

Weed Management in New England Vineyards

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I usually title my talks on this subject as weed management in Lake Erie vineyards, or New York vineyards, something I actually know something about. I hope you can find something useful from the options we have evaluated at Cornell and that are used in New York vineyards. For the purpose of this discussion, I'll distinguish between managing weeds and/or cover crops in the row middles and in the vineyard rows. Much of our research has been done in Concord vineyards that have a unique set of management goals, so some interpretation is needed if you are growing other cultivars.

Row Middle Weed and Cover Crop Management

Studies conducted at the Fredonia Lab over the past 25 years, cooperating with Cornell researchers including Drs. Bob Pool, Alan Lakso, and Terry Bates, have investigated the effects of weeds, cover crops, and management practices on vine growth and yield. ConCORDs are grown primarily for the juice market where quality is defined primarily as meeting minimum brix requirements. Growers make money by attaining high yields that meet processor standards. High yields are achieved by growing large vines with the potential to ripen large crops. Your management goals may differ considerably from this if you are trying to maximize grape and wine quality by limiting vine growth and yield.

From our studies in Concord we know that:

- Competition from weed or cover crop growth has a substantial effect on vine growth and yield and fruit quality.
- Excessive cultivation can have deleterious effects including increased risk of erosion on hillside vineyards, decreased soil organic matter, and reduced permeability.
- A single application of glyphosate in the row middles can substitute for 3-4 annual cultivations and can be associated with some cultural and economic benefits.
- Organic mulches can increase soil organic matter, conserve moisture, suppress weed growth, and lead to increased vine size. They can also have a substantial effect on vine mineral nutrition, including higher potassium and lower magnesium status.
- Any actively growing cover (including legumes) between bloom and veraison can reduce vine size and yield.

- Mowing a cover crop such as orchard grass has a very limited and temporary effect on reducing the competitive effect of the sod.
- Perennial legumes can also suppress vine size, but are sometimes associated with somewhat higher juice soluble solids.
- For Concords, an effective cover crop is annual rye which provides green cover during the fall, winter, and spring while minimizing competition for water and nutrients during the summer.

Under-the-trellis Weed Management

A team of Cornell researchers including Dr. Andy Senesac and Alice Wise from LIHRC in Riverhead, Dr. Robin Bellinder and Chris Benedict from the Ithaca campus, and myself, are involved in vineyard weed management research, and collaborate to publish annual guidelines that can be found at <http://ipmguidelines.org/grapes/default.asp>

Weed growth under the trellis during the growing season can

- Compete for water and nutrients
- Create a favorable habitat for certain insect pests such as cutworm larvae
- Serve as an alternate host for nematodes that can spread Tomato Ringspot Virus
- Compete for sunlight if weeds grow tall
- Interfere with pesticide penetration into the vine canopy
- Reduce air movement in the canopy and create a more favorable microclimate for disease infection

Mechanical weed control. Researchers in Ontario (Bradt, 1961) showed a yield increase of 25% when replacing mechanical cultivation with use of chemical herbicides. The Lake Erie juice grape industry has almost entirely abandoned mechanical weed control as mechanical methods are more labor and fuel intensive. On the other hand, tender grape varieties including vinifera are planted on resistant rootstocks, and annual covering of the graft union is usually achieved by mounding soil around the vines. Some options for mechanical vineyard weed control will be shown and discussed.

Chemical weed control. By far the most common method of weed control in New York vineyards, conventional programs use a combination of pre-emergence (soil-active) and post-emergence (chemical burn down or systemic) herbicides. Repeated use of the same herbicides (or those with similar chemistry) can lead to reduced effectiveness, so we suggest rotational programs that avoid the repeated use of the same herbicides.

The use of pre-emergence herbicides can be avoided by using only non-persistent, post-emergence herbicides such as glyphosate and glufosinate. Our work in New York indicates under-row weeds in vineyards can be effectively controlled using as few as two annual applications of post-emergence herbicides. Such programs can provide effective control of summer annual weeds, suppression or control of perennial and biennial weeds,

and a weed spectrum shift towards winter annuals that provide green cover during the winter when weed growth does not compete with grapevines.

In addition to using chemical herbicides for weed control, certain herbicides can also be used to burn off undesirable grapevine suckers with considerable labor savings. On the other hand, if suckers need to be retained for trunk renewal, weed management can become more complicated. An option that has been used with some success is the use of post-emergence herbicides in shielded sprayers such as the Controlled Droplet Applicator.

Alternative Weed Management in Vineyards

Living mulches. My colleagues Andy Senesac and Alice Wise from Long Island have tried establishing plant species under the vines that are minimally competitive with the grapevines, but that provide weed suppression during the growing season. To date they have not been successful, but this is an active area of research.

Under-trellis mowing. Another active area of research by Senesac and Wise, initial results indicate a buildup of low growing weeds such as dandelion and annual bluegrass that are likely excessively competitive with the vines.

Propane flaming. Cooperative research in the Lake Erie region with Tim Weigle from the NYS IPM Program indicated excessive vine damage from the use of propane flamers in Concord vineyards. Damage might be less extensive to vines trained to an upright training system such as VSP, but weed control was less effective with propane than with the post-emergence herbicide paraquat.

Organic herbicides. Alice Wise provided a summary of organic herbicides at the Viticulture 2007 conference in Rochester this past winter. Suppression of turf weeds using corn gluten meal is primarily a fertilizer effect and will not provide broad-spectrum weed control. Scythe (pelargonic acid) might gain organic status, but the product is expensive and does not control perennials. Andy Senesac has evaluated acetic acid (vinegar) for vineyard weed control as has found similar limitations as those for pelargonic acid. Clove oil, cinnamon oil, and pine oil have some herbicidal properties, but only on small broadleaf weeds and they are expensive.

Synthetic mulches. Plastic mulches are used in grapevine nurseries, but are very difficult to work with in established vineyards. Geotextile mulches have been evaluated mostly for fruit quality enhancement and are very expensive.

Organic mulches. Concerns about the use of organic mulches under the vines include expense, insufficient weed control, introduction of weed seed under the trellis, creation of habitat favorable for rodents and cutworms, and nitrogen imbalances in the vines as organic matter (i.e. wood chips) decompose.