

Regional Patterns of Herbicide Resistance Traits in Pigweed Escapees.

Executive Summary - North Dakota Soybean Council

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Research Conducted

The NAGC partnered with weed scientists at NDSU to identify herbicide resistance (HR) in North Dakota pigweed populations. Surveyors collected pigweeds from September through November 2021 in 16 counties. NDSU researchers propagated seeds in the greenhouse and divided seedlings into treatment groups to be sprayed with either glyphosate, imazamox, or fomesafen. Along with herbicide testing, leaf samples were submitted to NAGC to search for genetic markers associated with resistance to the three herbicides.

Why the research is important to ND soybean farmers

Finding HR hotspots is a top priority in ND after the recent invasion of Palmer amaranth and the increasing suspicion of extensive HR in other pigweeds. Each year farmers report pigweeds that escape herbicide applications, yet no formal surveys or experiments have explored these issues. Our project is the first in ND to begin a survey to test multiple pigweed species for HR using both herbicide trials and genetic testing.

Final findings of the research

Seedling survival in the greenhouse and independent genetic testing support widespread HR in pigweeds (Fig. 1). In total, 1796 seedlings, mostly waterhemp, were included in the herbicide treatments (Fig. 2). Waterhemp populations in 6 counties could overcome all three herbicides. Genetic analysis found markers linked to glyphosate and fomesafen resistance in both field (parent) and greenhouse (offspring) plants. In fact, waterhemp populations had plants with genetic markers linked to resistance for both herbicides, suggesting stacked resistance within individuals. The survey also found three new infestations of Palmer amaranth in Ward County, as well as evidence for imazimox resistance in tumble pigweeds for the first time.

Benefits/Recommendations to ND soybean farmers and industry

Identifying HR populations through greenhouse and genetic testing is beneficial at multiple levels. At the county level, reporting HR populations help agencies monitor the spread of these troublesome traits and provides data on where resources are needed for eradication. Creating a statewide distribution map increases awareness of encroaching HR pigweeds and intensifies scouting efforts. At the farm level, knowing the exact HR traits in the field helps with decisions on herbicides to include (or avoid). Mixes of herbicides are used to combat pigweeds, but the returns of using particular mixes diminishes when local pigweeds have resistance to herbicides in the mix. Lastly, growers rely on NDSU Extension for recommendations on effective herbicides, which are based on data from greenhouse or test plot research. NAGC's ability to provide genetic testing for HR alleviates some of the demands for greenhouse work and further helps researchers select seed sources for herbicide trials when space and time are limited.

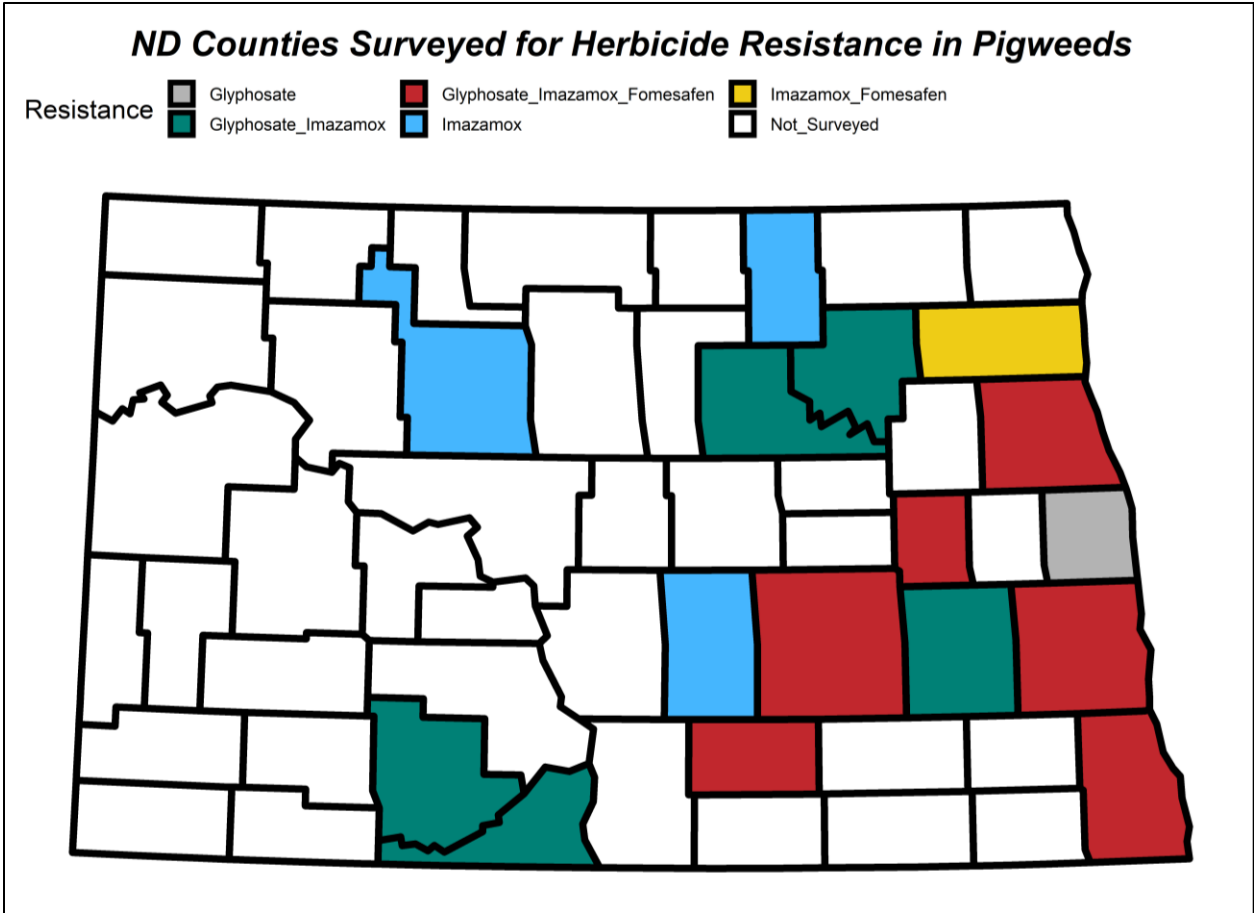


Figure 1. Statewide map describing the particular HR diversity of pigweed samples from the 16 counties. There were pigweeds resistant to at least one herbicide in all surveyed counties.



Figure 2. Cone-tainers containing pigweed seedlings that are ready for herbicide trials in the greenhouse. A single leaf was collected for genetic analysis prior to treatment.