

FLAME CONTROL FOR WEED MANAGEMENT IN CABBAGE AND TOMATO. Annette L. Wszelaki and Douglas J. Doohan, Postdoctoral Researcher and Associate Professor, Department of Horticulture and Crop Science, The Ohio State University, Ohio Agricultural Research and Development Center, 1680 Madison Ave., Wooster, OH 44691

In the spring of 2002, a field trial was established to control weeds safely, effectively, and economically in vegetable crops, by employing a flame weeder. Composted dairy manure (5 tons/A), bedded on sawdust and straw, and dairy manure (10 tons/A) were broadcast and incorporated into the field prior to planting in both years. The field was cultivated and beds prepared on one-half of the field on 28 May, 2002 and 20 June, 2003. 'Peto 696' tomato and 'Bravo' cabbage seeds were hot water treated and sown in mid-April of both years into 288-cell plug trays containing organic potting mix (#423, Paygro Co., South Charleston, OH) amended with Bradfield Gold 3-1-5 (Bradfield Industries, Inc., Springfield, MO) at a rate of $\sim 300 \text{ g/m}^3$. On 29 May, 2002 and 20 June, 2003 seedlings were transplanted 40 cm apart into rows 9 m long on 1.5 m centers, half on raised beds and half on flat ground. On 20 June, 2002 at 10:30 AM (28.3 °C, RH 56.6%, wind from the SSE, wind speed: 1.2 kph (vector), 2.3 kph (scalar)) and 5:00 PM (31.4 °C, RH 36.1%, wind from SSE, wind speed: 2.5 kph (vector), 3.3 kph (scalar)) and 21 July, 2003 at 10:00 AM (21.0 °C, RH 97.8%, wind from the SSE, wind speed: 1.8 kph (vector), 2.2 kph (scalar)) tomato and cabbage transplants were flamed with a Red Dragon 8-burner row crop flamer (Flame Engineering, Inc., LaCrosse, KS). Burners were arranged in a staggered crossfire pattern, set at a 60° angle (from horizontal), 10 cm from the crop and a pressure of 30 psi. Varying tractor speeds were used: 0 kph (unflamed), 4 kph, 8 kph, and 12 kph (2002 only). Plant injury due to flaming (% versus control) was evaluated 5 and 15 (2003) or 20 (2002) days after flaming (DAF). Weed control was evaluated 5, 20, 30, 40, and 50 DAF in 2002, and 5 and 15 DAF in 2003. At harvest, head traits were evaluated in the cabbage and diseases and disorders evaluated in the tomatoes that were flamed in the morning. Yield was calculated for both crops.

In 2002, the morning flaming treatments caused more injury (average $\sim 10\text{-}40\%$) to cabbage and tomatoes than the afternoon flaming (average 2-4%). In both years, cabbage plants were more severely affected than tomato plants. All flaming treatments damaged the cabbage plants more than the control, with the 4 kph treatment causing more injury ($\sim 60\%$) than the 8 ($\sim 30\%$) or 12 ($\sim 5\%$) kph treatments, after 5 DAF. However, by 15 (2003) or 20 (2002) DAF, there was no evidence of injury in any treatment. In the morning flaming of tomato, damage was greater on raised beds than flat ground and greater in the 4 and 8 kph treatments than the unflamed and 12 kph treatments after 5 DAF. After 15 or 20 DAF, there was no sign of injury on any tomato plants. Afternoon flaming in 2002, in either crop, caused little injury ($<5\%$), but controlled weeds much less effectively than morning flaming.

In all cases, any flaming speed provided greater weed control than the unflamed, unweeded control. In 2002, after 5 DAF, weed control in tomato was most effective in the 4 and 8 kph treatments, with $\geq 90\%$ and $\sim 80\%$ control, respectively. In cabbage, from 20-50 d after flaming in 2002, the 4 kph treatment provided better control than all other treatments, with nearly 70% control versus the unflamed, unweeded treatment on both bed types, even at 50 d. Results were similar for tomato, though the 4 kph, raised bed combination was more effective in controlling weeds than flat ground, as the 4 kph-raised bed treatment had 70% weed control at 50 d, while the 4 kph-flat ground treatment was no different than the control. In 2003, after 5 d, the 4 kph treatment was most effective in tomato with $>70\%$ control in both bed types. However, after 15 d, control in the 4 kph treatment was reduced to $\sim 20\%$. In cabbage, weed control was generally more effective on raised beds versus flat ground, though, due to the extremely wet conditions in 2003, weed control was not sustained as in 2002. In both years, grasses and succulent weeds were harder to control than broadleaf weeds.

Regarding tomato fruit quality, in both years, flaming reduced the incidence of blossom end rot. Yields were greater in the slower speed flaming treatments than the weedy control. In cabbage, larger heads and higher yields were found with the 4 kph flaming treatment.