

Planting Green: A Cover Crop Management Strategy for Weed Suppression

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Planting green is a cover crop management strategy aimed at maximizing cover crop biomass. Typically, cash crops, such as soybean, are planted into a standing cover crop. Then, when planting green, the cover crop is terminated within a few days after planting (Reed et al., 2019). Planting green can be an effective weed suppression tactic in integrated weed management due to the delay in cover crop termination allowing for more cover crop biomass production and prolonged early season crop competition with weeds compared to standard termination practices (2-3 weeks prior to planting) (Reed et al., 2019). In the Northeast U.S., planting green can aid in reducing herbicide use, input cost, and risk of developing herbicide resistance due to its weed suppressive attributes (Bunchek et al., 2020; Wallace et al., 2019). However, planting green can present challenges associated with cash crop establishment, herbicide coverage, and additional cover crop management decisions (Bunchek et al., 2020; Reed et al., 2019).

Cover crop seeding rate for planting green depend largely on weed suppression goals and cover crop residue management concerns. While it is popular for farmers to increase seeding rates based on the assumption that increasing seeding rates will increase cover crop biomass, an abundance of residue could be a concern for cash crop establishment if planter equipment does not manage cover crop residue (Haramoto, 2019; Reed et al., 2019). Despite the assumption that increased seeding rates are needed for adequate biomass accumulation, our field study comparing varying seeding rates of cereal rye cover crop found that residue accumulation did not differ across a gradient of seeding rates ranging from 51 kg ha⁻¹ to 135 kg ha⁻¹ when planted at optimal seeding dates in Pennsylvania and Delaware. When cereal rye was present, winter and

summer annual weeds were suppressed compared to a fallow control. Soybeans were planted using a no-till planter with and without roller-crimpers and row cleaners for residue management in Pennsylvania and Delaware, respectively. We found that the presence of a cover crop and variable seeding rates did not affect soybean yield. Although agronomic management should be adjusted based on site specific soil and weather conditions, results from this study suggest that using lower cereal rye seeding rates seeded at optimal timing when planting green can achieve cover crop weed suppression goals while maintaining soybean yield regardless of planter residue management in the Northeast United States.

Planting green tactics primarily target weeds in the early season when weed seedlings are dependent on their seed reserves (Fenner & Thompson, 2005). Larger weed seeds tend to have greater seed reserves allowing for a greater chance of seedling survival under reduced light conditions and physical barriers created by the cover crop compared to smaller weed seeds (Ganade & Westoby, 1999; Kidson & Westoby, 2000; Leishman & Westoby, 1994). Our greenhouse study investigating weed survival and development across varying weed seed sizes under a gradient of rye biomass found that increasing rye biomass decreased seedling survival. However, large-seeded species maintained greater survival across all biomass levels compared to small-seeded species (**Figure 1**). For seedlings that survived, resources were diverted to aboveground biomass in an attempt to acquire more light resulting in weak, spindly stems. While this strategy increases chances of survival, it increases the plants' susceptibility to additional stresses such as herbicides (Ganade & Westoby, 1999). Our results suggest that use of a cover crop can reduce risk of developing herbicide resistance by reducing weed densities (Loux et al., 2017; Montgomery et al., 2018) and size (Bunchek et al., 2020) and that weed communities may

shift to large-seeded species based on their ability to survive and reproduce in a planting green system.

Crop management considerations should be targeted to meet grower goals. In addition to weed suppression benefits, planting green may provide economic benefits by reducing seed costs and altering herbicide programs. When long-term planting green, weed community shifts should be considered in herbicide programs. While planting green has several benefits, some cash crop species may not perform consistently so cash crop species selection should be carefully considered (Reed et al., 2019).

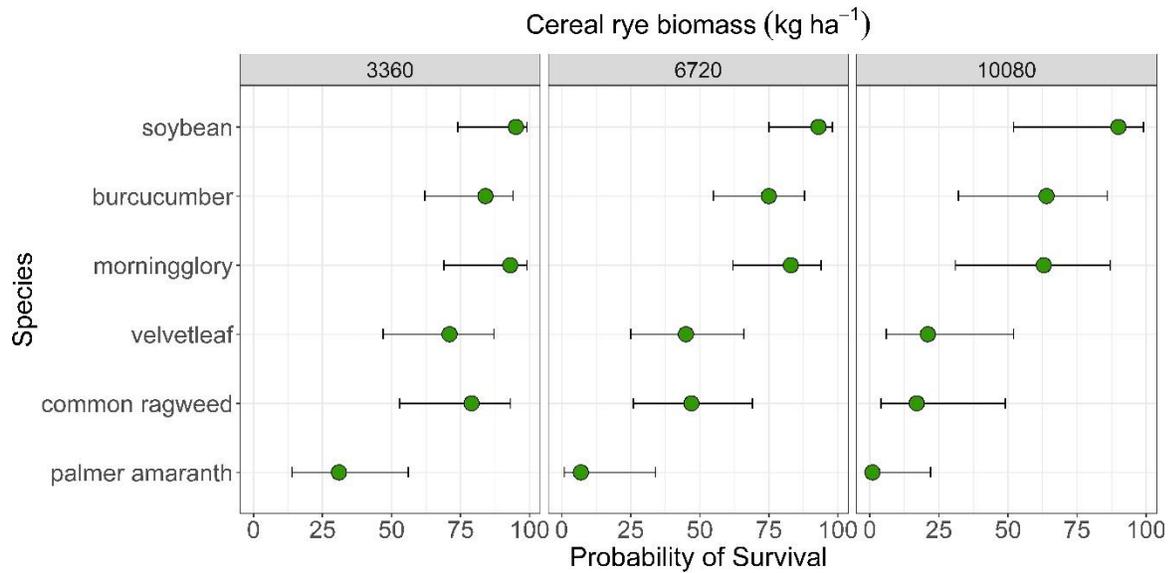


Figure 1. Probability of seedling survival across plant species and cereal rye biomass.

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