

EFFECTS OF TILLAGE AND IRRIGATION PRACTICES IN SUGAR BEET ON DISEASES, WEEDS, AND INSECT PESTS AND THEIR NATURAL ENEMIES

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ABSTRACT

Strip tillage (ST) provides a number of agronomic and economic benefits to sugar beet production. However, little is known regarding how reduced tillage affects pests and their natural enemies. During 2010, a study at the University of Idaho Kimberly R & E Center (Kimberly, ID) was initiated to examine disease, weed, and insect responses to two tillage treatments (ST and conventional tillage [CT]) and four irrigation treatments based on evapotranspiration (ET) rates of CT sugar beet (50, 75, 100, and 125% ET).

No uniform disease development was observed for *beet necrotic yellow vein virus* (BNYVV) or *Rhizoctonia solani* during 2010. During 2011, *Rhizoctonia solani*-inoculated rows showed stronger reduction in ERS relative to non-inoculated rows for CT plots than for ST plots. No significant treatment responses were observed for stand loss or disease severity during 2012.

Most weed responses to treatments varied among years, possibly due to variations in weed populations from year to year. Annual sowthistle density tended to be higher in CT in 2010, was significantly higher in 2011, and was lower in CT in 2012. Common lambsquarters responses to irrigation rate varied from year to year. Green foxtail density within rows was higher in CT in 2010, but did not differ by tillage in 2011-2012. Green foxtail was the most abundant weed species and was most affected by irrigation rates; densities between rows pooled across years and tillage treatment increased with increasing ET.

Beet leafminer flies and bean aphids were the most abundant insect pests over the course of the study. During 2010-2012, leafminer eggs often were more abundant in CT plots; however, larval counts typically did not differ by tillage type. On some sample dates, eggs were less abundant in plots under 50 or 125% ET; however, larvae showed no response to irrigation treatments. Bean aphids were more abundant in CT than ST plots on one sample date in 2010 and showed a curvilinear response to irrigation treatments, with highest abundance under 100% ET and lowest under 50% ET; otherwise, bean aphids showed no significant treatment responses.

Natural enemy responses over the course of the study differed among taxa, but overall predatory arthropod abundance was greater in ST plots during some dates over the season. Spiders generally were more abundant in ST plots. Staphylinid beetles and harvestmen were more abundant in ST plots early in the season and more abundant in CT plots late in the season. Carabid beetle densities did not differ between tillage types. Results suggest that pest (disease, weed, and insect) pressure may be similar between CT and ST systems, and certain soil-dwelling predatory arthropods are favored by ST.