AGR1404 Development of Rapid Assays for Determination of Group 1 and 2 Herbicide Resistance in Weeds

Rapid herbicide-resistant (HR) weed bioassays can facilitate timely and economical screening of suspected populations as a first step in their management. The objectives of this project were to develop (1) rapid (seven day) soil-less bioassays for screening wild oat (*Avena fatua* L.) and green foxtail (*Setaria viridis* L. Beauv.) for resistance to the Group 1 (acetyl CoA carboxylase inhibitor) herbicides, clethodim and pinoxaden; and (2) rapid bioassays for screening wild oat (model grass weed) and wild mustard (*Sinapis arvensis* L.; model broadleaf weed) for resistance to herbicides belonging to various Group 2 herbicide (acetolactate synthase [ALS] inhibitor) classes. Shoot length inhibition and presence of seedlings with shoot tips exhibiting chlorophyll (with or without emerged first leaf) at 1 µM clethodim and 16 µM pinoxaden reliably identified HR and – susceptible (HS) wild oat and green foxtail seedlings in an agar dish bioassay. Using a root length bioassay for wild mustard, concentrations of flucarbazone, pyroxsulam, imazamox/imazethapyr, and metsulfuron were added to a representative Saskatchewan soil. The developed soil pouch bioassay enabled HR biotypes to be distinguished from HS biotypes, and was successfully applied for determination of percentage of HR plants in wild mustard populations. Root length bioassay for wild oat did not allow differentiation of HR from HS biotypes, as all of the examined biotypes were found to be tolerant to flucarbazone, pyroxsulam, and metsulfuron, but sensitive to imazamox/imazethapyr. It was then decided to pursue cleavers (*Galium* spp.) as a weed species for which the bioassay for resistance may be suitable. Preliminary studies with cleavers showed that root length inhibition of an HS biotype increased significantly whereas it remained unchanged for an HR biotype in response to addition of all four ALS-inhibiting herbicides to the model soil. Future work is recommended to evaluate the herbicide concentrations at which HS and HR biotypes can be distinguished for cleavers, to use this test to assess the percentage of resistance in cleavers populations.