



# Texas Agricultural Extension Service

## Texas Citrus Insecticide and Miticide Guide

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### Basis of Pesticide Selection

Using a pesticide wisely requires forethought and analysis of a particular pest problem or situation to determine the best choice under those particular conditions. Often, more than one choice exists for a particular pest. Factors that should be considered in selecting one pesticide over another include:

- *Product efficacy* or effectiveness;
- *Application frequency* needed or amount of residual control provided;
- *Cost* per acre, factoring in the number of applications required to achieve control;
- *Potential hazards* to applicator, mixer and grove workers; signal words on the product label are a good indication of this hazard;
- *Hazard to beneficials* and other non-target organisms and
- *Use restriction*, including re-entry intervals, preharvest intervals, number of allowable applications, time required between applications and restriction on mixing with other products, particularly oils.

**Use of the information contained in the guide.** This publication is designed to provide, to the best extent possible, a listing of the insecticides and miticides available for use against selected citrus crop pests. It is written for comparison and educational purposes only and is not intended to provide complete information for applications of a product. The product label attached to the container always must be consulted before use.

The pesticide listing for control of citrus pests was compiled from the most recent product labels available at the time this guide was prepared. No guarantee of effectiveness is intended by listing a particular product for use against a particular pest; only that the pest is listed on the label for the product. For selected pests, where a sufficient research base exists, an efficacy rating (ER) is provided to give a performance index of various products for controlling a particular pest. Ratings are based on field tests conducted in Texas and other citrus growing areas. Local conditions and pest pressure may cause actual performance to vary.

### Effects of pH on Spray Solutions

Water sources used for pesticide applications in the Lower Rio Grande Valley are alkaline with pH readings typically ranging from 7.8 to 8.2. Use of high pH water, particularly above 8.0, may affect the performance of many pesticides, particularly organophosphates and carbamates. Degradation of certain pesticides is more rapid at higher pH, especially at higher temperatures (>95°F). Little information is available on the degradation rate of specific pesticides in high pH water; some pesticides are relatively unaffected. Generally, it is a good idea to check pH levels with a pH meter on a regular basis and buffer spray water with suitable acid buffer down to a range of 6-7 pH. When tank mixes of more than one pesticide or when fertilizer is combined with a pesticide, the final spray solution should be checked to determine pH.

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## Use of Spray Adjuvants

Adjuvants or spray additives are intended to enhance product performance or coverage. Surfactants or spreading agents lower the spray particle surface tension allowing droplets to spread out on plant surfaces instead of combining to form large droplets subject to run-off. They are especially useful when spraying hard-to-wet surfaces such as waxy citrus leaves, armored scale insects, mite colonies with webbing or hairy-surfaced weeds. Some pesticide products are formulated with surfactant included.

Stickers and extenders function to lengthen pesticide performance life by increasing product tenacity or weathering qualities of materials sprayed on plant surfaces. These frequently are combined with surfactants and are available as "spreader-stickers." Other adjuvants available for special applications include anti-foam agents and suspending agents that improve performance and enhance application of pesticide suspensions. In general, adjuvants properly used increase product performance, reduce waste and help minimize non-target contamination.

## Pesticide Safety

The key to using pesticides safely is to be aware of potential hazards and take adequate precautions before and during use to prevent any unwanted effects. Before using any pesticide, **read the label**. Besides application instructions, the label provides information on re-entry intervals, hazards to the environment and non-target organisms, a statement of practical treatment or first-aid in case of exposure, storage and disposal procedures for containers, pre-harvest intervals to avoid excessive residues and the symptoms of poisoning. Users also should consult *Texas Pesticide Laws and Regulations* for state provisions that affect the application of pesticides to citrus.

## Protecting Bees from Pesticides

With the exception of some tangerines and tangelos, most citrus cultivars do not require honeybee pollination. However, blooming citrus is highly attractive to honeybees as a food source and may provide a good nectar source for a high quality honey sought by beekeepers. Although insecticides are not routinely applied during bloom, it is important to recognize that many pesticides applied to citrus are toxic to honeybees. The insecticides may cause significant bee death while they are foraging in sprayed orchards or through contamination of water or pollen brought back to

the hive. The grower and beekeeper should cooperate closely to minimize bee losses. The following guidelines will reduce bee losses:

- If at all possible, avoid spraying during bloom. If applications are needed, apply when the fewest bees are foraging. Applications in the evening are least hazardous, early morning sprays are second best and mid-day sprays are the worst relative to bee hazards.
- To prevent heavy losses of bees, don't allow pesticides to drift onto colonies. Bees often cluster on the front of their hives on hot evenings. Pesticide drift or direct spray at this time generally results in high levels of mortality.
- Where insecticides are needed, consider their toxicity. "Highly toxic" pesticides present an extreme hazard to bees and should be used during bloom only if no other alternative exists. Insecticides categorized as "Moderately toxic" or "Relatively non-toxic" pose a much reduced hazard to bees and may be applied with relative safety in the evening or morning hours. For specific hazard ratings of pesticides to honeybees, refer to the pesticide recommendation table.

## Precautions for Certain Miticides and Insecticides

Many pesticides have special precautions listed on the label that should be considered prior to their use. Failure to completely follow label guidelines may result in excessive residues at harvest, plant injury, poor pest control or undue hazards to non-target organisms including the applicator. The following are some of the major precautions for some of the most commonly used citrus pesticides:

**Petroleum oil sprays.** When applied properly, oils provide a very useful tool for controlling some citrus pests without damage to beneficial organisms but the sprays require careful use to avoid plant injury. Soil moisture, humidity, temperatures, growth stage of leaves and fruit and the type of oil used can influence whether or not tree injury occurs. Spray oils should not be applied when soil moisture is low or when relative humidity is below 30 percent and daytime temperatures are likely to exceed 95° F. Effective use of oils for pest control requires that the oil persist on the tree long enough to kill the pest but not long enough to cause tree injury. Persistence of oil film on foliage beyond the tree's tolerance can interfere with photosynthesis and transpiration. Such damage can



**Table 1. Effectiveness of selected pesticides against major citrus pests.**

Pesticide	Formulated rate/ acre	Days to harvest (PHI)	Re-entry interval (days) <sup>3</sup>	Signal word <sup>1</sup>	Honey- bee hazard <sup>2</sup>	Toxicity to beneficials <sup>4</sup>		Citrus rust	Mites		Armored scales	Brown soft scale	Mealy-bugs
						Mites	Insects		Texas citrus	Citrus red			
Acaraben 4E	4-6 pt		ASTD	W	HT	-	-	3	1	1	N	N	N
Carzol 92 SP	5-10 oz	7	1	D	MT	-	H	3	0	N	+	+	N
Comite 6.5	2-3 pt	7	ASTD	D	RNT	-	L	1	2	3	N	N	N
Dicofol 4 EC	3-8 pt	7	ASTD	C	RNT	H	L	3	3	3	N	N	N
Ethion 4E	4-6 pt	0**	1	D	HT	-	-	3	0	2	1	1	N
Guthion 2L	2.5-3.75 pt	28**	7-SL	D	HT	-	H	1	2	N	3	3	2
Lorsban 4E	2-7 pt	21**	1	W	HT	-	-	2	0	0	2	3	0
Morestan 25 WP	5 lb	21	ASTD	C	RNT	M	L	2	3	3	N	N	N
Oil	2.5-3.75 gal		ASTD	C	RNT	M	M	0	0	3	3	0	0
Sevin 80S	2.5-3 lb*	5	ASTD	W	HT	L	H	N	+	N	+	3	0
Sulfur 6E	1-11 pt*		ASTD	C	RNT	H	L	2	0	N	+	N	N
Supracide 2E	2.5-5 pt*	14**	30	D	HT	H	H	N	N	+	3	3	1
Temik 15 G	33-67 lb		See label	D	HT	-	-	3	3	1	N	0	0
Vendex L	10-20 oz*	7	ASTD	D	RNT	L	L	3	3	3	N	N	N
Vydate L	625-2.5 pts*	7	ASTD	D	HT	-	-	3	N	N	N	N	N

\*Amount per acre derived by multiplying amount per 100 gal x 2.5; 250 gallons per acre is the assumed volume.

\*\*PHI depends on rate, method of application, the number of applications or particular citrus crop; consult label.

<sup>1</sup>Signal words: D = danger (most hazardous), W = warning, C = caution (least hazardous).

<sup>2</sup>Honeybee hazard: HT = highly toxic, MT = moderately toxic, RNT = relatively non-toxic.

<sup>3</sup>Re-entry intervals: ASTD = allow spray to dry.

<sup>4</sup>Hazard to beneficials: H = highly toxic, M = moderately toxic, L = low level or nontoxic to beneficials, - = no information available.

**Key to efficacy ratings:**

- | Rating | Control Expected  |
|--------|---|
| 1      | = Suppression (<60% control)  |
| 2      | = Moderate control (60-80%)   |
| 3      | = Good to excellent control (80-100%)   |
| 0      | = Not labeled for this pest but provides some control when used for labeled pests |
| N      | = Not labeled   |
| -      | = Unknown effect  |
| +      | = May stimulate this pest   |

result in twig dieback, leaf drop, reduced yield and the reduction in amount of fruit sugars (soluble solids).

Tangerines and tangelos tend to be more sensitive to oil damage than grapefruit and oranges. Late summer or fall applications of oil sprays may delay maturity, which will interfere with proper coloring of early harvested fruit and may cause increased cold susceptibility. Persistence of oils on leaf surfaces increases with higher oil dosages or through the use of oil with higher distillation temperatures such as a narrow range 440-type oil. When choosing the type or rate of oils, keep in mind that oil dissipates more quickly under higher temperatures.

In situations where damage is likely from a regular oil spray because of hot, dry conditions, oil can be added at a low percentage to certain insecticide sprays to improve coverage. Before combining oil with any pesticide, read the label carefully to make sure the risk of phytotoxicity is not excessive. **Do not combine oil sprays**

**with sulfur or follow an application of sulfur within at least 30 days or plant injury may occur.** When combining pesticides with oil, use of emulsifiable concentrates or other liquid formulations is preferred over wettable or soluble powders.

**Comite.** Complete coverage is essential. Leaf distortion and/or fruit spotting may occur when used in the spring or it may occur if Comite is tank mixed with oil or applied within 2 weeks of an oil application. Do not use in a spray solution above pH 10 or mix with alkaline materials (such as lime).

**Ethion.** Do not apply within 90 days of a previous application.

**Guthion.** With one application per season, a 7-day preharvest interval should be observed; if two applications are required, PHI = 28 days.

**Lorsban 4E.** Do not apply when temperatures exceed 95° F. Do not apply when trees are stressed by drought or high temperature. Lorsban 4E should not be used in combination with Difolatan



80. For orchard floor application, do not tank mix with Roundup or Paraquat herbicides.

**Morestan.** One application per season.

**Sulfur.** Do not make sulfur applications during hot weather. Applications are restricted to November through May. Do not apply within 30 days of an oil application.

**Supracide.** Make no more than two applications per growing season, with at least 45 days between applications. Do not apply within 14 days of harvest. If applied with oil, the preharvest interval is 60 days.

**Vendex.** Do not apply more than four times in 12 months or within 7 days of harvest.

### Policy Statement for Making Pest Management Suggestions

The information and suggestions included in this publication reflect the opinions of Extension entomologists and pathologists based on field tests or use experience. The management sug-

gestions are a product of research and are believed to be reliable. However, it is impossible to eliminate all risks. Conditions or circumstances that are unforeseen or unexpected may result in less than satisfactory results even when these suggestions are used. The Texas Agricultural Extension Service will not assume responsibility for such risks. Such responsibility shall be assumed by the user of this publication.

Suggested pesticides must be registered and labeled for use by the Environmental Protection Agency and the Texas Department of Agriculture. The status of pesticide label clearances is subject to change and may have changed since this publication was printed. County Extension agents and appropriate specialists are advised of changes as they occur.

The user is always responsible for the effects of pesticide residues on his livestock and crops, as well as problems that could arise from drift or movement of the pesticide from his property to that of others. Always read and follow carefully the instructions on the container label.

**Table 2. Additional products labeled for use on citrus.**

Product <sup>2</sup>	Labeled use	Rate per acre <sup>1</sup>	Signal word	Days to harvest
Cygon 400	Mealybugs, mites	4-8 pt	W	4
Cythion 57%	Scales	1-1.5 pt	W	7
Diazinon AG500	Aphids, soft scale	0.5-1 pt	W	21
Dibrom 8E	Aphids, mites, brown soft scale	2.5 pt*	D	7
Dipel 2X	Orangedog	0.3-0.6 lb	C	0
Imidan 50 WP (oranges only)	Scales	2.5 lb*	D	7
Lannate L	Beet armyworm	2-4 pt	D	1
Lorsban 15 G	Ants	6.7	C	28
Metasystox-R	Aphids, Texas citrus mite	2.5-3.75 pt*	C	7
Parathion 4E	Scales, mealybugs	1.6 pt*	D	14
Thiodan 3E	Aphids	1.5-3.5 qt	W	Non bearing
Zolone 3EC	Orangedog, whiteflies	4-8 pt	W	14

<sup>1</sup>\* = Amount per acre derived by multiplying amount per 100 gallons x 2.5; 250 gallons per acre is the assumed volume.

<sup>2</sup>Phytotoxicity may occur on young leaves and fruit; see label for precautions.

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