Project Title: Palmer amaranth control in sugarbeet

Project Number/Description: 2018-4, this is a new project

Project Leader: Thomas J. Peters, Extension Sugarbeet Agronomist, NDSU and Univ. of Minnesota

Other Personnel Involved: Nevin Lawrence, Assistant Professor, Univ. of Nebraska, Scottsbluff and Cody Creech, Assistant Professor, Univ. of Nebraska, Scottsbluff

Project Location: TBD in Nebraska

Justification for Research: Summary of Literature Review: Palmer amaranth (*Amaranthus palmeri*) is an aggressive and invasive weed, native to the desert regions of the southwest United States and northern Mexico. It has slowly infiltrated the southeast United States and has become one of the most significant weed pests of cotton and soybean production in the south. Adding to urgency, many populations are resistant to glyphosate (SOA9) and ALS herbicides (SOA2). Palmer amaranth was identified in CRP acreage in Lyon and Yellow Medicine Counties in southwest Minnesota in 2016 and recently was identified in Todd and Douglas Counties in west central, MN. Palmer amaranth could potentially become a major agronomic weed in sugarbeet.

Palmer amaranth, like waterhemp, is dioecious or individual plants are either male or female. Dioecious forces outcrossing and genetic diversity thus providing Palmer amaranth the ability to adapt and quickly spread herbicide resistance genes when selection pressure is applied (as when producers repeatedly apply single mode of action herbicides). Palmer amaranth is a prolific seed producer. Each plant can produce at least 100,000 seeds when they compete with a crop and in noncompetitive scenarios, can produce nearly a half million seeds. Palmer amaranth seeds thrive in no-till or reduced tillage fields. In those situations, seeds can stay in their ideal emergence zone, the top inch of soil. Humans easily transport the small seeds through grain, seed, or feed contamination; or on farm equipment such as combines. Palmer amaranth plants can grow 2 or 3 inches per day under ideal conditions. Palmer amaranth can create yield losses up to 91 percent in corn (Massinga, et al.) and up to 79 percent in soybean (Bensch, et al.) when allowed to compete throughout the growing season. Populations have evolved resistance to multiple herbicide modes of action, including ALS inhibitors, triazines (SOA5), HPPD inhibitors (SOA27), dinitroanilines (SOA3), and glyphosate. Emergence period extends well into the growing season and can, at times, emergence after crop harvest. This emergence period forces producers to manage the weed throughout the year.

Research to control palmer amaranth in sugarbeet has been conducted in Michigan by Dr. Christy Sprague. Dr. Sprague's research concluded layering of ethofumesate PRE and chloroacetamide herbicides POST was the most effective palmer amaranth control strategy. Betamix was also a valuable tank-mix component since populations in Michigan are resistant to PowerMax. A greenhouse experiment conducted by Peters at NDSU in 2016 found POST control on small Palmer amaranth. Ethofumesate with Betamix plus UpBeet suppressed or control 2-inch Palmer amaranth but did not control 4- or 8-inch Palmer amaranth.

It is important that recommendations be developed for Minnesota and North Dakota since soil texture and organic matter are different than Michigan soils. A possibility is to conduct trials in Nebraska with indigenous Palmer amaranth populations and where soils are similar to North Dakota and Minnesota. 2018 Objective: Consider Palmer amaranth control in sugarbeet using weed control programs that fit Minnesota and North Dakota production.

Materials and Methods: Project shall be implemented in collaboration with Drs. Nevin Lawrence and Cody Creech, University of Nebraska. Experiment shall be planted at three locations in Nebraska where

Palmer amaranth is an indigenous weed. Intent is for at least one of the locations to consider soils similar to North Dakota and Minnesota. Experiment shall be a randomized complete block design and four replications. Data collection shall include a visual assessment of weed control and weed counts per square meter where appropriate. Experiment would be carefully managed for diseases including rhizoctonia and Cercospora leaf spot. The treatment list shall include:

Trt #	Product	Rate (pt, or fl oz/A)	Sugarbeet stage (lvs)
1	PowerMax / PowerMax	28 / 28	2 / 6
2	Etho / PM / PM	3p / 28 / 28	Pre / 2 / 6
3	Ethofumesate / Warrant	3p / 4p	Pre/ 4
4	Ethofumesate / Ethofumesate	3p / 3p	Pre/ 4
5	Ethofumesate / Warrant	3p / 4p	Pre/ 6
6	Ethofumesate / Ethofumesate	3p / 3p	Pre/ 6
7	Ethofumesate / Warrant /Warrant	3p / 3p / 3p	Pre/ 4 / 6
8	Ethofumesate / Ethofumesate / Etho	3p / 2p / 2p	Pre/ 4 / 6

Time Line of Anticipated Accomplishments: Results of field experiments shall be summarized and written in the Sugarbeet Research and Extension Report and discussed at grower field tours and meetings in 2018. A tour could be arranged for General Agronomists at the Cooperatives in June or early July. Project may be continued in 2019-20 so that data can be published in a referee journal.

Progress Toward Objectives of On-going Projects: Not relevant at this time

Budget Requested: $8,118 (see the attached Budget Summary for details).