Response of Corn and Palmer amaranth to Mesotrione

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Abstract

❖Mesotrione is a herbicide used for the selective pre- and post-emergence control of a wide range of broadleaf and grass weeds in corn (*Zea mays*).
❖It inhibits the enzyme 4-hydroxyphenylpyruvate dioxygenase (HPPD) which leads to stop biosynthesis of plastoquinone, a key factor in the synthesis of carotenoid pigment.
❖The depletion of carotenoids leading to bleaching symptoms followed by necrosis in sensitive plants.
❖Palmer amaranth (*Amaranth Palmeri*) is one of the major weeds in corn production system.
❖This study was conducted to test the hypothesis that mesotrione may be effective to control Palmer amaranth and safe for use in corn.
❖Therefore, the objective of this research was to evaluate response of corn and Palmer amaranth to mesotrione.
❖Corn and Palmer amaranth plants were treated with mesotrione at 105 g ai ha^{-1},and plant survival data was collected at 3 week after application. There was no injury reported to any of the corn plant, and plant survival rate was reported 100%. However, Palmer amaranth plants showed bleaching symptoms followed by necrosis and plant death. Only 12.5% Palmer amaranth plants survived after mesotrione application.
❖These results demonstrated the tolerance of corn and sensitivity of Palmer amaranth to mesotrione.

Hypothesis and Objective

Hypothesis: Mesotrione may be effective to control Palmer amaranth and safe for corn.

Objective: To evaluate response of corn and Palmer amaranth to Mesotrione.

Study System

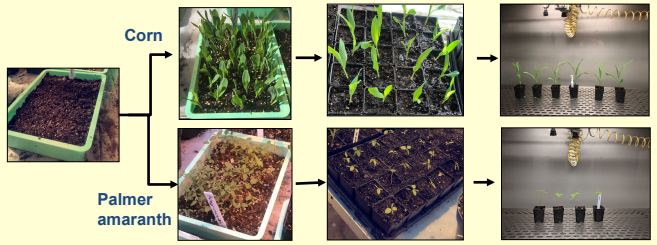
This study was conducted in greenhouse (fig 1.) using Palmer amaranth and corn. Greenhouse conditions was maintained for 15/9 h (day/night) of photoperiod, 35/24 C (day/night) temperature, and Relative humidity 60%.

Figure 1. Greenhouse at Department of Agronomy, KSU where study was conducted

Figure 2. A bench type track sprayer used for mesotrione application

Methods and Experimental Design

❖**Plant type:** Corn and Palmer amaranth
❖**Soil type:** Potting mix (17.0% organic matter, Fafard potting mix)
❖**Pot size:** 9cm (L)×9cm (W)×10cm (H)
❖**Experimental design:** Completely randomized design with four replications and experiment was conducted twice
❖Mesotrione was applied at 105 g ai ha^{-1} (field recommended rate) when corn at 3 to 4 leaf stage and Palmer amaranth at 4 to 5 leaf stage
❖Additionally, crop oil concentrate (Agridex) and AMS (Liquid N-Pak; Winfield) were added at 1% v/v and 1% w/v, respectively in spray solution.
❖Treatments were applied with a bench type track sprayer (fig. 2) equipped with an flat-fan nozzle 8002 calibrated to deliver 187 L/ha at 222 kPa in a single pass at 4.8 km h^{-1}.
❖Plant survival data was collected at 3 week after treatment (WAT)
❖Data was analyzed using excel



(1) Seed planted in tray
(2) Germinated in 3 to 5 days
(3) Seedlings transplanted into pots
(4) Plant treated at 3 to 4 leaf stage for corn and 4 to 5 leaf stage for Palmer amaranth

Results

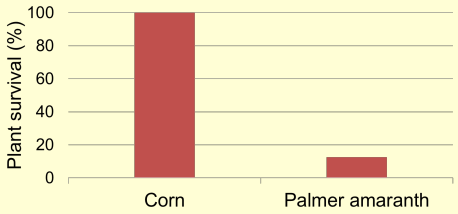


Figure 3. Percentage of corn and Palmer amaranth plants survived after mesotrione application at 3 WAT

Nontreated Mesotrione treated

Figure 4. Corn Plants 3 WAT

Figure 5. Palmer amaranth showing bleaching symptoms 1 WAT

Nontreated Mesotrione treated

Figure 6. Palmer amaranth 3 WAT

Conclusions

❖There was no injury reported to any of the corn plant, and plant survival rate was reported 100% (Fig 3 and 4).
❖Palmer amaranth plants showed bleaching symptoms followed by necrosis and plant death. Only 12.5% Palmer amaranth plants survived after mesotrione application (Fig 3, 5, and 6).
❖Corn is tolerant to mesotrione as a consequence of selective metabolism by cytochrome P450 monooxygenase(s) enzymes.

Future Directions

❖ The tolerance of other crops including soybean, cotton, sorghum, and peanut will be tested for mesotrione.

❖ The efficacy of mesotrione will be tested for other problematic weed species including kochia, common waterhemp, and horseweed.

References

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