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Department Head: Robert Gillen

Project Timeline: March 1, 2018 through February 28, 2019

Progress Report: June 15, 2018

Objective # 1. Determine the baseline sensitivity of waterhemp and Palmer amaranth populations from Kansas fields to glyphosate, 2,4-D, and dicamba.

- In addition to previous seed collections of Palmer amaranth populations by Dr. Phillip Stahlman, about twenty more populations were collected in fall of 2017. Matured seeds of Palmer amaranth plants (40 to 45 female heads per field site) were randomly collected from northcentral Kansas fields.
- The collected female heads from each population were hand-threshed and cleaned by using different size sieves and a column blower. Cleaned seeds of those 20 populations were tested for germination in incubation chambers and showed variable level of dormancy in preliminary experiments.
- Therefore, seeds of those populations were kept in paper bags and stored at 4 °C to release the dormancy and will be further subjected to germination test by end of June.
- Greenhouse experiments to study the baseline sensitivity of Palmer amaranth populations to glyphosate, 2,4-D, and dicamba will be initiated in July.
- Field survey on further seed collections of Palmer amaranth and waterhemp populations will be initiated during the late summer of 2018 across the various parts of Kansas.
Objective # 2. Investigate the mechanism of 2,4-D resistance in Palmer amaranth.

- Progeny of a previously identified putative 2,4-D-resistant Palmer amaranth population were subjected to recurrent group selection for two generations to have a sufficient seed of a more homogenous Palmer amaranth population for 2,4-D resistance.
- Since we do not phenotype each individual plant in the population, we need to have a high frequency of resistant plants in a population to start with the mechanism study.
- Therefore, we made crosses of male and female plants of putative 2,4-D-resistant population that had survived 2,4-D treatment under controlled conditions to advance at least 2 generations.
- We anticipate to have enough seed by end of July and will start mechanism experiments during the fall of 2018.

Objective # 3. Evaluation of integrated herbicide programs for managing herbicide-resistant (HR) waterhemp and Palmer amaranth in Roundup Ready 2 Xtend® soybeans.

- Two field experiments have been established: One at the Kansas State University Agricultural Research Center (KSU-ARC) near Hays, KS and second at Kansas State University Ashland Bottom (KSU-AB) research farm near Manhattan, KS.
- Soybean plots are established under no-till wheat stubbles at the KSU-ARC; whereas, study site at KSU-AB is under conventional tillage system.
- Experiments at both sites are setup in randomized complete block design with 4 replications.
- Study site at KSU-AB had natural infestation of glyphosate-resistant (GR) Palmer amaranth; whereas, seedbank of GR Palmer amaranth was artificially established at KSU-ARC site.
- A Roundup Ready 2 Xtend soybeans Asgrow “AG34X7” at 156,900 seeds/ac was planted on May 22, 2018 at KSU-ARC, while Roundup Ready 2 Xtend soybeans Asgrow “AG39X7” at 130,000 seeds/ac was planted on June 4 at KSU-AB.
- The selected preemergence (PRE) herbicide programs were applied at each location immediately after soybean planting.
- Data collection on soybean performance and Palmer amaranth control will be recorded in the upcoming weeks at both sites.

Objective # 4. Develop and deliver education materials for management/containment of HR waterhemp and Palmer amaranth in Kansas soybean production.

- Field plot demonstration for objective # 3 will be showcased to the clientele in the upcoming annual field days at KSU-AB and KSU-ARC.
- Information generated on the baseline sensitivity of Palmer amaranth and waterhemp populations to selected herbicides, mechanism of 2,4-D-resistance in Palmer amaranth, and herbicide recommendations for managing HR waterhemp and Palmer amaranth will be compiled into annual field research reports, and refereed publications at the end of the project.
Personnel:

1. A Ph.D. student has recently been recruited to conduct the aforementioned research objectives and oversee the progress of project under direct supervision of the PI.
2. An undergraduate summer intern has also been hired to assist in the greenhouse and field experimentation.