

A COMPUTER-GUIDED FLAME WEEDER FOR WEED CONTROL IN CARROT AND SNAP BEAN. Chad M. Herrmann and Bernard H. Zandstra, Graduate Assistant and Professor, Michigan State University, East Lansing, MI 48824.

A precision-guided flame weeder was developed for shielded weed control in emerged vegetable crops. The machine is equipped with an Eco-Dan® local positioning system which uses camera and computer guidance technology to detect a crop row and position the weeder accurately in relation to the row. Four 1.5 m long stainless steel shields are installed on the toolbar, and 500,000 kJ liquid propane torches are mounted under each shield. Several experiments were conducted in 2008 and 2009 to evaluate postemergence weed control with the flame weeder in snap bean and carrot. Each crop was planted with three single rows per plot with row spacing of 41 cm. There was a 5 cm wide band centered on each crop row that remained untreated, so approximately 90% of the total plot area was treated. Plots were treated when snap beans had one expanded trifoliate leaf and most weeds had 4-6 true leaves. Treatments were applied to carrots when plants had 1-2 fern leaves and weeds had 4-8 leaves.

A factorial arrangement in a RCB design was used to assess combinations of propane pressure and ground speed. In the snap bean evaluations, propane pressures of 0.07, 0.17, 0.24, and 0.31 MPa were applied at ground speeds of 1.6, 3.2, 5.6, and 8.0 km/hr. Plots treated at 1.6 km/hr resulted in snap bean injury, and injury increased from 36-60% proportionally with increasing propane pressure at that speed. All treatments with ground speeds greater than 1.6 km/hr did not result in snap bean injury. Carrots were more susceptible to thermal injury than snap beans, and 30-38% crop injury occurred in treatments of 0.17 MPa or higher and ground speed of 3.2 km/hr. Visual ratings, weed counts, and weed biomass were assessed for redroot pigweed, common lambsquarters, common purslane, and large crabgrass. Propane pressures of 0.17, 0.24, and 0.31 MPA with ground speeds of 1.6 or 3.2 km/hr controlled 83-97% of both redroot pigweed and common lambsquarters. Common purslane and large crabgrass were more difficult to control and often regrew, but 83-85% control of common purslane and 75-83% control of large crabgrass was achieved when treated at 0.31 MPa and 1.6 km/hr. Propane fuel usage was related proportionally to pressure in a linear manner, and the most effective treatments in terms of both efficacy and crop safety consumed propane at approximately 20-30 kg/ha.