

Honeyvine Milkweed Control in Tree Fruits, Small Fruits, and Grapes

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Honeyvine milkweed is a perennial weed commonly found in Kentucky fields, groves, and orchards. In general, honeyvine milkweed is a difficult weed to control due to its extensive taproot system and rapid growth rate. It is especially difficult to control in permanent crop situations such as plantings of apples, blueberries, and grapes. This is due to the fact that soil tillage is not practiced in orchards, blueberry fields, or vineyards, which would otherwise destroy the root system of honeyvine milkweed and prevent it from getting established.

This publication discusses the biology and growth habit of honeyvine milkweed and addresses its management and control specifically in plantings of tree fruits, small fruits, and grapes. It also includes detailed information on herbicides labeled for use in tree fruits, small fruits, and grapes. Finally, this publication discusses results of herbicide research conducted at the University of Kentucky Research and Education Center that sheds light on the performance of various herbicides in the control or suppression of honeyvine milkweed.

Plant Description

Name: Honeyvine milkweed.

Other names: Bluevine, climbing milkweed, dog's collar, Enslin's vine, honeyvine, peavine, sandvine, smooth anglepod, smooth swallow-wort.

Latin name: *Ampelamus albidus* (Nutt.) Britt.

Other Latin names: *Gonolobus laevis* Michx.; *Cynanchum laeve* (Michx.) Pers.

Family: Milkweed family or Asclepidaceae.

Origin: Native to United States.

Distribution: Roadsides, waste places, fencerows, thickets, pastures, low moist woods, and fallow and cultivated fields.

Life cycle: Perennial herb.

Stems: Smooth and slender, without milky juice, growing up to 13 feet (4 m) tall.



Above: Honeyvine milkweed at six-leaf stage—plant is 6 inches tall.



Right: Honeyvine milkweed at 12-leaf stage—plant is now 18 inches tall. The plant tripled in height in one week's time.

Leaves: Opposite (2 per node), long-stalked, dark green, and 1 to 3 inches wide, with a wide basal sinus and prominent veins.

Flowers: Borne in roundish clusters on long stalks in the leaf axis; blooms July through September.

Fruits: Long, smooth, slender green pods 3 to 6 inches long that open along one seam and contain many light-brown, oval, winged seeds tipped with silky hairs; each plant can produce up to 50 pods.

Roots: A deep perennial taproot reaching 6 feet in fertile soils, with many lateral roots, which are fleshy and brittle.

Distribution: Pennsylvania to eastern Nebraska, south to Texas and northern Florida.

Facts and folklore: Beekeepers recommend this plant as an excellent source of pollen.

Similar weeds: Often confused with field bindweed (*Convolvulus arvensis* L.), which is similar in most aspects, except that field bindweed has alternate leaves (1 per node).

Control Classification

Honeyvine milkweed is considered a difficult weed to control, especially if it is established. The following reasons contribute to its aggressive growth and infestation and difficulty of control:

1. Deep perennial taproot that survives winter freezes
2. Rapid growth reaching up to 12 feet in one season; if left unchecked, one plant can cover a trellised apple tree.
3. Adaptability to live and grow in various soil types
4. Extended period of germination or sprouting from taproot
5. Large number of pods and seeds produced per year
6. Winged seeds suitable for wind dissemination

Growth Habit

Honeyvine milkweed is commonly found in all regions of Kentucky. It sprouts from roots in May in Kentucky and continues to germinate over a long period. When the weather warms up, a 6-inch shoot can grow to 3 feet and wrap around a corn stalk in one week. In shaded areas, as under the tree canopy in a fruit orchard, honeyvine milkweed grows fast with long internodal spaces and few leaves near the ground. Once it reaches the lower tree branches, it leafs out and continues to grow fast until it reaches the top of the tree. No herbicides are available for its control at this stage.

Orchard and Vineyard Management

A tried-and-true control of milkweed that has reached the tree is to cut the vine at ground level and let it slowly wither and die. The stem breaks easily, possibly due to its fast growth, and can easily be pulled or broken with bare hands. However, this is not a permanent solution, as the plant regenerates from the extensive root system.

The best approach in controlling honeyvine milkweed is to prevent it from getting established in the first place. Between the extensive perennial taproot and the numerous wind-disseminated seeds, it is easy to understand how one weed can infest a large area if given time.

There are few herbicides labeled for tree fruits (apple, cherry, peach, pear, plum), small fruits (blueberry, blackberry, raspberry, strawberry), and grapes, which are known to control or suppress honeyvine milkweed. These herbicides are listed in Table 1. Control efficacy rating for preemergence and postemergence application is also presented.

All preemergence herbicides are rated fair, with only partial control or suppression of honeyvine milkweed. Still, their use and effectiveness should not be discounted. Germination or growth suppression weakens the weed, resulting in reduced growth rate and spread. Use of preemergence herbicides will also keep the rows weed-free, enabling growers to easily see the new sprouts of honeyvine milkweed for immediate action and control by spot treatment with Roundup or Rely.

Table 1 clearly indicates that only the nonselective, postemergence, and broad spectrum herbicides, Rely and Roundup, have any significant control over honeyvine milkweed. Even after complete kill of top growth is achieved with these two herbicides, honeyvine milkweed will very likely re-sprout and re-infest the orchard or vineyard. This is due to the fact that neither herbicide is likely to completely kill the extensive taproot. However, consistent attention to the weed infestation level and its growth stage, combined with regular spot application of Roundup or Rely, will ensure that honeyvine milkweed will remain under check, if not completely eradicated from the site with time.

Table 1. Honeyvine milkweed control ratings of preemergence and postemergence herbicides labeled for tree fruits and small fruits, including grapes.

Trade Name	Common Name	Efficacy Rating ^a of:	
		Preemergence Control	Postemergence Control
Gallery	isoxaben	Partial ^b	-
Princep	simazine	Partial	-
Showcase	isoxaben + trifluralin + oxyfluorfen	Partial	-
Snapshot	isoxaben + trifluralin	Partial	-
Reglone	diquat	-	Partial
Rely	glufosinate	-	Excellent ^c
Roundup	glyphosate	-	Excellent

^a Rating is based on label information for each herbicide.
^b Partial control signifies that the herbicide may only stunt or suppress growth, even at the highest application rate.
^c Excellent control signifies that the herbicide may completely kill the top growth of the weed at the high rate; however, it may sprout again from the underground taproot.

Evaluation of Chateau Herbicide

Chateau 51WG, by Valent, is an herbicide labeled for bearing and nonbearing fruit trees and grape. It provides residual control of susceptible weeds and additional burndown activity when used as a burndown program. It is also labeled as part of a fall application program to provide residual weed control into midspring. Chateau is labeled for nonselective control of many annual and perennial grasses and broadleaves. The recommended application rate of Chateau is 6 to 12 oz/A.

The Chateau label does not include honeyvine milkweed on the list of weeds controlled or suppressed. Consequently, Chateau is not included in Table 1. However, experiments conducted at the University of Kentucky Research and Education Center in apple, peach, and grape have shown promising results in suppression of honeyvine milkweed up to 75 days after application. For this reason, results of two experiments conducted in 2006 are presented to detail performance of Chateau when compared with other preemergence herbicides.

In both experiments, a postemergence herbicide (Roundup or Gramoxone) was added to all treatments for additional control of already emerged spring weeds. Treatments were applied on April 26 and 27, 2006, using a CO₂-pressurized backpack with a two-nozzle, shielded boom at 30 pounds per square inch (psi) and 20 gallons per acre (gpa). The spray band width is 3 feet on both sides of the grapevine row, for a total band width of 6 feet per row.

In the first experiment (Table 2), visual injury ratings were taken at 28 and 75 days after treatment (DAT) to quantify short-term and long-term residual control by the herbicide treatments applied. At 28 DAT, Chateau alone (treatment 2) and chateau combinations (treatments 7 to 10) had the highest ratings values of 9 to 10, equivalent to 90% to 100% control of honeyvine milkweed. Prowl and Surflan followed next with about 60% to 70% control, and Princep and Karmex were last with about 40% to 50% control. Note that treatment 1 (Roundup alone) performed as well as treatments 3, 5, and 6 (Prowl, Princep, and Karmex). Therefore, honeyvine milk-



Honeyvine milkweed size on April 26, 2006 in a grape vineyard.



The same grape vineyard showing the size of the honeyvine milkweed on July 10, 2006, if left unattended to.

weed control in treatments 3, 5, and 6 was from the Roundup rather than the other herbicide in the spray mix. Only Chateau alone (treatment 2) gave additional milkweed control over the Roundup portion of the spray mix.

By 75 DAT, a new comparison was made of the performance of the various herbicide treatments. At that stage, only treatments with Chateau alone or in combinations with other preemergence herbicides still showed any residual control of the weed, with an injury control rating of 3 to 5, or about 30% to 50% control over the control treatment. At 75 DAT, the control treatments (Roundup alone) and treatments 3 to 6 had lost any residual control of honeyvine milkweed.

Although 30% to 50% control is not a significant value and not even close to total eradication of the weed, it is important to realize that 75 DAT is about mid-July. If left unchecked, honeyvine milkweed would have reached the grapevine top wire by mid-July. Instead, the weed is just starting to actively grow where the grapevine is shading out the weed competition.

Table 3 shows data of a second experiment involving preemergence herbicides used on hilled and nonhilled grapes. Visual injury ratings were evaluated at 34 DAT only. In French hybrid and *vinifera* grapes, cultivars requiring hilling to protect the graft union from winter injury, Chateau at both low (6 oz/A) and high (12 oz/A) rates had 100% control of honeyvine milkweed, and was equal to that achieved with Goal 13 pt/A. Honeyvine milkweed control observed with Chateau and Goal in hilled grapes was equal to that of Solicam, Princep, and Surflan, but was better than that observed with Karmex.

In nonhilled grapes, a similar result was obtained generally with two notable exceptions—Karmex was the worst performer in hilled grapes but one of the best treatments in the non-hilled grapes; the opposite was true for Surflan.

No later ratings were taken in this experiment, so no conclusions can be drawn on the performance of Chateau or the other preemergence herbicides on honeyvine milkweed control.

Table 2. Visual injury ratings of various preemergence herbicides on honeyvine milkweed in a grape experiment conducted at the University of Kentucky Research and Education Center in 2006.

Treatment ^a	Rate/A	Application Timing	% Control of Topgrowth:	
			28 DAT ^b	75 DAT
1	Control		60 ab	10 d
2	Chateau 51WG	12 oz	100 a	50 a
3	Prowl 3.3EC	5 pt	60 ab	10 d
4	Surflan 4AS	6 pt	70 ab	10 d
5	Princep 4L	4 pt	40 b	10 d
6	Karmex 80DF	2.5 lb	50 ab	10 d
7	Chateau 51WG	12 oz	100 a	30 c
	Prowl 3.3EC	5 pt		
8	Chateau 51WG	6 oz	100 a	40 b
	Surflan 4AS	6 pt		
9	Chateau 51WG	12 oz	90 ab	50 a
	Princep 4L	4 pt		
10	Chateau 51WG	6 oz	100 a	50 a
	Karmex 80DF	2.5 lb		
LSD (P=0.05)			33	5

^a Roundup WeatherMax 5.5L at 24 oz/A was added to all treatments.
^b DAT = Days After Treatment.
^c Preemergence treatments were applied on April 26, 2006.

Table 3. Visual injury ratings of various preemergence herbicides on honeyvine milkweed in a hilled and nonhilled grape experiment conducted in Washington County, Kentucky in 2006.

Treatment ^a	Rate/A	Application Timing	% Control of Topgrowth:	
			34 DAT ^b (Hilled)	34 DAT (Non-Hilled)
1	Control		10 c	10 c
2	Chateau 51WG	6 oz	100 a	90 ab
3	Chateau 51WG	12 oz	100 a	90 ab
5	Karmex 80DF	3 lb	50 b	80 ab
6	Goal XL 2WC	13 pt	100 a	100 a
7	Solicam 80DF	5 lb	80 ab	90 ab
8	Princep 4L	10 pt	70 ab	80 ab
9	Surflan 4AS	12 pt	90 ab	50 b
LSD (P=0.05)			28	25

^a Gramoxone Max 3L at 2 pt/A was added with all treatments for control of existing weeds.
^b DAT = Days After Treatment.
^c Preemergence treatments were applied on April 27, 2006.

Registered Herbicides Label Information

The following information is a brief summary of the label information for the herbicides listed in Table 1. Because

these herbicides are also labeled for other crops and uses, this information should not be viewed as applicable for all crops and situations infested with honeyvine milkweed. The information is tailored only for tree fruits, small

fruits, and grape production. Always consult the label before use for additional information. Where trade names are used, no endorsement is intended, nor criticism implied of products not named.

Gallery 75DF

isoxaben 0.75 lb ai/lb

Company: Dow AgroSciences.

Rate: 1.33 lb/A. Only partial control or suppression of honeyvine milkweed is achieved. Repeat applications should not be made within 60 days. Maximum rate of 4 lb/A per 12-month period.

Crops: Gallery is labeled on nonbearing apple, cherry, peach, pear, plum, grape, blueberry, blackberry, and raspberry. Non-bearing is defined as plants that will not bear fruit for at least one year after treatment.

General comments: Gallery is a preemergence herbicide. Apply in late summer to early fall, in early spring or anytime prior to germination of target weeds, or immediately after cultivation. Gallery does not control established weeds. Gallery is stable on the soil surface for up to 21 days but must be incorporated by moisture to be effective. A single rainfall or irrigation of 0.5 inch or more is necessary for activation. If weeds emerge due to lack of rainfall or irrigation, shallow cultivation to a depth of 1 to 2 inches will incorporate the herbicide and destroy existing weeds. Do not apply through any type of irrigation system.

Advisory statement: Caution—causes eye irritation; harmful if inhaled.

Personal protection:

- Short-sleeved shirt and long pants.
- Shoes plus socks.

Environmental statements: Do not contaminate water when disposing of equipment washwaters. Do not apply directly to water or to areas where surface water is present.

Preharvest interval: None.

Rain delay: None.

Restricted-entry interval: 12 hours.

Rotation restrictions: None.

Forage restrictions: Do not graze, harvest, or feed treated orchard cover crops to livestock.

Tank mixtures: Gallery may be tank-mixed if:

- The tank mix is labeled for the timing and method of application.
- Tank-mixing with Gallery is not prohibited by the label of the tank mix product.
- The tank mix combination is compatible as determined by a “jar test.”

Princep 4L

simazine 4 lb ai/gal

Company: Syngenta.

Rates: Apple pear, and sour cherry—2 to 4 qt/A; Blueberry, blackberry, and raspberry—2 to 4 qt/A in the spring or apply a split application or 2 qt/A in the spring plus 2 qt/A in the fall in a minimum of 40 gal of water/A. On plantings less than six months old, use half the above rate. Do not apply when fruit is present; Grape—2 to 4.8 qt/A anytime between harvest and early spring. Do not use in vineyards established less than three years to avoid crop injury; Peach, plum, and sweet cherry—1.6 to 4 qt/A in late fall to early spring prior to weed emergence.

Crops: Princep is labeled on apple, cherry, peach, plum, grape, blueberry, blackberry, and raspberry.

General comments: Apply Princep before weeds emerge or after removal of weed growth. Since Princep enters weeds mainly through their roots, moisture is needed to move it into the root zone. Very dry soil conditions following application may necessitate shallow cultivation. Avoid contact with fruit, foliage, or stems. Apply only to orchards or groves where trees have been established 12 months or more. Make only one application per year.

Advisory statement: Caution—causes eye irritation; harmful if absorbed through skin or inhaled. Avoid breathing vapors or spray mist. Avoid contact with eyes, skin, or clothing.

Personal protection:

- Long-sleeved shirt and long pants.
- Shoes plus socks.
- Chemical-resistant gloves.

Environmental statements: Do not contaminate water when disposing of equipment washwaters. Do not apply directly to water or to areas where surface water is present. Simazine is a chemical which can seep or leach through soil and enter groundwater.

Preharvest interval: See general comments above.

Rain delay: None.

Restricted-entry interval: 12 hours.

Rotation restrictions: None.

Forage restrictions: Do not graze treated areas.

Tank mixtures: Gramoxone, Roundup, and Surflan.

Reglone 2EC

diquat 2 lb ai/gal

Company: Syngenta.

Rates: 1.5 to 2 pt/A in minimum 15 gal water/A. Always add a nonionic surfactant containing 75% or greater surface active agent at 0.06% to 0.5% v/v or 0.5 to 4 pt per 100 gal.

Crops: Reglone is labeled on nonbearing apple, cherry, peach, pear, plum, grape, blueberry, blackberry, and raspberry.

General comments: Reglone desiccant is a nonvolatile herbicide for use as a general postemergence herbicide to control weeds in nonbearing crops. Reglone is a contact-type herbicide and requires actively growing green plant tissue to function. Thorough coverage of all green plant tissue is essential for effective control. Herbicidal activity is usually quite rapid with effects visible in a few days. Retreatment may be necessary for complete control of grasses and older established weeds. Do not apply through any type of irrigation system.

Advisory statement: Warning—may be fatal if absorbed through skin, harmful if swallowed or inhaled; causes substantial but temporary eye injury, and skin irritation. Avoid breathing vapor or spray mist.

Personal protection:

- Coveralls over short-sleeved shirt and short pants.
- Chemical-resistant gloves made of any waterproof material.
- Chemical-resistant footwear plus socks.
- Protective eyewear.
- Chemical-resistant headgear for overhead exposure.
- Chemical-resistant apron when cleaning equipment, mixing, or loading.

Environmental statements: This pesticide is toxic to aquatic invertebrates. Do not apply directly to water or to areas where surface water is present. Do not contaminate water when disposing of equipment washwaters.

Preharvest interval: 1 year.

Rain delay: 30 minutes.

Restricted-entry interval: 24 hours.

Rotation restrictions: None.

Harvest and forage restrictions: Do not use for food or feed for one year after application. Keep livestock and pets out of treated fields and crop areas.

Tank mixtures: None.

Rely 1EC

glufosinate 1 lb ai/gal

Company: Bayer CropScience.

Rates: 1.5 to 4 fl oz/gal for spot application. 4 qt/A when weeds are less than 6 inches and 6 qt/A when weeds are 6 inches or taller. Maximum rate of 4.5 gal/A per season for apple and 12 qt/A for blueberry and grape per season.

Crops: Rely is labeled on nonbearing apple, grape, and blueberry.

General comments: Rely is a nonselective herbicide for use as a general postemergence herbicide to control weeds in nonbearing crops. Plants that have not yet emerged at the time of application will not be controlled. Rely is a contact-type herbicide and requires actively growing green plant tissue to function. Thorough spray coverage of all green plant tissue is important for effective control. Visual effects occur within two to four days after application under good growing conditions. Retreatment may be necessary for complete control of grasses and older established weeds. Rely will only partially control or suppress honeyvine milkweed, even at the highest application rate. Do not apply through any type of irrigation system. Do not apply Rely on trees within one year of transplanting.

Advisory statement: Warning—causes substantial but temporary eye injury; harmful if swallowed, inhaled or absorbed through skin. Avoid contact with skin, eyes or clothing. Avoid breathing vapor or spray mist.

Personal protection:

- Short-sleeved shirt and long pants.
- Chemical-resistant gloves made of any waterproof material.
- Shoes plus socks.
- Protective eyewear.

Environmental statements: Do not apply directly to water, or to areas where surface water is present. Do not clean equipment or dispose of equipment washwaters in a manner that will contaminate water resources or arable land.

Preharvest interval: 14 days.

Rain delay: 4 hours.

Restricted-entry interval: 12 hours.

Rotation restrictions: None.

Forage restrictions: Do not graze, harvest, or feed treated orchard cover crops to livestock.

Tank mixtures: Princep, Devrinol, Surflan, Solicam, Sinbar, Karmex, Goal.

Roundup WeatherMax 5.5L

glyphosate 5.5 lb ai/gal

Company: Monsanto.

Rates: 16 to 32 fl oz/A. Addition of ammonium sulfate at 1 to 2% (8.5 to 5 lb/100 gal) may increase performance, especially under hard water conditions, drought, or when tank-mixing with residual herbicides. Surfactants, buffering agents, or pH adjusting agents are not recommended. However, colorants or drift control additives are acceptable. Only partial control or suppression of honeyvine milkweed is achieved. Repeat applications should not be made within 60 days. Maximum rate of 5.3 qt/A per 12-month period.

Crops: Roundup is labeled on apple, cherry, peach, pear, plum, grape, blueberry, and blackberry.

General comments: Roundup is a postemergence, systemic herbicide, with no soil residual activity. It is generally nonselective and gives broad spectrum control of many annual weeds, perennial weeds, woody brush, and trees. Visible effects on most annual weeds occur within two to four days but on most perennial weeds may not occur for seven days or more. Cool or cloudy weather may delay development of visual symptoms. Annual weeds are easiest to control when they are small. Best control of most perennial weeds is obtained when Roundup is applied at late growth stages approaching maturity. Always use the higher rate within the recommended range when weed growth is heavy or dense or weeds are growing in an undisturbed area. Avoid contact with green trunks, foliage, or fruit of planted crop to avoid injury. Various generic formulations of glyphosate are available on the market.

Advisory statement: Caution—harmful if inhaled; causes moderate eye irritation. Avoid contact with eyes, skin, or clothing. Avoid breathing vapor or spray mist.

Personal protection:

- Long-sleeved shirt and long pants.
- Shoes plus socks.
- Chemical-resistant gloves.

Environmental statements: Do not contaminate water when disposing of equipment washwaters. Do not apply directly to water, or to areas where surface water is present.

Preharvest interval: 14 days for blackberry, blueberry, and grape; one day for apple and pear; 17 days for cherry, peach, and plum.

Rain delay: Heavy rain soon after application may wash this product off of the foliage.

Restricted-entry interval: 4 hours.

Rotation restrictions: None.

Forage restrictions: Do not graze, harvest, or feed treated orchard cover crops to livestock.

Tank mixtures: Roundup may be tank-mixed with Goal, Devrinol, Karmex, Prowl, Princep, Solicam, and Surflan.

Showcase 2.5TG

isoxaben + trifluralin + oxyfluorfen 1.25 lb ai/50 lb bag

Company: Dow AgroSciences.

Rate: 200 lb/A. Only partial control or suppression of honeyvine milkweed is achieved. Repeat applications should not be made within 60 days. Maximum rate of 600 lb/A per 12-month period.

Crops: Showcase is labeled on nonbearing cherry, peach, and plum. Nonbearing is defined as plants that will not bear fruit for at least one year after treatment.

General comments: Showcase is a preemergence herbicide. Apply anytime prior to germination of target weeds or immediately after cultivation. Length of weed control will vary with rate applied, weed population, temperature, watering regime, and other factors. Showcase doesn't control established weeds. A single rainfall or irrigation of 0.5 inch or more is necessary for activation. Optimum weed control is obtained when Showcase is activated within three days of application. If weeds emerge due to lack of rainfall or irrigation, shallow cultivation to a depth of 1 to 2 inches will incorporate the herbicide and destroy existing weeds.

Advisory statement: Caution—causes moderate eye irritation; harmful if absorbed through skin or inhaled. Prolonged or frequently repeated skin contact may cause allergic reaction in some individuals.

Personal protection:

- Coveralls over long-sleeved shirt and long pants.
- Chemical-resistant footwear plus socks.
- Chemical-resistant gloves.
- Chemical-resistant apron for mixers and loaders.

Environmental statements: Extremely toxic to freshwater fish and aquatic invertebrates. Do not contaminate water when disposing of equipment washwaters. Do not apply directly to water or to areas where surface water is present.

Preharvest interval: 1 year.

Rain delay: None.

Restricted-entry interval: 24 hours.

Rotation restrictions: None.

Forage restrictions: None.

Tank mixtures: None.

Snapshot 2.5TG

isoxaben + trifluralin 1.25 lb ai/50 lb bag

Company: Dow AgroSciences.

Rate: 200 lb/A. Only partial control or suppression of hon-eyvine milkweed is achieved. Repeat applications should not be made within 60 days. Maximum rate of 600 lb/A per 12-month period.

Crops: Snapshot is labeled on nonbearing apple, cherry, peach, pear, plum, grape, blueberry, blackberry, and raspberry. Non-bearing is defined as plants that will not bear fruit for at least one year after treatment.

General comments: Snapshot is a preemergence herbicide. Apply anytime prior to germination of target weeds or immediately after cultivation. Length of weed control will vary with rate applied, weed population, temperature, watering regime, and other factors. Snapshot doesn't control established weeds. A single rainfall or irrigation of 0.5 inch or more is necessary for activation. Optimum weed control is obtained when Snapshot is activated within three days of application. If weeds emerge due to lack of rainfall or irrigation, shallow cultivation to a depth of 1 to 2 inches will incorporate the herbicide and destroy existing weeds.

Advisory statement: Caution—causes moderate eye irritation; harmful if swallowed or inhaled. Prolonged or frequently repeated skin contact may cause allergic reaction in some individuals.

Personal protection:

- Short-sleeved shirt and long pants.
- Shoes plus socks.

Environmental statements: Extremely toxic to freshwater fish and aquatic invertebrates. Do not contaminate water when disposing of equipment washwaters. Do not apply directly to water, or to areas where surface water is present.

Preharvest interval: 1 year.

Rain delay: None.

Restricted-entry interval: 12 hours.

Rotation restrictions: None.

Forage restrictions: None.

Tank mixtures: None.

References

Weed Description

- *Interactive Encyclopedia of North American Weeds*, Copyright Southern Weed Science Society, Champaign, IL, Produced by ThunderSnow Interactive, 5720 Wentworth Dr., Johnston, IA 50131.
- *Weeds of North Central States, North Central Regional Research Publication No. 281, Bulletin 772*, University of Illinois at Urbana-Champaign, College of Agriculture, Agriculture Experiment Station
- *Weeds of Kentucky and Adjacent States—A Field Guide*, Patricia Dalton Haragan, The University Press of Kentucky, 663 South Limestone Street, Lexington, KY 40508-4008.
- *Ohio Perennial and Biennial Weed Guide* at www.oardc.ohio-state.edu/weedguide/listall.asp

Herbicide Label Information

- Crop Data Management Systems, Inc., online website at <http://www.cdms.net/manuf/manuf.asp>

Research Results

- “Weed Control in Non-Bearing Grape”—UKREC. J. Masabni. 2005. Research report in *Fruit and Vegetable Crops Research Reports* (PR-521) published by Kentucky Agricultural Experiment Station, University of Kentucky, College of Agriculture, Department of Horticulture, Lexington, Kentucky, 40546.