MSU Weed Science

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Influence of weed height on the synergism atrazine and HPPD-inhibitors in triazine-resistant Palmer amaranth

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Field experiments were conducted near Middleville, MI in 2013 and 2015 to determine the effect of weed height on the synergism between atrazine and HPPD inhibitors in a multiple (glyphosate, ALS-inhibitors, and atrazine)-resistant Palmer amaranth population. Herbicide treatments included: atrazine (560 g/ha^{-1}) + COC (1% v/v), mesotrione (105 g/ha^{-1}) + COC (1% v/v), topramezone (18 gha $^{-1}$) + MSO (1% v/v), and tembotrione (92 g/ha^{-1}) + MSO (1% v/v) applied alone and the HPPD inhibitors were applied in combination with atrazine. In 2015, the HPPD inhibitor, tolpyralate (40 g ha^{-1}) + MSO (1% v/v), applied alone and in combination with atrazine was also included. Herbicide applications were made at two application timings, when Palmer amaranth was 8 and 15 cm tall. Evaluations for weed control were made at 7 and 21 days after treatment (DAT), and weed biomass was harvested at the conclusion of the experiment. Weed height and the addition of atrazine to the HPPD inhibitors influenced Palmer amaranth control. Palmer amaranth control and biomass reduction were greater when applications were made to 8 cm tall Palmer amaranth. The addition of atrazine to mesotrione and topramezone increased Palmer amaranth control at the 8 cm timing. Atrazine combinations with mesotrione, tembotrione, and topramezone were the only treatments that provided greater than 90% Palmer amaranth control for the 8 cm timing 21 DAT. There was a 30% increase in Palmer amaranth control when atrazine was added to mesotrione and tembotrione and applied at the 15 cm timing. The only HPPD inhibitor to demonstrate a synergistic relationship with atrazine was topramezone at the 8 cm timing. All other HPPD inhibitor and atrazine combinations were additive in the field, regardless of application timing. The optimal timing for Palmer amaranth control with many of the HPPD-inhibiting herbicides applied with atrazine is 8 cm. This research also demonstrates a differential response of Palmer amaranth to the different HPPD-inhibiting herbicides. Further research is needed to understand the relationship between atrazine and the HPPD inhibitors on this multiple-resistant population.

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