

Weed Pests of Grapes in the North Central Region

Weeds and Weed Control: Weeds can cause tremendous problems in the vineyard. Besides competing with the grapevine for nutrients, light, and moisture, weeds provide shelter and food for other pests. Dense weed growth impairs air circulation in the vineyard, creating an environment where grape diseases can flourish. In addition many weeds, such as common dandelion, can be alternate hosts for nepoviruses. Weeds must be controlled to maintain a productive vineyard.

Weeds can be categorized as annuals or perennials. Annual weeds complete their life cycle, from emergence to setting seed and dying, in less than 12 months. Summer annuals (common lambsquarters, pigweed, green foxtail, for example) emerge in the spring or early summer and complete the cycle by fall. Winter annuals (such as shepherd's purse, red dead nettle, henbit) may germinate anywhere from mid-summer through fall (depending on the species), overwinter as a rosette, and resume growth in spring, typically setting seed and dying by May or June. With annuals, destroying the top growth usually kills the entire plant and prevents further seed production.

Perennial weeds complete their lifecycle over two or more years. Perennials can be some of the most difficult weeds to control in vineyards. Quackgrass, johnsongrass, yellow nutsedge, Canada thistle and field bindweed, bermudagrass (southern portion of North Central Region), and trumpetcreeper and other viney weeds are specifically problematic. Perennials spread and reproduce mainly by underground vegetative structures.

Weed Management: Weed control in vineyards is usually accomplished through application of herbicides in a band under the vine row. Row middles are most often maintained in sod to support equipment and reduce erosion. Herbicides can be very useful and substantially reduce labor costs compared to hand cultivation. Some growers use mechanical cultivation to control weeds under the row, but equipment is expensive and soil moisture conditions must be perfect for this method to be successful. Non-chemical alternatives such as flaming are occasionally used to manage weeds.

Selective Herbicides: Herbicides are either selective or non-selective. A *selective herbicide* affects some plants but not others. A *non-selective herbicide* will kill any plant it contacts.

Contact Herbicides: Contact herbicides affect only the tissue sprayed. They do not move within the plant. Only above-ground tissues that are directly sprayed will be affected. Contact herbicides (e.g., Gramoxone) are useful for controlling small annuals and for temporarily reducing growth of perennials.

Systemic Herbicides: Systemic, or translocated, herbicides, are those that move within the plant. Systemic herbicides applied to the soil (e.g., Karmex) are absorbed by roots and translocated to leaves where they inhibit physiological processes such as photosynthesis. Systemic herbicides applied to the foliage (e.g., Roundup) translocate to the root system, provided the herbicide is applied at the correct growth stage.

Residual Herbicides: A residual herbicide or persistent herbicide (e.g., Princep) is one applied to the soil (may also be applied to leaves) where it slowly breaks down over time but continues to control germinating weeds for some time after application. Some residual herbicides may persist long

enough to damage crops planted a year or more after application. Residual herbicides may or may not be selective, and they may or may not be systemic.

Proper Application: To be effective, herbicides must be selected properly for the weeds they are to control; they must be applied at the proper time, at the proper rate, and with the proper equipment. The degree of weed control depends largely on the skill of the operator. In most cases, herbicide rates given are for overall coverage (**broadcast rates**). For **band** treatment common in vineyards, the amount of herbicide applied is reduced according to the portion of area treated. For example, if a grower wants to control weeds in a 4-foot wide band beneath a crop planted in rows 10 feet apart, the rate of herbicide needed per acre of crop will be 4/10 of the broadcast rate per acre.

Herbicides can injure grape vines if used improperly. Therefore, sprayer adjustment and calibration should be as precise as possible to assure accurate and uniform applications. Growers must use nozzles appropriate for herbicide application at low pressures (20-40 psi) on a fixed boom-type applicator. This type of sprayer is calibrated easily and, when designed properly, will deposit herbicide uniformly. Calibrate the sprayer carefully, and apply herbicides according to the suggested rates. Continued use of the same herbicide can lead to resistance development in weeds, or the establishment of tolerant weeds. It is recommended that the same herbicide be used for no more than two consecutive years to avoid resistance problems and improve weed control spectrum.

Tank Mixes: Certain herbicides may be combined in suitable tank-mixes. Consult product labels for approved combinations and recommended rates. Do not use tank mixes that are not listed on the label. By using tank mixes, a preemergence herbicide can be applied together with a postemergence herbicide to provide improved weed control, or two preemergence herbicides may be applied at reduced rates, each to gain better weed control and reduce the risks of crop damage.

Use Restrictions: Herbicide use is controlled by federal regulations which prescribe the crops upon which the herbicides can be used and the timing and rates for which these materials are registered. Be sure to use only registered materials at the rates recommended. Herbicides are covered by Worker Protection Standards where they apply. Restricted-entry intervals (REI) and Personal Protective Equipment (PPE) information are included on the product label.

Herbicides registered for use in grapes:

- **Pre-emergent herbicides**

- dichlobenil (Casoron)
 - Use: Annual and perennial grasses and broadleaves; not really used
 - Efficacy: Good to Excellent
 - Comments: Not used much. Expensive. Granular formulation difficult to use.
- flumioxazin (Chateau)
 - Use: Annual broadleaves and suppression of grasses
 - Efficacy: Excellent
 - Comments: Recent grape registration (2005). Vines need to be 2 yrs unless trained or protected PHI=60 days; lasts 6-8 weeks, may wear out quick depending on conditions

- napropamide (Devrinol)
 - Use: Annual grasses and broadleaves; not really used
 - Efficacy: Fair
 - Comments: PHI=35 days; somewhat expensive; doesn't work as well
- isoxaben (Gallery) (non-bearing)
 - Use: Most broadleaves
 - Efficacy: Good-Excellent
 - Comments: Non-bearing vines only (12 month PHI); very expensive; only product that provides broad-leaf control on new plantings
- oxyfluorfen (Goal)
 - Use: Annual broadleaves and suppression of grasses
 - Efficacy: Excellent
 - Comments: Age Restriction: 3 years or trellised 3 ft off ground; Has some post-emergent activity; Good broad-leaf control; Not used as much
- diuron (Karmex)
 - Use: Annual grasses and broadleaves
 - Efficacy: Excellent
 - Comments: Age restriction: vines need to be at least 3 years old or at least 1.5 inch trunk diameter; widely used; great blend with Chateau; soil type concern (light soils may cause possible vine damage); inexpensive, may result in supply shortages
- pronamide (Kerb) (Restricted Use Pesticide)
 - Use: Annual and perennial grasses and certain broadleaves
 - Efficacy: Fair
 - Comments: not widely used; expensive; supplies are short; fall application not conducive to grape growers (who usually apply in spring)
- simazine (Princep)
 - Use: Annual grasses and broadleaves
 - Efficacy: Excellent
 - Comments: Age restriction: 3 years; widely used; economical; Princep/surflan is a standard tank mix
- pendimethalin (Prowl) (non-bearing)
 - Use: Annual grasses and certain broadleaves
 - Efficacy: excellent
 - Comments: Non bearing only (12 month PHI); widely used, especially in new plantings; economical; some reports of bad odor
- isoxaben + trifluralin (Snapshot)
 - Use: Annual grasses and certain broadleaves
 - Efficacy: Excellent
 - Comments: Non-bearing only (12 month PHI). Granular formulation difficult to apply (growers not set up for this as well); Expensive;

- norflurazon (Solicam)
 - Use: Annual grasses and broadleaves and suppression of yellow nutsedge
 - Efficacy: Good
 - Comments: Age restriction: 2 years; PHI=60 days; some usage

- oryzalin (Surflan)
 - Use: Annual grasses and certain broadleaves
 - Efficacy: Excellent, when tank mixed
 - Comments: widely used, although some growers have stopped using it; not really effective when used alone; needs to be watered in; works best when it is incorporated into soil

- trifluralin (Treflan)
 - Use: Annual grasses and broadleaves
 - Efficacy: Good
 - Comments: PHI=60 days; not widely used; inexpensive; needs to be incorporated within 24 hours

- **Post Emergent Herbicides**

- carfentrazone (Aim)
 - Use: Annual broadleaves
 - Efficacy: Good; Excellent on suckering
 - Comments: PHI=3 days. Can be used for sucker control; some usage; Great tank mix with gramoxone, Roundup (enhances efficacy, gets the weeds that Roundup/gramoxone misses); Effective at low doses;

- bentazon (Basagran)
 - Use: Annual broadleaves and yellow nutsedge
 - Efficacy: Good (for yellow nutsedge)
 - Comments: Non-bearing only (12 month PHI); minimally used (only if you have a yellow nutsedge problem)

- fluazifop (Fusilade)
 - Use: Most annual and perennial grasses
 - Efficacy: Good (on grasses)
 - Comments: Non-bearing only (12 month PHI); some usage; soybean/grape growers may use it more

- paraquat (Gramoxone) (restricted use pesticide)
 - Use: Most annual grasses and broadleaves and top kill of perennials.
 - Efficacy: Good
 - Comments: Can be used for sucker control; widely used; Adjuvant use improves performance; Needs careful usage (inhalation risk, permanent damage); Gramoxone/Princep is an inexpensive mix; used extensively for sucker control in juice grapes; instant gratification (see weeds die!)

- sethoxydim (Poast)
 - Use: Annual and perennial grasses
 - Efficacy: Good (on grasses with correct timing)
 - Comments: PHI=50 days; some usage; takes a while to see results; doesn't affect suckers

- diquat (Reglone)
 - Use: Annual grasses and broadleaves
 - Efficacy:
 - Comments: Non-bearing only (12 month PHI); relatively new; not widely used

- glufosinate (Rely)
 - Use: Annual and perennial grasses and broadleaves
 - Efficacy: Fair-Good
 - Comments: PHI=14 days. Can be used for sucker control; Age restriction 1 year; some usage; used later in season as a Roundup replacement;

- glyphosate (Roundup, Touchdown)
 - Use: Annual and some perennial grasses and broadleaves
 - Efficacy: Good-Excellent
 - Comments: PHI=14 days; widely used (#1 usage in IA); weed resistance concerns (especially because of the wide usage); often tank mixed; inexpensive; not volatile

- pelargonic acid (Scythe)
 - Use: Annual and perennial grasses and broadleaves
 - Efficacy: Poor
 - Comments: PHI=14 days; organically approved; stinks; not widely used; expensive

- clethodim (Select)
 - Use: Most annual and perennial grasses
 - Efficacy: Good
 - Comments: Non-bearing only (12 month PHI); not widely used; some usage if they have other crops (soybeans, etc.)

- vinegar
 - Efficacy: Poor
 - Comments: organic growers are trying to use it

“To do” list for weeds

Research needs

- Non-chemical weed control (mechanical, etc.)
- Effective weed control in organic production
- Technology transfer from other grape systems (Europe)
- Companion crops (issues with long-term competition with grapes)
- Mulches (efficient plastic mulches, etc.)
- Herbicides on new plantings
- Specific weeds that present problems: horsenettle, honeyvine bindweed, marestail, nutsedge, black nightshade, lambsquarters, ragweed, bermudagrass
- Research on herbicide resistance in vineyard weed populations

Regulatory needs

- Phenoxy herbicide (2,4-D, Dicamba) drift issues:
 - Especially as Roundup resistance leads to increased 2,4-D and dicamba usage (crop to crop spray drift specifically), and new Dicamba and 2,4-D “ready” soybean varieties are released
 - Especially an issue in areas of country (IL, IN, IA) with large areas of corn and soybeans etc.
 - Regulations vary from state to state
 - Definition of volatility and drift make enforcement difficult
 - The introduction of Dicamba resistant soybeans in 2009 may create additional risk for growing grapes in the Midwest

Education needs

- Education on off target damage (drift and volatility) management (for commercial applicators)
- Roundup resistance education (minimizing Roundup resistance)
- Pre-plant site selection in weed control
- Education on weed control, herbicides in general (because it’s a complex topic)
- Education on managing herbicide resistance in weed populations

Table 6. Herbicide Effectiveness on Major Weeds in Vineyards†

HERBICIDE	ANNUAL BROADLEAF								ANNUAL GRASSES						PERENNIAL WEEDS						
	Chickweed	Lambsquarters	Mustard	Pigweed	Ragweed	Smartweed	Horseweed	Yellow Rocket	Barnyard Grass	Brome Grass	Crabgrass	Fall Panicum	Sanbur	Witchgrass	Foxtail	Bindweed	Chickweed	Dandelion	Golderod	Wild Grape	Ground Ivy
Casoron	E ¹	E	E	E	E	E	F	G	G	P	F	F		G	G	P	G	G		P	F
Devrinol	G	G	P	G	P	F	P	P	E	E	E	E		E	E	N	G	P	N		
Gallery	E	G	F	F	G		E		P		P				P		E	P			
Goal	G	E	F	E	G	G	F	F	F		F	F			F	P	G	P	N		
Surflan	E	G	F	G	P	P	P	P	G		G	G		E	E	N	G	P	N		
Kerb	G	P	F	F	F	F	P	F	E	E	E	G	E	F	G	N	G	N			
Simazine	E	E	E	E	E	E	F	E	E	F	F	F		F	E	F	E	P	N		
Solicam	G	F	F	F	F	G	F	G	G	F	G	G		F	E	P	G	P	N		
Fusilade	N	N	N	N	N	N	N	N	E	F	G	G		E	E	N	N	N	N		
Gramoxone Extra	E	E	E	E	G	E	G	G	E	E	E	E		E	E	P	P	P	P	P	P
Poast	N	N	N	N	N	N	N	N	E	F	G	E		E	E	N	N	N	N		
Rely	G	F		G	F	G	E	G	G	F	F	G	F		G	F	G	G	F		
Roundup Ultra	E	E	E	E	E	E	G	G	E	E	E	E		E	E	E	E	G	E	F	G
Touchdown	E	G	G	F	G	G		G	E	G	G	G		E	E	F	E	N			
2,4-D	P	F	G	G	G	G	P	G	N	N	N	N		N	N	G	P	E	P	F	P

¹Control ratings: E = excellent, G = good, F = fair, P = poor, and N = not labeled or no activity against this pest.

† From Michigan State University 2007 Fruit Management Guide (Bulletin E-154).

Table 6 (con't). Herbicide Effectiveness on Major Weeds in Vineyards†

HERBICIDE	PERENNIAL WEEDS (CONT.)														
	Mallow	Milkweed	Nightshade	Nutsedge	Quackgrass	Plantain	Poison Ivy	Sowthistle	Stinging Nettle	Canada Thistle	Velvetleaf	Vetches	Virginia Creeper	Horsenettle	Shepherd's Purse
Gallery	P		G			G					G		N	P	G
Surflan	N	N	N	N	P		N	P		N	P		N	N	N
Simazine	N	P	G	P	F	P	N	F		P		P	N	P	G
Solicam	N	P		P	F	F	N	F		P	F		N	P	G
Fusilade	N	N	N	N	G	N	N			N	N		N	N	N
Gramoxone Extra	P	P	P	F	P	F	P	P	P	P	P	P	P	P	F
Poast	N	N	N	N	F	N	N	P		N	N		N	N	N
Rely	P	P	F	N	F	G	F	P	F	F	G	N	N	N	F
Roundup Ultra	F	E	E	F	E	F	E	G	F	E	G	F	G	F	G
Touchdown		F	G	F	G			E		F	F				G
2,4-D	P	P		P	N	E	F	F		G	G	F	P	P	G

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