# Horseweed (Marestail) Resistance

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## Abstract

Horseweed has documented resistance to EPSPS inhibitors, PSII inhibitors, ALS inhibitors, and PSI inhibitor (Heap, 2018). Glyphosate resistant horseweed moves the herbicide into a vacuole preventing the herbicide from damaging the plant (Ge, 2010). The objective of the this experiment was to determine if nine different horseweed populations were resistant or not to six different herbicide. Experimental design was a randomized complete block with six herbicides, nine locations, and five replications. Heights were recorded for each population before spraying. Each herbicide was sprayed on October 5, 2018, and rates were paraquat (840 g ai/ha), glyphosate (1260 g ae/ha), glufosinate (738 g ai/ha), Atrazine (560 g ai/ha), chlorimuron (13.1 g ai/ha), and dicamba (560 g ai/ha). Horseweed showed the most resistance to atrazine and glyphosate across all locations, and paraquat in some locations. No herbicide had total control fourteen days after spraying. Dicamba had the greatest control of horseweed across all nine locations. Resistance was difficult to identify because horseweed plants were too mature to effectively be control.

## Purpose

The purpose of this research is to gather data on horseweed resistance of six different herbicides across nine different locations in the midwest.

## Questions, Hypotheses, and Predictions

Hypothesis: Horseweed (marestail) will have the most resistance to glyphosate and atrazine throughout all nine locations.

## Study System

Horseweed is a weed species that can be found all throughout the world and is a problem in crop land. Horseweed is generally a winter annual weed but can also germinate 8 to 9 months out of the year. Typically in Kansas horseweed germinates in the fall, bolts in the spring and goes to seed in the late summer.


**Figure 1.** Examples of herbicide products used in the screen of horseweed for herbicide resistance.

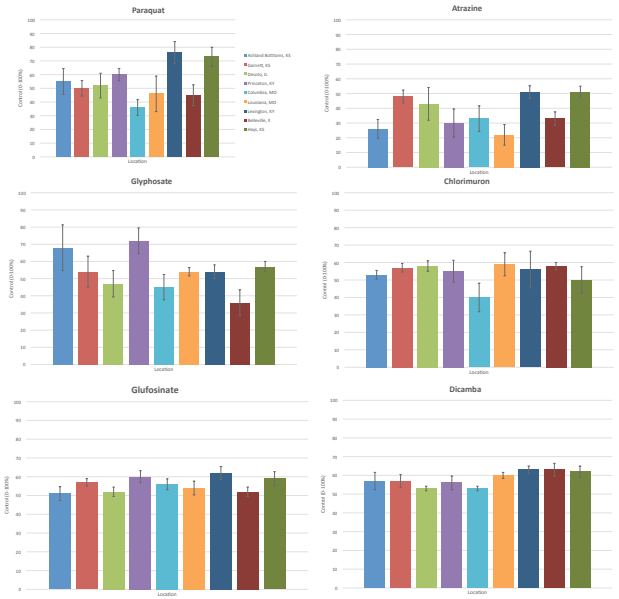
## Methods and Experimental Design

Horseweed seed was collected from two geographically different locations from four states. Experimental design was a randomized complete block with six herbicides, nine locations, and five replications. Five replications from each location were grouped together. Each locations reps were chosen at the same height as the other locations. All horseweed plants were sprayed on October 5, 2018. The 6 herbicides and rates were paraquat (840 g ai/ha), glyphosate (1260 g ae/ha), glufosinate (738 g ai/ha), Atrazine (560 g ai/ha), chlorimuron (13.1 g ai/ha), and dicamba (560 g ai/ha). Visual ratings were taken on 3, 7, and 14 days after treatment using a 0-100% control scale (0- no control, 100- completely dead).

## Results

Horseweed showed the most resistance to atrazine and glyphosate across all locations, and paraquat in some locations. No herbicide had total control 14 days after spraying. Dicamba had the greatest control of horseweed across all nine locations .

**Figure 2**. Level of control of horseweed from each population in response to different herbicide resistance.




## Conclusions

Overall horseweed shows resistance to three different herbicides across nine locations in four different states. Horseweed is quickly metabolizing or relocating the most common herbicides applied across the Midwest. These results show that horseweed may not be controlled with the usual herbicides that have worked in the past. Producers need to consider using herbicide applications with multiple effective modes of action to decrease selection pressure on a given herbicide.

**Figures 3**. A,B,C, and D respectively. A) The spray chamber used to apply the herbicides. B) One replication of horseweed including all nine populations being treated with one herbicide. C) Multiple trays of each herbicide replication. D) Horseweed showing epinasty from dicamba herbicide 7 days after treatment.

## Future Directions

Future experiments will include multiple replications from each growth stage of horseweed to recommend specific herbicides at certain growth stages. In this experiment there was difficulties accessing the true value of control because horseweed plants were too mature. Most of the horseweed plants from different locations bolted at different times and some even went to seed so that may have resulted in less control from the herbicides.

## References

Ge, X., D'Avignon, D., Ackerman, J., & Sammons, R. (2010). Rapid vacuolar sequestration: The horseweed glyphosate resistance mechanism. Pest Management Science, 66(4), 345-348.

Heap, I. The International Survey of Herbicide Resistant Weeds. Online. Internet. Saturday, December 1, 2018 .

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