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Texas Citrus
Weed Control

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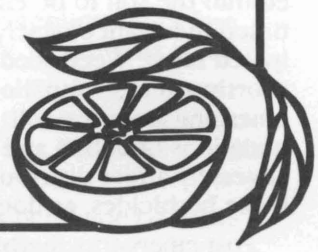

Weed control in citrus orchards is essential to the objectives of good orchard management because weeds compete for available water and nutrients. Vines can completely cover tree canopies, thereby limiting production efficiency of the tree and interfering with pest control. In addition, weed species can host various pests which also affect citrus crops. Methods of weed control include mechanical, herbicidal or limited combinations of the two.

Mechanical Control

Mechanical weed control operations, normally required following each irrigation and major rainfall, begin in February and continue into November. Machinery includes disks, tree hoes (rotovators), flying saucers and shredders. The first three can easily cause damage to tree trunks and skirts as well as surface roots, even when used by skilled operators. The shredder only keeps weed growth in check. Permanent borders cannot be maintained, so temporary irrigation borders must be knocked down before tillage and replaced for the next irrigation, thereby increasing costs.

At best, weeds are allowed to grow and compete with the orchard before mechanical control methods are employed. Any delay in cultivation or shredding allows weeds to go to seed, thus perpetuating the problem of control. Tillage operations move buried weed seeds to the surface where they can germinate, and tillage may actually spread infestations of perennial weeds such as bermudagrass and Johnsongrass.

Cultivation increases soil moisture losses by breaking the surface crust and exposing moist soil to evaporation by air and sunlight. Late fall cultivation can stimulate tree growth and increase the orchard's susceptibility to cold. In addition, a loose soil absorbs less solar radiation than a firm, packed soil surface, thereby increasing potential freeze damage.

Mechanical weed control is still practiced in some Texas citrus orchards because of tradition or grower preference, and because its cost is perceived to be less than that for herbicidal weed control. In terms of actual cash flow this belief may be partly true but, when all economic costs of ownership, maintenance and use of equipment are allocated to mechanical weed control operations over the season, it becomes the more expensive of the two alternatives.

Herbicidal Weed Control

Herbicidal weed control is applied in late February through early April and again in August or September, using one or more of a variety of available pre-emergence herbicides to prevent weed seedlings from growing. A post-emergence herbicide may be included to kill existing weeds during the early stages of establishing a good herbicide program. Weeds which escape from the pre-emergence herbicides are spot treated with post-emergence herbicides as necessary.

The establishment of a successful herbicidal weed control program in orchards may take 2 years to accomplish, requiring higher label rates of herbicides, inclusion of post-emergence herbicides in the spray and repeated spot treatment. Once established, weed control becomes easier and less expensive as lower label rates of herbicides can be used, and post-emergence materials are used only in occasional spot spraying.

The choice of herbicides depends upon mode of action, the weed species involved and relative costs of the materials. No single herbicide is effective against all weed species that are encountered in an orchard, so tank-mixed combinations are common. Tree age and variety also influence herbicide selection; i.e., some herbicides cannot be used in young trees or on some varieties of citrus. Some herbicide rates depend upon soil texture.

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Herbicidal Mode of Action

Pre-emergence herbicides must be incorporated into the soil to be effective, so applications are timed in advance of scheduled irrigations or anticipated rains. Weed seedlings absorb the herbicide shortly after germination and usually die before emerging from the soil. Standing weeds and accumulations of debris and litter on the orchard floor adversely affect distribution and effectiveness of these herbicides, as does a cloddy soil surface.

Post-emergence herbicides kill existing weeds either by desiccation or by translocation to all growing points. Both types must be applied in sufficient volume to thoroughly wet the vegetation. Coverage and efficiency are enhanced by the use of surfactants, and severe weed infestations are more easily controlled if the weeds are mowed a couple of weeks prior to herbicide use. Most post-emergence herbicides have limitations on the time interval between application and rainfall.

The desiccants simply burn existing vegetation upon contact, which limits their use to annual weeds and seedling perennials. Established perennials have extensive underground storage organs which can quickly regrow new tops, so translocated herbicides are necessary to kill the entire plant. This difference in mode of action precludes the use of the two types of materials together.

Special Weed Problems

Properly selected and applied pre-emergence herbicides should provide adequate control of most weed seedlings. However, because no herbicide is effective against all weed species, resistant weeds will quickly proliferate in the orchard. Such weeds should be identified so that a herbicide which does control them can be incorporated into the next application to complement the existing herbicide.

One situation which leads to numerous apparent escapes or resistant weeds occurs on heavier soils which tend to develop surface cracks between irrigations. Pre-emergence herbicides usually are confined to a shallow surface layer of soil. Some weed species below this layer will germinate in soil cracks and emerge without having come into contact with the herbicide barrier. Little can be done about this problem except to spot treat with contact herbicides before seeds can be produced. This problem usually decreases as the orchard matures and as residual pre-emergence herbicide infiltrates such areas.

Pre-emergence herbicides are most effective when applied directly to bare soil. The presence of standing weeds reduces the effective soil coverage of herbicides, thereby leading to less than optimum control. However, this problem disappears as the overall weed control program effectively eliminates standing weeds. Although leaf litter under the tree also intercepts herbicide, both the litter and tree shade reduce the germination of most weeds.

Several pre-emergence herbicides will control seedlings of perennial weeds, but few suppress established perennials. Because perennial weeds typically regenerate from underground root-stem systems, top kill by any means is ineffective. An intensive program of spot treatment with systemic or translocated herbicides is necessary to eliminate such weeds from the orchard.

Johnsongrass, bermudagrass and guineagrass require intensive control efforts. Control of these perennials can be achieved by treating the regrowth 2 to 3 weeks after mowing or cutting. This assures that the weeds are actively growing and that the herbicide will be translocated to all parts of the plant. Guineagrass growing up through the tree canopy can be pulled down flat so that its leaves can be sprayed without also spraying the tree. All three grasses may require retreatment to achieve complete control.

Perennial vines are particularly difficult to control because of their growth in the tree canopy and because there rarely is sufficient leaf surface area near the ground to permit adequate uptake of contact herbicides. Established vines should be pulled by hand or severed mechanically, followed in 2 to 3 weeks by careful spot treatment with contact herbicides. The general resistance to contact herbicides by such vines as morningglory, possum grape, goatsbeard and milkweed vine may be overcome by using higher label rates plus surfactants. Repeated mechanical or hand de-vining in conjunction with spot treatment and a good pre-emergence herbicide program ultimately will provide effective vine control.

Herbicide Terminology

Annual Weed - one that germinates, grows, sets seed and dies in one season; e.g., Coloradograss, sunflower, careless weed.

Biennial Weed - one that germinates and grows one season, then flowers and produces seed and dies the following season; e.g., wild carrot.

Broadcast Spray - uniform application of herbicide to the entire orchard floor.

Contact Herbicide - one that kills plant tissue on contact by desiccation of leaves and stems; e.g., paraquat, or by translocation to the entire plant; e.g., Roundup®.

Desiccation - the drying-up and death of tissues; i.e., leaves and stems.

DF - Dry Flowable, a dry formulation that pours from the container, designed to eliminate or reduce pesticide dust and residue, replacing many wettable powder formulations.

Emulsion (E) or Emulsifiable Concentrate (EC) - a formulation in which the herbicide is dissolved in one liquid which is then suspended in minute globules in another liquid; e.g., oil in water.

Herbicide - any compound that kills plants.

Incorporation - mixing a herbicide into the surface soil by mechanical means, rainfall or irrigation.

Non-selective - equally toxic to almost all plants.

Perennial Weed - one that lives over several years, produces seed annually and grows back from the roots; e.g., Johnsongrass, guineagrass, bermudagrass.

Phytotoxic - poisonous to plants, usually describing chemical damage on desirable plants, e.g., herbicide damage to citrus trees (leaves).

Post-emergence - herbicide application after weed emergence; a herbicide which kills existing weeds.

Pre-emergence - herbicide application before weed emergence; a herbicide which kills weed seedlings during emergence.

Selective Herbicide - one that is more toxic to some plants than to others; e.g., Fusilade® is selective for grasses.

Spot Spray - application of herbicide by hand-held spray gun directly to individual weeds.

Strip Application - uniform application of herbicide to a limited portion of the orchard floor; i.e., a narrow strip along either side of the tree row.

Surfactant - a material added to herbicide solutions to enhance distribution of the spray and to improve coverage and action on weeds.

Suspension - a formulation in which very fine, solid herbicidal particles are dispersed, but not dissolved, in a liquid.

Systemic or Translocated Herbicide - one which can be absorbed in one part of a plant and which exerts toxic effects on the entire plant.

Wettable Powder - a formulation of very fine, solid herbicidal particles which can be dispersed or suspended in a liquid.

Table 1. Herbicides for weed control in Texas oranges and grapefruit.

Trade Name	Chemical	Rate/acre	Comments
Pre-emergence herbicides			
Devrinol 50 DF	napropamide	8 lb.	Apply fall to early spring, irrigate to incorporate. Do not apply within 35 days of harvest.
Eptam 7 E	EPTC	3.5-7.0 pt.	Incorporate with cultivation equipment in nursery or non-bearing. For bearing orchards, meter 3.5 pt/a into flood irrigation.
Goal 1.6 E	oxyfluorfen	2.5-10 pt.	**Nonbearing only**. Do not use until growth flush has hardened. Post-emergent activity at the higher rates.
Hyvar L	bromacil	2-8 qt.	Rate depends on tree age and soil type, 8-qt. maximum/year. Some post-emergent activity. Hyvar X also labelled.
Karmex DF	diuron	2-6 lb.	Minimum age of 1 year, some post-emergent activity.
Krovar I DF	bromacil + diuron (1:1)	2-8 lb.	Rate depends upon tree age and soil type. 16-lb maximum per year on bearing trees. Some post-emergent activity.
Krovar II DF	bromacil + diuron (2:1)	2-8 lb.	Rate depends upon tree age and soil type. 8-lb maximum per year on bearing trees. Some post-emergent activity.
Princep Caliber 90	simazine	4.4-5.3 lb.	Do not use for 1 year after freeze damage. Princep 4L also labelled.
Prowl	pendimethalin	2-4 qt.	**Nonbearing use only**. Avoid contact with trees. Prowl 3.3 EC also labelled.
Solicam DF	norflurazone	2.5-5 lb.	Rate varies with soil type, 10-lb maximum per year. Labelled for chemigation.
Surflan AS	oryzalin	2-6 qt.	Labelled for chemigation.
Treflan	trifluralin	1-4 qt.	Must be soil incorporated, rate varies with soil type. Treflan M.T.F. and TRI-4 also labelled.
Post-emergence herbicides			
Ansar 8100	DSMA	3-6 lb.	Three-application limit, use in 100 gal. water. Avoid all tree contact.
Bueno 6	MSMA	2.67 pt.	**Nonbearing use only**. Three-application limit, use in 100 gal water. Avoid all tree contact. Not for use within 1 year of harvest. Super Arsonate also labelled.
Fusilade 2000	flazifop-p-butyl	1-1.5 qt.	**Non-bearing use only**. Crop oil concentrate or surfactant must be included. Not for use within 1 year of harvest. Grass control only.
Gramoxone Extra	paraquat	2-3 pt.	Crop oil concentrate or non-ionic surfactant required. Avoid all tree contact.
Poast	sethoxydim	1.5-2.5 pt.	Spot treatment at 1-1.5%. Crop oil concentrate or Dash® required for activity. Grass control only.
Roundup	glyphosate	1-5 qt.	Spot treatment at 0.75-1.5%.
Touchdown	sulfosate	to 5.3 pt.	**Nonbearing use only**. Not for use within 1 year of harvest. Spot treatment at 0.25-5%.

The above information is for comparison and educational purposes only. It is not intended to provide sufficient information on which to base application. Although the information was compiled from the most recent product labels, pesticide labels are subject to change.

It is the grower's responsibility to read and follow all directions for use as stated on the product label.

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