INTRODUCTION:

• In the North Central region, 81 percent of the soybean are glyphosate resistant varieties (CTIC 2001).
• No-tillage production has increased to 60 percent with glyphosate used as the primary burn-down herbicide (USDA NASS 2003).
• Glyphosate resistant horseweed is a growing threat for no-tillage soybean acres across the North Central region. Glyphosate resistant horseweed was first reported in Delaware in 2000 (VanGessel 2001). It has since been reported in several other states including Indiana, Ohio, Tennessee, and Arkansas.
• Horseweed is generally a winter annual weed, but 5 to 32 percent are spring germinating (Buhler and Owen 1979). Fall and/or spring tillage is effective for the control of horseweed because it destroys the over-wintering rosette (Kapusta 1979). Horseweed may spread across the region fast because it is wind-disseminated and can establish in a wide range of soil and climatic conditions (Bhowmik and Bekech 1993).
• While tillage may be an effective integrated weed management approach, it is important to find other integrated solutions for the preservation and protection of existing no-tillage fields.
• Horseweed resistance to other herbicides include: Paraquat in MS, Triazines in Europe, ALS integrated solutions for the preservation and protection of existing no-tillage fields.

WHY IS HORSEWEED BECOMING RESISTANT?

Characteristics that enhance SELECTION PRESSURE:

Weed characteristics:
- Annual life cycle
- Highly susceptible to specific herbicides
- Highly susceptible to glyphosate
- High frequency of use
- High seed production
- Extended germination
- Long residual activity in the soil
- Single site of action
- Highly effective on a certain weed
- Extended germination
- High use rate compared to the amount needed for weed control
- High frequency of use
- Lack of crop rotation
- Little or no tillage for weed control
- Multiple application of herbicides with the same site of action

EXPERIMENT OBJECTIVE:

• The objective of this experiment was to evaluate the efficacy of glyphosate tank mixes on a mixed resistant and susceptible horseweed population.

MATERIALS AND METHODS:

• Randomized complete block design field experiment in 2003
• Long term no-till field located in Sellersburg, IN with mixed R & S horseweed population
• 20 treatments X 4 replications in ‘10’ x ’50’ plots
• Glyphosate treatment alone was compared to glyphosate plus tank mixes
• Applications were made 12 days before planting
• Biomass reduction ratings taken 12, 22, 39, and 55 days after EPP application

DATA ANALYSIS:

• Data was analyzed in Agriculture Research Manager (ARM 6.1.12)
• Data was subjected to ANOVA and Means were separated by Fisher’s Protected LSD (P = 0.05)

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RESULTS AND DISCUSSION:

Figure 4: tank mix herbicides that improved horseweed control over glyphosate alone

Figure 5: Tank mix herbicides that did not improve horseweed control over glyphosate alone

(* ) significant at the α = 0.05

• Cloransulam-methyl, flumioxazin, and flumetsulam all provided significantly better horseweed efficacy than glyphosate alone

LITERATURE CITED:


FUTURE RESEARCH:

In the next three years my research will focus on the biology, ecology, and management of glyphosate resistant horseweed. In addition to efficacy studies, I will be conducting two additional studies to further the subject of the biology and ecological aspects of this weed in various agricultural management systems. The objectives of these studies are listed below.

• Management Options - Determine the influence of crop rotation, cover crops, residual non-glyphosate herbicides, and burndown application timing on R and S population density in the soil seedbank.
• Horseweed Survivorship - Compare biology and fitness characteristics, and winter mortality rates of horseweed from fall vs. spring herbicide application timings.