Power and Pitfalls of Genetic Resistance Testing

Abstract:

Crop production in Canada is greatly affected by herbicide-resistant weeds. Herbicide resistance is estimated to cost Canadian farmers tens to hundreds of millions in some provinces (e.g. Saskatchewan: $43 to $343 Million annually) due to increased use of herbicides and decreased crop yield and quality from weed competition. Traditional dose-response methods using weed seeds planted and grown in greenhouse to confirm resistance to specific herbicides in suspected weeds can take 6-12 months and results can only be considered for decision making purposes in the following season. Recently developed genetic tests use leaf tissues from suspected weed samples collected in fields and involve DNA extraction and analyses to determine the presence of mutations conferring resistance in the plant. This molecular approach renders resistance testing much cheaper and faster, hence more accessible to farmers. Test results can be communicated back to farmers within 1-2 weeks of sampling, allowing efficient, in-season decision-making and adjustments to weed management programs. Since 2015, multi-partner projects featuring collaborative networks of federal, provincial and private researchers continue contributing to a growing list of quick genetic test protocols for many concerning weed species. There are currently at least 94 developed and validated tests made available to regional service labs offering testing to farmers for 30 weed species covering 5 herbicide resistance groups. Thousands of genetic tests have been conducted commercially across many Canadian provinces. These services support information-based weed management decisions at field level through enabling farmers to detect issues early and make timely choices based on the presence of resistant weeds in their crops.