Distribution of Resistance to Imazamox and Tribenuron-methyl in Native Sunflower

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Introduction

Genetic diversity is abundant in native plant species. However, with the introduction of imazamox tolerant (Clearfield) sunflowers and the future introduction of tribenuron-methyl (Express) tolerant sunflowers, an evaluation of the native sunflower tolerance to these herbicides needed to be gauged in order to evaluate future possible genetic outcrossing of the imazamox tolerant and tribenuron-methyl tolerant gene from domesticated sunflowers to native sunflowers. Thanks to the National Sunflower Association weed survey, native sunflower samples were collected from various areas in North and South Dakota, Nebraska, Kansas, and Colorado. This allowed for the evaluation of tolerance to these herbicides from a large number of native sunflower from various locations.

Objective

Evaluate the tolerance of native sunflower to either imazamox or tribenuron-methyl from various locations across the Great Plains before the release of imazamox or tribenuron-methyl tolerant sunflowers.

Procedure

Common (*Helianthus annuus*) and prairie (*Helianthus petiolaris*) sunflower seeds were collected by volunteers through the National Sunflower Association 2002 survey. Seeds were collected from 12, 13, 16, 5, and 3 sites in North Dakota, South Dakota, Kansas, Colorado, and Nebraska, respectively. Longitude and latitude coordinates for each site was recorded. Each site surveyed represented 2,000 hectares (5,000 acres) of sunflowers.

Seeds were cleaned, surface sterilized, scarified, gibberellic acid vacuum infiltrated, and germinated as described by Al-Khatib et al. (1998). Once germinated, cotyledons were placed into pots with a 1:1 mixture of sand and Morrill loam with an organic matter of 2.8% and pH of 5.7. Pots were placed in a greenhouse with a 16-h photoperiod and a temperature of 23/20 C $\pm$ 2 (day/night). Seedlings were fertilized weekly and thinned to three plants per pot over time.

Sunflower seedlings either received imazamox at 43.8 g ai/ha (Beyond at 5 oz/A) with a nonionic surfactant at 0.25% v/v and 28%N at 2.5% v/v or tribenuron-methyl at 17.3 g ai/ha (Express at 0.33 oz/A) with a nonionic surfactant at 0.25% v/v. Applications were made to 7.5 to 10 cm tall sunflower. Treatments had six to 10 replications and the study was repeated twice.

Sunflower survival to either imazamox or tribenuron-methyl was classified as resistant while plant death was classified as susceptible. The recorded sunflower response to the herbicides along with the longitude and latitude coordinates were entered into ArcView and a graphical representation of response of sunflower for each herbicide was generated relative to the location the seeds were collected from.

Results

Resistance to imazamox and tribenuron-methyl was determined in 46 populations of common sunflower and three populations of prairie sunflower. In all fields sampled, at least 8% and 57% of the fields exhibited resistance to imazamox or tribenuron-methyl. In Kansas, at least 12% and 94% of the fields exhibited resistance to imazamox or tribenuron-methyl. More resistance to these herbicides occurred in Colorado, Kansas, and Nebraska than North and South Dakota. This may be due to more prevalent use of sulfonylurea and imidazolinone herbicides over a longer period of time in the southern sampling area than in the north.

In addition, this survey clearly indicates that imazamox and tribenuron-methyl resistance occurred in fields before the release of Clearfield or Express tolerant sunflower.

Acknowledgements

Thanks to the coordinators of the seed collection (Ron Meyer, Roger Stockton, and Max Dietrich) and volunteers who collected the samples for the National Sunflower Association 2002 survey, and thank you to the Integrated Pest Management division of the USDA who supported this work through a mini-grant.

Literature Cited

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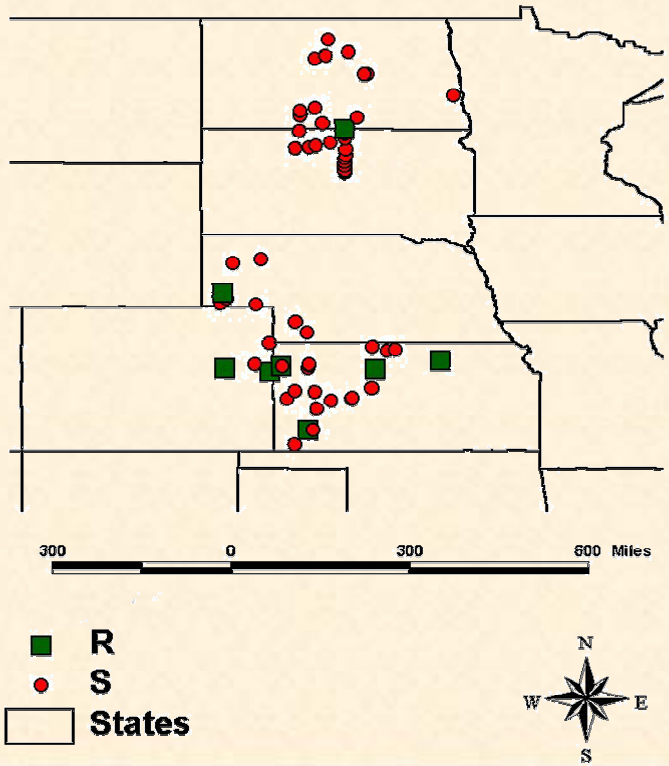
Sunflower Resistance

Imazamox



Tribenuron