Center for Crop Diversification
Martin-Gatton College of Agriculture, Food and Environment

Center for Crop Diversification Fact Sheet
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Weed Management

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Introduction

Weed management is a major crop production concern in Kentucky. Weeds compete for crop nutrients, water, light and space as well as harboring potential pests and diseases, resulting in poorer growth and lower yields, leading to lower financial returns for producers. Weed management is a long-term concern, as poor weed management during one season can result in higher weed seed populations germinating in subsequent years. Weed pressure can greatly increase annual weed management costs in commodity row crop production, creating financial pressure on producers, especially during periods of low prices. Weed management is also a major challenge for organic farming in Kentucky and surrounding states.

Weed control is often divided into major strategies or practices. Cultural controls include maintaining good soil fertility, crop rotations, using weed suppressive cover crops and other aspects of crop culture that create healthy crops that robustly compete with weeds. Prevention includes practices like properly cleaning equipment and using certified weed-free crop seed. Mechanical controls use cultivation equipment or weed barriers to keep weeds at bay, while chemical control uses herbicides. Another strategy is the use of biological controls, using organisms including animals, insects and diseases that may combat weeds.

This fact sheet will provide an overview of the major weed management methods for specialty crop production in Kentucky.

Key Techniques for Producers

Selection of weed control methods depends on the crop, production system or preferences and field history. The major weed control methods are applicable in both conventional and organic production systems.

Herbicides

Herbicides are important and may be an economical weed management method for both row crop and specialty crop production. Guidelines and restrictions for herbicide

use should always be followed, and these guidelines are contained on herbicide labels. THE PESTICIDE LABEL IS A LEGAL DOCUMUENT AND THE LABEL IS THE LAW. Kentucky producers will find extensive herbicide application guidelines for field and specialty crops through university Extension resources, certified crop care advisors and other industry publications. Remember that just because a pesticide is labeled for use nationally, it must also be labeled for use in the Kentucky. Chemicals purchased out of state may not be legal to use in Kentucky. Check with the Kentucky Department of Agriculture for current registrations.



A tractor that has been custom modified by adding a power steering unit is cultivating a two-row bed of lettuce. Under the belly of the tractor a basket weeder is cultivating between the crop rows at a depth of 1 inch, and a combination of Danish S-tines and spyders are cultivating the sides of the beds and wheel tracks at the rear of the tractor.

Mechanical

Mechanical weed control involves removing weeds using machines or manual labor, such as hoeing. Cultivators such as sweeps, side knives, rotary hoes, tine weeders and finger weeders can be used to uproot young weeds or disturb germination of weed seeds, buying time until the crop canopy has formed. The most effective cultivators disturb only the uppermost portion of the soil since most weed seeds germinate in the top 1-1.5 inches. This is done to minimize bringing buried weed seed into this germination zone. Hand hoeing and weed pulling are effective but labor-intensive means of eliminating problem weeds. Mechanical methods are a mainstay of most organic production systems. Soil compaction is one concern when adding additional machine operations or foot traffic across crop fields. Limit traffic on the field when the soils are wet to minimize this. The use of cover cropping and deep tillage can help break up the hardpan that can develop. Smaller acreage growers may also consider the use of permanent beds so that the growing beds receive minimal compaction.



A finger weeder is being used to cultivate two rows of kale. The cultivator provides between-row and in-row cultivation at a depth of 1 inch. The yellow fingers are flexible rubber and are used to scrub out weeds in the plant rows, while sweeps and side knives cultivate between the rows and on the sides of the beds. This tool is used for the final cultivation before canopy closure and once the plants can tolerate some soil disturbance without being uprooted.

Mulches

Mulches, including both plastic mulches and straw or similar organic matter mulch, create a physical barrier to weed growth and germination. Mulches are viewed as creating overall positive benefits for weed control. There are also economic and management costs to the producer, and concerns about which mulches may be allowed by the certifying agency. Organic mulches can help add organic matter to the soil but tie up soil nitrogen during the decomposition phase, so additional nitrogen may need to be added, increasing costs. If a living cover is used, it needs to be turned under early enough so that the nitrogen is available for crop use. Paper-type or biodegradable mulches are often used in organic systems. Some have fertilizer incorporated with them. These may be allowed, but a concern in the past has been the longevity of the materials, as they often did not last long enough in the season to be cost-effective. Plastic mulches provide a superior weed barrier but create additional costs for equipment, labor and mulch disposal. There is currently recycling of agricultural mulches in Kentucky. Different colors of plastic mulch, like black, white, clear and silver can modify soil temperatures and may also provide advantages for insect management, depending on the color. Mulch is widely used to suppress weeds in nursery and ornamental production.

Cover Crops

Cover Crops, including living mulches or “green manures,” have grown in popularity for both weed control and soil health benefits. Cover crops can aid in weed control by outcompeting weeds for light and nutrients, and through root secretion of allelopathic chemicals that act as natural herbicides to prevent weed seed germination. In Kentucky and similar climates, cover crops can be especially helpful in conventional, no-till and organic systems to manage winter annual and cool-season weed growth. Cover crops are often used in tandem with other weed control techniques for total weed management.



Muskmelons are grown under a mesotunnel system utilizing mesh over bent electrical conduit hoops for exclusion of cucumber beetles. The system also uses shredded Miscanthus mulch for full-season weed control. The mulch was applied with a round bale shredder to a depth of 5 inches prior to transplanting.

Special Considerations for Organic Producers

Certified organic crop producers in Kentucky draw on a variety of weed control methods to manage weed pressure. Optimum weed management often occurs through a well-designed strategy of prevention and the use of cultural, mechanical and chemical tools.



Peppers were transplanted onto black plastic and cultivated with a custom-modified cultivating tractor twice over a two-week period. A cover crop of teff (Eragrostis tef) was then sown using a drop spreader. The teff is very drought tolerant and smoothers weeds while sequestering carbon, increasing organic matter, and providing erosion control. The teff is mowed once or twice during the growing season and soil incorporated at the end of the season.

References/Resources:

- "On-Farm Sweet Corn Plasticulture Trial," in Fruit and Vegetable 2015 Research Report, PR-706 (University of Kentucky), page 35 http://www2.ca.uky.edu/agcomm/pubs/PR/PR706/PR706.pdf

- "Bell and Uba Tuba Pepper: Infrared Transmitting vs. Black Plastic Evaluation," in Fruit and Vegetable 2014 Research Report, PR-688 (University of Kentucky), page 28 http://www2.ca.uky.edu/agcomm/pubs/PR/PR688/PR688.pdf

- "Effects of Plastic and Hay Mulches on Soil Temperature and Moisture in Organic Heirloom Tomato and Watermelon Production," in Fruit and Vegetable 2012 Research Report, PR-656 (University of Kentucky), page 34 http://www2.ca.uky.edu/agcomm/pubs/pr/pr656/pr656.pdf

- "Weed Control Effectiveness of Hay and Straw Mulches Between Plastic-covered Beds," in Fruit and Vegetable 2010 Research Report, PR-608 (University of Kentucky), page 45 http://www2.ca.uky.edu/agcomm/pubs/pr/pr608/pr608.pdf

- "Weed Control in Bearing Blueberry," in Fruit and Vegetable 2007 Research Report, PR-555 (University of Kentucky), page 41 http://www2.ca.uky.edu/agcomm/pubs/pr/pr555/pr555.pdf

- "Fall Weed Control in Grapes," in Fruit and Vegetable 2006 Research Report, PR-538 (University of Kentucky), page 27
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- "Weed Control in Bearing Grape — UKREC," in Fruit and Vegetable 2006 Research Report, PR-538 (University of Kentucky), page 29
http://www2.ca.uky.edu/agcomm/pubs/pr/pr538/pr538.pdf

- Weed Management Systems for Organically Grown Bell Peppers, in Fruit and Vegetable 2004 Research Report, PR-504, (University of Kentucky), page 48
http://www2.ca.uky.edu/agcomm/pubs/PR/pr504/pr504.pdf

- "Effects of Blue, Green and Black Plastic Mulches on Muskmelon Yields and Returns," in Fruit and Vegetable 2004 Research Report, PR-504 (University of Kentucky), page 51 http://www2.ca.uky.edu/agcomm/pubs/PR/pr504/pr504.pdf

- Vegetable Production Guide for Commercial Growers, ID-36 (University of Kentucky)
http://www2.ca.uky.edu/agcomm/pubs/id/id36/id36.pdf

- Midwest Fruit Pest Management Guide, ID-232 (University of Kentucky et al., 2017)
https://ag.purdue.edu/hla/Hort/Pages/sfg_sprayguide.aspx

- Weed Control (Penn State University) http://extension.psu.edu/pests/weeds/control

- Principles of Sustainable Weed Management for Croplands (ATTRA, 2003)
https://attra.ncat.org/attra-pub/summaries/summary.php?pub=109

- Sustainable Weed Management for Small and Medium-Scale Farms (ATTRA, 2014)
https://attra.ncat.org/attra-pub/summaries/summary.php?pub=479

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