

GUZA, COREY J.<sup>3</sup> \*, COREY V. RANSOM<sup>1</sup>, DON MORISHITA<sup>2</sup>, AND CAROL MALLORY-SMITH<sup>3</sup>, Oregon State University, Malheur Experiment Station, 595 Onion Ave., Ontario, OR 97914, Twin Falls R&E, Center P.O. Box 1827, Twin Falls, ID 83303, Oregon State University, 107 Crop Science Bldg., Corvallis, OR 97330. **Effectiveness of glyphosate and glufosinate for weed control in transgenic *Beta vulgaris* varieties.**

#### ABSTRACT

Due to the development of herbicide resistant sugar beet varieties, five studies were conducted at two locations, Ontario, OR, and Kimberly, ID, to determine the effect of application rates, timings, and additives for weed control, and the impact on sugar beet (*Beta vulgaris*) yield with the herbicides Liberty (glufosinate) and Roundup (glyphosate). For the Liberty trials, two application sequences, one initiated on 1-inch weeds and the other initiated on 3-inch weeds were followed by sequential applications of Liberty at two rates, 21 oz/A and 27 oz/A with and without the addition of ammonium sulfate (AMS). These treatments were compared to a standard herbicide program of Progress (ethofumesate-desmedipham-phenmedipham) applied to cotyledon (COT), 2-4 leaf (2-4 LF) and 6-8 leaf (6-8 LF) sugar beets at a rate of 1.5 pt/A. The Liberty studies were identical at both locations. The remaining three trials, two at Ontario and one at Kimberly, involved Roundup resistant sugar beets and Roundup Ultra applications at a rate of 1.0 qt/A. Of the two trials at Ontario, one of the studies involved Roundup timings compared to a standard treatment of Progress applied to COT, 2-4 LF and 6-8 LF sugar beets at a rate of 1.5 pt/A. The other trial at Ontario involved Roundup Ultra combined with residual herbicides. These combinations were compared to a standard herbicide program of Nortron (ethofumesate) applied preplant incorporated (PPI) at a rate of 2.0 pt/A, Progress applied COT at 1.13 pt/A, Progress and Upbeet (triflurosulfuron) applied 2-4 LF at 1.5 pt/A and 0.03 oz/A, and Progress, Upbeet and Poast (sethoxydim) applied 6-8 LF at 1.5 pt/A, 0.03 oz/A and 1.5 pt/A. The Roundup study at Kimberly was a combination of the two Ontario studies. The Roundup treatments in this study were compared to the same standard as the Ontario residual herbicide study with the exception that Poast was not applied 6-8 LF at Kimberly. To determine the most effective time to apply Roundup, two timing sequences were evaluated. One began at COT stage sugar beets and the other began at 2-4 LF sugar beets. Roundup applications were made 1 and 2, 2 and 3, and 4 weeks after the initial COT application and 1 and 2, and 4 weeks after the initial 2-4 LF application. Roundup Ultra tank mixed with 1.7 pt/A of Dual II Magnum, 0.64 lb/A of S-dimethenamid, and 2.0 pt/A of Nortron were applied once to 2-4 LF sugar beets. The study design for all five trials was a randomized complete block and the spray volume was 20 gal/A (GPA). The Liberty resistant sugar beet varieties, Beta 8757 LL at Ontario, and Beta 8455 LL at Kimberly, were planted on April 16, 1998 and April 22, 1998, respectively. The same Roundup resistant variety, HM Pillar RR, was planted April 22, 1998, at Ontario and May 7, 1998, at Kimberly. Evaluations were taken on the weed species redroot pigweed (*Amaranthus retroflexus*), common lambsquarters (*Chenopodium album*), and hairy nightshade (*Solanum sarrachiodes*) 28 days after the final herbicide treatment. Multiple applications of Liberty provided control at levels equal to the standard herbicide program for most treatments (91-100%). However, common lambsquarters control was lower in treatments for which Liberty was initially applied to 1-inch weeds at 21 oz/A at Ontario, OR (85%). The same result occurred for Liberty treatments applied initially at 3-inch common lambsquarters at a rate of 21 oz/A without ammonium sulfate (75%) as well as a rate of 27 oz/A with ammonium sulfate (68%) at Kimberly. Sequential applications of Roundup Ultra and tank mixtures of Roundup

Ultra with residuals were effective in controlling all weed species studied, providing 94 to 100% control. Sugar beet yields with Liberty and Roundup Ultra treatments were equal to the standard herbicide treatments. However, with Liberty treatments, applied at rates of 27 oz/A with and without ammonium sulfate applied to 1-inch weeds, and 21 oz/A of Liberty with ammonium sulfate applied to 3-inch weeds, sugar beet yields were greater, 35, 37 and 36 ton/A, than the standard treatments at Kimberly, 23 ton/A. Sugar beet yields with Roundup Ultra applied sequentially for all treatment timings were also greater, 35 to 38 ton/A, than yields with the respective standard program at Ontario, 30 ton/A. Liberty resistant sugar beet yields at Ontario, with variety Beta 8757 LL, ranged between 39 and 42 ton/A. Liberty resistant sugar beet yields at Kimberly, with variety Beta 8455 LL, ranged between 23 and 37 ton/A. Sugar beet yields with the Roundup resistant variety HM Pillar RR ranged between 34 and 38 ton/A in Ontario and between 30 and 35 ton/A in Kimberly.