline of Dec. 14, but the hotel will accept reservations after this date at the conference rate based on availability.

I had conversations with the Northeast ASA group (NEBASA), Northeast IPM, Mid-Atlantic EPPC, and the Eastern Entomological Society of America about hosting a joint meeting in 2007. All fell through for 2007 with the exception of MA-EPPC who has verbally committed to join us in 2007. They would like to join our program committee in organizing the 2007 meeting. I'm not sure exactly the extent of their involvement, but it should prove beneficial to both. The 2007 Program Chair and the President should plan to meet with the MA-EPPC group shortly after our 2006 annual meeting.

Executive Committee Members: Some replacement candidates for the Executive Committee have been identified. Dan Kunkel has agreed to serve another term as the Legislative Liaison. Dwight Lingenfelter will replace Brent Lackey as the Public Relations Representative in 2006. Jeff Derr's term as WSSA rep will expire in 2006 and a replacement is currently being sought.

VICE PRESIDENT
Renee J. Keese

The Program Committee for the year comprised of the following section chairs: Hiwot Menbere (Agronomy), Rick Iverson (Conservation, Forestry & Industrial), Robert Richardson

(Ornamentals), Rakesh Chandran (Research Posters), Mike Fidanza (Turfgrass & Plant Growth Regulators), Chris Becker (Vegetables & Fruit), and Eric Gallandt (Weed Biology & Ecology).

Planning began in spring for a joint symposium with NEAPMS. The Aquatic & Terrestrial Weed Control symposium was planned to target both NEWSS and NEAPMS members and golf course superintendents. Kathie Kalmowitz worked on outreach with GCSAA and for providing certification credits. A Weed ID Workshop was to be organized to follow the symposium. After the joint symposium and workshop, a joint NEWSS/NEAPMS social mixer was planned.

A total of six NEWSS symposia topic ideas were received after the January 2005 meeting, and they were pursued with the appropriate section chairs. As of the July EC meeting, the program was gradually coming together. Three symposia were being planned as follows: Ornamental Weed Control for Nurseries (targeting growers); Issues with Irrigation Water for Fruit and Vegetable Crops; and Turfgrass Teaching and Outreach. The joint symposium with NEAPMS was also progressing. Six topics with potential speakers and back-up speakers were identified. Topics included weed control with chemicals, weed control with biological and mechanical methods, golf course issues, salt marsh restoration, and purple loosestrife. The intent was also to conduct outreach and provide for recertification credits to invite golf course superintendents. The Weed ID Workshop following the symposium would include aquatic and terrestrial specimens. The theme for 2006 conference was decided to be water related.

The program draft was prepared for editing at the October EC meeting. Final meeting room locations were assigned with the hotel. The total number of NEWSS member volunteer papers was 99 with section breakdown as follows: Agronomy – 17; Posters – 26; Weed Biology/Ecology – 13; Turfgrass & PGRs- 18; Ornamentals – 12; Vegetables & Fruit – 8; and Conservation, Forestry & Industrial – 5. Several sessions have added roundtable discussion topics to their agenda. The NEAPMS program was included in our program booklet which was a total of 15 papers. The joint symposium on Aquatic & Terrestrial Weed Control had 8 presentations. The Education and Outreach symposium organized by Mike Fidanza and the Ornamental symposium organized by Randy Prostak and Todd Mervosh added another 15 presentations. Outreach activities included mailing brochures to ornamental growers in the area. Including the General Session, the joint NEWSS/NEAPMS meeting had a total of 142 posters, papers and presentations. This included 15 student papers and 4 student posters in the awards contest. Title submissions generally ran late with about half coming in via the website, and the other half were faxed or e-mailed. Website change considerations for next year would to be better able to track and identify the student presentations and speakers.

The theme for the 2006 meeting is “Bridging Technology with Partnerships in Aquatic and Terrestrial Weed Control”. The keynote speaker will be Dr. Ernest Delfosse with ARS, on a topic of ARS weed science programs (update) and ties to aquatic and terrestrial weed control. The welcoming address will be given by Dr. Michael Sullivan, Director of the Rhode Island Department of Environmental Management, located in Providence.

The final program went to the printer on November 15. Minor edits were required for formatting (once the printed program is received the electronic copy will be formatted to match what was printed to avoid these charges for next year). A total of 300 program booklets were ordered for NEWSS and 160 programs were ordered for NEAPMS. Shipments of booklets to members occurred in early December.

Section chairs and co-chairs were contacted in early December informing them on their meeting responsibilities. Since no time in the program was scheduled for uploading presentations, they

were informed that presentations should be forwarded to them prior to the meeting. Some talks will still come in at the conference, but most will be forwarded before January to facilitate loading onto computers. There was also a reminder to make arrangements for LCD projectors to be at the meeting.

SECRETARY-TREASURER
Brian Manley

The 2005 annual meeting was held at the Capital Hilton in Washington DC on January 3-6, 2005. The annual meeting was attended by 326 people including 146 regular members, 13 distinguished members, 2 retired members, 30 students, 59 attending the invasive/endangered species symposium, 53 attending the turfgrass symposium, 17 invited speakers and 6 guests. Additionally, there were 27 NEASHS members that attended the concurrent horticulture meetings. The total NEWSS membership for 2005 is 203.

NEWSS Secretary/Treasurer Annual Report for 2005

2005 Financial Report: November 1, 2004 to October 31, 2005

Category	Amount
Revenue	
Annual Meeting Awards (BASF)	$300.00
Annual Meeting Registration	$12,200.00
Coffee Break Support	$1,200.00
Individual Membership	$6,090.00
Interest Income	$884.14
Invasive Species Symposium	$1,700.00
NEASHS	$799.40
Proceedings	$5,055.00
Sustaining Membership	$2,600.00
Turfgrass Symposium	$1,585.00
Weed Contest	$4,450.00
Weeds of the Northeast	$30.38
Total Revenue	***$36,893.92***
Expenses	
Administration	$1,116.66
Annual Meeting	$13,206.82
Annual Meeting Awards	$1,096.04
CAST	$1,970.32
Insurance	$1,268.79
Newsletter	$403.68
Proceedings	$3,451.68
Programs (Annual Meeting)	$1,788.00
Student Room Reimbursement	$3,453.32
Website	$2,163.05
Weed Contest	$4,308.88
WSSA Director of Science Policy	$4,000.00

Total Expenses	***$38,227.24***
Total Revenue - Expenses (Excess or Deficit)	***-$1,333.32***
October 31, 2004 Savings Certificate Accounts (IDS - American Express)	$22,098.58
October 31, 2004 Bank of America Savings Account	$24,675.64
October 31, 2004 Bank of America Checking Account	$444.08
Total Net Worth October 31, 2004	***$47,218.30***
October 31, 2005 Savings Certificate Accounts (IDS - Ameriprise Financial)	$22,669.10
October 31, 2005 Bank of America Savings Account	$22,839.26
October 31, 2005 Bank of America Checking Account	$176.62
Total Net Worth October 31, 2005	***$45,684.98***

Bonding insurance for the officers and year-round liability insurance coverage were obtained in 2005 for the society.

PAST PRESIDENT
Robin Bellinder

The Awards committee members for the 2006 annual meeting were: Robin Bellinder (Chair), Scott Glenn, David Mayonado, Jeff Derr, and Brian Olson. We reviewed nominations for the Award of Merit, Distinguished Member, Outstanding Educator, and Outstanding Researcher. Recommendations were submitted to the Executive Committee for approval at the October Board meeting. At the recommendation of the Board, we will be presenting a special award to Rob Hedberg, thanking him for his contributions to the Society during his tenure as Director of Science Policy. The student paper contest judges will be Scott Glenn (Chair), David Mayonado, Jeff Derr, and Brian Olson. Paul Stachowski and Grant Jordan will chair the Poster Judging committee and the Photo Judging committee, respectively.

The archives for my year as President have been given to the Archivist, Dan Kunkel. The Archives contained the 2005 Program, Volume 59 Proceedings, the Awards Presentation of the 59th annual meeting, April, August, and November 2004 Newsletters, Minutes of the EC meetings in January, March, August, October, 2004 and January, 2005, Minutes of the January 5, 2005 annual Business Meeting, and the Manual of Operating Procedures (MOP's) that were revised in October, 2005. Added this year to the Archives were the nomination letters for the Society's Awards recipients.

The Awards brochure has been prepared and the MOP's have been revised. Copies of both documents will be available at the annual meeting in January, 2006. The new MOP's include general revisions and clarifications throughout as well as the new rules for the Northeastern Collegiate Weed Science Contest. Plaques for the Award recipients, the special award, the out-going Secretary/Treasurer, and out-going President have been purchased.

EDITOR
Hilary Sandler

Two publications were produced for the 2006 Annual Meeting: the meeting program and the Annual Proceedings. The program was 48 pages long with 99 titles (poster and oral presentations), 23 symposium talks, and 13 presentations from Northeast Aquatic Plant Management Society for a total of 135 titles. These were mailed out in early December by the editor using first-class postage. The proceedings were 210 pages long and 200 copies were printed. One-hundred and fifty books were delivered to the hotel and 50 books were sent to Riverhead, NY for standing orders. Ninety-three abstracts were printed in Volume 60. In addition, the Presidential address from the 2005 meeting and five abstracts from the Washington meeting were published in the supplement to the proceedings. As in 2005, two indices were compiled: an Authors Index and a Main Subject Index (combining the previously stand-alone Herbicides, Weeds, Crops, Non-crops, and Subject indices into one index). In 2006, approximately 87% of the authors who submitted titles also submitted abstracts (excluding symposium presentations). Instructions for Authors were modified slightly from the previous year.

Several cost-saving measures were supported by the EC and were enacted for this meeting: reduction in the total number of programs and proceedings printed and reduction in the number of programs sent out by first class mail. Four-hundred and sixty programs were printed (300 programs for NEWSS and 160 mailed directly to NEAPMS); we had ordered 550 programs in 2005 for NEWSS alone. Approximately 210 programs were mailed only to those currently registered as members and to invited speakers; this was 160 fewer programs mailed than in 2005. Members who received their program in the mail were strongly encouraged to bring the program to the meeting as fewer copies would be available. We printed 50 fewer proceedings in 2006 than in 2005.

Despite many frustrations and miscommunications, we continued to work with the server provider for our web site, Host Depot of South Florida. We gained the ability to independently edit and upload items on the web site by mid-summer. By the September deadline, most members were able to sign in and submit titles and abstracts on the web site. More problems were encountered with the title submission, since this process occurred first, than with the abstract submission. Almost 90% of all abstracts received were sent and received via the web site. Many members sent email versions as a back-up file if something seemed suspect on the web site. Of the problems that were reported, several people had trouble logging on due to password issues, others received a “page not displayed” error or the abstract was not visible in the text box, and some submitters were not members and were not permitted to log onto the web site. We had one report of authors being listed incorrectly. We need to work with Host Depot to more clearly identify who is the presenter of the talk and which presentations are by students. Several outstanding issues with the membership database, with respect to incorporating the flexibility and functionality of member updates, etc. (critical for the secretary-treasurer), remain to be resolved. In addition to researching other server options, we will continue to work with Host Depot in 2006 to improve the site, the database, and the submission process.

PUBLIC RELATIONS
Brent Lackey

Activities during the year included writing NEWSS news articles that were forwarded for publication in the WSSA and SWSS spring newsletters. Coordination was provided with all Executive Committee members and other members for submitting articles and photos for the NEWSS Newsletters. Newsletters were prepared and forwarded electronically for April, August, and November. Working on website and other issues, we continue to progress on efforts to support electronic communication with the membership. Electronic publishing of newsletters and periodic communication with the membership has continued since August 2003. Electronic copies of the annual Proceedings were made available for purchase beginning at the 2004 meeting and were also made available at the 2005 meeting. A newly constructed on-line membership database, integrated within the new web site, will improve both accuracy and functionality of member information. Website development has been slow and at times difficult with the server, Host Depot. By mid-year we were finally able to edit site content which facilitated faster and more efficient communication and website maintenance.

RESEARCH AND EDUCATION COORDINATOR
Kathie Kalmowitz

Certification Credits: The states were contacted for the pesticide recertification points for the specific state pesticide license. I have heard back from most states. I did receive a rejection from New York and I have re-filed with them. At this time I do not know if my exception additional letter and information will be accepted. Most all states now use electronic notification, a few states require their own forms to be used and these I have received. I have also filed for CCA (Certified Crop Advisor) accreditation from the Agronomy Society. I have not heard the response yet but do not anticipate any problems with my application.

Other activities during the year which included education and outreach were as follows:

Aquatics Symposium: Early in the year GCSAA and Education coordinator Diana Kern were contacted to ask if an aquatics symposium would be acceptable to GCSAA as an educational opportunity for golf course superintendents. Following the program details and time segments GCSAA was sent all the appropriate paperwork and the outreach activity received both 0.4 credits for our symposium and the Allied Partner logo from GCSAA. A flier was designed to advertise the event, and GCSAA listed our activity on the education link of their website.

Outreach efforts began following the October Executive Committee meeting. All golf course superintendent associations in New England and New York were contacted via phone calls and emails. The following organizations agreed to place the Aquatic Symposium flier in their hard copy newsletters or electronic newsletters and to place on their websites: Vermont GCSA, Rhode Island GCSA, Northeastern GCSA, GCSA of New England, Maine GCSA, GCSA of Cape Cod, Metropolitan GCSA (NY), and the Connecticut Association of GC Superintendents. All Executive Secretaries for the associations that I spoke with were very supportive of getting this educational opportunity advertised for their members. One association required 500 hard copies of the flier and these were provided at no cost to the society.

General Session: Working with the Program Chair, names were solicited as potential keynote speaker for the General Session. The desired speaker was identified from the leads supplied and the Program Chair made the contacts to get the commitment and theme of the

presentation. A general theme was proposed to bridge the idea of the different society members coming together to address technology and weed control issues that impact aquatic and terrestrial weed management and stewardship.

Additional Symposiums: Mike Fidanza organized and recruited speakers for an Education and Outreach Symposium on Teaching and Scholarship. He submitted his complete program to the Program Chair. No additional help was requested for his symposium. Randy Prostak and Todd Mervosh organized an Ornamental Symposium and recruited the speakers for their session. Randy reported that he and Todd used various recognized organizations throughout New England to advertise their outreach activity. They designed a flier to advertise the symposium and forwarded it to the following organizations along with other activities:

- Massachusetts Nursery and Landscape Association newsletter
- New England Nursery Association mailing and newsletter
- New York State Nursery and Landscape Association newsletter
- Rhode Island Nursery and Landscape Association newsletter and short article
- New Hampshire Plant Growers Association list-serve and newsletter
- New Jersey Nursery and Landscape Association November newsletter
- Pennsylvania Landscape and Nursery Association e-newsletter and web calendar
- Maryland Nursery and Landscape Association newsletter
- Virginia Nursery and Landscape Association (Jeff)
- Connecticut Nursery and Landscape Association (Todd) newsletter and list-serve
- Delaware Nursery and Landscape Association list-serve
- Maine Nursery and Landscape Association list-serve and newsletter
- Ohio Nursery and Landscape Association the Buckeye calendar of event
- Vermont Association of Professional Horticulturalist website and newsletter
- Western Virginia Nursery and Landscape Association(Jeff)
- UMass Extension LNUF program List-serve and web pages
- UMass Extension Floriculture program List-serve and web pages

Graduate Students: Following the summer board meeting a flier was designed along with a cover letter providing encouragement to students to give papers, posters or other means of participating in the annual meeting. These packets of fliers were sent to each of the following state schools and coaches for delivery to students: Canadian schools, Mass., Conn., Rhode Island, New York, Penn State, Maryland, Delaware, Virginia, West Virginia, Ohio State, North Carolina State, Clemson University, and New Jersey.

Summer Weed Contest: This year's contest was held in Lancaster, Pennsylvania and was hosted by Dave Johnson at the Penn State Research and Extension Center. Student winners were as follows:

<u>Graduate Division</u>

- 1st place team: NCSU (Walter Thomas, Whitney Barker, Wesley Everman)
- 2nd place team: Clemson (Mayak Malik, Prashant Jha, Marcos Oliveria)
- 3rd place team: VA Tech (David McCall, John Willis)
- 1st place individual: John Willis (VA Tech)
- 2nd place individual: Wesley Everman (NCSU)
- 3rd place individual: Prashant Jha (Clemson)

<u>Undergraduate Division</u>

- 1st place team: Guelph team B (Andrew Chisholm, Brian Gowan, Chrissie Schill)

- 2nd place team: Guelph team A (Phil Aitkin, Gerald Pynenborg, Jim Burns)
- 3rd place team: Cornell (Kristine Averill, Cameron Douglass)
- 1st place individual: Gerald Pynenborg, Guelph
- 2nd place individual: Jim Burns, Guelph
- 3rd place individual: Brian Gowan, Guelph

I want to thank all the volunteers who assisted with the years activities. These include Dave Johnson for the Weed Contest, Mike, Randy, and Todd for their symposiums, and Renee Keese who put everything together.

SUSTAINING MEMBERSHIP
Dave Spak

Duties of Sustaining Membership Chair were transferred from Susan Rick in early 2005.

Letters requesting support for the NEWSS summer weed contest were sent in early August. A total of six companies (BASF, Bayer, Monsanto, Syngenta, Valent, and Dow) contributed $4,250 for the contest. Many industry members also donated many hours of their time to help Penn State host a successful contest.

Letters requesting sustaining membership dues and support for coffee breaks at the annual meeting for 2006 were sent in late September. At the summer board meeting, the Executive Committee voted to increase the cost of coffee break support from $200 to $300 and this increase was reflected in the letter. To date, we have 16 paid sustaining member companies contributing a total of $2,400. A total of 7 companies contributed $2,100 for coffee breaks at the 2006 meeting. Sustaining members for 2006 and those supporting the coffee breaks will be acknowledged at the 2006 meeting and in the 2007 meeting program.

Additional support has been raised for the Social Mixer following the joint symposium with NEAPMS at the 2006 annual meeting. We have commitments from four companies who will receive acknowledgement at the meeting for providing this support.

The Sustaining Membership contact and address list has been updated as it is an ongoing project. New contacts have been added to the list from various sources to recruit new membership.

The herbicide list was sent to all current Sustaining Member companies for necessary revisions. All comments have been forwarded to Hilary Sandler for editing.

NEWSS job placement service forms have been included in the annual meeting registration form.

Finally, there are plans to discuss restructuring the Sustaining Membership fees into a tiered system that would have various levels of support. Therefore, new fees may be implemented for 2007.

CAST REPRESENTATIVE
Robert D. Sweet

The most important happening at CAST in 2005 was the change in EVP. The performance of the outgoing EVP was unsatisfactory due to serious family problems. A committee screened 22 applicants and invited 3 to the spring board meeting. Each met with small groups of us and each made a 10 minute presentation to the board. We chose Dr. John Bonner from Land O'Lakes. He brings a promotional operating style as well as a good acquaintance with industries associated with the U.S. Livestock business. The paid office staff seems to have accepted him quite well.

An additional type of CAST publication has been initiated. It is called a "Commentary" and has several favorable aspects i.e., it provides a short (2 pages) summary of the science involved in an agriculture or food issue and is completed in 2 months or less. The negatives are that sometimes aspects are not included due to lack of space; all other CAST activities are put aside so the staff can concentrate on the Commentary.

The budget is balanced but very tight. The shrinkage is due to reduced support from agribusiness. All member societies are being asked to talk to businesses about the work of CAST and to learn how CAST can be more helpful to them.

GRADUATE STUDENT REPRESENTATIVE
Jacob N. Barney

My first order of business this year was to update the graduate student resource list. I added all new students to the list and removed all graduated students. I emailed everyone on the list asking for thesis/dissertation subjects, contact info, and approximate graduation dates.

Using the results of a survey I conducted following last year's weed contest, the Weed Contest Committee (newly staffed), decided on some significant changes to the 2005 contest at Penn State. The committee decided to add new weeds to the ID list, pared down the herbicide list, added multiple choice questions to both the weed ID and herbicide ID, and added new areas to the farmer problems, namely invasive and organic-related questions. I also conducted a survey following this contest to assess the student's and coach's sentiments on the changes – which seemed to be an overwhelming success. Dave Johnson and colleagues will have a poster at the 2006 annual meeting detailing the changes, responses, and outcomes of the contest.

Following the weed contest I organized a tour of a local farming operation – Cedar Meadow Farm. Cornell, Nova Scotia, and Virginia Tech attended the tour, and all seemed to enjoy the unique operation run by Steve Groff.

For the annual mixer I have organized for several speakers to address the topic of "Ethics in Weed Science Research." The topic will cover what we as researchers should consider when designing experiments that contain potentially harmful, non-native or aggressive, weeds. Most weeds are not federally, state, or locally regulated, leaving the burden of responsibility on the researcher. Slated to speak are Toni DiTommaso (Cornell) and Mike Burton (NCSU) on invasives, Mark VanGessel (UD) on herbicide resistant/tolerant weeds, and Pat Burch (Dow) on industry protocols.

I will begin looking for my replacement this year as 2006 will be my last year.

WSSA REPRESENTATIVE
Jeffrey Derr

I attended the 2005 WSSA annual meeting in Hawaii, reporting to their board on recent activities of NEWSS. The meeting at the Sheraton Waikiki was a success. There were 767 registered for the meeting, which included approximately 200 spouses and 60 students. There were 433 presentations, including 267 posters and 166 oral presentations. I also represented NEWSS at the 2005 WSSA board meeting in July in New York City

The 2006 WSSA meeting will be held February 13-17, 2006 at the Marriott Marquis on Broadway in New York City. This will be the 50th anniversary of WSSA, with special events being planned, including printing of a history for the society. There will be 5 symposia: Obtaining Grant Funds: Experiences and Advice, Advances and Regulatory Implications of Modeling Approaches to Environmental Fate, Challenge of minor crop weed control & future direction, Natural Products in Weed Management and Biology, and Grass Weed Resistance: Fighting Back. If received by December 5, member pre-registration is $250, student pre-registration is $180, and nonmember pre-registration is $350. If one waits until between December 6 and January 19 to pre-register, these costs rise to $350, $230, and $450, respectively. Registration onsite is $405 for members, $280 for students, and $505 for nonmembers. So there definitely is an incentive to pre-register early. The pre-registration and onsite registration costs for guest/spouse are the same - $75. Hotel costs at the Marriott Marquis in New York are $175 plus tax, single or double.

The 2007 WSSA meeting will be in San Antonio in the Riverwalk district. This is a very attractive location and is near the Alamo. Room night costs will be approximately $159 per night. Several sites are being considered for 2008, including Chicago, with Puerto Rico and Orange County, CA being considered for 2009.

2005 APMS met July 12-14, 2005 in San Antonio
2005 CWSS-SCM met Nov. 26-30, 2005 in Niagara Falls, Ontario
2005 NCWSS met December 12-15, 2005 in Kansas City
2006 SWSS meeting - January 22-26, 2006 at the Omni Hotel in San Antonio
2006 WSWS meeting - March 14-16, 2006, John Ascuaga's Nugget, Reno

The 2008 International Weed Science Society meeting is scheduled for June 2008 in Vancouver. WSSA will be sponsoring this event.

Dr. Lee Van Wychen has accepted the position of WSSA Director of Science Policy. Although Reid Smeda, Treasurer of WSSA, developed a new funding plan for the Director of Science policy position, the additional funds are not currently needed and the NEWSS contribution will remain at $4,000 per year.

I am chairing a committee to look at improving the WSSA website, along with looking into possible cooperation with the regional societies. The committee consists of the regional reps to WSSA, the regional and WSSA webmasters, plus the chair of the computer committee. The WSSA board approved 2 funded positions: Technical Webmaster and Editor. The next step is to develop job announcements specs for the website and develop proposals to go out on bid for redesign/hosting of the website.

WSSA board approved $5,000 to support the development of weed pages for www.gardenmosaics.org . Toni DiTommaso is involved in this project.

WSSA membership dues will increase to $135 regular and $40 student, which includes online access to the journals. There will be an additional charge of $20 for those desiring a printed copy of Weed Science and Weed Technology.

A WSSA Graduate Student Organization has been formed, with a Constitution and Manual of Operating Procedures developed. Their president will serve as a representative to the WSSA board. Each regional will have 2 representatives on the GSO board. The NEWSS graduate students will elect representatives for the WSSA GSO board.

LEGISLATIVE COMMITTEE REPORT
Daniel L. Kunkel, Chair and
Lee Van Wychen, Director of Science Policy, WSSA

WSSA Names New Director Of Science Policy - Based on the consensus of the WSSA Board, Dr. Lee Van Wychen took over the position of Director of Science Policy on July 11, 2005. Lee brings a wealth of Washington experiences to the job. He was selected as a Congressional Science Fellow through the Agronomy, Crop and Soil Science Society's Congressional Science Fellowship program in 2003. During the past two years, Lee has worked in the offices of Rep. Gil Gutknecht (MN) and Nick Smith (MI) where he analyzed, advised, and implemented the offices' legislative strategy on agriculture, environment, science, energy, trade, and budget policies. His experiences on the Hill have helped him to build a solid network of contacts in federal lobbying and stakeholder groups, academic societies, and regulatory and oversight agencies.

Lee Grew up in Wisconsin and completed his Masters degree in Weed Science under the late Dr. Gordon Harvey in Madison. Lee then completed a Ph.D. in Land Resources and Environmental Science under Dr. Bruce Maxwell at Montana State University. Lee can be contacted at: Director of Science Policy, National and Regional Weed Science Societies, 900 Second Street, N.E. Suite 205, Washington, DC 20002, Phone:(202)408-5388, Fax:(202)408-5385, Email: Lee.VanWychen@WeedScienceOrgs.com

Working in conjunction with Rich Bonanno, WSSA Washington Liaison Committee Chairman, Lee listed six goals that he would like to accomplish in his first newsletter report.

The following are a list of those goals followed by updated meeting notes from a conference call with the WSSA Washington Liaison Committee and Regional Weed Science Presidents on October 26, 2005.

1. Expand the awareness of weed science issues and increase participation in the 7th National Invasive Weeds Awareness Week (NIWAW 7).
    a. PTI Grant for 2007- Lee asked for guidance in regards to applying for another National Fish and Wildlife Foundation- Pulling Together Initiative (PTI) grant of $15,000 for NIWAW 8. Rich indicated that WSSA would like to continue to play a major role in future NIWAW's. Since then, Lee completed the Pre-Proposal on Oct. 28, 2005 and final Proposal on Dec. 9, 2005. Formal announcement of award recipients is on May 15, 2006.

b. Legislative Visits training course- Lee explained that the Invasive Species Awareness Coalition that organizes NIWAW and is chaired by Nelroy Jackson has been busy planning NIWAW 7. This year will include a more unified legislative focus with an official NIWAW position on several key issues. Part of this legislative push will include organized Congressional visits by key NIWAW participants that target House and Senate committees which deal with invasive weed policy and funding. In addition Lee said that he has led two on-line training courses titled "Legislative Visits 101: Making your visit count" and will conduct the third and final session on Jan. 23, 2005 at 4 PM (ET). More information can be found at: http://www.nawma.org/niwaw/niwaw_index.htm

2. Work with the USDA-ARS to adopt Weed Science as a Federal job series
   a. Congressional Letter to OPM – Lee said the Office of Personal Management has not responded to past requests from Rob Hedberg and is working with Hilda Diaz-Soltero on this. Lee thought that Congressional action may be needed in the form of a letter to OPM that is signed by key Representatives and Senators. Lee is working on drafting this letter and plans to make visits to "the Hill" to garner support.

3. Expand the WSSA's participation and recognition within the EPA.
   a. Discussion of meeting with Don Stubbs, Associate Administrator with EPA Office of Pesticide Policy. Lee and John Jachetta discussed the results from their recent meeting with Don Stubbs. EPA is looking for info on Rangeland and R-O-W expertise. Lars Anderson said we should invite WSSA members with this type of expertise to DC for periodic seminars on these topics. John Jachetta said we need to make sure to invite EPA employees to NIWAW. John mentioned another topic could be application technology and how to assess spray drift in urban areas. Since then, we have tentatively scheduled a seminar at EPA on March 2, 2006 with one or two weed scientists to talk about rangeland and R-O-W issues.

   b. Conducting EPA field visits, and reciprocal expert visits to DC. Lars Anderson mentioned the success of his 2 week tour in the west with EPA employees. John Jachetta said we could also be effective by organizing a small trip where an EPA employee spends a week at a University or with an Extension Agent. Other suggestions included forming a small discussion group at the WSSA meeting in New York with EPA officials that will be attending and to use commodity groups as a vehicle to get EPA involved. Lee has invited Don Stubbs and Kurt Getsinger to meet with the WSSA Board in New York as well as participate in the WSSA WLC meeting.

   c. John Jachetta said that we need to discuss some of these ideas when Carol Mallory-Smith is in DC at the end of Nov. Lee will organize a meeting with Carol, John, and himself and EPA's Don Stubbs and Lois Rossi. Since then, Carol and John were not able to travel to DC in Nov, but Lee still met with Don Stubbs.

4. Increase Weed Science research funding opportunities.
   Focus of USDA's Biology of Weedy and Invasive Plant NRI Program. Several people were deeply concerned about the direction of this NRI Grant program. This year's grant program now includes all invasive species (e.g., not just plants). Jill said that when she was panel manager several years ago, they had expanded the grant program to Invasive Plants because of the poor submission rate from Weed Biology. She thinks this may be the case again; however Michael Bowers, the new CSREES Program Leader for Ecology, has said that the only way to get more funding dollars is to change what you

are doing. We need to continue to educate Bowers about the significance of applied weed science research. Don Shilling said we should draft a letter to Bowers and get the commodity groups on Board. Carol said that Bowers will attend the WSSA Meeting in New York and that we need to make sure he attends a number of sessions and possibly meets with the Board of Directors. Lee said he will continue to meet with Bowers to discuss weed science research priorities. In terms of the poor submission rate from weed biology, Lars said we need to encourage more NRI applications. Lee will send out a notice of the NRI program via email during the first week of November. The letter of intent for NRI grants is due in early December.

CSREES Workshop on Plant and Pest Biology Priorities- Lee stated that WSSA will have the opportunity to address CSREES about its future research priorities in the area of plant and pest biology on Nov. 16 in Alexandria, VA. Carol has since talked to David Shaw, who agreed to make the presentation at the workshop. Lee will work with the WSSA Research committee over the next 10 days to draft a 1 page written summary of our priorities that is due by Nov. 9. (Please see the Dec. Newsletter story below for more information). The following link will take you to NRI Competitive Grants Program Request for Applications (RFA): http://www.csrees.usda.gov/funding/rfas/nri_rfa.html

5. Find opportunities to advance the awareness and financial support of weed science in the 2007 Farm Bill.
    a. Lee said the National Association of Wheat Growers (NAWG) is initiating a Weed Resistance management project through the NAWG Foundation that will produce a web-based curriculum on the topic. Primary target audiences include wheat growers and educators. NAWG needs to recruit a respected weed scientist in each of several geographic/climatic regions to serve as a reviewer. The reviewers would be provided an honorarium to compensate them for their time. NAWG will also be looking for a weed science graduate student affiliated with on of the universities to serve as a technical coordinator. Lee talked with Darren Coppock, NAWG Executive Director, to get more details and proceeded to work with Nathan Danielson from BioCognito, the company being used by NAWG to organize the work, to request applications from interested weed scientists. On Dec. 7, 2005, Biocognito chose Dr. Lynn Fandrich from Oregon State to head the project. A similar weed resistance project is likely to be conducted for cotton in the near future.

    b. Lee attended a Co-FARM meeting where Rob Hedberg was the guest speaker. Rob said that administration/OMB wants to increase competitive funding across the entire Federal portfolio as that is perceived to result in the highest quality research. Rich said this has been talked about for years and that we need to stress the balance needed between competitive funding that needs to be longer term with formula funding that is perceived to leverage/match significant state dollars.

6. Build a coalition to promote funding for invasive weed management through hunting and fishing groups.
    a. Meetings with Russ Mason- Intn'l Assoc. of Fish and Wildlife Agencies (IAFWA) and Ron Helinski- Wildlife Management Institute- Lee stated that there is a lot of potential to sequester invasive weed research dollars by building a coalition with wildlife groups. The wildlife groups have a lot of resources to help us. It's an easy selling point as ~ 75% of Congress is a member of the sportsmen's caucus. We just need to convince them of the fish and game habitat losses caused by invasive weeds.

b. Selection of a WSSA Member for IAFWA's Invasive Species Committee. Lee said this would be a great opportunity to get one or more weed science members involved and actively promoting the devastation of wildlife habitat loss caused by invasive weeds.

The WSSA Provides Comments for the USDA-CSREES Stakeholder Workshop on Plant and Pest Biology Priorities and Concerns

On November 16, 2005, the USDA Cooperative State Research, Education, and Extension Service (CSREES) hosted a one day workshop on stakeholder priorities in the area of plant and pest biology. Over 20 different stakeholder groups provided comments and concerns during the workshop. Working in conjunction with the WSSA Research and Competitive Grants Committee, written comments were submitted along with an oral presentation by Dr. David Shaw, who did an excellent job in presenting WSSA's concerns.

The WSSA expressed its deep concern with the direction of the NRI Competitive Grants Program 51.9, The Biology of Weedy and Invasive Species in Agroecosystems. This is a significant source of competitively awarded funding for many weed scientists. This grant program now targets not only weedy and invasive plants, but all other invasive species without an increase in funding this year. There are other NRI grant programs that deal with the biology of arthropods, nematodes, and microorganisms which were not opened up to invasion biology for their representative organisms. The WSSA stated that it would like to see invasion biology for different species placed in their respective NRI Programs.

Two other concerns the WSSA expressed for the current request for application (RFA) for the NRI Program on The Biology of Weedy and Invasive Species in Agroecosystems were: 1) its focus on ecological studies on invasive species at the population level and above with no emphasis on weed biology at the suborganismal level; and 2) the fact that this is the only NRI Grant Program that now requires a letter of intent, thus reducing the flexibility of weed scientists to consider other NRI Grant Programs and limiting the grant preparation period to less than 1.5 months.

The WSSA also provided comments to USDA-CSREES about the need for increased funding for weed science research in the following areas:

- Weed Biology and Ecology- Better understanding of weed biology and weed ecology is needed for development of more effective integrated weed management systems which utilize all tools available including cultural, mechanical, biological and chemical control strategies. Weed biology and weed ecology research is also needed to accelerate progress in several areas of weed management such as GPS/GIS based variable rate herbicide applications, herbicide resistant crops (HRC) and knowledge based decision support systems. The value of these management tools depends greatly on better understanding of the mechanisms of weed, crop and cropping system interactions. This includes research in weed genetics and physiology.
- Invasive Weeds- Predictive tools are needed to identify species of concern and potential for invasion into sensitive ecosystems. Systems for early detection and rapid response (EDRR) are also needed to combat potentially serious weed invasions caused by human activity, whether accidental or intentional. Development of tools to assess impacts of weeds on ecosystems, including threatened and endangered species, requires basic research on the mechanisms of plant invasion. Economic assessment tools are also needed to quantify the impacts of the problem and to help set management priorities.

- Knowledge Based and Systems-Approach Based Decision Support Strategies- With the proliferation of computer technology there are good opportunities to build decision aids that integrate biology and control data, expert knowledge and grower wisdom with social, economic and environmental perspectives. To build these systems, more long- term and large-scale studies are necessary with growers and advisors included in their development. The variable response of crops and weeds according to species, growth stage and environmental conditions also needs further research.

EPA Issues Endangered Species Protection Program Guidance
The EPA published its "Endangered Species Protection Program Field Implementation Notice" in the November, 2, 2005 Federal Register. The document can be found at http://www.epa.gov/fedrgstr/EPA-PEST/2005/November/Day-02/p21838.htm. It formalizes a lengthy review process between EPA and other federal agencies on how the EPA addresses concerns about endangered species when it reviews pesticide registrations while not placing undue burden on pesticide users. EPA will implement the Endangered Species Protection Program through pesticide label statements that refer users to Endangered Species Protection Bulletins. These bulletins will only be issued when specific pesticide use limitations are necessary to protect federally listed species or their designated critical habitat and will be available via the EPA's Website or via a toll free number, both of which will be identified on the new pesticide label once it's available.

Other News regarding Endangered Species:
"US House Backs Changes in Endangered Species Act" is the title of a September 30 Reuters report which states in part that " ... In a bid to reshape decades of US environmental policy, the US House of Representatives on Thursday approved legislation to overhaul the Endangered Species Act and make it harder to shield the habitat of plants and animals threatened with extinction. The bill was approved by a 229-193 vote. The White House supports the legislation, although it does want some changes. The Senate has not yet taken up companion legislation and is unlikely to accept such drastic revisions in the law, originally enacted in 1973, so some compromises are likely if the bill is ever to become law. Many Republicans and Democrats alike want to update and streamline the current law, better defining the scientific standards that will apply to protecting endangered species and trying to reduce the number of lawsuits that arise. But they disagree over many of the specifics. The bill authored by House Resources Committee Chairman Richard Pombo, a California Republican, includes more protections and payments for property owners and developers. Critics say it would rely too much on voluntary conservation efforts by the private sector. The Pombo bill would address property owners' and business groups' complaints and set up a system for government payments when land cannot be developed due to an endangered species. It also eases some limitations on certain pesticides ... Most Democrats and some moderate Rep1ublicans backed an alternative bill that they said would do more to ensure that new 'species recovery plans' protect the wildlife. The Natural Resources Defense Council said in a statement that the Pombo bill would lead to more extinctions ... Democratic critics of the Pombo bill said current law has helped protect the Florida manatee, the California condor and the bald eagle, and that the bill would threaten that progress ..." - The complete text of the Reuters story is posted at http://www.planetark.com/dailynewsstory.cfm/newsid/32739/story.htm - The Bill, H.R. 3824, as approved by the full US House of Representatives, would " ... amend and reauthorize the Endangered Species Act of 1973 to provide greater results conserving and recovering listed species, and for other purposes ..." and is posted at http://clerk.house.gov/cgi-bin/lgwww_bill.pl?203824

WSSA Provides Comments to the Canadian Pest Management Regulatory Agency (PMRA) on Herbicide Use in Rangeland

The PMRA (Pest Management Regulatory Agency) of Canada has been working with stakeholders to gain input on the practicality of prescribing no-spray buffer zones for protection of native plants in rangeland and aquatic habitats from the effects of herbicide spray drift. The PMRA is concerned that broadleaf herbicides may negatively impact native vegetation without the observance of spray drift buffer zones. I would like to thank John Jachetta from Dow AgroSciences for bringing this issue to the WSSA's attention and would also like to thank the Canadian PMRA for seeking input from the WSSA on this critical land management question.

The question of the applicability of spray-drift buffers to rangeland is especially important to weed scientists and practitioners, as the unique issues that must be addressed in rangeland are not at all similar to those present in crops. Virtually all weed control applications in a rangeland setting are for invasive weed management. The main objective of rangeland weed management is to prevent conversion of the plant community to an invasive species monoculture and restore the natural balance of the site. If invasive weeds are not controlled in the buffer areas surrounding treatment sites in rangeland, a refugia for the weeds remains enabling them to reestablish in the treated site.

In cropland, the main objective of weed control is to remove plant competition and shift the use of the site's resources into the production of a single species, e.g., the crop. Under this management scheme, the presence of a buffer-zone around the site may be useful in fostering natural diversity and to provide refuge for birds and other species that would not prosper in the adjacent field. However, the application of such buffers to rangeland weed control will likely have the opposite effect. An unsprayed buffer in rangeland is likely to be little more than a refuge for invasive species and a source of seed for re-infestation of the treated area. The WSSA would again like to thank the PMRA for seeking our input on this important rangeland management question.

Pesticide Product Information is now available for 90,000 Products in an On-line Searchable Data Base - The Pesticide Product Database includes the name of the product, the registration number of the product, company number and name, registration date, cancellation date and reason (if canceled) and product manager name and phone number. The Pesticide Product Database is a component of the National Pesticide Information Retrieval System (NPIRS) through the Purdue University Center for Environmental Regulatory Information Services (CERIS) at http://ppis.ceris.purdue.edu/ - Questions may be directed to the NPIRS staff at 765-494-6561; e-mail: staff@npirs.ceris.purdue.edu

USDA Releases $5M to Restore and Protect Wetlands in 20 States - On July 19, 2005, Agriculture Deputy Secretary Chuck Conner announced the availability of $5 million in the Wetlands Reserve Program (WRP) for restoration activities in 20 states. These funds will restore and protect nearly 40,000 acres of wetlands. "This is another step towards meeting the President's wetlands initiative goal set last year to restore, improve and protect at least 3 million acres of wetlands. Through cooperative conservation efforts with federal and state agencies, private landowners and nongovernmental organizations, saving wetlands is resulting in cleaner air and water, healthier soil and improved fish and wildlife habitat," said Conner.

WRP, administered by the Natural Resources Conservation Service, is a voluntary conservation program that offers landowners the opportunity to protect, restore and enhance wetlands on

their property. The goal of the program is to achieve the greatest wetland functions and values and create optimum wildlife habitat on every acre enrolled in the program.

States receiving the WRP funds are: California: $250,000; Delaware: $300,000; Idaho: $56,500; Illinois: $40,000; Iowa: $125,000; Louisiana: $800,000; Maryland: $20,000; Michigan: $250,000; Minnesota: $350,000; Mississippi: $100,000; Missouri: $550,000; Nebraska: $150,000; New York: $300,000; North Carolina: $93,000; Ohio: $100,000; Oklahoma: $50,000; South Carolina: $385,000; Tennessee: $75,000; Texas-:$521,125; and Vermont: $10,000. Additional information on WRP is available at http://www.nrcs.usda.gov/programs/wrp/.

Pesticide Drift: On July 25, 2005, the USDA ARS issued a News Release, titled "Unique Software for Preventing Pesticide Drift," which states in part that "The first user-friendly computer software for estimating the droplet drift distances for pesticide spray applications has been released by ARS and Ohio State University agricultural engineers. Heping Zhu and Robert Fox at ARS' Application Technology Research Unit in Wooster, Ohio, and Erdal Ozkan at OSU-Columbus named the new software "DRIFTSIM," for Drift Simulator ... The OSU Communications and Technology Office is distributing the DRIFTSIM software for a nominal fee. The Windows-based software can help farmers and Extension Service educators minimize pesticide drift by helping them choose equipment, settings and techniques. It also helps manufacturers design pesticide formulations and pesticide spraying equipment to minimize drift potential of their products. To calculate the likelihood of pesticide drift, the program allows pesticide spray operators and manufacturers to specify wind speed, droplet size and speed, nozzle height, operating pressure, air temperature and relative humidity ..." See http://www.ars.usda.gov/is/pr/2005/050725.htm to read the complete text of the ARS News Release.

USDA Forest Service Forest Health Management program received an appropriation of $126 million for FY06. This is the same as in FY05 - which in this budget climate, passes for a triumph. The actual amount available for tackling the introduced insects and diseases will be somewhat less in FY06 than in FY05 because of inflation and larger earmarks for the southern pine beetle.

Congress Passes FY2006 Agriculture Appropriations Bill

The House and Senate approved the conference report on the FY2006 Agriculture appropriations bill and President Bush signed it into law on November 10, 2006. It was only the fourth of eleven FY2006 spending bills to make it through the entire legislative process. The $100.2 billion Agriculture spending bill boosts spending on food stamps and nutrition programs but delays the implementation of country-of-origin labeling laws and maintains the ban on the re-importation of prescription drugs.

The bill funds USDA Research and Development programs at $2.4 billion, a slight cut of $9 million or 0.4 percent that stands in sharp contrast to a requested 15 percent cut because of hundreds of millions of dollars in earmarks. USDA intramural Research and Development funding declined 1.7 percent or $22 millions to $1.3 billion, primarily because of a drop in research and development facilities construction funding.

Congress rejected USDA's proposals to slash formula funds in its extramural research portfolio, and instead preserves a balance between formula funds, competitive funds, and earmarks. The final Agriculture appropriations bill keeps Hatch Act formula funding for land-grant colleges at

$179 million, in contrast to a USDA proposal to eliminate half of this funding and shift the funds to a new $75 million competitive grants program. The National Research Initiative (NRI) of competitively awarded research grants increases slightly to $183 million. Earmarked special research grants, however, grow from $120 million to $128 million. The FY2006 appropriation for Forest Service Research and Development is $329 million, up $15 million from last year.

Farm Bill Forums: The dates, locations and times of the forums will be announced as they are scheduled and be available on the USDA website http://www.usda.gov/farmbill.

Six key topics will frame the forums, which the public is invited to comment on:

1. How should farm policy be designed to maximize US competitiveness and our country's ability to effectively compete in global markets?
2. How should farm policy address any unintended consequences and ensure that such consequences do not discourage new farmers and the next generation of farmers from entering production agriculture?
3. How should farm policy be designed to effectively and fairly distribute assistance to producers?
4. How can farm policy best achieve conservation and environmental goals?
5. How can federal rural and farm programs provide effective assistance in rural areas?
6. How should agricultural product development, marketing, and research-related issues be addressed in the next farm bill?

Respondents can submit their comments electronically on the USDA home page (http://www.usda.gov) by selecting "Farm Bill Forums." Comments can also be emailed to FarmBill@usda.gov, or be sent by mail to: Secretary of Agriculture Mike Johanns, Farm Bill, 1400 Independence Avenue SW, Washington, DC 20250-3355. USDA will review the public comments received by December 30, 2005, including any analyses, reports, studies and other material submitted with the comments that address the six questions.

Other legislative areas important to Weed Scientist in 2004 included WSSA's comments in support of the joint Counterpart Regulations for Consultation under Section 7 of the Endangered Species Act (Counterpart Regulations). Rob Hedberg comment on behalf of WSSA that based on the use of science to improve the management of invasive species and to improve the pesticide regulatory process. Rob noted in his letter to the U.S. Fish and Wildlife Service that the "EPA has the scientific expertise and an established process to adequately evaluate the human health and ecological risks of pesticides. Their process is efficient, productive and thorough. Moreover, the Agency has made substantial progress in the past decade to make the process transparent to all stakeholders so that it is clear how, when and why decisions will be made. We believe that giving the Agency authority to make the initial "Not Likely to Adversely Affect (NLAA)" determination will yield sound decisions in a timely and efficient manner that minimizes duplication, uncertainty and ambiguity." The counter part regulations have been accepted and it is believed that this counter part regulation will resolve some (but not all) of the Double Jeopardy problems for pesticide registrations associated with Endangered Species Act.

The Sixth Annual National Invasive Weeds Awareness Week (NIWAW VI) was held in Washington, DC the week of February 27th to March 4, 2005. Constituents representing more than 50 percent of U.S. states gathered to advance efforts toward protecting native ecosystems through awareness, education and control of invasive plant species. More than 150 participants, including representatives of government agencies, non-profits, private industry and landowners, spent the week lobbying state legislators and attending briefings from federal agencies including

the United States Department of Agriculture, Department of the Interior and Army Corps of Engineers. Through a partnership between the Invasive Species Council and the National Geographic Society, NIWAW participants also enjoyed an early screening of the first in a new TV series titled Strange Days on Planet Earth. The first show appeared on PBS, on April 20 and investigated the ecological and economic damages triggered by invasive species infestations.

The next NIWAW VII will be held February 26 to March 3rd. Individuals and organizations interested in this issue are invited to participate in this event and help build on the success of NIWAW activities in previous years. The Invasive Weeds Awareness Coalition has been working hard to put together a jam-packed week of events designed to focus attention on the Federal government's and Congress's role in dealing invasive weed problems. More info will be posted on the NIWAW website.

BioTech Crops in the EU are still having a tough go.
According to a June 24, 2005 Reuters Report, titled "EU ministers uphold sovereign right to ban GMOs," which states in part that " ... EU environment ministers dealt a blow on Friday to efforts to get more GMO crops grown in Europe as they agreed to uphold eight national bans on genetically modified maize and rapeseed types. The vote was a sharp rebuff for the European Union's executive Commission, which had wanted the ministers to endorse an order to lift the bans within 20 days. EU law provides for national GMO bans if the government can justify the prohibition. It was also the EU's first agreement on GMO policy since 1998, when the bloc began its unofficial moratorium on approving new GMO foods and crops ... 'A very large majority, 22 member states, rejected proposals to lift these national bans ... Between 1997 and 2000, Austria, France, Germany, Greece and Luxembourg banned specific GMOs on their territory, focusing on three maize and two rapeseed types approved shortly before the start of the EU moratorium ... The EU executive now has several options, including returning to the ministers with the same proposals for lifting the bans, though at a later date, or changing them radically ... Green groups were ecstatic that the EU had finally agreed to slap down not just one of the national bans, but all eight.

The re-registration Eligibility Decision was issued in August of this year for 2,4-Dichlorophenoxyacetic acid (2,4-D). As well EPA established Tolerances for Hop, Soybean and Wild Rice - EPA issues a Final Rule establishing tolerances for residues in or on hop, soybean, and wild rice which were requested by the Interregional Research Project Number 4 (IR-4) and the Industry Task Force II on 2,4-D Research Data (Task Force) - Effective July 27, 2005 with objections and hearing requests due to EPA by September 26, 2005 - EPA OPPTS OPP Contact: Joanne Miller, Registration Division at 703 305 6224; e-mail: Miller.Joanne@EPA.gov - EPA July 27 Federal Register: http://a257.g.akamaitech.net/7/257/2422/01jan20051800/edocket.access.gpo.gov/2005/05-14886.htm. Other products due for reregistration eligibility decisions in 2006 include: aAcetochlor, amitraz, ethephon, fomesafen, imazaquin, and propazine.

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NEWSS PAST PRESIDENTS

Gilbert H. Ahlgren	1947-49
Robert D. Sweet	1949-50
Howard L. Yowell	1950-51
Stephen M. Raleigh	1951-52
Charles E. Minarik	1952-53
Robert H. Beatty	1953-54
Albin O. Kuhn	1954-55
John Van Geluwe	1955-56
L. Danielson	1956-57
Charles L. Hovey	1957-58
Stanford N. Fertig	1958-59
Gordon Utter	1959-60
E. M. Rahn	1960-61
Lawrence Southwick	1961-62
Donald A. Shallock	1962-63
Anthony J. Tafuro	1963-64
Robert A. Peters	1964-65
Gideon D. Hill	1965-66
Richard D. Ilnicki	1966-67
John E. Gallagher	1967-68
John A. Meade	1968-69
Homer M. Lebaron	1969-70
John F. Ahrens	1970-71
George H. Bayer	1971-72
Arthur Bing	1972-73
Ralph Hansen	1973-74
Walter A. Gentner	1974-75
Henry P. Wilson	1975-76
Richard J. Marrese	1976-77
C. Edward Beste	1977-78
James D. Riggleman	1978-79
James V. Parochetti	1979-80
M. Garry Schnappinger	1980-81
Raymond B. Taylorson	1981-82
Stephan Dennis	1982-83
Thomas L. Watschke	1983-84
James C. Graham	1984-85
Russell R. Hahn	1985-86
Edward R. Higgins	1986-87
Maxwell L. McCormack	1987-88
Roy R. Johnson	1988-89
Stanley F. Gorski	1989-90
John B. Dobson	1990-91
Prasanta C. Bhowmik	1991-92
Stanley W. Pruss	1992-93
Ronald L. Ritter	1993-94
Wayne G. Wright	1994-95
Bradley A. Majek	1995-96
Thomas E. Vrabel	1996-97
Joseph C. Neal	1997-98
David B. Vitolo	1998-99
A. Richard Bonanno	1999-00
Brian D. Olson	2000-01
Jeffrey F. Derr	2001-02
David J. Mayonado	2002-03
D. Scott Glenn	2003-04
Robin R. Bellinder	2004-05
Timothy E. Dutt	2005-06

AWARD OF MERIT

1971	Gilbert H. Ahlgren	Rutgers University
	Homer Neville	L.I. Ag. & Tech, Farmingdale, NY
	Claude E. Phillips	University of Delaware
	M. S. Pridham	Cornell University
	Stephen A. Raleigh	Penn State University
1972	Robert Bell	University of Rhode Island
	Stuart Dunn	University of New Hampshire
	Alfred Fletcher	NJ State Dept. of Health
	Frank N. Hewetson	Penn Fruit Res. Lab.
	Madelene E. Pierce	Vassar College
	Collins Veatch	West Virginia University
	Howard L. Yowell	Esso Research Lab.
1973	Moody F. Trevett	University of Maine
1974	Robert H. Beatty	Amchem Products, Inc.
	Arthur Hawkins	University of Connecticut
1975	Philip Gorlin	NY City Environ. Cont.
	Herb Pass	CIBA-GEIGY Corp.
	Robert D. Sweet	Cornell University
1976	C. E. Langer	University of New Hampshire
	Charles E. Minarik	US Dept. of Agriculture-ARS
	Herb Pass	CIBA-GEIGY Corp.
1977	L. L. Danielson	US Dept. of Agriculture-ARS
	Madelene E. Pierce	Vassar College
	Lawrence Southwick	Dow Chemical Company
	John Stennis	US Bureau of Fish & Wildlife
1978	None Awarded	
1979	Carl M. Monroe	Shell Chemical Company
	Charles Joseph Noll	Penn State University
	Jonas Vengris	University of Massachusetts
1980	Otis F. Curtis, Jr.	NY Agricultural Experiment Sta.
	Theodore R. Flanagan	University of Vermont
	Oscar E. Shubert	Virginia University
1981	Dayton L. Klingman	US Dept. of Agriculture-ARS
	Hugh J. Murphy	University of Maine
	John Van Geluwe	CIBA-GEIGY Corp.
1982	Robert D. Shipman	Penn State University
1983	Arthur Bing	Cornell University
	William E. Chappel	Virginia Tech
	Barbara H. Emerson	Union Carbide Agricultural Prod.
1984	William H. Mitchell	University of Delaware
	Roger S. Young	West Virginia University
1985	John A. Jagschitz	University of Rhode Island

1986	John R. Havis	University of Massachusetts
1987	None Awarded	
1988	J. Lincoln Pearson	University of Rhode Island
1989	Robert A. Peter	University of Connecticut
1990	Bryant L. Walworth	American Cyanamid Co.
1991	Don Warholic	Cornell University
1992	Robert Duel	Rutgers University
	Richard Ilnicki	Rutgers University
	William V. Welker	USDA/ARS
1993	None Awarded	
1994	John F. Ahrens	CT Agricultural Experiment Sta.
	John B. Dobson	American Cyanamid
	J. Ray Frank	USDA-ARS/IR-4
1995	Francis J. Webb	University of Delaware
1996	Robert M. Devlin	University of Massachusetts
	Wilber F. Evans	Rhone-Poulenc Ag. Co.
	Raymond B. Taylorson	University of Rhode Island
	S. Wayne Bingham	Virginia Tech
1997	Jean P. Cartier	Rhone-Poulenc Ag. Co.
1998	Stan Pruss	Novartis Crop Protection
	Max McCormack, Jr.	University of Maine
1999	None Awarded	
2000	Richard J. Marrese	Hoechst-NorAm
2001	Nathan L. Hartwig	Penn State University
	Edward R. Higgins	Novartis Crop University
2002	Garry Schnappinger	Syngenta Crop Protection
2003	None Awarded	
2004	C. Edward Beste	University of Maryland-Emeritus
	James C. Graham	Monsanto (retired)
2005	Thomas L. Watschke	Penn State University
2006	Steve Dennis	Syngenta Crop Protection

DISTINGUISHED MEMBERS

1979	George H. Bayer	Agway, Inc.
	Robert A. Peters	University of Connecticut
	Robert D. Sweet	Cornell University
1980	John F. Ahrens	CT Agricultural Experiment Sta.
	John E. Gallagher	Union Carbide Agric. Prod.
	Richard Ilnicki	Rutgers University
1981	Robert H. Beatty	Amchem Products, Inc.
	Arthur Bing	Cornell University
	John A. Meade	Rutgers University
1982	Walter A. Gentner	US Dept. of Agriculture-ARS
	Hugh J. Murphy	University of Maine
1983	L. L. Danielson	US Dept. of Agriculture-ARS
1984	Barbara H. Emerson	Union Carbide Agric. Prod.
	Henry P. Wilson	Virginia Tech
1985	None Awarded	
1986	Chiko Haramaki	Penn State University
	Dean L. Linscott	USDA-ARS/Cornell University
1987	Gideon D. Hill	E. I. DuPont DeNemours
	Williams V. Welker	US Dept. of Agric-ARS
1988	Wendell R. Mullison	Dow Chemical
	James V. Parochetti	US Dept. of Agriculture-CSRS
1989	None Awarded	
1990	Robert M. Devlin	University of Massachusetts
1991	John (Jack) B. Dobson	American Cyanamid
	Robert D. Shipman	Penn State University
1992	Gary Schnappinger	Ciba-Geigy Corp.
1993	Steve Dennis	Zeneca Ag. Products
	James Graham	Monsanto Ag. Co.
1994	Russell Hahn	Cornell University
	Maxwell McCormick	University of Maine
1995	Richard Ashly	University of Connecticut
	Richard Marrese	Hoechst-NorAm
1996	Roy R. Johnson	Waldrum Specialist Inc.
	Edward R. Higgins	Ciba Crop Protection
1997	Raymond B. Taylorson	UDSA-ARS
	Wayne G. Wright	DowElanco
	Stanley F. Gorski	Ohio State University
1998	Prasanta Bhowmik	University of Massachusetts
1999	C. Edward Beste	University of Maryland
2000	J. Ray Frank	IR-4 Project
	Stanley W. Pruss	Ciba Crop Protection
2001	Ronald L. Ritter	University of Maryland

DISTINGUISHED MEMBERS

2002	Bradley A. Majek	Rutgers University
	Thomas L. Watschke	Penn State University
2003	Nathan L. Hartwig	Penn State University
2004	C. Benjamin Coffman	USDA
	Joseph C. Neal	North Carolina State University
2005	David Vitolo	Syngenta Crop Protection
2006	A. Richard Bonnano	University of Massachusetts
	Thomas Vrabel	Eco Soil Systems, Central H.S.

OUTSTANDING RESEARCHER AWARD

1999	Garry Schnappinger	Novartis Crop Protection
2000	Prasanta C. Bhowmik	University of Massachusetts
2001	Robin Bellinder	Cornell University
2002	Jerry J. Baron	IR-4 Project, Rutgers University
2003	Arthur E. Gover	Penn State University
2004	Mark J. VanGessel	University of Delaware
2005	Bradley A. Majek	Rutgers University
2006	Grant Jordan	ACDS Research

OUTSTANDING EDUCATOR AWARD

1999	Douglas Goodale	SUNY Cobleskill
2000	Thomas L. Watschke	Penn State University
2001	C. Edward Beste	University of Maryland
2002	E. Scott Hagood	Virginia Tech University
2003	Andrew F. Senesac	Cornell University
2004	William S. Curran	Pennsylvania State University
2005	Antonio DiTomasso	Cornell University
2006	Russell Hahn	Cornell University

OUTSTANDING GRADUATE STUDENT PAPER CONTEST

1979	1	Bradley Majek	Cornell University
	2	Betty J. Hughes	Cornell University
1980	1	John Cardi	Penn State University
	2	Timothy Malefyt	Cornell University
1981	1	A. Douglas Brede	Penn State University
	2	Ann S. McCue	Cornell University
1982	1	Thomas C. Harris	University of Maryland
	2	Barbara J. Hook	University of Maryland
	HM	L. K. Thompson	Virginia Tech
	HM	Timothy Malefyt	Cornell University
1983	1	Anna M. Pennucci	University of Rhode Island
	2	Michael A. Ruizzo	Ohio State University
	HM	I. M. Detlefson	Rutgers University
1984	1	Robert S. Peregoy	University of Maryland
	2	Ralph E. DeGregorio	University of Connecticut
1985	1	Stephan Reiners	Ohio State University
	2	Erin Hynes	Penn State University
1986	1	Elizabeth Hirsh	University of Maryland
	2 (tie)	Ralph E. DeGregorio	University of Connecticut
	2 (tie)	Avraham Y. Teitz	Ohio State University
1987	1	Russell W. Wallace	Cornell University
	2 (tie)	Daniel E. Edwards	Penn State University
	2 (tie)	Frank J. Himmelstein	University of Massachusetts
1988	1	William K. Vencill	Virginia Tech
	2	Lewis K. Walker	Virginia Tech
	HM	Scott Guiser	Penn State University
	HM	Frank J. Himmelstein	University of Massachusetts
1989	1	Frank S. Rossi	Cornell University
	1	Amy E. Stowe	Cornell University
1990	1	William J. Chism	Virginia Tech
	2	Russell W. Wallace	Cornell University

1991	1	Elizabeth Maynard	Cornell University
	2	Daniel L. Kunkel	Cornell University
1992	1	J. DeCastro	Rutgers University
	2	Ted Blomgren	Cornell University
	3	Fred Katz	Rutgers University
1993	1	Eric D. Wilkens	Cornell University
	2	Henry C. Wetzel	University of Maryland
1994	1	Jed B. Colquhoun	Cornell University
	2	Eric D. Wilkins	Cornell University
1995	1	Sydha Salihu	Virginia Tech
	2	John A. Ackley	Virginia Tech
	HM	Jed B. Colquhoun	Cornell University
1996	1	Dwight Lingenfelter	Penn State University
	2	Mark Issacs	University of Delaware
	HM	Jed B. Colquhoun	Cornell University
1997	1	David Messersmith	Penn State University
	2	Sowmya Mitra	University of Massachusetts
	HM	Mark Issacs	University of Delaware
1998	1	Dan Poston	Virginia Tech
	2	Travis Frye	Penn State University
	3	David B. Lowe	Clemson University
1999	1	Hennen Cummings	North Carolina State University
	2	John Isgrigg	North Carolina State University
2000	1	Matthew Fagerness	North Carolina State University
	2	Steven King	Virginia Tech
	3	Gina Penny	North Carolina State University
2001	1	Robert Nurse	University of Guelph
	2 (tie)	W. Andrew Bailey	Virginia Tech
	2 (tie)	Steven King	Virginia Tech
2002	1.	G. Michael Elston	University of Massachusetts
	2.	Caren A. Judge	North Carolina State University
2003	1.	Matt Myers	Penn State University
	2.	J. Scott McElroy	North Carolina State University

	3.	Robert Nurse	Cornell University
2004	1.	Whitnee L. Barker	Virginia Poly Inst. & State Univ.
	2.	Caren A. Judge	North Carolina State University
	3.	Erin R. Haramoto	University of Maine
2005	1.	Jacob Barney	Cornell University
	2.	Steven Mirsky	Penn State University
2006	1.	Steven Mirsky	Penn State University
	1.	Robert Shortell	Rutgers University
	2.	Bryan Dillehay	Penn State University

COLLEGIATE WEED CONTEST WINNERS

1983 - Wye Research Center, Maryland

Graduate Team: University of Guelph
Undergraduate Team: Penn State University
Graduate Individual: Mike Donnelly, University of Guelph
Undergraduate Individual: Bob Annet, University of Guelph

1984 - Rutgers Research and Development Center, Bridgeton, New Jersey

Graduate Team: University of Guelph
Undergraduate Individual: D. Wright, University of Guelph
Graduate Individual: N. Harker, University of Guelph

1985 – Rohm and Haas, Spring House, Pennsylvania

Graduate Team: University of Maryland
Undergraduate Individual: Finlay Buchanan, University of Guelph
Graduate Individual: David Vitolo, Rutgers University

1986 - FMC, Princeton, New Jersey

Graduate Team:
Undergraduate Team: University of Guelph
Graduate Individual: R. Jain, Virginia Tech
Undergraduate Individual: Bill Litwin, University of Guelph

1987 - DuPont, Newark, Delaware

Graduate Team: University of Guelph
Undergraduate Team: University of Guelph
Graduate Individual: Lewis Walker, Virginia Tech
Undergraduate Individual: Allen Eadie, University of Guelph

1988 - Ciba-Geigy Corp., Hudson, New York

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Undergraduate Individual: Del Voight, Penn State University
Graduate Individual: Carol Moseley, Virginia Tech

1989 - American Cyanamid, Princeton, New Jersey

Graduate Team: Cornell University
Undergraduate Team: SUNY Cobleskill

Graduate Individual: Paul Stachowski, Cornell University
Undergraduate Individual: Anita Dielman, University of Guelph

1990 - Agway Farm Research Center, Tully, New York

Graduate Team: Virginia Tech
Undergraduate Team: SUNY Cobleskill
Graduate Individual: Brian Manley, Virginia Tech
Undergraduate Individual: Dwight Lingenfelter, Penn State University

1991 - Rutgers University, New Brunswick, New Jersey

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Graduate Individual: Carol Moseley, Virginia Tech
Undergraduate Individual: Tim Borro, University of Guelph

1992 - Ridgetown College, Ridgetown, Ontario, CANADA

Graduate Team: Michigan State University
Undergraduate Team: Ohio State
Graduate Individual: Troy Bauer, Michigan State University
Undergraduate Individual: Jeff Stackler, Ohio State University

1993 - Virginia Tech, Blacksburg, Virginia

Graduate Team: Virginia Tech
Undergraduate Team: SUNY Cobleskill
Graduate Individual: Brian Manley, Virginia Tech
Undergraduate Individual: Brian Cook, University of Guelph

1994 - Lower Eastern Shore Research and Education Center, Salisbury, Maryland

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Graduate Individual: Brian Manley, Virginia Tech
Undergraduate Individual: Robert Maloney, University of Guelph

1995 - Thompson Vegetable Research Farm, Freeville, New York

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Graduate Individual: Dwight Lingenfelter, Penn State University
Undergraduate Individual: Jimmy Summerlin, North Carolina State University

1996 - Penn State Agronomy Farm, Rock Springs, Pennsylvania

Graduate Team: Michigan State University
Undergraduate Team: SUNY, Cobleskill
Graduate Individual: John Isgrigg, North Carolina State University
Undergraduate Individual: Mark Brock, University of Guelph

1997 - North Carolina State University, Raleigh, North Carolina

Graduate Team: Michigan State University
Undergraduate Team: University of Guelph
Graduate Individual: Brett Thorpe, Michigan State University

1998 - University of Delaware, Georgetown, Delaware

Graduate Team: Virginia Tech
Undergraduate Team: University of Guelph
Graduate Individual: Shawn Askew, North Carolina State University
Undergraduate Individual: Kevin Ego, University of Guelph

1999 - Virginia Tech, Blacksburg, Virginia

Graduate Team: North Carolina State University
Undergraduate Team: Nova Scotia Agricultural College
Graduate Individual: Rob Richardson, Virginia Tech
Undergraduate Individual: Keith Burnell, North Carolina State University

2000 - University of Guelph, Guelph, Ontario, CANADA

Graduate Team: Virginia Tech
Undergraduate Team: Ohio State University
Graduate Individual: Shawn Askew, North Carolina State University
Undergraduate Individual: Luke Case, Ohio State University

2001 - University of Connecticut, Storrs, Connecticut

Graduate Team: North Carolina State University
Undergraduate Team: Penn State University
Graduate Individual: Matt Myers, Penn State University
Undergraduate Individual: Shawn Heinbaugh, Penn State University

2002 - ACDS Research Facility, North Rose, New York

Graduate Team: North Carolina State University
Undergraduate Team: North Carolina State University
Graduate Individual: Scott McElroy, North Carolina State University

Undergraduate Individual: Sarah Hans, North Carolina State University

2003 – Syngenta Crop Protection, Eastern Region Technical Center, Hudson, NY

Graduate Team: North Carolina State University
Undergraduate Team: University of Guelph
Graduate Individual: Andrew MacRae, North Carolina State University
Undergraduate Individual: Jonathan Kapwyk, University of Guelph

2004 – North Carolina University, Raleigh, NC

Graduate Team: North Carolina State University
Undergraduate Team: University of Guelph
Graduate Individual: John Willis, Virginia Tech
Undergraduate Individual: Jenny English, University of Guelph

2005 – Pennsylvania State University, Landisville, PA

Graduate Team: North Carolina State University
Undergraduate Team: University of Guelph
Graduate Individual: John Willis, Virginia Tech
Undergraduate Individual: Gerard Pynenborg, University of Guelph

2006 – DuPont Chemical, Newark, DE

Graduate Team: North Carolina State University
Undergraduate Team: University of Guelph
Graduate Individual: Virender Kumar, Cornell University
Undergraduate Individual: Adam Pfeffer, University of Guelph

RESEARCH POSTER AWARDS

1983 1. Herbicide Impregnated Fertilizer of Weed Control in No-Tillage Corn - R. Uruatowski and W. H. Mitchell, Univ. of Delaware, Newark
2. Effect of Wiper Application of Several Herbicides and Cutting on Black Chokeberry - D. E. Yarborough and A. A. Ismail, Univ. of Maine, Orono
HM. Corn Chamomile Control in Winter Wheat - R. R. Hahn, Cornell Univ., Ithaca, New York and P. W. Kanouse, New York State Cooperative Extension, Mt. Morris

1984 1. Herbicide Programs and Tillage Systems for Cabbage - R. R. Bellinder, Virginia Tech, Blacksburg, and T. E. Hines and H. P. Wilson, Virginia Truck and Ornamental Res. Station, Painter
2. Triazine Resistant Weeds in New York State - R. R. Hahn, Cornell Univ., Ithaca, NY
HM. A Roller for Applying Herbicides at Ground Level - W. V. Welker and D. L. Peterson, USDA-ARS, Kearneysville, WV

1985 1. No-Tillage Cropping Systems in a Crown Vetch Living Mulch - N. L. Hartwig, Penn State Univ., University Park
2. Anesthetic Release of Dormancy in *Amaranthus retroflexus* Seeds - R. B. Taylorson, USDA-ARS, Beltsville, MD and K. Hanyadi, Univ. of Agricultural Science, Keszthely, Hungary
2. Triazine Resistant Weed Survey in Maryland - B. H. Marose, Univ. of Maryland, College Park
HM. Wild Proso Millet in New York State - R. R. Hahn, Cornell Univ., Ithaca, NY

1986 1. Discharge Rate of Metolachlor from Slow Release Tablets - S. F. Gorski, M. K. Wertz and S. Refiners, Ohio State Univ., Columbus
2. Glyphosate and Wildlife Habitat in Maine - D. Santillo, Univ. of Maine, Orono

1987 1. Mycorrhiza and Transfer of Glyphosate Between Plants - M. A. Kaps and L. J. Khuns, Penn State Univ., University Park
2. Redroot Pigweed Competition Study in No-Till Potatoes - R. W. Wallace, R. R. Bellinder, and D. T. Warholic, Cornell Univ., Ithaca, NY

1988 1. Growth Suppression of Peach Trees With Competition - W. V. Welker and D. M. Glenn, USDA-ARS, Kearneysville, WV
2. Smooth Bedstraw Control in Pastures and Hayfields - R. R. Hahn, Cornell Univ., Ithaca, NY

1989 1. Burcucumber Responses to Sulfonylurea Herbicides - H. P. Wilson and T. E. Hines, Virginia Tech, Painter, VA

2. Water Conservation in the Orchard Environment Through Management - W. V. Welker, Jr., USDA-ARS Appalachian Fruit Res. Sta., Kearneysville, WV

1990 1. Reduced Rates of Postemergence Soybean Herbicides - E. Prostko, J. A. Meade, and J. Ingerson-Mahar, Rutgers Coop. Ext. Mt. Holly, NJ
2. The Tolerance of Fraxinus, Juglans, and Quercus Seedings to Imazaquin and Imazethapyr - L. J. Kuhns and J. Loose, Penn State Univ., University Park

1991 1. Johnsongrass Recovery from Sulfonylurea Herbicides - T. E. Hines and H. P. Wilson, Virginia Tech, Painter, VA
2. Growth Response to Young Peach Trees to Competition With Several Grass Species - W. V. Welker and D. M. Glenn, USDA-ARS, Kearneysville, WV

1992 1. Teaching Weed Identification with Videotape - B. Marose, N. Anderson, L. Kauffman-Alfera, and T. Patten, Univ. of Maryland, College Park
2. Biological Control of Annual Bluegrass (*Poa annua* L. *Reptans)* with *Xanthomonas campestris* (MYX-7148) Under Field Conditions - N. D. Webber and J. C. Neal, Cornell Univ., Ithaca, NY

1993 1. Development of an Identification Manual for Weeds of the Northeastern United States - R H. Uva and J. C. Neal, Cornell Univ., Ithaca, NY
2. Optimum Time of Cultivation for Weed Control in Corn - Jane Mt. Pleasant, R. Burt and J. Frisch, Cornell Univ., Ithaca, NY

1994 1. Herbicide Contaminant Injury Symptoms on Greenhouse Grown Poinsettia and Geranium - M. Macksel and A. Senesac, Long Island Horticultural Res. Lab, Riverhead, NY and J. Neal, Cornell Univ., Ithaca, NY
2. Mow-kill Regulation of Winter Cereals Grown for Spring No-till Crop Production - E. D. Wilkins and R. R. Bellinder, Cornell Univ., Ithaca, NY

1995 1. A Comparison of Broadleaf and Blackseed Plantains Identification and Control - J. C. Neal and C. C. Morse, Cornell Univ., Ithaca, NY
2. Using the Economic Threshold Concept as a Determinant for Velvetleaf Control in Field Corn - E. L. Werner and W. S. Curran, Penn State Univ., University Park

1996 1. Preemergence and Postemergence Weed Management in 38 and 76 cm Corn - C. B. Coffman, USDA-ARS, Beltsville, MD
2. Common Cocklebur Response to Chlorimuron and Imazaquin - B. S. Manley, H. P. Wilson and T. E. Hines, Virginia Tech, Blacksburg, VA

1997 None Awarded

1998 1. Weed Control Studies with Rorippa sylvestris - L. J. Kuhns and T. Harpster, Penn State Univ., University Park, PA
2. Postemergence Selectivity and Safety of Isoxaflutole in Cool Season Turfgrass - P. C. Bhowmik and J. A. Drohen, Univ. of Massachusetts, Amherst, MA

1999 1. Winter Squash Cultivars Differ in Response to Weed Competition - E. T. Maynard, Purdue Univ., Hammond, IN
2. Effectiveness of Row Spacing, Herbicide Rate, and Application Method on Harvest Efficiency of Lima Beans - S. Sankula, M. J. VanGessel, W. E. Kee, and J. L. Glancey, Univ. of Delaware, Georgetown, DE

2000 1. Weed Control and Nutrient Release With Composted Poultry Litter Mulch in a Peach Orchard - P. L. Preusch, Hood College, Frederick, MD; and T. J. Tworkoski, USDA-ARS, Hearneysville, WV
2 The Effect of Total Postemergence Herbicide Timings on Corn Yield - D. B. Vitolo, C. Pearson, M. G. Schnappinger, and R. Schmenk, Novartis Crop Protection, Hudson, NY
2 Pollen Transport from Genertically Modified Corn – J. M. Jemison and M. Vayda, Univ. of Maine, Orono, ME

2001 1. Evaluation of methyl bromide alternatives for yellow nutsedge control in plasticulture tomato - W. A. Bailey, H. P. Wilson, and T. E. Hines, Virginia Tech, Painter, VA.
2. Evaluation of alternative control methods for annual ryegrass in typical Virginiacrop rotations - S. R. King and E. S. Hagood, Virginia Tech, Blacksburg, VA.

2002 1. Effectiveness of mesotrione to control weeds in sweet corn. J. M. Jemison, Jr. and A. Nejako, Univ. Maine, Orono.
2. Flufenacet plus metribuzin for italian ryegrass control in Virginia wheat. W. A. Bailey, H. P. Wilson, and T. E. Hines, Virginia Tech, Painter.

2003 1. Comparison of two methods to estimate weed populations in field-scale agricultural research. R. D. Stout, M. G. Burton, and H. M. Linker, North Carolina State Univ.
2. Diquat plus glyphosate for rapid-symptom vegetation control in turf. W. L. Barker, S. D. Askew, J. B. Beam, Virginia Tech, Blacksburg; and D. C. Riego, Monsanto Co., Carmel, IN.

2004 1. Biology of the invasive plant pale swallow-wort. L. Smith, S. Greipsson, and A. DiTommaso. Cornell Univ.
2. Evaluating perennial groundcovers for weed suppression: Roadside trials and demonstrations. A. Senesac, I. Tsontakis-Bradley, J. Allaire, and L. Weston. Cornell Univ.

2005 1. Cover crop management impacts on the weed seed predator, *Harpalus rufipes*. A. Shearin, S.C. Reberg-Horton, E. Gallandt, and F. Drummond, Univ. Maine, Orono.

2. Carfentrazone, quinclorac, and trifloxysulfuron effects on seeded bermudagrass establishment and crabgrass control. J. Willis, D.B. Ricker, and S.D. Askew. Virginia Tech, Blacksburg.

2006 1. Mesotrione for preemergence broadleaf weed control in turf. D. Ricker, J. Willis, S. Askew, Virginia Tech, Blacksburg.

2. Using a wet blade mower for pest control, fertility, and growth retardation in fine turfgrass. J. Willis and S.D. Askew. Virginia Tech, Blacksburg.

INNOVATOR OF THE YEAR

1986	Nathan Hartwig	Penn State University
1987	Thomas Welker	USDA/ARS Appl. Fruit Res. Sta.
1988	None Awarded	
1989	John E. Waldrum	Union Carbide Agric. Prod.
1990	None Awarded	
1991	Thomas L. Watschke	Penn State University
1992	E. Scott Hagood	Virginia Tech
	Ronald L. Ritter	University of Maryland
1993	None Awarded	
1994	George Hamilton	Penn State University
1995	Kent D. Redding	DowElanco
1996	James Orr	Asplundh Tree Expert Co.
1997	George Hamilton	Penn State University
1998	None Awarded	
1999	Award Discontinued	

OUTSTANDING APPLIED RESEARCH IN FOOD AND FEED CROPS

1991	Russell R. Hahn	Cornell University
1992	Henry P. Wilson	Virginia Tech
1993	None Awarded	
1994	Robin Bellinder	Cornell University
1995	None Awarded	
1996	E. Scott Hagood	Virginia Tech
1997	Ronald L. Ritter	University of Maryland
1998	None Awarded	
1999	Award Discontinued	

OUTSTANDING APPLIED RESEARCH IN TURF, ORNAMENTALS, AND VEGETATION MANAGEMENT

1991	Wayne Bingham	Virginia Tech
1992	John F. Ahrens	CT Agricultural Experiment Sta.
1993	Joseph C. Neal	Cornell University
1994	Prasanta C. Bhowmik	University of Massachusetts
1995	Andrew F. Senesac	Long Island Hort. Research Lab
1996	Larry J. Kuhns	Penn State University
1997	Jeffrey F. Derr	Virginia Tech
1998	None Awarded	
1999	Award Discontinued	

OUTSTANDING PAPER AWARDS

1954 Studies on Entry of 2,4-D into Leaves - J. N. Yeatman, J. W. Brown, J. A. Thorne and J. R. Conover, Camp Detrick, Frederick, MD

The Effect of Soil Organic Matter Levels on Several Herbicides - S. L. Dallyn, Long Island Vegetable Research Farm, Riverhead, NY

Experimental Use of Herbicides Impregnated on Clay Granules for Control of Weeds in Certain Vegetable Crops - L. L. Danielson, Virginia Truck Expt. Station, Norfolk, VA

Cultural vs. Chemical Weed Control in Soybeans - W. E. Chappell, Virginia Polytechnical Institute, Blacksburg, VA

Public Health Significance of Ragweed Control Demonstrated in Detroit - J. H. Ruskin, Department of Health, Detroit, MI

1955 A Comparison of MCP and 2,4-D for Weed Control in Forage Legumes - M. M. Schreiber, Cornell Univ., Ithaca, NY

1956 None Awarded

1957 Herbicidal Effectiveness of 2,4-D, MCPB, Neburon and Others as Measured by Weed Control and Yields of Seedling Alfalfa and Birdsfoot Trefoil - A. J. Kerkin and R. A. Peters, Univ. of Connecticut, Storrs

Progress Report #4 - Effects of Certain Common Brush Control Techniques and Material on Game Food and Cover on a Power Line Right-of-Way - W. C. Bramble, W. R. Byrnes, and D. P. Worley, Penn State Univ., University Park

1958 Effects of 2,4-D on Turnips - C. M. Switzer, Ontario Agricultural College, Guelph, Canada

Ragweed Free Areas in Quebec and the Maritimes - E. E. Compagna, Universite Laval at Ste-Anne-de-la-Pocatiere, Quebec, Canada

1959 Yields of Legume-Forage Grass Mixtures as Affected by Several Herbicides Applied Alone or in a Combination During Establishment - W. G. Wells and R. A. Peters, Univ. of Connecticut, Storrs

Influence of Soil Moisture on Activity of EPTC, CDEC and CIPC - J. R. Havis, R. L. Ticknor and P. F. Boblua, Univ. of Massachusetts, Amherst

1960 The Influence of Cultivation on Corn Yields When Weeds are Controlled by Herbicides - W. F. Meggitt, Rutgers Univ., New Brunswick, NJ

1961 Preliminary Investigation of a Growth Inhibitor Found in Yellow Foxtail *(Setaria glauca* L.) - H. C. Yokum, M. J. Jutras, and R. A. Peters, Univ. of Connecticut, Storrs

1962 The Effects of Chemical and Cultural Treatment on the Survival of Rhizomes and on the Yield of Underground Food Reserves of Quackgrass - H. M. LeBaron and S. N. Gertig, Cornell Univ., Ithaca, NY

Observations on Distribution and Control of Eurasian Watermilfoil in Chesapeake Bay, 1961 - V. D. Stotts and C. R. Gillette, Annapolis, MD

1963 The Relation of Certain Environmental Conditions to the Effectiveness of DNBP of Post-Emergence Weed Control in Peas - G. R. Hamilton and E. M. Rahn, Univ. of Delaware, Newark

The Influence of Soil Surface and Granular Carrier Moisture on the Activity of EPTC - J. C. Cialone and R. D. Sweet, Cornell Univ., Ithaca, NY

The Determination of Residues of Kuron in Birdsfoot Trefoil and Grasses - M. G. Merkle and S. N. Fertig, Cornell Univ., Ithaca, NY

1964 Control of Riparian Vegetation with Phenoxy Herbicides and the Effect on Streamflow Quality - I. C. Reigner, USDA-Forest Service, New Lisbon, NJ; W. E. Sopper, Penn State Univ., University Park; and R. R. Johnson, Amchem Products, Inc., Ambler, PA

EPTC Incorporation by Band Placement and Standard Methods in Establishment of Birdsfoot Trefoil - D. L. Linscott and R. D. Hagin, Cornell Univ., Ithaca, NY

1965 1. Corn Chamomile *(Anthemis arvensis* L.) Responses to Some Benzoic Acid Derivatives - Barbara M. Metzger, Judy K. Baldwin and R. D. Ilnicki, Rutgers Univ., New Brunswick, NJ

2. The Physical Properties of Viscous Sprays for Reduction of Herbicide Drift - J. W. Suggitt, The Hydro-Electric Power Commission of Ontario, Canada

1966 1. Weed Control Under Clear Plastic Mulch - Carl Bucholz, Cornell Univ., Ithaca, NY

2. A Chemical Team For Aerial Brush Control on Right-of-Way - B. C. Byrd and C. A. Reimer, Dow Chemical Co

1967 1. Influence of Time of Seeding on the Effectiveness of Several Herbicides Used for Establishing an Alfalfa-Bromegrass Mixture - R. T. Leanard and R. C. Wakefield, Univ. of New Hampshire, Durham

2. Weed Competition in Soybeans - L. E. Wheetley and R. H. Cole, Univ. of Delaware, Newark

1968 None Awarded

1969 1. Weed and Crop Responses in Cucumbers and Watermelons - H. P. Wilson and R. L. Waterfield, Virginia Truck and Orn. Res. Sta., Painter

2. Effect of Several Combinations of Herbicides on the Weight and Development of Midway Strawberry Plants in the Greenhouse - O. E. Schubert, West Virginia Univ., Morgantown

1970 1. Effects of RH-315 on Quackgrass and Established Alfalfa - W. B. Duke, Cornell Univ., Ithaca, NY

1971 1. Activity of Nitralin, Trifluralin and ER-5461 on Transplant Tomato and Eggplant - D. E. Broaden and J. C. Cialone, Rutgers Univ., New Brunswick, NJ

2. Field Investigations of the Activities of Several Herbicides for the Control of Yellow Nutsedge - H. P. Wilson, R. L. Waterfield, Jr., and C. P. Savage, Jr., Virginia Truck and Orn. Res. Sta., Painter

1972 1. Study of Organisms Living in the Heated Effluent of a Power Plant - M. E. Pierce, Vassar College and D. Allessandrello, Marist College

2. Effect of Pre-treatment Environment on Herbicide Response and Morphological Variation of Three Species - A. R. Templeton and W. Hurtt, USDA-ARS, Fort Detrick, MD

1973 1. A Simple Method of Expressing the Relative Efficacy of Plant Growth Regulators - A. R. Templeton and W. Hurtt, USDA-ARS, Fort Detrick, MD

2. Agronomic Factors Influencing the Effectiveness of Glyphosate for Quackgrass Control –F. E. Brockman, W. B. Duke, and J. F. Hunt, Cornell Univ., Ithaca, NY

1974 1. Weed Control in Peach Nurseries - O. F. Curtis, Cornell Univ., Ithaca, NY

2. Persistence of Napropamide and U-267 in a Sandy Loam Soil - R. C. Henne, Campbell Institute for Agr. Res., Napoleon, OH

1975 1. Control of Jimsonweed and Three Broadleaf Weeds in Soybeans - J. V. Parochetti, Univ. of Maryland, College Park

HM. The Influence of Norflurazon on Chlorophyll Content and Growth of *Potomogeton pectinatus* - R. M. Devlin and S. J. Karcyzk, Univ. of Massachusetts, East Wareham

HM. Germination, Growth, and Flowering of Shepherdspurse - E. K. Stillwell and R. D. Sweet, Cornell Univ., Ithaca, NY

1976 1. Top Growth and Root Response of Red Fescue to Growth Retardants - S. L. Fales, A. P. Nielson and R. C. Wakefield, Univ. of Rhode Island, Kingston

HM. Selective Control of *Poa annua* in Kentucky Bluegrass - P. J. Jacquemin, O. M. Scott and Sons, and P. R. Henderlong, Ohio State Univ., Columbus

HM. Effects of DCPA on Growth of Dodder - L. L. Danielson, USDA ARS, Beltsville, MD

1977 1. The Effects of Stress on Stand and Yield of Metribuzin Treated Tomato Plants - E. H. Nelson and R. A. Ashley, Univ. of Connecticut, Storrs

HM. The Influence of Growth Regulators on the Absorption of Mineral Elements - R. M. Devlin and S. J. Karcyzk, Univ. of Massachusetts, East Wareham.

HM. Quantification of S-triazine Losses in Surface Runoff: A Summary - J. K. Hall, Penn State Univ., University Park

1978 1. Annual Weedy Grass Competition in Field Corn - Jonas Vengris, Univ. of Massachusetts, Amherst

HM. Metribuzin Utilization with Transplanted Tomatoes - R. C. Henne, Campbell Institute of Agr. Res., Napoleon, OH

1979 1. Herbicides for Ground Cover Plantings - J. F. Ahrens, Connecticut Agric. Expt. Station, Windsor

2. Weed Control Systems in Transplanted Tomatoes - R. C. Henne, Campbell Institute of Agr. Res. Napoleon, OH

1980 1. Integrated Weed Control Programs for Carrots and Tomatoes - R. C. Henne and T. L. Poulson, Campbell Institute of Agr. Res. Napoleon, OH

2. Suppression of Crownvetch for No-Tillage Corn - J. Carina and N. L. Hartwig, Penn State Univ., University Park

HM. Effect of Planting Equipment and Time of Application on Injury to No-tillage Corn from Pendimethalin-Triazine Mixtures - N. L. Hartwig, Penn State Univ., University Park

1981 1. Weed Control in Cucumbers in Northwest Ohio - R. C. Henne and T. L. Poulson, Campbell Institute of Agr. Res. Napoleon, OH

2. Prostrate Spurge Control in Turfgrass Using Herbicides - J. A. Jagschitz, Univ. of Rhode Island, Kingston

HM. Some Ecological Observations of Hempstead Plains, Long Island - R. Stalter, St. John's Univ., Jamaica, NY

1982 1. Differential Growth Responses to Temperature Between Two Biotypes of *Chenopodium album* - P. C. Bhowmik, Univ. of Massachusetts, Amherst

2. Chemical Control of Spurge and Other Broadleaf Weeds in Turfgrass - J. S. Ebdon and J. A. Jagschitz, Univ. of Rhode Island, Kingston

HM. Influence of Norflurazon on the Light Activation of Oxyfluorfen - R. M. Devlin, S. J. Karczmarczyk, I. I. Zbiec and C. N. Saras, Univ. of Massachusetts, East Wareham

HM. Analysis of Weed Control Components for Conventional, Wide-row Soybeans in Delaware - D. K. Regehr, Univ. of Delaware, Newark

1983 1. Comparisons of Non-Selective Herbicides for Reduced Tillage Systems - R. R. Bellinder, Virginia Tech, Blacksburg and H. P. Wilson, Virginia Truck and Orn. Res. Station, Painter

2. The Plant Communities Along the Long Island Expressway, Long Island, New York - R. Stalter, St. John's Univ., Jamaica, NY

HM. Effect of Morning, Midday and Evening Applications on Control of Large Crabgrass by Several Postemergence Herbicides - B. G. Ennis and R. A. Ashley, Univ. of Connecticut, Storrs

1984 1. Pre-transplant Oxyfluorfen for Cabbage - J. R. Teasdale, USDA-ARS, Beltsville, MD

2. Herbicide Programs and Tillage Systems for Cabbage - R. R. Bellinder, Virginia Tech, Blacksburg and T. E. Hines and H. P. Wilson, Virginia Truck and Orn. Res. Station, Painter

1985 1. Peach Response to Several Postemergence Translocated Herbicides - B. A. Majek, Rutgers Univ., Bridgeton, NJ

1986 1. Influence of Mefluidide Timing and Rate on *Poa annua* Quality Under Golf Course Conditions - R. J. Cooper, Univ. of Massachusetts, Amherst; K. J. Karriok, Univ. of Georgia, Athens, and P. R. Henderlong and J. R. Street, Ohio State Univ., Columbus

2. The Small Mammal Community in a Glyphosate Conifer Release Treatment in Maine - P. D'Anieri, Virginia Tech, Blacksburg; M. L. McCormack, Jr., Univ. of Maine, Orono; and D. M. Leslie, Oklahoma State Univ., Stillwater

HM. Field Evaluation of a Proposed IPM Approach for Weed Control in Potatoes - D. P. Kain and J. B. Sieczka, Cornell Univ., Long Island Horticultural Research Laboratory, Riverhead, NY and R. D. Sweet, Cornell Univ., Ithaca, NY

1987 None Awarded

1988 1. Bentazon and Bentazon-MCPB Tank-mixes for Weed Control in English Pea - G. A. Porter, Univ. of Maine, Orono; A. Ashley, Univ. of Connecticut, Storrs; R. R. Bellinder and D. T. Warholic, Cornell Univ., Ithaca, NY; M. P. Mascianica, BASF Corp., Parsippany, NJ; and L. S. Morrow, Univ. of Maine, Orono

2. Effects of Herbicide Residues on Germination and Early Survival of Red Oak Acorns - R. D. Shipman and T. J. Prunty, Penn State Univ., University Park

2. Watershed Losses of Triclopyr after Aerial Application to Release Spruce Fir - C. T. Smith, Univ. of New Hampshire, Durham and M. L. McCormack, Jr., Univ. of Maine, Orono

1989 None Awarded

1990 None Awarded

1991 Award Discontinued

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HERBICIDE NAMES: COMMON, TRADE, AND CHEMICAL

Common and Chemical Names of Herbicides Approved by The Weed Science Society of America

Common Name	Trade Name	Chemical Name
acetochlor	Breakfree;Harness, Surpass, Topnotch, Degree	2-chloro-N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide
acifluorfen	Blazer, Status Blazer Ultra	5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoic acid
alachlor	Intrro, MicroTech, Partner; many	2-chloro-N-(2,6-diethylphenyl)-N-(methoxymethyl) acetamide
alloxydim	Clout	methyl 2,2-dimethyl-4,6-dioxo-5-[1-[(2-propenyloxy)amino]butylidene]cyclohexanecarboxylate
ametryn	Evik	N-ethyl-N'-(1-methylethyl)-6-(methylthio)-1,3,5-triazine-2,4- diamine
amicarbozone	Dinamic	4-amino-N-(1,1-dimethylethyl)-4,5-dihydro-3-(1-methylethyl)-5-oxo-1H-1,2,4-triazole-1-carboxamide
aminopyralid	Milestone	2-pyridine carboxylic acid, 4-amino-3,6-dichloro-2-pyridinecarboxylic acid
asulam	Asulox	methyl[(4-aminophenyl)sulfonyl]carbamate
atrazine	Aatrex, many	6-chloro-N-ethyl-N'-(1-methylethyl)-1,3,5-triazine-2,4-diamine
azimsulfuron	Gulliver	N-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-1-methyl-4-(2-methyl-2H-tetrazol-5-yl)-1H-pyrazole-5-sulfonamide
beflubutamid		2-[4-fluoro-3-(trifluoromethyl)phenoxy]-*N*-(phenylmethyl)butanamide
benefin	Balan	N-butyl-N-ethyl-2,6-dinitro-4-(trifluoromethyl) benzenamine
bensulfuron	Londax	2-[[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]methyl]benzoic acid
bensulide	Bensumec, Betason, Prefar	O,O-bis(1-methylethyl)S-[2-[(phenylsulfonyl)amino]ethyl]phosphorodithioate
bentazon	Basagran, Lescogran	3-(1-methylethyl)-(1H)-2,1,3-benzothiadiazin-4(3H)-one 2,2-dioxide

Common Name	Trade Name	Chemical Name
benzfendizone		methyl 2-[2-[[4-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2H)pyrimidinyl)phenoxy]methyl]-5-ethylphenoxy]propanoic acid
bispyribac	Velocity, Regiment	2,6-bis[(4,6-dimethoxy-2-pyrimidinyl)oxy]benzoic acid
bromacil	Hyvar	5-bromo-6-methyl-3-(1-methylpropyl)-2,4(1H, 3H)pyrimidinedione
bromoxynil	Brominal, Buctril, Moxy	3,5-dibromo-4-hydroxybenzonitrile
butafenacil	Inspire	2-chloro-5-(3-methyl-2,6,dioxo-4-triflouromethyl-3,6-dihydro-2H-pyrimidyl)-benzoic acid 1-allylocycarbonyl-1-methyl-ethyl-ester
butralin	AMEX-820, TAMEX	4-(1,1-dimethylethyl)-N-(1-methylpropyl)-2,6-dinitrobenzenamine
butylate	Sutan+, Genate Plus	S-ethyl bis(2-methylpropyl)carbamothioate
cacodylic acid	Cotton-aide, Montar, Phytar 560	dimethyl arsinic acid
carfentrazone	Aim, Affinity, QuickSilver IVM, Stingray	α,2-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl] -4-fluorobenzenepropanoic acid
chlorflurenol	Maintain, CF 125	2-chloro-9-hydroxy-9H-fluorene-9-carboxylic acid
chlorimuron	Classic	2-[[[[(4-chloro-6-methoxy-2-pyrimidinyl)amino]carbonyl]a-mino]sulfonyl]benzoic acid
chlorsulfuron	Corsair, Glean, Telar, Glean,Lesco TFCr	2-chloro-N-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl) amino]carbonyl] benzenesulfonamide
clethodim	Prism, Select, Envoy	(E,E)-(±)-2-[1-[[(3-chloro-2-propenyl)oxy]imino]propyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
clomazone	Command	2-[(2-chlorophenyl)methyl]-4,4-dimethyl-3-isoxazolidinone
clopyralid	Reclaim, Stinger, Transline, Lontrel	3,6-dichloro-2-pyridinecarboxylic acid
cloransulam	FirstRate	3-chloro-2-[[(5-ethoxy-7-fluoro[1,2,4]triazolo[1,5-c] pyrimidin-2yl)sulfonyl]amino]benzoic acid
copper sulfate	Copper Sulfate	copper sulfate
cycloate	Ro-Neet	S-ethyl cyclohexylethylcarbamothioate

Common Name	Trade Name	Chemical Name
cyclosulfamuron	Ichiyonmaru, Nebiros Double-Up	N-[[[2-(cyclopropylcarbonyl)phenyl]amino]sulfonyl]-N'-(4,6-dimethoxy-2- pyrimidinyl)urea
cyhalofop	Clincher	(R)-2-[4-(4-cyano-2-fluorophenoxy)phenoxy]propanoic acid
2,4-D	many	(2,4-dichlorophenoxy)acetic acid
dazomet	Basamid	tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione
2,4-DB	Butoxone, Butyrac	4-(2,4-dichlorophenoxy)butanoic acid
DCPA	Dacthal	dimethyl 2,3,5,6-tetrachloro-1,4-benzenedicarboxylate
desmedipham	Betanex	ethyl[3-[[(phenylamino)carbonyl]oxy]phenyl]carbamate
dicamba	Banvel, Clarity, Vanquish	3,6-dichloro-2-methoxybenzoic acid
dichlobenil	Barrier, Casoron, Dyclomec, Norosac	2,6-dichlorobenzonitrile
dichlorprop	Weedone 2,4-DP	(±)-2-(2,4-dichlorophenoxy)propanoic acid
diethatyl	Antor	N-(chloroacetyl)-N-(2,6-diethylphenyl)glycine
diclofop	Hoelon, Illoxan	(±)-2-[4-(2,4-dichlorophenoxy)phenoxy]propanoic acid
diclosulam	Strongarm	N-(2,6-dichlorophenyl)-5-ethoxy-7-fluoro[1,2,4]triazolo[1,5-c] pyrimidine-2-sulfonamide
difenzoquat	Avenge	1,2-dimethyl-3,5-diphenyl-1H-pyrazolium
diflufenzopyr		2-[1-[[[(3,5-difluorophenyl)amino]carbonyl]hydrazono]ethyl]-3-pyridinecarboxylic acid
dimethanamid	Frontier	2-chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide
dimethanamid-P	Outlook	(S)-2-chloro-N-(2,4-dimethyl-3-thienyl)-N-(2-methoxy-1-methylethyl)acetamide
diphenamid	Enide	N,N-dimethyl-a-phenyl benzeneacetamide
diquat	Diquat, Reglone, Reward	6,7-dihydrodipyrido[1,2-a:2',1'-c]pyrazinediiumion
dithiopyr	Dimension	S,S-dimethyl 2-(difluoromethyl)-4-(2-methylpropyl)-6-trifluoromethyl)- 3,5-pyridinedicarbothioate
diuron	Karmex, Direx	N'-(3,4-dichlorophenyl)-N,N-dimethylurea

Common Name	Trade Name	Chemical Name
DSMA	Ansar, many	disodium salt of MAA
endothall	Aquathol, Accelerate, Desicate, H-273	7-oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
EPTC	Eptam, Eradicane Extra, Genep, Genep Plus	S-ethyl dipropyl carbamothioate
ethalfluralin	Sonalan, Curbit, Edge	N-ethyl-N-(2-methyl-2-propenyl)-2,6-dinitro-4-(trifluoro-methyl)benzenamine
ethametsulfuron	Muster	2-[[[[[4-ethoxy-6-(methylamino)-1,3,5-triazin-2-yl]amino] carbonyl]amino]sulfonyl]benzoic acid
ethofumesate	Nortron	(±)-2-ethoxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate
fenoxaprop	Acclaim, Horizon, Puma, Whip	(±)-2-[4-[(6-chloro-2-benzoxazolyl)oxy]phenoxy]propanoic acid
flazasulfuron	Mission	*N*-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-3-(trifluoromethyl)-2-pyridinesulfonamide
florasulam	Primus, Boxer	N-(2,6-difluorophenyl)-8-fluoro-5-ethoxy[1,2,4]triazolo[1,5-c]pyrimidine-2-sulfonamide
fluazifop	Fusilade, Horizon, Ornamec	(R)-2-[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy]-propanoic acid
flucarbazone	Everest	4,5-dihydro-3-methoxy-4-methyl-5-oxo-N-[[2-(trifluoromethoxy)phenyl]sulfonyl]-1H-1,2,4-triazole-1-carboxamide
flufenacet	Define	N-(4-fluorophenyl)-N-(1-methylethyl)-2-[[5-(trifluoromethyl)-1,3,4-thiadiazol-2-yl]oxy]acetamide
flumetsulam	Python	N-(2,6-difluorophenyl)-5-methyl[1,2,4]triazolo[1,5-a] pyrimidine-2-sulfonamide
flumiclorac	Resource	[2-chloro-4-fluoro-5-(1,3,4,5,6,7-hexahydro-1,3-dioxo-2H- isoindol-2-yl)phenoxy]acetic acid
flumioxazin	Broadstar, Flumizin, Sumisoya, Valor, SureGuard	2-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2H-1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1H-insoindole-1,3(2H)- dione
fluometuron	Cotoran	N,N-dimethyl-N'-[3-(trifluoromethyl)phenyl]urea
flupoxam		1-[4-chloro-3-[(2,2,3,3,3-pentafluoropropoxy)methyl]- phenyl]-5-phenyl-1H-1,2,4-triazole-3-carboxamide

Common Name	Trade Name	Chemical Name
flupropacil		1-methylethyl 2-chloro-5-[3,6-dihydro-3-methyl-2,6-dioxo-4-(trifluoromethyl)-1(2H)-pyrimidinyl]benzoate
flupyrsulfuron		2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-6-trifluoromethyl)-3-pyridinecarboxylic acid
fluridone	Avast, Sonar	1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4(1H)- pyridinone
fluroxypyr	Starane, Spotlight, Tomahawk, Vista	[(4-amino-3,5-dichloro-6-fluoro-2-pyridinyl)oxy]acetic acid
fluthiacet	Action, Appeal	[[2-chloro-4-fluoro-5-[(tetrahydro-3-oxo-1*H*,3*H*-[1,3,4]thiadiazolo[3,4-a]pyridazin-1-ylidene)amino]phenyl]thio]acetic acid
fomesafen	Reflex, Flexstar	5-[2-chloro-4-(trifluoromethyl)phenoxy]-N-(methylsulfonyl)-2-nitrobenzamide
foramsulfuron	Option, Revolver	2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-4-(formylamino)-*N,N*-dimethylbenzamide
fosamine	Krenite	ethyl hydrogen (aminocarbonyl)phosphonate
glufosinate	Finale, Liberty, Rely	2-amino-4-(hydroxymethylphosphinyl)butanoic acid
glyphosate	Glyphomax, Glyphos, Roundup, Touchdown; many	N-(phosphonomethyl)glycine
halosulfuron	Manage, Permit, Sandea, Sempra, Sledgehammer	3-chloro-5-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]amino]sulfonyl]-1-methyl-1H-pyrazole-4-carboxylic acid
hexazinone	Pronone, Velpar	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione
imazamethabenz	Assert	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H- imidazol-2-yl]-4(and 5)-methylbenzoic acid (3:2)
imazamox	ClearCast, Raptor, Odessey	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H- imiazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid
imazapic	Cadre, Plateau	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid

Common Name	Trade Name	Chemical Name
imazapyr	Arsenal, Chopper, Stalker, Habitat	(±)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo -1H -imidazol-2-yl]-3-pyridinecarboxylic acid
imazaquin	Image, Scepter	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H - imidazol-2-yl]-3-quinolinecarboxylic acid
imazethapyr	NewPath, Pursuit	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H - imidazol-2-yl]-5-ethyl-3-pyridinecarboxylic acid
iodosulfuron	Husar	4-iodo-2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino]sulfonyl]benzoic acid
isoproturon		N,N-dimethyl-N'-[4-(1-methylethyl)phenyl]urea
isoxaben	Gallery	N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-2,6-dim eth- oxybenzamide
isoxaflutole	Balance, Balance Pro	(5-cyclopropyl-4-isoxazolyl)[2-(methylsulfonyl)-4-(trifluoromethyl)-phenyl]methanone
ketospiradox		2-[(2,3dihydro-5,8-dimethyl-1,1-dioxidospiro[4H-1-benzothiopyran-4,2'-[1,3]dioxolan]-6-yl)carbonyl]-1,3-cyclohexanedione ion(1-)
lactofen	Cobra	(±)-2-ethoxy-1-methyl-2-oxoethyl 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenz oate
linuron	Lorox, Linex, Afolan	N'-(3,4-dichlorophenyl)-N-methoxy-N-methylurea
maleic hydrazide	Royal MH30, Royal Slo-Gro	1,2-dihydro-3,6-pyridazinedione
MCPA	many	(4-chloro-2-methylphenoxy)acetic acid
MCPB	Cantrol, Thistrol	4-(4-chloro-2-methylphenoxy)butanoic acid
mecoprop	Mecomec, Super Chickweed Killer	(±)-2-(4-chloro-2-methylphenoxy)propanoic acid
mefluidide	Embark, Vistar	N-[2,4-dimethyl-5-[[(trifluoromethyl)sulfonyl]amino] phenyl]acetamide
mesotrione	Callisto	2-(4-mesyl-2-nitrobenzoyl)-3-hydroxycyclohex-2-enone
metamifop		(*R*)-2-[4-(6-chloro-1,3-benzoxazol-2-yloxy)phenoxy]-2′-fluoro-*N*-methylpropionanilide
metham	Vapam	methylcarbamodithioic acid
metolachlor	Dual, Pennant	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1- methylethyl)acetamide
s-metolachlor	Cinch, Dual Magnum Pennant Magnum	2-chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1- methylethyl)acetamide, S-enantiomer

Common Name	Trade Name	Chemical Name
metosulam	Barko	N-(2,6-dichloro-3-methylphenyl)-5,7-dimethoxy[1,2, 4] triazolo[1,5-a]pyrimidine-2- sulfonamide
metribuzin	Sencor	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one
metsulfuron	Ally, Blade, Cimarron, Escort, Manor	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino] carbonyl]amino]sulfonyl]benzoic acid
molinate	Ordram	S-ethyl hexahydro-1H-azepine-1-carbothioate
MSMA	Ansar, Bueno, Daconate	monosodium salt of MAA
napropamide	Devrinol	N,N-diethyl-2-(1-naphthalenyloxy)propanamide
naptalam	Alanap	2-[(1-naphthalenylamino)carbonyl]benzoic acid
nicosulfuron	Accent	2-[[[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]a mino] sulfonyl]-N,N-dimethyl-3-pyridinecarboxamide
norflurazon	Evital, Solicam, Predict, Zorial	4-chloro-5-(methylamino)-2-(3-(trifluoromethyl)phe nyl)-3 (2H)-pyridazinone
oryzalin	Surflan	4-(dipropylamino)-3,5-dinitrobenzenesulfonamide
oxadiargyl	TopStar	3-[2,4-dichloro-5-(2-propynyloxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2(3*H*)-one
oxadiazon	Ronstar	3-[2,4-dichloro-5-(1-methylethoxy)phenyl]-5-(1,1-dimethylethyl)-1,3,4-oxadiazol-2-(3H)-one
oxaziclomefone		3-[1-(3,5-dichlorophenyl)-1-methylethyl]-2,3-dihydro-6-methyl-5-phenyl-4*H*-1,3-oxazin-4-one
oxyfluorfen	Goal GoalTender	2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluorome thyl) benzene
paraquat	Boa, Cyclone, Gramoxone, Starfire	1,1'-dimethyl-4,4'-bipyridiniumion
pebulate	Tillam	S-propyl butylethylcarbamothioate
pelargonic acid	Scythe	nonanoic acid
pendimethalin	Pentagon, PendiMax, Pendulum, Prowl, Prowl H2O, many	N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzena mine
penoxsulam	Granite, Grasp	2-(2,2-difluoroethoxy)-N-(5,8-dimethoxy [1,2,4]triazolo[1,5-c]pyrimidin-2-yl)-6-(trifluoromethyl) benzenesulfonamide

Common Name	Trade Name	Chemical Name
phenmedipham	Spin-Aid	3-[(methoxycarbonyl)amino]phenyl (3-methylphenyl)carbamate
picloram	Tordon, Grazon	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid
primisulfuron	Beacon, Rifle	2-[[[[[4,6-bis(difluoromethoxy)-2-pyrimidinyl]amino] carbonyl]amino]sulfonyl]benzoic acid
prodiamine	Barricade, Factor, RegalKade	2,4 dinitro-N3,N3-dipropyl-6-(trifluoromethyl)-1,3-benzenediamine
prometon	Pramitol	6-methoxy-N,N'-bis(1-methylethyl)-1,3,5-triazine-2, 4- diamine
prometryn	Caparol, Cotton Pro	N,N'-bis(1-methylethyl)-6-(methylthio)-1,3,5-triazin e-2,4- diamine
pronamide	Kerb	3,5-dichloro (N-1,1-dimethyl-2-propynyl)benzamide
propachlor	Ramrod	2-chloro-N-(1-methylethyl)-N-phenylacetamide
propanil	Propanil, Stam, Superwham	N-(3,4-dichlorophenyl)propanamide
prosulfuron	Peak	*N*-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]-2-(3,3,3-trifluoropropyl)benzenesulfonamide
pyraflufen	ET	[2-chloro-5-[4-chloro-5-(difluoromethoxy)-1-methyl-1*H*-pyrazol-3-yl]-4-fluorophenoxy]acetic acid
pyrazon	Pyramin	5-amino-4-chloro-2-phenyl-3(2H)-pyridazinone
pyribenzoxium		diphenylmethanone *O*-[2,6-bis[(4,6-dimethoxy-2-pyrimidinyl)oxy]benzoyl]oxime
pyridate	Lentagran, Tough	O-(6-chloro-3-phenyl-4-pyridazinyl) S-octyl carbonothioate
pyrithiobac	Staple	2-chloro-6-[(4,6-dimethoxy-2-pyrimidinyl)thio]benzo ic acid
quinclorac	Drive, Facet	3,7-dichloro-8-quinolinecarboxylic acid
quizalofop	Assure II, Targa	(±)-2-[4-[(6-chloro-2-quinoxalinyl)oxy]phenoxy]prop anoic acid
rimsulfuron	Matrix, Tranxit	N-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-3 - (ethylsulfonyl)-2-pyridinesulfonamide
sethoxydim	Poast	2-[1-(ethoxyimino)butyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one
siduron	Tupersan	N-(2-methylcyclohexyl)-N'-phenylurea
simazine	Aquazine, Princep; many	6-chloro-N,N'-diethyl-1,3,5-triazine-2,4-diamine
sodium chlorate	Defol	sodium chlorate
sulcotrione	Galleon	2-[2-chloro-4-(methylsulfonyl)benzoyl]-1,3-cyclohexanedione

Common Name	Trade Name	Chemical Name
sulfentrazone	Authority, Spartan	N-[2,4-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1H-1,2,4-triazol-1-yl] phenyl]methanesulfonamide
sulfometuron	Oust	2-[[[[(4,6-dimethyl-2-pyrimidinyl)amino]carbonyl]amino] sulfonyl]benzoic acid
sulfosulfuron	Maverick, Outrider, Certainty	*N*-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-2-(ethylsulfonyl)imidazo[1,2-a]pyridine-3-sulfonamide
tebuthiuron	Spike	N-[5-(1,1-dimethylethyl)-1,3,4-thiadiazol-2-yl]-N,N'-dimethylurea
terbacil	Sinbar	5-chloro-3-(1,1-dimethylethyl)-6-methyl-2,4(1H,3H) - pyrimidinedione
thiazafluron	Dropp	N,N'-dimethyl-N-[5-(trifluoromethyl)-1,3,4-thiadiazol -2-yl] urea
thiazopyr	Mandate, Visor	methyl2-(difluoromethyl)-5-(4,5-dihydro-2-thiazolyl) -4-(2-methylpropyl) -6-(trifluoromethyl)-3-pyridinecarboxylate
thifensulfuron	Harmony GT	3-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino] carbonyl]amino]sulfonyl]-2-thiophenecarboxylic acid
thiobencarb	Bolero	S-[(4-chlorophenyl)methyl]diethylcarbamothioate
tralkoxydim	Achieve	2-[1-(ethoxyimino)propyl]-3-hydroxy-5-(2,4,6-trimethylphenyl)-2-cyclohexen-1-one
triallate	Far-Go, Avadex, Showdown	S-(2,3,3-trichloro-2-propenyl) bis(1-methylethyl) carbamothioate
triasulfuron	Amber	2-(2-chloroethoxy)-N-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl] benzenesulfonamide
tribenuron	Express	2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)methylamino] carbonyl]amino]sulfonyl]benzoic acid
triclopyr	Garlon, Grandstand, Pathfinder, Remedy, Turflon, Renovate	[(3,5,6-trichloro-2-pyridinyl)oxy]acetic acid
trifloxysulfuron	Enfield, Envoke, Monument	*N*-[[(4,6-dimethoxy-2-pyrimidinyl)amino]carbonyl]-3-(2,2,2-trifluoroethoxy)-2-pyridinesulfonamide
trifluralin	Treflan, Tri-4, Trilin; many	2,6-dinitro-N,N-dipropyl-4-(trifluoromethyl)benzenamine
triflusulfuron	UpBeet	2-[[[[[4-(dimethylamino)-6-(2,2,2-trifluoroethoxy)-1,3,5- triazin-2-yl]amino]carbonyl]amino]sulfonyl]-3-methylbenzoic acid

Common Name	Trade Name	Chemical Name
topramezone	Impact	[3-(4,5-dihydo-3-isoxazolyl)-2-methyl-4-(methylsulfonyl) phenyl](5-hydoxy-1-methyl-1H-pyrazol-4-yl)methanone
vernolate	Vernam	S-propyl dipropylcarbamothioate

COMMON PRE-PACKAGED HERBICIDES

Common Pre-packaged Herbicides and Common Name of the Component Chemicals

Trade Name	Common Name of Individual Herbicides
Accent Gold	clopyralid + flumetsulam + nicosulfuron + rimsulfuron
Atrabute+	atrazine + butylate
Authority First	sulfentrazone + cloransulam-methyl
Axiom	flufenacet + metribuzin
Backdraft	glyphosate + imazaquin
Basis	rimsulfuron + thifensulfuron
Basis Gold	atrazine + nicosulfuron + rimsulfuron
Betamix	desmedipham + phenmedipham
Bicep II Magnum	atrazine + s-metolachlor
Bicep Lite II Magnum	atrazine + s-metolachlor
Bison	bromoxynil + MCPA
Boundary	s-metolachlor + metribuzin
Breakfree ATZ	acetochlor + atrazine
Breakfree ATZ Lite	acetochlor + atrazine
Bronate	bromoxynil + MCPA
Brushmaster	dicamba + 2,4-D + 2,4-DP
Buckle	triallate + trifluralin
Bullet	alachlor + atrazine
Canopy	chlorimuron + metribuzin
Canopy XL	chlorimuron + sulfentrazone
Canopy EX	chlorimuron + tribenuron
Celebrity	dicamba + nicosulfuron
Chaser	triclopyr + 2,4-D
Cheyenne	fenoxaprop + MCPA + thifensulfuron + tribenuron
Cimarron Max	dicamba + metsulfuron + 2,4-D
Cinch ATZ	atrazine + s-metolachlor
Clarion	nicosulfuron + rimsulfuron
Confront	clopyralid + triclopyr
Cool Power	dicamba + MCPA + triclopyr
Crossbow	triclopyr + 2,4-D
Curtail	clopyralid + 2,4-D
Curtail M	clopyralid + MCPA
Dakota	fenoxaprop + MCPA
Degree Xtra	acetochlor + atrazine
Dissolve	mecoprop + 2,4-D + 2,4-DP
Distinct	dicamba + diflufenzopyr
Domain	flufenacet + metribuzin
Eclipse	clopyralid + MCPA + 2,4-DP
Epic	flufenacet + isoxaflutole
Equip	mesosulfuron(AEF-130060) + iodosulfuron
Event	imazapyr + imazethapyr
Exceed	primisulfuron + prosulfuron

Trade Name	Common Name of Individual Herbicides
Extreme	glyphosate + imazethapyr
FieldMaster	acetochlor + atrazine + glyphosate
Finesse	chlorsulfuron + metsulfuron
Finesse Grass and Broadleaf	chlorsulfuron + flucarbazone-sodium
Fire Power	glyphosate + oxyfluorfen
Forefront	aminopyralid + 2,4-D
Fuego	dicamba + triasulfuron
FulTime	acetochlor + atrazine
Fusion	fenoxaprop + fluazifop
Grazon P+D	picloram + 2,4-D
Guardsman Max	atrazine + dimethenamid
Harmony Extra	thifensulfuron + tribenuron
Harness Xtra	acetochlor + atrazine
Horizon 2000	fenoxaprop + fluazifop
Hornet	clopyralid + flumetsulam
Horsepower	dicamba + triclopyr + 2,4-D
Journey	glyphosate + imazapic
Kansel Plus	oxadiazon + pendimethalin
Keystone, Keystone LA	acetochlor + atrazine
Krovar	bromacil + diuron
Laddok S-12	atrazine + bentazon
Landmark II	chlorsulfuron + sulfometuron
Landmaster	glyphosate + 2,4-D
Lariat	alachlor + atrazine
Layby Pro	linuron + diuron
Liberty ATZ	atrazine + glufosinate
Lightning	imazapyr + imazethapyr
Lumax	atrazine + mesotrione + s-metolachlor
Marksman	atrazine + dicamba
Millennium Ultra	clopyralid + dicamba + 2,4-D
Momentum	clopyralid + triclopyr + 2,4-D
NorthStar	dicamba + primisulfuron + prosulfuron
Oasis	imazapic + 2,4-D
OH2 (Ornamental Herbicide)	oxyfluorfen + pendimethalin
Oustar	hexainone + sulfometuron
Oust Extra	metsulfuron + sulfometuron
Overdrive	dicamba + diflufenzopyr
PastureGard	triclopyr + fluroxypyrr
Power Zone	carfentrazone + dicamba+ mecoprop + MCPA
PrePair	napropamide + oxadiazon
Prefix	S-metolachlor and fomesafen.
Preview	chlorimuron + metribuzin
Prompt	atrazine + bentazon
QuickPro	diquat + glyphosate
Ready Master ATZ	atrazine + glyphosate
Redeem R&P	clopyralid + triclopyr
Regal O-O	oxadiazon + oxyfluorfen
RegalStar	oxadiazon + prodiamine

Trade Name	Common Name of Individual Herbicides
Resolve SG	dicamba + imazethapyr
Rhino	atrazine + butylate
Rout	oryzalin + oxyfluorfen
Sahara	diuron + imazapyr
Salute	metribuzin + trifluralin
Shotgun	atrazine + 2,4-D
Showcase	trifluralin + isoxaben + oxyfluorfen
Simazat	atrazine + simazine
Snapshot	isoxaben + trifluralin
Sonic	cloransulam + sulfentrazone
Speed Zone	carfentrazone + dicamba + mecoprop + 2,4-D
Spirit	primisulfuron + prosulfuron
Squadron	imazaquin + pendimethalin
Stampede	MCPA + propanil
Status	dicamba + diflufenzapyr
Steadfast	nicosulfuron + rimsulfuron
Steadfast ATZ	atrazine + nicosulfuron + rimsulfuron
Steel	imazaquin + imazethapyr + pendimethalin
Stellar	flumiclorac + lactofen
Sterling Plus	atrazine + dicamba
Strategy	clomazone + ethalfluralin
Stronghold	imazapyr + imazethapyr + mefluidide
Synchrony STS	chlorimuron + thifensulfuron
Team	benefin + trifluralin
Telone C17, Telone C35	chloropicrin + dichloropropene
Tiller	fenoxaprop + MCPA + 2,4-D
Tordon 101M	picloram + 2,4-D
Total	bromacil + diruon + sodium chlorate + sodium metaborate
Triamine	mecoprop + 2,4-D + 2,4-DP
Tri-Ester	mecoprop + 2,4-D + 2,4-DP
Trimec 992	dicamba + mecoprop + 2,4-D
Trimec Classic	dicamba + mecoprop + 2,4-D
Trimec Super	dicamba + dichlorprop + 2,4-D
Tri-Scept	imazaquin + trifluralin
Trupower	clopyralid + dicamba + MCPA
Typhoon	fluazifop + fomesafen
Velpar Alfamax	hexazione + diuron
Vengeance	dicamba + MCPA
Weedmaster	dicamba + 2,4-D
Westar	hexazinone + sulfometuron
Widematch	clopyralid + fluroxypyr
XL 2G	benefin + oryzalin
Yukon	dicamba + halosulfuron

EXPERIMENTAL HERBICIDES

Experimental Number	Common Name (Proposed), Trade Name, Company Name
AC-900001	picolinafen/Pico, BASF
AEF-130060	mesosulfuron/Osprey, Bayer
BAS 620	tepraloxydim/Aramo, Equinox, Honest, BASF
BAY MKH 6561	propoxycarbazone/Attribute, Olympus, Bayer
BK-800	Uniroyal
CGA-184927	clodinofop-propargyl/Discover, Syngenta
CGA-277476	oxasulfuron/Dynam, Syngenta
KIH-485	Kumiai
V-3153	flufenapyr, Valent
F4113	carfentrazone + glyphosate, FMC

PLANT GROWTH REGULATORS

Common Name	Trade Name
AVG	Retain
6-benzyl adenine	BAP-10
chlorflurecol	Maintain
chlormequat chloride	Cycocel
clofencet	Detasselor
copper ethylenediamine	Inferno
diphenylamine	
diminozide	B-nine
ethephon	Florel
forchlorfenuron	
GA 4 7/G BA	Promalin, Rite Size
GABA	Auxigro
MBTA	Ecolyst
mepiquat chloride	Mepex, Mepex Gin Out, Pix
paclobutrazol	Bonzi, Clipper, Trimmet
prohexadione	Apogee
sodium nitrophenolate	Atonik
trinexapac	Palisade, Primo
uniconazole……	Prunit, Sumagic

COMMON AND CHEMICAL NAMES OF HERBICIDE MODIFIERS

Common Name	**Chemical Name**
benoxacor	(*RS*)-4-dichloroacetyl-3,4-dihydro-3-methyl-2*H*-1,4-benzoxazine
cloquintocet	(5-chloroquinolin-8-yloxy)acetic acid
cyometrinil	(Z)-α-[(cyanomethoxy)imino]benzeneacetonitrile
dichlormid	2,2-dichloro-N,N-di-2-propenylacetamide
dicyclonon	1-(dichloroacetyl)hexahydro-3,3,8a-trimethylpyrrolo[1,2-α]pyrimidin-6(2*H*)-one
dietholate	O,O-diethyl O-phenyl phosphorothioate
fenchlorazole	1-(2,4-dichlorophenyl)-5-(trichloromethyl)-1*H*-1,2,4-triazole-3-carboxylic acid
fenclorim	4,6-dichloro-2-phenylpyrimidine
flurazole	phenylmethyl-chloro-4-(trifluoromethyl)-5-thiazolecarboxylate
fluxofenim	1-(4-chlorophenyl)-2,2,2-trifluoroethanone *O*-(1,3-dioxolan-2-ylmethyl)oxime
furilazole	3-(dichloroacetyl)-5-(2-furanyl)-2,2-dimethyloxazolidine
isoxadifen	4,5-dihydro-5,5-diphenyl-3-isoxazolecarboxylic acid
mefenpyr	1-(2,4-dichlorophenyl)-4,5-dihydro-5-methyl-1*H*-pyrazole-3,5-dicarboxylic acid
mephenate	4-chlorophenyl methylcarbamate
naphthalic anhydride	1H,3H-naphtho[1,8-cd]-pyran-1,3-dione
oxabetrinil	α-[(1,3-dioxolan-2-yl)methoxyimino]benzeneacetonitrile

Disclaimer

Names for chemicals in these lists are correct to the best of the Editor's ability and current information available at the time of printing. This information is provided as a courtesy to our members and readers of the Proceedings. Compounds may be added or removed from the market at any time. All persons using this information for official or other purposed should always verify the validity of the product information contained in these lists.

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