Response of Selected Indiana Horseweed (*Conyza canadensis*) Populations to 2,4-D

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Introduction

To manage glyphosate-resistant horseweed in Indiana 2,4-D will likely continue to be an important pre-plant burndown herbicide. Preliminary screens on several populations with different herbicides were conducted to determine levels of sensitivity to glyphosate and other herbicides. Prior to this study, no 2,4-D resistant horseweed populations had been reported. In our preliminary screens, we found one population susceptible to glyphosate, but tolerant to 2,4-D. A second population was glyphosate resistant and tolerant to 2,4-D (Creech et. al 2004). Based on these results, we conducted 2,4-D dose response studies on a number of different populations to determine if populations with elevated 2,4-D tolerance were common in Indiana.

Figure 1. Horseweed in a mature Indiana soybean field.

Objective

The objective of this study was to evaluate the biological and reproductive response of various horseweed populations to 2,4-D.

Materials and Methods

There were a total of 9 Indiana horseweed populations selected from the initial 2X (1lb ai/A) screen, each showing the different degree of 2,4-D tolerance. The 3 populations that were fairly sensitive, were subjected to 2,4-D ester at 0, 0.03, 0.06, 0.13, 0.25, 0.5, 1, and 2 lb ai/A. The 6 populations that were fairly tolerant were subjected to 2,4-D ester at 0.13, 0.25, 0.5, 1, 2, 4, and 6 lb ai/A. Treatments were applied in a spray chamber at 20 GPA when the horseweed rosettes were 2-4 inches. Visual ratings were collected 21 days after treatment (DAT) on a scale of 0 (no visible injury) to 100 (plant was completely killed). Plants that survived were allowed to bolt and produce seed. The seeds from 12 capitula's per plant were counted and all data was subjected to analysis of variance and means separated with Fisher's Protected LSD at the 0.05 level.

Results and Discussion

Table 1. Horseweed control 21 DAT with various rates of 2,4-D ester.

	Horseweed Population			
2,4-D rate	90	153	404	7056
lb ai/a	% visual control			
0.13	38	54	39	52
0.25	54	78	50	68
0.5	69	85	62	80
1	78	91	81	94
LSD (0.05)	6			

Table 2: Horseweed capitula and seed count 4 MAT. Twelve capitula's per plant were assessed from plants that survived 0.13 lb ai/A.

Pop.	2,4-D Rate	Capitula	Seed	Total Seed
	lb ai/a	#		
90	0	277	40	11052
153	0	397	49	19294
	0.13	543	57	30734
404	0	451	42	19032
	0.13	698	47	33015
7056	0	375	46	17363
	0.13	618	47	29231
LSD (0.05)		ns	5	ns

Populations 90 and 404 were more tolerant to 2,4-D than 153 and 7056. The images below show the level of control of population 90 (tolerant to 2,4-D) and 153 (sensitive to 2,4-D) with various rates of 2,4-D. Note the response at the 0.13 lb ai/A rate. Population 90 did not produce seed (Table 2). Population 153 did produce substantial amounts of seed. Also, the images below show the control of population 404 (tolerant) and 7056 (sensitive) with various rates of 2,4-D. Population 404 produced more seed at 0 and 0.13 lb ai/A than 7056 (Table2).

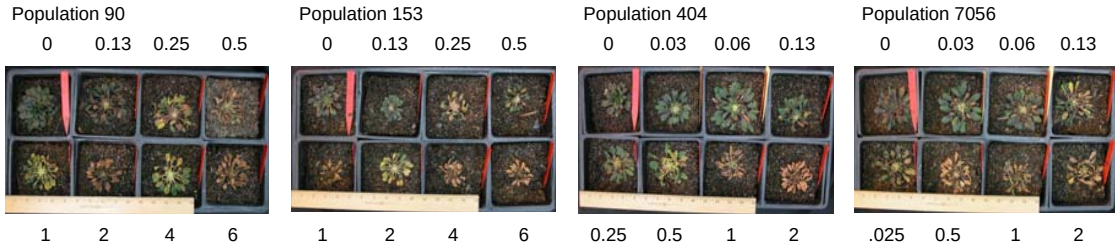

Figure 2. Response of four horseweed populations to various rates of 2,4-D ester. Herbicide rates are in lb ai/A.

Conclusions

Populations 90 and 404 were noticeably more tolerant to 2,4-D than 153 and 7056. Even though population 90 expressed some tolerance to 2,4-D, surviving plants did not produce seed. Although populations 153 and 7056 were fairly sensitive to 2,4-D, plants that survived a low rate were able to produce seed.

At this point we would not classify 90 and 404 as 2,4-D resistant. However, this research shows that differential levels of tolerance to 2,4-D exist in Indiana horseweed populations and plants that survive sub lethal rates can produce viable seed. This will be an important consideration as we determine the appropriate management strategies that minimize development and spread of glyphosate and ALS resistant horseweed populations. To date we have screened 52 out of 461 populations for tolerance to 2,4-D and will continue screening additional populations and evaluating the relationship between plant size and survival rates and seed production of various populations.

Literature Cited

Creech, J. Earl, et al. 2004, North Central Weed Sci. Soc. Abstr. 44. North Central Weed Sci. Soc. Champaign, IL. (Dec. 2004).