**ML 2015, CH. 76, Art. 2, Sec. 6a, MITPPC Sub-Project #12 Project Abstract**
For the Period Ending January 30, 2020

**PROJECT TITLE:** MITPPC Sub-project #12: Developing robust identification assays for *Amaranthus palmeri* in seed mixture
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**FUNDING SOURCE:** Environment and Natural Resources Trust Fund
**LEGAL CITATION:** ML 2015, Ch. 76, Art. 2, Sec. 6a

**SUB-PROJECT AMOUNT: $208,230**
**AMOUNT SPENT: $ 208,230**
**AMOUNT REMAINING: $ 0**

**SOUND BITE:** This project created a highly reliable test for detecting Palmer Amaranth, in individual plants and pools of seed. The test is expected to be commercially available and will be an important tool for Minnesota farmers, crop consultants, and agronomic specialists. Palmer amaranth can reduce corn and soybean yields by 80-90%.

## Overall Project Outcome and Results
Palmer Amaranth is an aggressive and prolific weed species that poses a major ecological and economic risk to growers in the state of Minnesota. Closely related to other pigweed species, Palmer has a far more severe impact on agricultural row cropping systems. Early identification of Palmer Amaranth is critical, as it has developed resistance to some of the most widely used herbicides; ALS-inhibitors, PPO-inhibitors, and glyphosate. Visual identification of Palmer Amaranth against other pigweed species is difficult, which has led to the use of genetic testing becoming the standard for identifying Palmer.

To address this emerging challenge we collected at team of weed science experts from the University of Minnesota, Colorado State University and the Minnesota Department of Agriculture. This team developed an improved genetic test to maximize the robustness and reliability of Palmer Amaranth identification for both individual plants and bulk seed screenings. To achieve this, our team collected Pigweed samples across the United States as well as Mexico, South America and Africa. We extracted DNA samples from a total of 24 populations of Palmer amaranth and 42 non-Palmer pigweeds, resulting in DNA from over 2,000 individual plants. We sequenced more than 800 of these samples through the University of Minnesota Genomic center to search for genetic differences between Palmer and the other species. These differences served as a target for developing a set of genetic markers that can be used for species identification. Once developed the genetic markers were tested against 1,250 pigweed samples to assess their performance.

The final result is a highly reliable test for (>99.7% accuracy) for detecting Palmer Amaranth, both for individual plants and pools of seed. This test will be an important tool for Palmer control for Minnesota growers, crop consultants, and other agronomic specialists. The test is expected to be commercially available in 2020.

## Project Results Use and Dissemination

This project resulted in the development of a robust, highly accurate and easy to use assay for the identification of Palmer Amaranth against other pigweed species. This assay is commercially viable, and a patent was filed for the two markers developed solely at UMN on March 27th, 2020 (Patent #63,000,946). Collaborators at Colorado State University has stated their interest in licensing the tests and offering them as part of a comprehensive Pigweed seed testing service.

This project has also resulted in the creation of a large body of genetic sequence data for Pigweeds assembled from across a wide geographic range. This data will be a valuable resource for future work on Palmer Amaranth and related pigweed species, and will be made publically available through NCBI.

Results of this project were shared at a seminar at Colorado State University, a session at a joint meeting of the Upper Midwest Invasive Species Conference and North American Invasive Species Management Association, and an Applied Plant Science seminar at the University of Minnesota. A YouTube video about the project was created for general audiences as well.

Active presence during regional Palmer Amaranth conference calls allowed us to keep neighboring states appraised of our progress and will be one avenue of announcement for when the Palmer identification test when it becomes commercially available.

A peer reviewed journal article is currently in writing to be submitted to Frontiers in Plant Science, and presentations are being prepared for sessions at two upcoming conferences: the Ecological Society of America in August 2020 and the Upper Midwest Invasive Species Conference in October 2020..