

Organic Control of Canada Thistle in an Apple Orchard

By Chris McGuire

My wife Juli and I raise organic apples at Two Onion Farm in Lafayette County, southwest Wisconsin. Like many apple growers, we've planted dwarf trees because they provide a quick return on investment and are easy to manage in many ways. However, a weakness of dwarf trees is that they have shallow root systems and compete poorly with weeds; therefore we spread hardwood bark mulch around the trees to suppress annual weeds. Over time, however, aggressive perennial weeds such as Canada thistle can invade the mulch. Canada thistle competes for water and nutrients with the trees, and the tall prickly thistle plants infuriate orchard workers who are picking fruit or doing other work in the lower tree branches.

Canada thistle has deep roots and, once established, it is very difficult to eliminate from an organic orchard. Digging out the thistle roots would be extremely time-consuming and destructive to the nearby apple trees. Research has shown that it is possible to deplete thistle's root reserves and gradually suppress or eliminate the plant by repeatedly killing the shoots, letting new shoots regrow, and then killing them again. However, to implement this strategy it is necessary to kill Canada thistle shoots about every three weeks. If the thistle shoots are killed at longer intervals, new shoots will grow and replenish the energy stored in the roots between each round of shoot killing. For many years we chopped down thistle patches in our orchard 2-4 times each growing season (at 5-10 week intervals), but the thistles persisted and patches expanded as roots spread and new shoots emerged.

We wondered if killing the thistle shoots every three weeks would really eradicate the weed. And if so, how we could fit this task into our busy farm schedules? In 2019-2020, we received funding from a USDA-SARE Farmer Rancher grant to evaluate organic methods for killing Canada thistle shoots. Our goals were to determine whether killing shoots every three weeks would eliminate the weed, and if so, to determine what was the most economical and effective method for killing the shoots.

We performed the project in an orchard of trees that had been planted in 2012-2015. Trees are six feet apart within the row, and there is a 5.5 foot wide strip of bark mulch under each tree row. We maintain a closely mowed grass aisle between tree rows, with a narrow bare strip of cultivated soil between the grass and mulch. We rarely see Canada thistle in the cultivated strip or grass, presumably because it does not tolerate regular mowing or cultivation.

We evaluated four methods for killing thistle shoots: (1) hand-pulling, (2) slicing off the shoots at ground level with a diamond hoe, (3) cutting the shoots as low as possible with a gas-powered string-trimmer, and (4) spraying the shoots with Avenger Weed Killer, an OMRI-listed, non-systemic herbicide. Each of the four methods was performed in two settings - in our standard bark mulch and in areas where we had applied a layer of recycled cardboard underneath the bark - thus making eight treatments in total. (We thought that the cardboard might reduce thistle emergence and lessen the time required to kill shoots). Each of the eight treatments was performed for two years in 14 thistle-infested plots in our orchard. We started treatments on May 22, 2019, and applied them every three weeks, with the last treatment of the year on September 25. In 2020, we applied treatments from May 15 to July 23. We counted the number of thistle shoots in each plot every three weeks, right before killing the shoots, and we measured the time and materials costs for applying the different treatments.

All the methods of killing shoots were extremely effective. Near the beginning of 2019 we counted a total of 1329 thistle shoots over all our plots. After each treatment, new shoots regrew, but they were progressively fewer and weaker. By the end of 2019 there were only 5 shoots in all of our plots, and by June 30 2020, none remained. We had expected some decrease in the population, but the speed of the decrease was surprising – and gratifying!

We observed several important differences between the treatments. Thistle density declined to zero in all plots, under all treatments. However, the decline in June and early July of 2019 was much more rapid in plots with a layer of cardboard mulch underlying the bark. By August 2019, however, thistle counts were similar in all treatments. In other words, cardboard hastened the decline of the thistles, but was not necessary to eventually eradicate them. Presumably many of the new shoots that tried to emerge in the spring were trapped under the cardboard and smothered. The time required to kill shoots was less in cardboard-mulched plots in early 2019, simply because there were fewer shoots to kill.

Of the four shoot-killing methods, string-trimming and hoeing were least expensive, costing \$2.11 and \$2.64 per tree over the two years of the study. (These costs include labor and operating expenses, but not upfront costs to purchase tools. "Cost per tree" means the cost to perform that treatment in the 6' x 5.5' area under one tree, for two years.) Hand-pulling was most time-consuming treatment and was expensive (\$4.96 per tree) because of labor costs. Spraying actually required the least time of any treatment, but was the most expensive method (\$7.86 per tree) because of the high cost of the spray product. Although cardboard mulch reduced the time needed for killing shoots, it did not save money because the time required to lay the mulch was greater than the subsequent time savings.

The results of this study were hopeful and encouraging. It is clearly possible to eradicate Canada thistle with a rigorous schedule of killing the shoots every three weeks. Of the methods we tried, we favor hoeing with a diamond hoe. String-trimming was somewhat faster and less expensive according to our data, but it does have several disadvantages which we did not quantify, including occasional damage to trunk guards, noise, fumes, vibration, higher cost of tool purchase, and perpetual and annoying maintenance issues. In addition, we observed that string trimming was ineffective against low-growing weeds, such as dandelion and crabgrass, which sometimes occur in our orchard, whereas hoeing can be used to control most other weeds in addition to thistles. We also think that cardboard mulching may have a place: although we calculated that cardboard mulching was not cost-effective, it may be justified if labor is particularly scarce in the late spring and summer. Cardboard can be laid down in late fall or early spring, thus saving precious time cutting down thistle shoots in the busier seasons.

Regardless of the method used, eliminating a dense patch of Canada thistle is expensive and time-consuming. It's best to prevent patches from establishing in the first place! If possible, keep Canada thistle plants from going to seed anywhere on your farm. And if Canada thistle is present in sod near the orchard, practice regular close mowing to eliminate or suppress the thistles and make them less likely to spread into mulched areas.

A detailed report of our results is available online at www.twoonionfarm.com/research/.

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Chris McGuire and his wife Juli raise organic apples and other fruits at Two Onion Farm in Belmont, WI.



1. Canada Thistle Emerging Through Bark Mulch



2. Rows of dwarf trees with bark mulch



3. Spreading mulch under newly planted trees