PETERS, THOMAS J.[1], AARON L. CARLSON[1] and RICHAD K. ZOLLINGER[2], [1]North Dakota State University and the University of Minnesota and [2]North Dakota State University, NDSU Dept. 7670, PO Box 6050, Fargo, ND 58108-6050. **A Systems Approach to Weeds Management in Fields Planted to Sugarbeet.**

ABSTRACT

While weeds were not regarded as a serious production problem by sugarbeet growers who completed the 2014 annual sugarbeet growers' survey, the percent of growers reporting excellent weed control using glyphosate has trended downward since 2008 and the number of growers reporting good weed control has trended higher. Weed shifts, as a result of selecting for biotypes of weeds with greater glyphosate tolerance, is a natural process but probably has been accelerated by the use of the RR weed control system in multiple crops in the crop sequence and may partially explain results from the sugarbeet growers' survey. There are several weeds in sugarbeet that are not adequately controlled by or are demonstrating low-level resistant to glyphosate. Herbicides applied in combination with glyphosate also are less efficacious against weeds due to resistant biotypes (acetolactase synthase inhibitors) or are being discontinued by their manufacturers (desmedipham plus phenmedipham). We are exploring is a weeds management strategy where herbicides from multiple herbicide families are used in crops grown in sequence with sugarbeet to indirectly benefit weed control in sugarbeet. Research objectives were waterhemp (Amaranthus spp.) and kochia (Kochia scoparia) control in corn and soybean utilizing a 'systems approach' that: a) is not reliant upon Roundup Ready technology; b) provides complete and season-long control of waterhemp and kochia; c) utilizes herbicides from herbicide families grouped by site of action that compliment herbicides used in other crops within the cropping sequence including sugarbeet; and d) utilizes herbicides with appropriate rotation flexibility, thereby allowing corn, soybean, and sugarbeet to be planted in the crop sequence. Experiments were conducted on natural populations of waterhemp near Herman, MN and on natural populations of kochia and lambsquarters near Barney, ND in 2014. Herbicide treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO2 at 40 psi to the center four rows of six row plots 30 feet in length in a field with moderate to heavy levels of glyphosate-resistant waterhemp. All evaluations at both locations were a visual estimate of percent fresh weight reduction in the four treated rows compared to the adjacent untreated strip. Experimental design was a randomized complete block with 4 replications at both locations. Corn injury was negligible from all herbicide treatments in corn but some herbicide treatments, especially SofA group 14 herbicides, injured soybean. Multiple herbicide treatments applied preemergence, preemergence plus postemergence or postemergence and representing site of action group families, long chain fatty acid inhibitors (15), PPO inhibitors (14), photosystem II inhibitors (5), auxin inhibitors (19) and growth regulators (4) provided near 100 percent control of green foxtail, waterhemp, lambsquarters and redroot pigweed at canopy closure in corn. Preemergence plus postemergence herbicides tended to provide broad-spectrum control in soybean as compared to postemergence herbicides which tended to provide weed specific control. There also are more SofA group 14 herbicides in herbicide treatments in soybean and thus, restricted options for diversifying herbicide families in soybean. Corn and soybean herbicides afforded good crop sequence flexibility.

Adapting and utilizing a systems approach will require a strategic orientation for decision making in crop production. For example, the Farmer must be keenly aware of problems weeds in fields and herbicide treatment and herbicide families' options for their control. Record keeping

and a commitment to prevent weed seed from entering the soil seedbank will be paramount to accomplishing the strategy. Finally, decision-making will involve consideration of data derived from multiple sources. Over time it may be valuable to adapt the decision support systems growers use in selecting weed control solutions from crop-based to weeds-based and incorporating additional supporting layers of data including site of action group, information on herbicide residues and ‘cost’ into an algorithm for selecting weed control programs at the field level and across crop sequences.