

DEVELOPING A FIELD SURVEY FOR THE ESTIMATION OF GLYPHOSATE-RESISTANT HORSEWEED IN INDIANA. Jeff W. Barnes, William G. Johnson, and Kevin D. Gibson, Post-Doctoral Research Associate, Assistant Professor, and Assistant Professor, Department of Botany and Plant Pathology, Purdue University, West Lafayette, IN 47907.

Discovery of horseweed in Indiana that is resistant to glyphosate in the fall of 2002 sparked interest from producers, crop advisors, extension personnel and industry representatives. A common theme to questions about the problem centers on the geographic distribution and frequency of glyphosate-resistant horseweed in Indiana. The objective was to develop a field survey system in which both geographic distribution and frequency of occurrence could be determined for horseweed. Counties in Indiana were selected for sampling based upon a point system which facilitated establishing an order for sampling. The point system was designed to place highest priority on counties with confirmed or suspected glyphosate-resistance and counties which had a high percentage of cropland in conservation tillage systems. Information on the acreage of corn and soybean devoted to different tillage systems was provided by the Conservation Tillage Information Center.

Survey sites were randomly pre-selected using maps developed from digital aerial raster imagery (orthophotos) originally developed by the United States Geological Service and Natural Resources Conservation Service and the 2000 Cropland Data Layer program conducted by the National Agricultural Statistical Service. Orthophotos and Cropland Data Layers for Indiana counties were compiled by the Purdue Center for Advanced Application in Geographic Information Systems. Maps were developed in the ArcView GIS 3.2 software program. Survey sites were selected in areas where land use was primarily devoted to soybean and corn production. The coordinates for the randomly selected fields were downloaded to a GPS unit and a route was developed to facilitate efficient travel time between survey sites. Information gathered at the survey site included presence of horseweed at the site, current crop, field tillage system, and presence of other weed species. If horseweed was present at the survey site seed from forty plants was sampled and subjected to screening in the greenhouse to determine if the horseweed was resistant to glyphosate. Since soybean was our primary crop of concern, if a pre-selected point was a planted to corn the point was moved to a soybean field within 1-km of the pre-selected site. If a survey site was not a soybean or corn field the survey site was moved to the closest soybean field. The random survey system was supplemented by taking additional samples from cropland in which horseweed were clearly visible from the road. The supplemental sample points were included as a means of identifying potential problem fields within a geographic range in which horseweed was not readily observed and pre-selected survey sites. Supplemental survey sites were not included in data analysis designed to answer the question of frequency of glyphosate-resistant horseweed in Indiana fields as this would have biased the answer.

In the fall of 2003, 792 sites were surveyed for the presence of horseweed in Indiana. Most of the points were in southeast Indiana where the first populations of glyphosate-resistant horseweed were discovered. Of the sites surveyed, 80% were from the randomly pre-selected sites and the remainders were a combination of sites from non-cropped areas, supplemental sites, and fields brought to our attention by producers or crop advisors. The random selection of survey sites from the orthophotos and Cropland Data Layer successfully identified a soybean or corn field with 85% accuracy. Approximately 40% of the sites identified corn fields and most of those sites were moved to a soybean field in close proximity. The combination of the pre-selected sites and supplemental sites have developed good county level maps depicting the geographic distribution and frequency of horseweed prior to crop harvest in Indiana. The data from resistance screening data, tillage system information from the Conservation Tillage Information Center, and data from a producer survey conducted in cooperation with the Indiana Agricultural Statistical Service will be combined to develop risk zone maps fully describing areas in Indiana at different risk levels of having glyphosate-resistant horseweed populations develop.