Controlling Weeds in Small-Seeded Crops Using Cultivation

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Cultivation may be used to improve weed management in small-seeded crops. It is typically most effective on small weeds in dry, loose soil. Aggressive cultivators used between crop rows can be very effective. However, it remains a challenge to use cultivation to control weeds in the crop row without damaging the crop. In-row cultivation tools rely on a size difference between the weeds and the crop – meaning they are designed to cause just enough soil disturbance to kill small weeds while allowing the larger crop plants to survive. A new generation of cultivators allow for several different tools to target the in-row zone at once. Such "stacking" of tools has been used to greatly increase the percent weed control in corn (Gallandt et al. 2017), but few studies have been conducted in small-seeded crops. Therefore in 2017, in-row cultivation tools used singly and in stacked combinations were evaluated in carrot crops in Michigan. Carrots were managed with a pre-emergence flame weeding, a hand weeding at around 40 days after planting, and one or two between-row cultivations. An in-row cultivation was conducted on 1" tall weeds at around 25 days after planting using the tools listed in Table 1. Weeds and crop plants were counted before and after cultivation to determine effectiveness. Overall, the "stacked" tool combinations killed a greater percentage of the weeds, but also killed a greater percentage of the crop. While the finger weeders killed the lowest percentage of the crop, the knives and disc hillers had the highest ratio of weeds killed to crop plants killed. Considering the crop loss, yield was somewhat minimally affected, possibly due to increased size of carrots in plots where density was reduced. The effectiveness of the in-row tools varied greatly with conditions, which suggests that further work is needed to determine the optimal adjustment for different soils, crops, and weeds. The torsion weeders appeared to be the most sensitive to variable conditions while the finger weeders seemed to be the least affected.

Table 1. Averaged results of the three in-row cultivation trials in carrots. Note that the in-row cultivation treatments were implemented in addition to pre-emergence flaming, between-row cultivation(s), and a late-season hand weeding.

In-row cultivation tool	Weeds killed (%)	Crop plants killed (%)	Yield (1,000 lb/ac)
harrow	20	17	26
finger	39	16	25
torsion	46	33	22
disc hillers	57	20	28
finger / disc hillers	79	38	22
finger / harrow	48	32	19
torsion / finger / harrow	55	31	23
none	-30*	0	26

*When no tool was used, 30% more weeds had emerged in the time between counts.

References

Gallandt ER, Brainard DC & Brown B (2017) Developments in physical weed control. In: *Integrated Weed Management for Sustainable Agriculture,* (ed RL Zimdahl) 261-283. Burleigh Dodds Science Publishing. Sawston, UK.

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