SEQUENTIAL HERBICIDE APPLICATIONS TO MANAGE WEED COMPETITVE LOADS IN CORN. Timothy L. Trower, Chris M. Boerboom, and Joseph D. Bollman, Senior Outreach Specialist, Professor, and Graduate Student, Department of Agronomy, University of Wisconsin, Madison, WI 53706.

Two field studies were conducted at the University of Wisconsin Arlington Research Station to investigate the effects of sequential herbicide applications on weed competitive loads and corn yields. Competitive load (CL) is the parameter used in WeedSOFT to integrate weed density and competitive ability across weed species to calculate potential early season and total season yield loss. The CL of a weed species is defined as the number of plants per 100 ft^2 multiplied by its competition index (CI) multiplied by a crop-weed height modifier. The sum of the CLs equals the total competitive load (TCL). Giant foxtail and common lambsquarters were the main weed species in both studies and have CIs of 0.7 and 3, respectively. The first study consisted of preemergence applications of dimethenamid at 0.47 lb ai/a or dimethenamid plus atrazine at 0.42 plus 0.52 lb ai/a applied alone or sequentially with glyphosate at 0.75 lb ae/a compared with postemergence glyphosate. Three postemergence timings were compared: early postemergence (3 to 4 inch weeds in the nontreated control), mid-postemergence (3 to 4 inch weeds in the dimethenamid treatment), and late postemergence (6 to 8 inch weeds in the dimethenamid treatment). The second study investigated the effect of TCL on weed growth and corn yield with half-rates of acetochlor, atrazine, pendimethalin, flufenacet, metolachlor, and mesotrione plus metolachlor applied preemergence as compared with a sequential program of the soil-applied herbicides followed by glyphosate. Weed species counts and heights were collected for 8 weeks after planting from two permanent quadrants per plot placed over the corn rows. The trial design for both studies was a complete randomized block with four replications and plots that measured 10 by 25 feet.

The TCL value of the nontreated control in the first study was 1398 compared with 351 for dimethenamid and 8 for dimethenamid plus atrazine when evaluated on June 30. TCL ranged from 56 to 70 at the time of the sequential glyphosate applications when dimethenamid was applied preemergence. TCL ranged from 0 to 13 at the time of the sequential glyphosate applications when dimethenamid plus atrazine was applied preemergence. In contrast, TLC values of 1602, 1104, and 1208 were calculated for glyphosate applied postemergence at the early, mid-postemergence, and late postemergence application timings, respectively. Information collected from the study was entered into WeedSOFT to predict early season and total season yield losses. WeedSOFT predicted a 78 bu/a total season yield loss for the nontreated control compared with an actual yield loss of 105 bu/a. The top yielding treatment in the experiment was 207 bu/a. The predicted early-season yield losses with the sequential glyphosate treatments were less than 1%. All sequential glyphosate applications following dimethenamid yielded more than dimethenamid alone. Yields did not differ among dimethenamid plus atrazine applied alone or sequentially with glyphosate. WeedSOFT predicted early-season yield losses ranging from 11 to 16 bu/a with glyphosate applied alone postemergence. Yields did not differ among glyphosate treatments applied alone at the three postemergence timings and yields were similar to dimethenamid treatments, but generally less than dimethenamid plus atrazine treatments.

All soil-applied herbicides in the second study had lower TCLs compared to the nontreated control. The TCL for the nontreated ranged from 937 at 32 DAT to 2676 at 61 DAT. The herbicides were ranked from greatest to lowest TCL when evaluated at 61 days after application: metolachlor, flufenacet, pendimethalin, atrazine, mesotrione plus metolachlor, and acetochlor. Weed and crop information was entered into WeedSOFT to determine the predicted early-season and full season yield loss. With only one exception, the final yield rankings matched the WeedSOFT predictions. Yields did not differ between acetochlor and mesotrione plus metolachlor applied preemergence or as a sequential treatment with glyphosate. Conversely, a sequential application of glyphosate increased

corn yield by 78 bu/a compared with flufenacet applied preemergence and 94 bu/a compared with metolachlor applied preemergence. The use of preemergence residual herbicides can reduce the early season weed density and height, which allows postemergence herbicide applications to be delayed without increasing the risk of yield loss from early season weed competition.