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Mulching for Weed Management in Organic Vegetable Production

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Mulching can reduce weed competition against vegetable crops, and save fuel and labor costs for weed control. Covering the soil surface with a suitable mulch can:

- Reduce weed seed germination.
- Shade and physically hinder emerging weeds.
- Enhance crop growth and competitiveness by conserving soil moisture and sometimes by modifying soil temperature.

Synthetic mulches like black polyethylene film other opaque materials, and infrared-transmitting (IRT) mulch effectively block weed emergence, and promote soil warming and early crop growth..

Organic mulches such as hay, straw , leaves, and chipped brush, are usually applied when the vegetable crop is well established and the soil has warmed to near-optimum temperatures. They are most effective on weeds emerging from seed, and least effective on aggressive perennial weeds emerging from rootstocks, rhizomes, or tubers. Organic mulch applied immediately after a final cultivation often suppresses later-emerging weeds until the crop has passed through its minimum weed-free period.

Mulches and Weed Seed Germination and Emergence

Light promotes seed germination in many agricultural weeds including common lambsquarters (*Chenopodium album*), some pigweeds (*Amaranthus* spp.), black nightshade (*Solanum nigrum*). Any opaque mulch, such as black plastic or several inches of hay, straw, or leaves, blocks the light stimulus, thereby reducing seed germination in these weeds after mulch application.

Seeds of an even wider range of common weeds respond to wide daily soil temperature fluctuations, including some that do not respond to light, such as common cocklebur (*Xanthium strumarium*), and foxtails (*Setaria* spp.). Many summer annuals, including pigweeds,germinate in response to high soil temperatures (85–100°F). Organic

mulches and white or reflective plastic films lower soil temperature and dampen daily fluctuations, thereby deterring weed seed germination.Even with light and temperature stimuli blocked, a percentage of the weed seed population will germinate

Mulch Effects on Crop and Weed Growth

In addition to reducing weed seed germination and emergence, mulch can improve the growth and competitiveness of established crops by conserving soil moisture and modifying soil temperatures. Soil warming under black or IRT plastic can enhance early season growth and maturation in heat-loving crops, while the soil cooling effect of organic and reflective film mulches benefits cool-weather vegetables like potato, and can help most crops thrive during hot summer weather.

It is important to note that, once a weed manages to emerge through the mulch, or emerges through a planting hole in plastic film, it enjoys the same soil moisture conservation and other mulch benefits as does the established crop. Conversely, any crop seedlings emerging beneath a mulch will be suppressed. Thus, it is common practice to spread straw or other organic mulches only after the crop is well established, and immediately after cultivation or manual removal of existing weeds.

Mulching Limitations and Pitfalls

In some circumstances, mulching can aggravate weed problems. Organic mulches, especially hay from off-farm sources, may carry seeds of new weed species into the field. An organic mulch that is too thin to suppress weeds (e.g., 1–2 tons per acre, or an inch or so of material) may allow weed emergence, then enhance weed growth by conserving soil moisture. Legume residues have also been reported to release enough nitrate-N to trigger germination of nitrate-responsive weeds such as redroot pigweed (*Amaranthus retroflexus*). Aggressive perennial weeds can emerge through a heavy (6 inch) organic mulch, thrive, and steal moisture and nutrients intended for the crop. Weeds growing through mulch are more difficult to control mechanically, and may require special high-residue cultivators.

Integrating Mulch with Other Weed Management Practices

Mulching cannot alone provide sufficient weed control, and works most effectively in conjunction with other practices. For example, market gardeners often spread hay or straw after cultivating one or more times during crop establishment. Because organic mulches rarely block 100% of weed emergence, they give best results when used in conjunction with good crop rotation and measures to prevent or limit weed propagation. Similarly, measures to reduce populations of nutsedge, morning glory, and other aggressive weeds may be needed before synthetic mulches can be used successfully.

Conclusion

Mulches contribute to weed management in organic crops by reducing weed seed germination, blocking weed growth, and favoring the crop by conserving soil moisture and sometimes by moderating soil temperature