EVALUATION OF A BIOHERBICIDE AND ANAEROBIC SOIL DISINFESTATION FOR WEED CONTROL IN SPECIALTY CROP PRODUCTION

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The diversity of crops grown by in-ground ornamental producers is so great that broad-spectrum herbicides are very rarely registered for these crops due to the high potential for phytoxicity in the target crop or a rotation crop. For this reason, there are no "herbicide partners" for fumigants or non-chemical soil disinfestation practices that have limited weed control efficacy. The registered bioherbicide 'Opportune™' (MBI-005 EP) developed by Marrone Bio Innovations Inc. (EPA 2012) may provide a potential tool to manage weeds in ornamentals and other specialty crops for both conventional and organic growers. *Streptomyces acidiscabies* strain RL-110 produces the active ingredient (thaxtomin A) through microbial fermentation. The objective of this research was to determine potential for use of this material in southeastern in-ground cut flower production. The product was also tested in combination with anaerobic soil disinfestation to evaluate weed suppression and yield of snapdragon for cut flower production.

To evaluate pre-emergence and post-emergence activity of the bioherbicide on introduced grasses and endemic weeds, a repeated pot experiment with Opportune™ was conducted in a greenhouse. The experiment was established in a completely randomized design. Soil collected from the surface horizon (0- to 15-cm) was sieved and used to fill pots (~400 cm^3). Opportune™-treated soil received 6.2 mL of diluted product (1mL of product in 300 mL of deionized water) which was thoroughly mixed with soil at the initiation of the experiment for pre-emergent treatments. For post treatments, each pot received 31 mL of diluted product (1mL of product in 1500 mL of deionized water). Similarly, control pots received deionized water alone. Field trials included five treatments: i- Opportune™ (2.7 mL m^{-2} of product diluted in 199 mL of water), ii- ASD (dry molasses amendment at 30:1 C/N ratio, C rate 4 mg C g^{-1} soil), iii- ASD + Opportune™, iv- Triflularin (positive control), and v- nontreated negative control. Plots were established at the Plateau Research and Education Center in Crossville, TN in June 2014 and May 2015. Flat beds (each 4.6 × 0.9 m) were established in a randomized block design with four replications per treatment. All beds were irrigated and plastic mulch applied for three weeks following soil amendment to ASD treatments. After three weeks, plastic was removed and herbicide treatments were applied. Snapdragon transplants were planted three days following herbicide treatment and weed density was assessed 3-weeks post planting.

Weed control by preplant application and pre + post application of Opportune™ in the pot study significantly differed among treatments. Both monocot (*Eleusine indica*, *Digitaria sanguinlis*) and dicot weed emergence was lower in bioherbicide treated pots than the untreated control (Figure 1). Field data showed that only Triflularin reduced dicot weed density compared to the untreated control, whereas no treatment reduced density of annual grasses (*Eleusine indica*, *Digitaria spp.*) compared to the untreated control (Figure 2). Regardless of weed density, there were no statistical differences among treatments for harvestable stems of snapdragon or stem length. Further study of efficacy bioherbicides in ASD-treated specialty crop systems is suggested.

References:

Environmental Protection Agency, 2012. Pesticide Product Label System. Details for MBI-005 EP. Biopesticides and Pollution Division (7511C), Office of Pesticides Programs, US EPA, Washington DC. Accessed: 25 Aug 2016. Available online https://iaspub.epa.gov/apex/pesticides/f?p=PPLS:8:0::NO::P8_PUID:501804

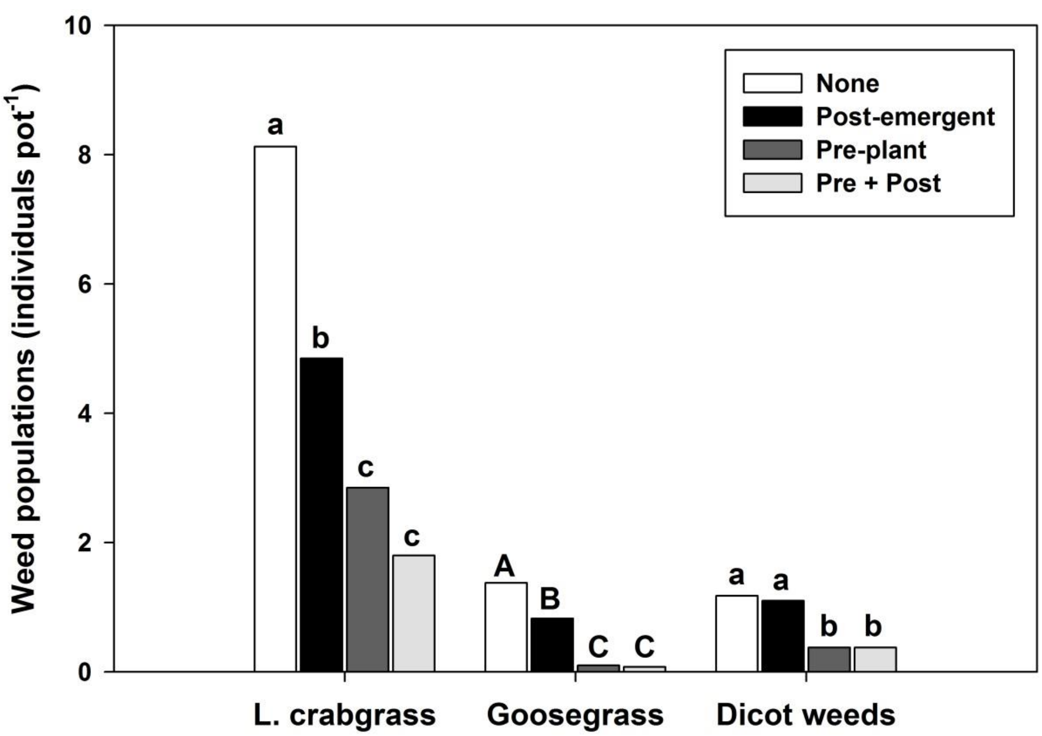

Figure 1. Effect of bioherbicide Opportune™ on weed control, pot study. Bars with different letters are significantly different at $p<0.05$ according to Fisher's PLSD test.

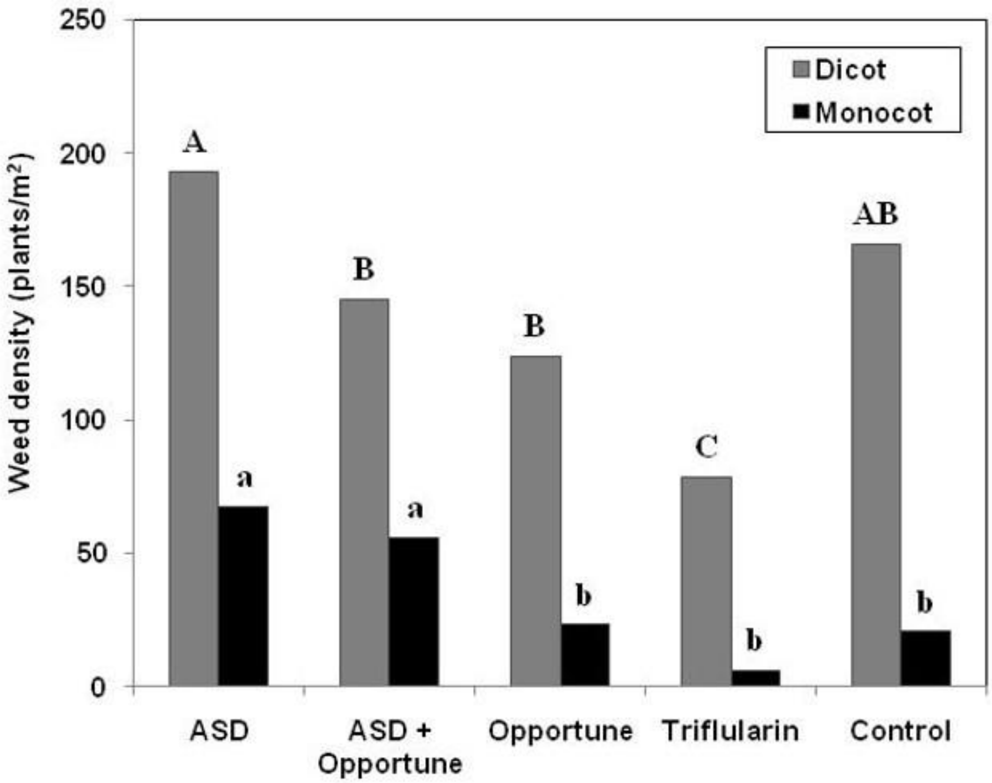

Figure 2. Effect of bioherbicide and ASD on weed density observed in field study, 2014-2015. Bars indicated by different letters are significantly different at $p<0.05$ according to Fisher's PLSD test.