

MORISHITA, DON W.<sup>1\*</sup>, STANLEY R. GORTSEMA<sup>2</sup>, JERRY D. NEUFELD<sup>2</sup> and DALE L. BAKER<sup>2</sup>, <sup>1</sup>University of Idaho, Twin Falls R&E Center, Twin Falls, ID and <sup>2</sup>University of Idaho, Power, Canyon, and Minidoka County Cooperative Extension. **Two Year In-Field Sprayer Calibration Survey of Sugar Beet Growers.**

#### ABSTRACT

Sugar beet growers are challenged every year to successfully and economically control weeds primarily because the primary postemergence herbicides used are not very effective. Consequently, growers typically make three to five sequential postemergence herbicide applications, all of which must be applied accurately and timely. Failure to do so with any of the application timings can result in poor weed control. The development and adoption of micro herbicide rates has amplified the importance of accurate application rates. Over the past 15 years, extension efforts have focused on proper sprayer calibration, using appropriate herbicide combinations, and application timing for the weed species present. The objectives of this two year survey were: 1) check the calibration accuracy of ATV and tractor sprayers in the field when they were spraying in 2005; 2) develop an easy step-by-step method for calibrating sprayers for growers; 3) conduct sprayer calibration presentations at grower meetings and write articles for the popular press to further educate growers on the benefits of sprayer calibration; and 4) conduct a follow-up survey in 2006 to measure any impact of our educational programs.

Because sugar beets in Idaho and eastern Oregon are grown under contract with a grower-owned cooperative and because the cooperative employs their own crop advisors, conducting an in-field survey is much easier in sugar beet because the crop advisors are in close contact with most growers. A protocol was developed to facilitate the calibration process. Typically, teams of four to six people worked together to collect the data, although some calibration checks were done by two people. Sugar company fieldmen were relied on heavily for locating growers who were in the field spraying. Once located, an applicator would be stopped at the end of the field so that spray could be collected in a 30 second time period. The applicator or grower was asked to provide their intended spray volume, sprayer speed, and spray band width. As soon as this was completed, the applicator was free to resume spraying. In many cases, the applicator was stopped for only 5 to 7 minutes. Sprayer speed was determined by either measuring the time for the sprayer to travel 100 feet or with a Global Positioning System unit. Additionally, since most postemergence sugar beet herbicides are applied in a band, the spray band width was measured as soon as the sprayer began applying herbicide. Thus, the three main variables measured were spray band width, sprayer speed, and spray output. Spray volume was then calculated from the measured variables.

In 2005 and 2006, 42 and 44% of the sprayers were pulled by ATVs and the rest were tractor-mounted or tractor-pulled sprayers. On average, there was very little difference in accuracy between tractor and ATV sprayers. Measured bandwidth ranged from 11% narrower than desired to 36% wider than desired in 2005 and from 17% too narrow to 23% too wide in 2006. Overall, average bandwidth was 5% too wide in 2005 and 2% too narrow in 2006. This is well within 90% accuracy. On average, spray bandwidth was about 11 and 9-inches in 2005 and 2006, respectively.

Sprayer speed was very close both years to the desired rate, averaging 1 and 0.1% too slow in 2005 and 2006, respectively. However, the speed ranged from 33% too slow to 16% too fast in 2005 and 19% too slow to 22% too fast in 2006. As expected, ATV speed in 2005 had a wide range than tractor speed, however, this was not observed in 2006. Only two of the 15 tractors and one of the 12 ATV sprayers in the 2006 survey did not use a speedometer or GPS unit to measure speed. On average, 85% of the sprayers in both years were within 99% accuracy of the desired speed.

Spray volume had the widest range of all variables for both years and ranged from 75% below to 31% above the desired spray volume. Averaged over all the growers surveyed, spray volume was about 5% below desired in 2005 and 3% above in 2006, which is excellent on average. Using a 90% calibration accuracy as the benchmark, 35% of the sprayers surveyed in 2005 were under-applying, 11% were over-applying and 54% were within the 10% error margin. Comparatively in 2006, 59% were applying within the 90% accuracy mark, with 11% under-applying and 30% over-applying. In other words, 46% of the sprayers surveyed were mis-applying herbicide by 10% or more and 41% were mis-applying by 10% or more in 2006. At a 95% calibration accuracy benchmark, 27 and 33% were within the 5% error margin in 2005 and 2006, respectively.

It appears that our winter education efforts were not totally successful. We gained a modest 5% improvement in calibration accuracy at the 90% level and the percentage of sprayers applying with 95% accuracy increased 6% from 2005 to 2006. Further educational efforts may be needed to increase the calibration accuracy of sprayers used for weed control in sugar beets.