Response of Nebraska horseweed (*Conyza canadensis*) populations to lactofen and cloransulam-methyl

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Introduction

The increased occurrence of herbicide-resistant biotypes in some weeds populations is a direct result of selection pressure generated by overreliance on herbicides in modern agriculture. Horseweed (*Conyza canadensis*) is one of the most problematic weed species which has reported cases herbicides resistance in current row crop production systems. Glyphosate-resistant horseweed is widely distributed across Nebraska. However resistance to other herbicide modes-of-action have not been widely reported in the state.

Objective

The objective of this study was to investigate the level and frequency of herbicide resistance to lactofen (Cobra®) and cloransulam-methyl (Firstrate®) in populations of horseweed in Nebraska.

Materials & Methods

Experimental Design

- Randomized complete block design with four replications (blocks) and two experimental runs

Treatment Structure

- Conducted using 94 populations of horseweed collected from 44 Nebraska counties
- Two herbicides: cloransulam-methyl (Firstrate®; ALS-inhibitor) and lactofen (Cobra®; PPO-inhibitor)
- Applications were made using 0.4 ai kg ha^{-1} for lactofen and 0.03 ai kg ha^{-1} for cloransulam-methyl in a single nozzle spray chamber using an application speed of 7 kph with a DG 9502EVS at 345 kPa positioned 0.38 m above the plant
- At 28 d after treatment (DAT), plants were clipped at the soil surface and placed in a dryer for 7 d then weighed
- Data were subjected to ANOVA and means were separated using Fisher's Protected LSD test with the Tukey adjustment

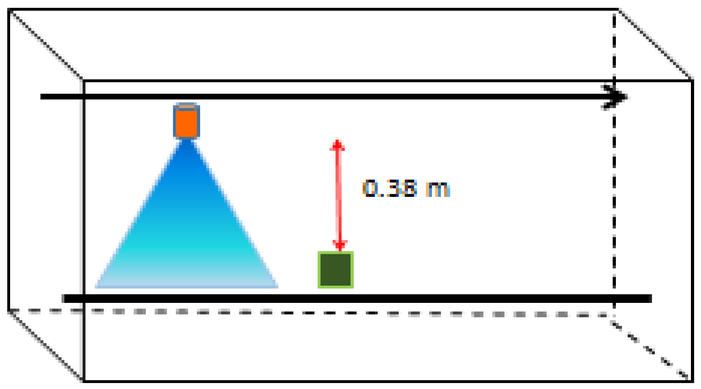

Figure 1. Illustration of spray chamber applying herbicide with the plant positioned 0.38 m above the nozzle.

Results & Discussion

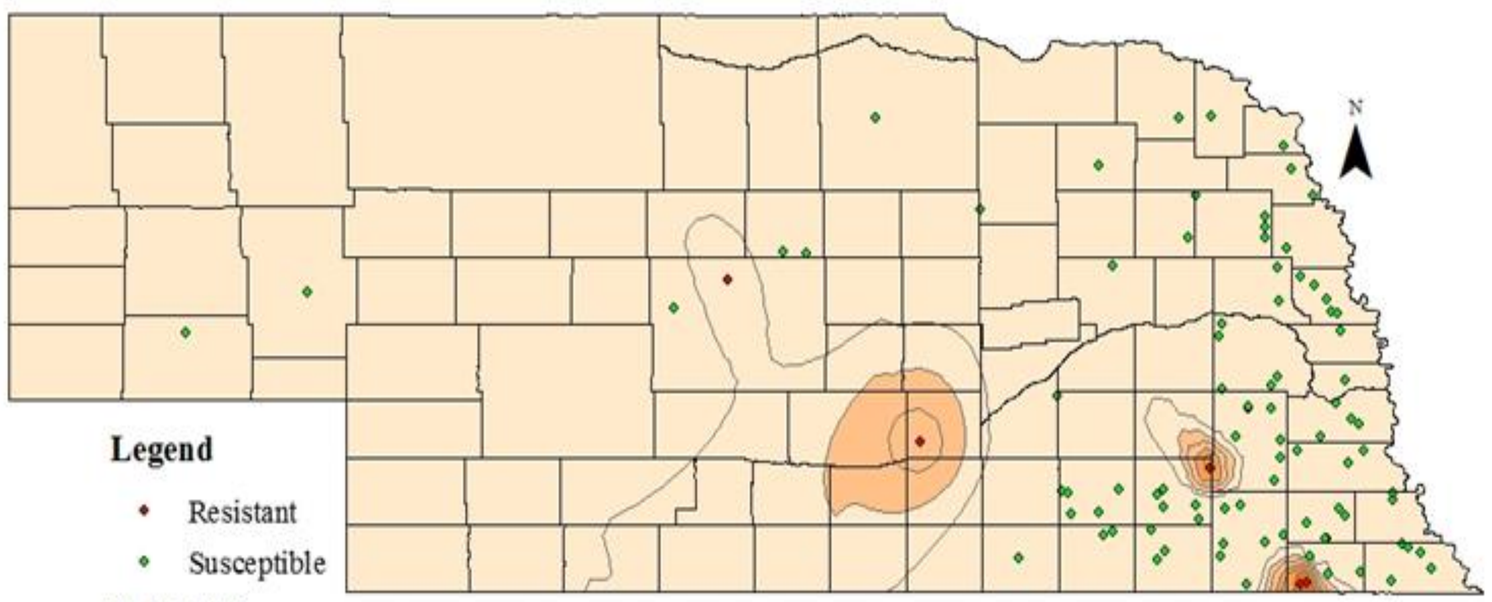

Figure 2. Distribution of ALS-inhibitor-resistant horseweed populations in Nebraska. Areas where darker colors appear are more likely to have ALS-inhibitor-resistant horseweed populations. Red dots indicate areas where ALS-inhibitor-resistant populations were confirmed and green dots indicate areas where susceptible populations were collected from.

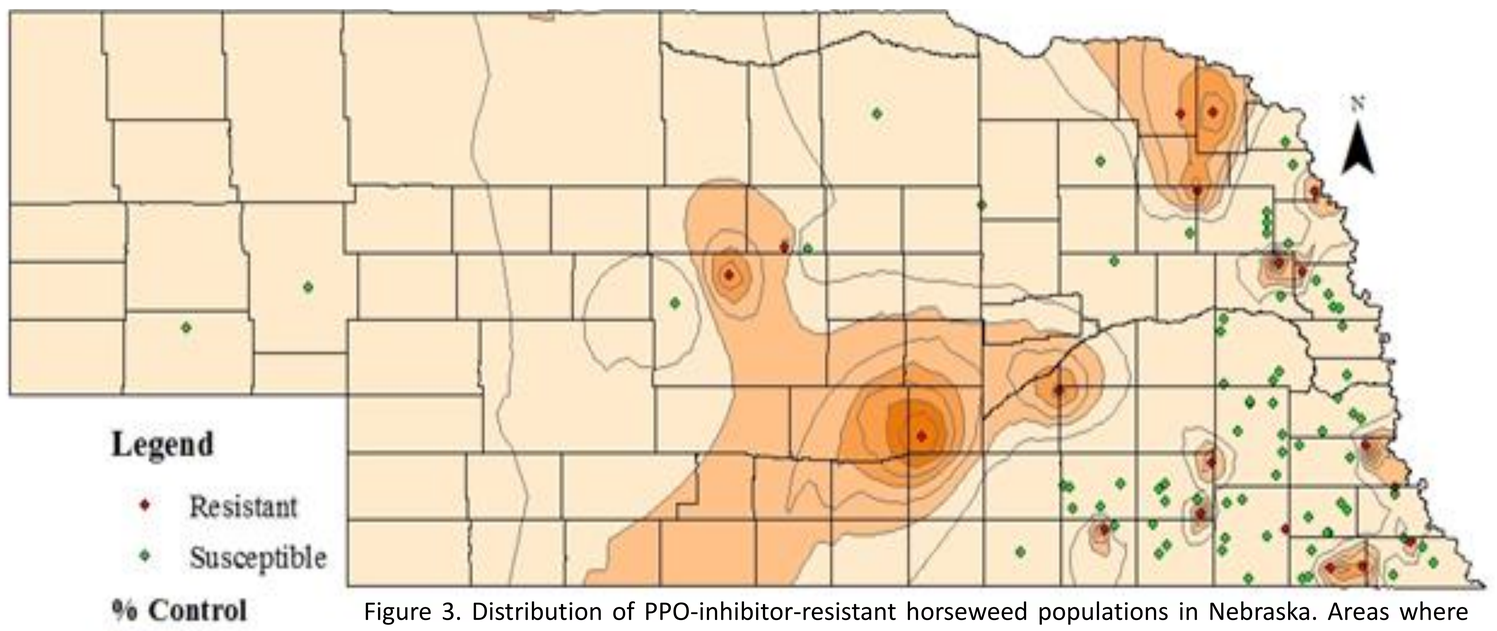

Figure 3. Distribution of PPO-inhibitor-resistant horseweed populations in Nebraska. Areas where darker colors appear are more likely to have PPO-inhibitor-resistant horseweed populations. Red dots indicate areas where PPO-inhibitor-resistant populations were confirmed and green dots indicate areas where susceptible populations were collected from.

- Results confirmed presence of six ALS-resistant horseweed populations and 19 PPO-inhibitor-resistant horseweed populations (Figure 2 and 3).
- ALS-resistant horseweed populations are distributed in the center and southeast and PPO-inhibitor-resistant horseweed populations are distributed in the center, east , southeast and northeast of Nebraska

Conclusion

The results of this work suggest the existence both ALS-inhibitor- and PPO-inhibitor-resistant horseweed populations in Nebraska. Most populations were resistant to either ALS-inhibitors or PPO-inhibitor but not both. However, three populations showed multiple resistance to both herbicides tested. It has also been shown that PPO-inhibitor resistance is more common than ALS-inhibitor resistance in Nebraska. Regarding the distribution of resistant populations in Nebraska, it was verified that the eastern half of Nebraska was much more likely to have resistance to either of the herbicides (likely due to the higher intensity of corn and soybean production systems). Prior work has shown that nearly all of these populations are glyphosate-resistant and growers will have to use proactive means for weed control in soybean where they have ALS-inhibitor- and PPO-inhibitor-resistant populations.