

Orchard Weed Management Survey Results and Herbicide Alternative Management Strategies Review

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At the 2019 Extension Implementation Program advisory group meeting, weed management was listed as a top priority of fruit and vegetable growers and Agricultural service providers. To establish an understanding of knowledge gaps in weed management, a weed identification quiz was administered to growers attending a weed management session at the New England Vegetable and Fruit Conference in Manchester NH, Dec. 10-12, 2019. Overall, most participating growers in the audience were able to correctly identify most of the weeds presented to them, however, depending on the weed in question, as high as 35% percent of respondents replied with “I don’t know” (for more details on the results from this quiz, see the [winter 2020 issue of Fruit Notes](#)).

The next step in this weed management knowledge gap assessment process was to create and administer a second survey designed for commercial fruit growers in the northeast intended to elicit specific management concerns. In July 2021, this survey was sent out to the Fruit Team’s Healthy Fruit newsletter mailing list, The Grape Notes mailing list, The Vegetable Team’s Vegetable Notes newsletter mailing list and was distributed in paper form at the Massachusetts Fruit Growers Association summer meeting.

Survey Results

Forty-two surveys were completed by fruit growers. Most respondents (81%) were Massachusetts growers. Other states represented in the survey responses were: NH, (10% of respondents) CT (5% of respondents), and VT and ME (2% of respondents, respectively).

Of the crops grown by respondents, apple was most common followed by peach, pear, cherry, raspberry, blackberry, blueberry, grape, and strawberry (Figure 1.). Other crops reported were: paw paw, persimmon, plum, apricot, cranberry, Christmas tree, corn, squash, “veggies” (one report of each),

tomatoes (2 reports) and pumpkins (3 reports). It is no surprise that growers with perennial crops have the most difficulty managing perennial weeds. More respondents listed managing perennial broadleaf weeds as being their greatest weed management challenge than any other weed type or class (Figure 2).

Overall, most growers who answered questions in this section stated they “never” use: organic herbicides; wood chip, plastic, or straw mulch; cover crops or mechanical cultivation. Hand weeding was the most widely used non-herbicide weed management method with 68% of respondents stating they used hand weeding at least some of the time. Of these, 11% rated this method as highly effective, 21% as not very effective, and 42% landed somewhere in the middle. Weed management strategies listed by growers in “other” category included: pre and post emergent herbicide programs, wood chip, cellulose, crushed stone and straw mulches, weed “whacker” and [DR trimmer](#) (author’s personal note: the DR trimmer looks like a promising tool to have in an orchard, perhaps worth researching).

Of the 42 total survey respondents, 10 provided written responses to the question “Moving forward, what research and/or information would be most helpful for weed management in your orchard, farm, vineyard (i.e., mulching, weed identification, weed management and vole habitat, herbicide resistance, etc.)?” (1) Eight of 10 listed weed identification as important information for them to acquire in the future. Two proposed photo identification resources. (2) Six of 10 listed mulch as an important research area for the future. (3) Two respondents expressed concerns regarding vole habitat. (4) Other responses varied but could most logically be categorized into (5) herbicide considerations and (6) specific weed issues (i.e., bittersweet, bindweed, etc.). There were two outlying responses that could not be readily categorized with others which were: “organic weed treatment” and “None, all un-

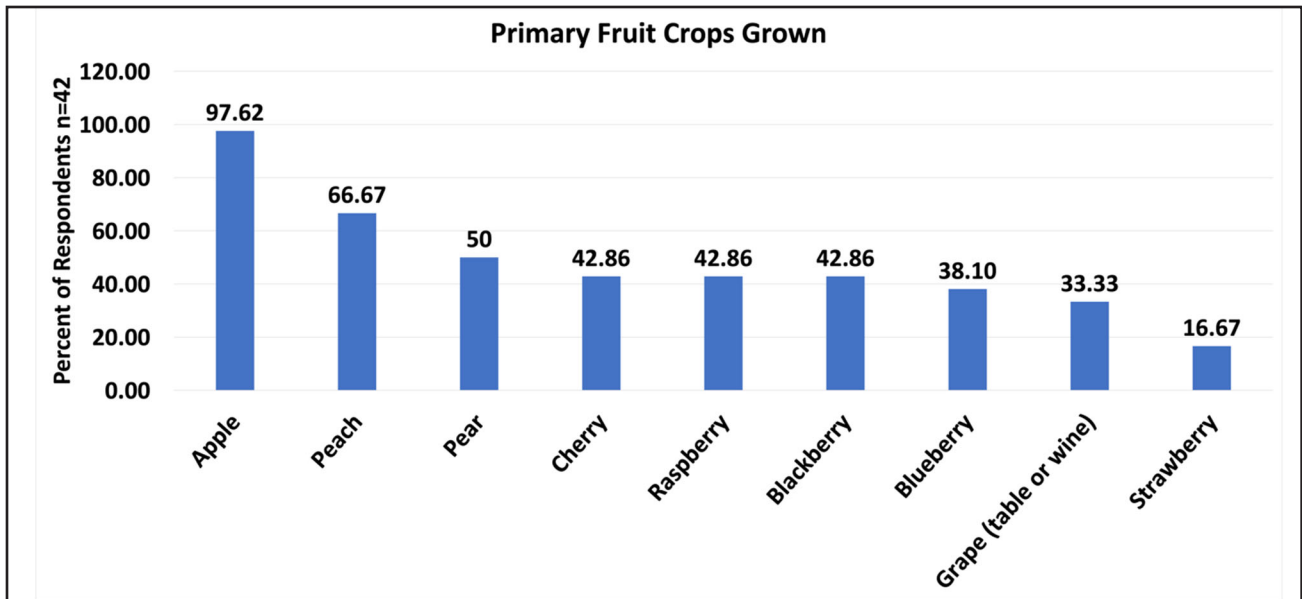


Figure 1. Primary fruit crops reported to be grown by respondents.

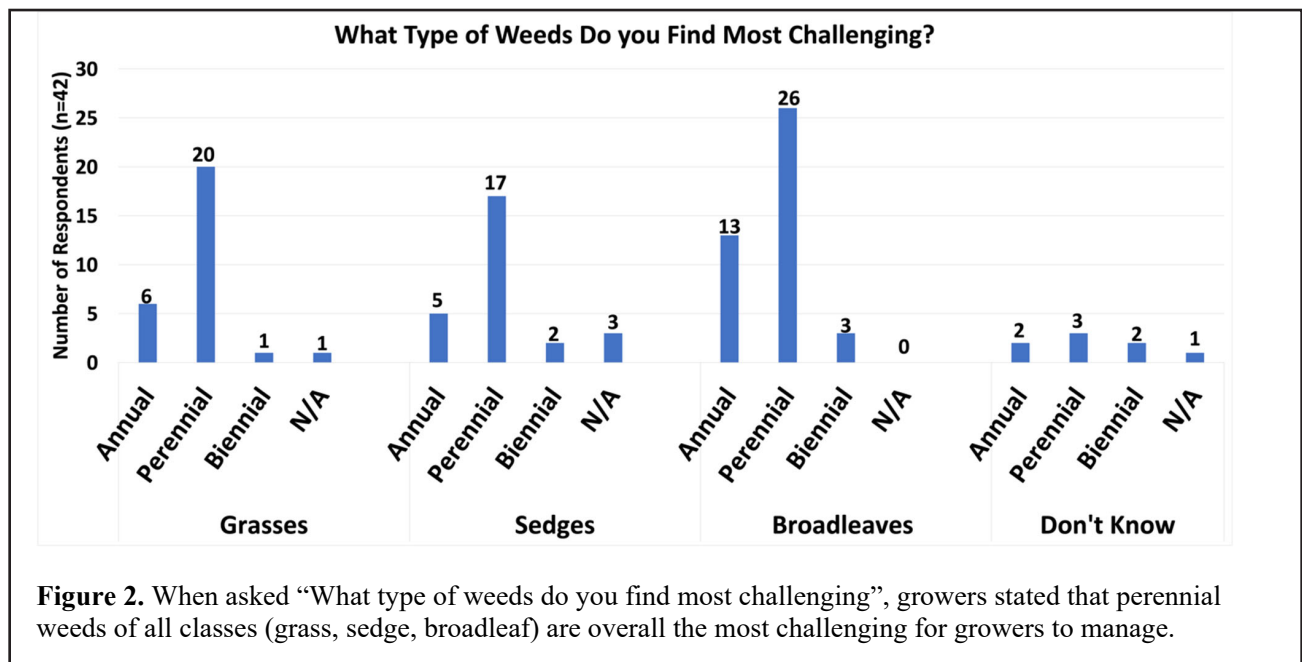


Figure 2. When asked “What type of weeds do you find most challenging”, growers stated that perennial weeds of all classes (grass, sedge, broadleaf) are overall the most challenging for growers to manage.

der control for the most part, just spray herbicides.”

The main goal of this article is to provide information to growers on weed identification resources and non-chemical weed management in orchards based on identified weed-related concerns. Additionally, given the known potential for management practices that do not leave a bare earth strip within the tree row to provide habitat for voles, this article will also discuss potential for alternative management strategies to foster these destructive pests.

Weed Identification Resources

47% of respondents stated they were “somewhat” or “not at all” confident in their ability to identify weeds as annual, perennial or biennial. 56% of respondents stated they were “moderately” or “very confident in their ability to identify a weed as “grass”, “broadleaf” or “sedge”. Understanding which weeds are present when, life cycle (i.e., perennial, annual, biennial) and growth habit increases a grower’s ability to effectively imple-

ment weed management strategies. Many resources both print and online, exist to aid in identifying common weed species. [UMass Extension's Landscape, Nursery and Urban Forestry Program](#) is home to the UMass online [Weed Herbarium](#). This collection of weed photos is listed alphabetically and can be searched by common name, scientific name, or by family name. [The UMass Cranberry Station](#) has developed a weed identification book which can be ordered by emailing: cranberry@umass.edu. MyIPM, a smartphone app, has begun development of a weed management category which currently contains photo identification of more than 35 weed species. This app can be downloaded for Android or iOS in the app store. Finally, and possibly most widely used, [Weeds of the Northeast](#) contains a key to identifying weeds, photos and growth habit descriptions and can be purchased through Cornell University Press.

Management Strategies- A Brief Review

Effect of non-herbicide Ground Management Systems (GMS) on Weed Suppression

Bark Mulch

- [Bark mulch](#), applied at a depth of 4"-6" depending on the study, has been found to suppress weeds adequately for a two-year period (Peck et. al. 2011, Granatstein and Mullinex 2008, Atucha et. al. 2011) but typically requires reapplication on the third year regardless of mulch depth.
- One study found that after the fifth year in a 16 year-long study, spot applications of glyphosate were necessary in [bark mulch](#) treatments to suppress emerging perennial weeds.
- Another study observed weeds growing up in and around mesh mouse guards deployed in mulch treatments and suggested that either spot herbicide applications or hand weeding would be necessary to mitigate the issues (i.e., borers) associated with weeds growing in such proximity to tree trunks.

Soil surface cultivation

- Mechanical cultivation (tillage) within tree rows was found to be effective at suppressing weeds for two to four weeks after each time this practice was performed in the orchard.
- Depending upon the study, this practice was performed 3-4 times per season between May and mid-July to August.

Synthetic mulches

- Polypropylene and other weed fabric type materi-

als were not found to be as effective at suppressing weeds as either mulch or soil surface cultivation.

- Polypropylene treatments often had weeds break through the material, requiring periodic hand weeding.

Living mulches

- In the early years of a planting, living mulches create the same competition issue within row as any weed cover.
- While these living mulches may suppress other weeds, they can become the weed themselves.

Effect of non-herbicide GMS on Vole Activity

- When considering mulch as a weed management option, many anecdotal comments can be found stating a connection to mulch and increased vole damage. However, very little research is available to support these statements. Merwin et. al. (1995) installed mouse guards in all GMS treatments, and still observed vole activity and tree damage in mulch/ground cover treatments at one study site. At the other site in the study, however, they did not observe this same level of activity suggesting that vole populations and subsequent damage can be site specific and influenced by factors other than GMS (predator populations, etc.).

Bark Mulch

- Merwin et. al. (1995) reported variability in vole populations and activity from year to year and site to site but reported that there was more damage in mulched plots than herbicide treated plots, especially in synthetic mulch plots. However, less damage was reported in wood chip mulch plots than other biomass mulches.
- Other studies have shown that wood chip mulch exhibits the same low level of vole activity and damage as clean cultivation supporting observations that voles do not move well through this material (Wiman et. al. 2009).

Soil surface cultivation

- Clean cultivated in row treatments experienced overall less vole activity as this practice removes all cover and attractive food sources (outside of trees) from the orchard rows.

Synthetic mulches

- Synthetic mulches appear to provide the greatest cover for voles as they can easily tunnel and nest underneath these (Image 1) remaining hidden from predators while feeding on roots and unprotected trunks.

Living mulches

- Wiman et. al. (2009) studied the effect of living mulches on vole activity in orchards in Washington. In their first year of study vole populations were sufficient to determine that these types of mulching systems provided ideal habitat for voles recording greater activity and tree damage. The second and third years had very low overall vole populations and as such were unable to draw significant conclusions regarding the level of activity and damage.

Additional note:

- Granatstein and Mullinix (2008) found that “Wood chips led to a 20% to 30% savings in irrigation water”. As rainfall becomes more sporadic, this is likely to be a useful water conservation service.
- Wood chip mulch source and composition is an important factor. The potential for importing weed seeds exists.

Conclusions

- Herbicides continue to offer growers the least expensive weed management option. However, with the demand for fruit grown using fewer synthetic inputs, wood mulch presents an interesting, potentially viable addition to the weed management program implemented in tree fruit in Massachusetts. More long-term research into the impact that this practice has on vole activity and damage is needed.
- Merwin et.al. (1995) estimated that cost of herbicides and wood chips was similar- \$200-\$400 over three years for herbicides and \$70-\$350 for wood chips (sourcing varies by region, this study was able to pick up you-carry mulch for free at the municipal lot, hence the lower end of the cost estimate). An updated cost analysis of this data is necessary given the overall increase in agricultural supply prices.
- Given the findings in the above-mentioned studies, living mulches and synthetic ground covers are not currently a viable herbicide alternative for tree fruit production.

Additional resources

[UMass Extension Landscape, Nursery and Urban Forestry Program.](#)

[UMass Extension Landscape, Nursery & Urban Forestry Program Weed Herbarium](#)

[UMass Cranberry Station](#)

[UMass Cranberry Station Fact Sheets](#)

[Weeds of the Northeast](#)

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