GUIDELINES FOR APPLICATION OF 2,4-D AND OTHER PHENOXY HERBICIDES IN PROXIMITY TO GRAPES

Introduction

Agriculture on Long Island has moved toward intensive, high value crops such as specialty vegetables, nurseries, sod farms and vineyards. Within the last decade, the proximity of sod farms to vineyards has posed a problem with off-target herbicide movement, specifically, 2,4-D. 2,4-D is a popular herbicide for control of broadleaf weeds on turfgrass. Unfortunately, either during or after application, 2,4-D can move to neighboring vineyards and vegetables and cause damage to both foliage and fruit.

Controlling pesticide drift is an issue that is important to all of agriculture. It minimizes waste and is better for the environment. It eliminates the need for lawsuits, fines, insurance claims and new regulations. In this day and age, reducing liability is a big advantage.

The purpose of this fact sheet is to address the issue of 2,4-D drift onto sensitive grapevines and vegetable fields and to present alternatives where drift is a problem. Sod growers, wine growers and vegetable growers will continue to farm neighboring properties so that one or both parties must compromise to avoid ill will and lawsuits.

Phenoxy herbicides

The name "phenoxy" derives from the chemical name of the herbicide 2,4-dichloro**phenoxy**acetic acid, also commonly referred to as **2,4-D.** This, and several chemically similar herbicides (MCPP, MCPA, 2,4-DP) are widely used postemergence herbicides that control broadleaf weeds selectively in grass crops. Among the crops labeled are wheat and other small grains, corn, sorghum, and pasture. These herbicides are approved for use on roadsides, rights-of-way, lawns, golf courses and sod turf. 2,4-D and its chemical relatives are the major components of the "Weed and Feed" herbicide: fertilizer pre-mix products that millions of homeowners apply to their lawns every year. 2,4-D is the third most widely used herbicide in the United States and Canada and the most widely used worldwide. This class of herbicides has been an integral part of agricultural production strategies for the past fifty years.

Grapevine sensitivity to phenoxy herbicides

Grapes, like most dicotyledons or broadleaf plants, are sensitive to injury by 2,4-D. Monocots, grasses and grass-like plants such as sedges, rushes and lilies, are not sensitive. The issue of sensitivity (or lack of) has to do with the way the plants metabolize 2,4-D in the leaf tissue. Dicots tend to retain high levels of the parent compound whereas monocots do not. Several studies have found that not only are grapes susceptible to 2,4-D injury, but they can retain the parent compound in leaf tissue for three weeks or longer.

Grapevines may be injured by herbicides with phenoxy-type active ingredients throughout the growing season. Grapes are most sensitive however during the first half of the season when shoot tips are actively growing. Shoot tips act as a sink, meaning the products of photosynthesis are drawn there through the phloem and utilized. Because 2,4-D is absorbed into the phloem, it is drawn to the actively growing shoot tips.

2,4-D typically is applied to turfgrass on Long Island during May and June. This is not only a period of rapid shoot growth in grapevines, but it also is the time that young clusters appear. More significantly, vine clusters bloom in mid-June, setting fruit shortly thereafter. Fruit also acts as a sink, drawing photosynthates from the leaves. If 2,4-D is present in leaf tissue at that critical time, it also can be drawn to the clusters.

Grapevines are injured by phenoxy herbicides through two avenues of unintended exposure:

1. Spray drift - small spray particles move with air currents to the grape leaves. Because of the super sensitivity of grapes, these particles can move hundreds of feet from the target and still cause visible injury to grapes.
2. Vapors – Phenoxy herbicides can remain volatile for several hours (more than 24) after spray application. If the vineyards are downwind of a crop that has been sprayed, injury can result even if there was no wind at the time of application.

Application Precautions Which May Minimize Grapevine Injury

- Don't spray when nearby grapevines are actively growing. On L.I., late April until harvest (September to early October). Local research is ongoing to determine the margin of safety for fall applications.
- If possible, maintain a 500-1,000 yard (0.25-0.5 mi.) buffer between spray and any grapevines.
- Use low sprayer pressure.
- Use low-pressure nozzle tips (large orifices).
- A commercial drift retardant may help reduce microscopic spray droplets.
- Spray under windless conditions or when wind is blowing away from nearby vines.
- Use low volatile amine formulations of phenoxy herbicides to reduce potential for volatilization.
- Don't use surfactants. They are not usually needed for increasing efficacy and they may increase injury to grapes.
- Don't spray if air temperature is predicted to be >80°F during the day of application.
- Shielded sprayers may help reduce physical spray drift, though they won't affect volatility.

Phenoxy Injury to Grapevines

The extent of 2,4-D injury on grapevines depends on a number of factors, including but not limited to stage of growth at the time of exposure; whether vines were directly impacted by drift and/or through volatilization; distance between 2,4-D application and vineyard; wind direction and speed; temperature; climatic inversions; specific characteristics of the spray application (high pressure, low pressure, brand of product, amount of water carrier, etc.), general health of vines; and so on. Because of these many factors, it is impossible to precisely predict the course of injury within a single season or in subsequent seasons.

Injury from the phenoxy class of herbicides is very distinctive in grapes. An examination of the entire affected area of the vineyard will generally reveal a group of symptoms that is diagnostic for this herbicide family. Typically, vines closest to the spray application are most affected. Damage generally becomes progressively less severe moving away from the source of drift. It is important to note that even if the vineyard is not directly adjacent to the 2,4-D application, damage can occur. On Long Island, damage has been noted in vineyards ½ mile from the suspected 2,4-D application. This is due to the tendency of 2,4-D to volatilize under the right climatic conditions. Additionally, volatilization can still occur several days after the original application, although the most injurious volatility probably occurs during the first 12-24 hours after application.

Injury by 2,4-D may be seen on both the foliage and the fruit. Shoot growth on injured vines may be retarded, though with slight to moderate exposure, normal growth will resume later in the season. The symptoms of 2,4-D injury are most pronounced on shoot tips and young leaves. Affected leaves are very small and fan-shaped with prominent, parallel veins and spiky margins. As shoots grow, new leaves often continue to express this symptom for several weeks. Leaves already fully expanded at the time of exposure usually do not display symptoms and appear normal.

The loss in photosynthetic leaf area has many implications for vine health and fruit production. Minor injury on vines usually has little negative impact. Moderate to severe injury may delay ripening of fruit or reduce ability to ripen a crop. This means fruit on these affected vines should be thinned or removed so as to not stress the injured vine. Delayed fruit maturation may exist only for that season; in cases of severe injury, the effect may be seen in subsequent seasons. Thus crop losses may occur beyond the season of exposure. A delay or impairment in the ability of the vine to develop wood or harden off properly may also occur. This would lead to winter injury, because shoots without proper wood development die over the winter.

With 2,4-D able to persist in the vine for periods of three weeks or longer, the potential for damage to fruit set is high. Observations of 2,4-D injury on grapevines over the last decade suggest that disruption to set is minimal or non-existent with minor leaf injury. With moderate to severe leaf symptoms, the potential for cluster damage is much higher. Moderately affected clusters set fewer berries. Where damage is severe, a cluster may set few or no berries.

SOME COMMONLY USED POSTEMERGENCE HERBICIDES WHICH CAN INJURE GRAPES BY SPRAY DRIFT OR BY VOLATILTY

Phenoxy (growth hormone regulating)		
Common Name	***Trade Names***	***Registered uses***
2,4D*	Amine 4, Weedar 64, several others	corn, grains, turf, pasture, rights-of way, brush control, tree fruit, asparagus, strawberries
2,4-DP (dichlorprop)*	Weedone Lo Vol 4	corn, grains, turf, pasture, rights-of way, brush control
MCPP (mecoprop)*	Mecomec, others	turf, pasture
MCPA*	Sword, Rhonox, others	grains, turf, pasture
dicamba *	Vanquish, Eliminate	turf, corn, pastures, rights-of -way, brush control
triclopyr*	Chaser, Turflon Ester	turf, rights-of -way, brush control
clopyralid	Lontrel, Stinger, Hornet	*not registered for Long Island use*
Non-Phenoxy		
halosulfuron	Manage, Permit	corn, sorghum, turf, field nurseries
glyphosate	Roundup Ultra/Touchdown	many crops
paraquat	Gramoxone Extra, Boa	many crops

** commonly sold in two- and three-way mixes for weed control in commercial and homeowner turf.*
(Some trades names: Trimec, Three Way, Chaser, Triplet, Mec Amine D)

There are many herbicide products currently on the market that contain a combination of two or three phenoxy or growth hormone regulating herbicides (see table). Recent studies conducted on Long Island have shown that exposure to trace amounts (1/100 labeled use rate) of any of the commonly used components of these mixtures has the ability to cause moderate to severe damage

to grapes. With this level of sensitivity, there is evidently no herbicide of this class that is safer to use than another near grapes. However, in this same study, the varieties: *Petit Verdot, Chardonnay* and *Cabernet Franc* were slightly more tolerant to very low levels of these herbicides than were *Cabernet Sauvignon, Merlot* and *Malbec.*

Alternatives to phenoxy herbicides

For broadleaf weed control in turf, there are a few currently registered herbicides that offer an alternative to the phenoxys. The postemergence herbicides bentazon (Basagran) and halosulfuron (Manage/ /Permit/Sandea) are relatively safe to use near grapes, but they are specialty products that are used to control yellow nutsedge in turf, corn and vegetables. Two other postemergence herbicides: Buctril and Corsair can be used for weed control in sod production on Long Island.

In ~~sweet or~~ field corn, postemergence herbicides in the sulfonylurea family such as Permit (Sandea), Accent or Beacon may offer a somewhat safer alternative to 2,4-D and dicamba (Banvel).

References

Many thanks to reviewers Mark Chien, Winegrape Agent, Penn State Cooperative Extension, Lancaster Co.; Rick Dunst, Director of the Fredonia (NY) Vineyard Laboratory; Dale Moyer, Extension Educator, Cornell Cooperative Extension of Suffolk County; and Dr. Robert Pool, Professor of Viticulture, Cornell University/NYS Agricultural Experiment Station, Geneva.

Ahmedullah, M., Marquis, L., Yang, C. and Kawakami, A. Metabolism of 2, 4-D in Grape. J. Amer. Soc. Hort. Sci. 110 (4) : 480-484. 1985.

Chien, Mark. 2,4-D : Herbicide Drift Into Vineyards. In newsletter The Grapevine, Jan. 2001. Penn State Coop. Ext., Lancaster Co.

Hellman, E. and Fults, J. Preventing Phenoxy Herbicide Damage to Grape Vineyards. From Oregon State Univ. Extension Service web site. Revised Oct. 1999.

Senesac, A.F. Grape Cultivar Response to Off-Target Applications of 2,4-D and Analogous Herbicides. Proc. Northeastern Weed Science Society. 55 : 131. Jan., 2001.

Prepared by:
Alice Wise and Andy Senesac
Extension Educators
Viticulturist and Weed Specialist, respectively
Revised April 2004