Oklahoma Cooperative Extension Service
CR-6209
12/2020
Current Report
EXTENSION
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Commercial Pecan Insect and Disease Control

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Pecans are native to Oklahoma and can be seen growing in the wild in many areas of the state. Records reveal that Native Americans were the first to know of pecan trees and respect the value of this nut crop.

Even though pecans are native to Oklahoma, it doesn't follow that they easily produce a consistently marketable product. A full management cultural program can make the difference between no marketable production and a consistent, high quality, profitable pecan crop. In the modern pecan tree management program, attention is given to (1) reduction of weed and grass competition, (2) annual fertilization, (3) thinning over-crowded tree stands, (4) managing destructive wildlife (e.g. crows, squirrels, feral hogs, etc.) (5) controlling insects and diseases, and in the case of improved orchards, (6) irrigation and (7) crop load management.

Insect and disease control of pecan is not an easy job. Approximately seven months are required for growth and development of a pecan crop. At some time during this period, weather conditions are likely to be favorable for numerous pests. While there are many cultural practices such as variety selection, orchard floor sanitation, use of cover crops (HLA-6250), use of trap crops, and thinning of orchards for adequate air circulation; in many seasons, insect and disease control through the application of pesticide sprays will be the difference between a good pecan crop and no crop.

No matter where one falls on the spectrum of chemical pest control, it is beneficial for all to scout for pests diligently and to make use of tools that have been developed to ensure peak results from any sprays applied. Proper product selection, rotation, and timing can provide safe and effective control while preserving beneficial organisms. For more information on pest monitoring and spray timing aids as well as resistant varieties, see Fact Sheets: EPP-7079, EPP-7163, EPP-7189, EPP-7190, EPP-7642, HLA-6200 and HLA-6201. The following website is also helpful in timing of fungicide applications: OSU Pecan Scab Advisor http://mesonet.org/index.php/agriculture/category/horticulture/pecan/pecan_scab_advisor

To apply an effective pesticide spray to pecan trees, follow these rules:

- Use effective chemicals in rotation (failure to use a rotation of chemicals classes can cause that class of pesticide to be ineffective).
- At the proper rate (concentration)
- Apply thoroughly
- At the proper time.

When one or more of these four rules is not carried out properly, the spray effectiveness is reduced or could totally fail.

The amount of spray applied to an individual tree or acre of trees may vary greatly depending on the type of equipment used and the manner in which it is operated. Most pecan growers in Oklahoma use ground machines calibrated to deliver 100 gallons of spray per acre. Each year, sprayer output should be calibrated and recorded with notes on pressure settings, tractor speed, and rpm's. Regardless of the gallonage of spray applied, the amount of chemical (pesticide) applied to an acre should remain the same. Suggested chemical rates in this publication are given as rate/acre. For more help with calibration – okpecans.okstate.edu/pecan-pests/PDFs/sprayer-calibration-for-pecans.

Variable tree size and spacing, particularly in native groves, complicate estimates of quantity of spray solution needed. These decisions must be made on an individual basis. An acre equivalent of pecan trees is approximately 30 square feet of cross sectional trunk area. This figure is derived by measuring tree trunks at 4.5 feet above ground, calculating, and totaling the area. When this total reaches 30, the number of trees is one acre equivalent.

Number of trees per acre equivalent can be estimated from the following table:

Tree diameter	*Trees per acre equivalent*
13 inches	30
19 inches	15
23 inches	10

For additional information on calculating cross sectional trunk area consult OSU Fact Sheet EPP-6208.

If the label requires 1 pound of chemical per acre and if the average tree size is 23 inches in diameter, then 10 trees should receive 1 pound of chemical. The chemical should be dissolved in adequate water to wet the entire tree canopy. The

amount of water required can vary depending on the amount of tree canopy and other conditions. Native trees that have been crowded for example, may not have canopy normally associated with the trunk size. In those cases, grower judgment must be utilized to determine if the volume of water utilized is adequate to cover the leaves. It is better to apply too much water than an inadequate amount.

Adequate spray solution must be applied to insure coverage of the entire tree canopy. Larger trees require more solution. Manufacturers' recommendations for gallons vary from 100 to 600 gallons per acre. Refer to the chemical label for any manufacturers' recommendations on gallons per acre to apply. This table is a guideline and not a legal document. Changes in registration status may occur. Consult the pesticide label before application. The label is the law.

Bee Precautions

Several insecticides listed are toxic to bees. Mow the orchard floor before application if weeds or cover crops are blooming. Read individual labels for specific bee protection measures for each product. Pecans are wind pollinated; however, bees and other pollinating insects by simply wander through orchards.

Pest/Time To Spray	*Insecticide and Formulation*[1]	*MOA Group***	*Amount of Material Needed Per Acre*[2]	*Comments*
DORMANT SEASON SCALE INSECTS (Obscure scale,San Jose Scale, etc.) and MITE CONTROL	Dormant oils		4-10 gals (3 gal/100 gal water)	All dormant oils should be applied in February or March, well before budbreak. Do not apply late, as injury will occur. Use paraffinic oils with unsulfonated residues (UR) greater than 92%. Thorough coverage is essential since these materials act to entrap or suffocate pests. During and after application, temperatures should be between 50-70° F.
	Dormant oil 435		3-3.5 gal/100 gal water	
	Superior Spray oil NW		2 – 3 gal/ 100 gal water	
	PureSpray green[OMRI]		3 - 3.5 gal/100 gal water	
	Damoil			
	Dormant and Summer Spray Oil[OMRI]			
	Esteem	7C	13-16 oz	Insect Growth Regulator – the addition of a superior spray oil at dormant or delayed dormant will improve scale control.
PHYLLOXERA (GALLS) Apply from bud break to when new shoot growth is 2 inches long. Controls are not effective when typical symptoms. appear (July).	Asana XL[r]	3A	4.8-14.5 oz	Make one or two applications. For best results with Lorsban, apply 1pt/100 gal at budbreak and the same 7-10 days later. When applying all sprays, thoroughly wet the foliage.
	Centric 40 WG	4A	2-2.5 oz	
	Cobalt Advanced	1B+3A	22-57 oz	
	Lorsban 4E[r]	1B	2.0-4.0 pts	
	Malathion 57 EC	1B	1.2 pts	
	Movento	23	6-9 fl oz	
	Sevin XLR+	1A	2-5 qts	
	Silencer[r]	3A	2.56-5.12 oz	
	Warrior II[r]	3A	1.28-2.56 oz	Do not apply more than 7.68 fl oz per acre per year post bloom (Warrior II).
PECAN NUT CASEBEARER[3] First Generation May 20 to June 10 when eggs appear (when tips of nuts turn brown). Second Generation July 15-25.	Altacor	28	2-4.5 oz	1 or 2 applications. If second application is needed, apply 7 to 10 days after the first. With adequate monitoring for casebearer eggs, one application of the biological control agent, *Bacillus thuringiensis* (found in Javelin and Dipel DF) or the insect growth regulator, (found in Confirm or Intrepid 2F) can provide safe effective control while preserving beneficial organisms.
	Apta	21A	17.0-27.0 oz	
	Asana XL[r]	3A	4.8-14.5 oz	
	Baythroid XL[r]	3A	2.0-2.4 oz	
	Belay	4A	3.0-6.0 oz	
	Cobalt Advanced[r]	1B+3A	16-57 oz	
	Confirm 2F	18	8.0-16.0 oz	
	Dipel DF[OMRI]	11A	0.5-2 lbs	
	Entrust SC[OMRI]	5	4-10 oz	
	Grandevo[OMRI]		1-3 lbs	
	Hero[r]	3A	10.3 oz	
	Imidan 70-W[4]	1B	2.0-3.125 lbs	
	Intrepid 2F	18	4-8 oz	
	Intrepid Edge	18+5	4.0-6.4 oz	
	Invertid 2F	18	4-8 oz	
	Javelin WG[OMRI]	11A	.25-4.0 lb	
	Lorsban 4E[r]	1B	1.5-4 pts	Under high insect pressure, use 2.0-2.5 pts per 100-300 GPA (Lorsban)
	Malathion 57 EC	1B	1.2 pts	
	Minecto Pro[r]	6 + 28	8-12 oz	
	Mustang-Maxx[r]	3A	3.2 to 4 oz	
	Proaxis[r]	3A	2.56-5.12 oz	
	Sevin XLR Plus	1A	2-5 qts	
	Silencer[r]	3A	2.56-5.12 oz	
	SpinTor 2 SC	5	4-10 oz	
	Troubadour 2F	18	4-8 oz	
	TurnStyle	18	4.-8 oz	
	Warrior II[r]	3A	1.28-2.56 oz	

Pest/Time To Spray	*Insecticide and Formulation*[1]	*MOA Group***	*Amount of Material Needed Per Acre*[2]	*Comments*
HICKORY SHUCKWORM July 1 - July 7 A repeat application two weeks later may be needed.	Altacor	28	2-4.5 oz	
	Apta	21A	17.0-27.0 oz	
	Asana XL[r]	3A	4.8-14.5 oz	
	Baythroid XL[r]	3A	2.4-2.8 oz	Shuckworm can continue to be a problem through shell hardening and may not peak until half-shell hardening (about the time of weevil emergence).
	Cobalt Adavanced[r]	1B+3A	22-57 oz	
	Confirm 2F	18	8.0-16.0 oz	
	Entrust SC[OMRI]	5	4-10 oz	
	Grandevo[OMRI]		1-3 lbs	
	Hero[r]	3A	10.3 oz	
	Imidan 70-W[4]	1B	2.0-3.125 lbs	
	Intrepid 2F	18	4-8 oz	
	Intrepid Edge	18+5	4.0-6.4 oz	
	Invertid 2F	18	4-8 oz	
	Lorsban 4E[r]	1B	2-4 pts	
	Proaxis[r]	3A	2.56-5.12 oz	
	Sevin XLR Plus	1A	2-5 qts	
	Silencer[r]	3A	2.56-5.12 oz	
	SpinTor 2SC	5	4-10 oz	
	Troubadour 2F	18	4-8 oz	
	TurnStyle	18	4-8 oz	
	Warrior II[r]	3A	1.28-2.56 oz	
PECAN WEEVIL[5] Late July, early August or when weevils appear, but before shuck split.	Asana XL[r]	3A	8-14.5 oz	The majority of weevils emerge immediately after a rain (1”-2”) and populations can continue late July to mid-Oct., depending on rainfall and/or soil type emerging from. See Fact Sheets EPP-7190 and EPP-7079 .
	Baythroid XL[r]	3A	2.0-2.4 oz	
	BoteGHA ES[OMRI]	UNF	.25 qt-1 qt	
	Grandevo[OMRI]		2-3 lbs	
	Hero[r]	3A	10.3 oz	
	Imidan 70-W[4]	1B	2.0-3.125 lbs	
	Mustang-Maxx[r]	3A	3.2-4.0 oz	
	Proaxis[r]	3A	2.56-5.12 oz	Control with Imidan may not be adequate when heavy populations are present.
	Sevin XLR Plus	1A	2-5 qts	
	Silencer[r]	3A	2.56-5.12 oz	
	Warrior II[r]	3A	1.28-2.56 oz	Pecans are most susceptible to injury from weevils during the dough stage till shuck split.
APHIDS When they appear Avoid controlling sub-economic infestations of aphids early in the season as it destroys beneficials.	Admire PRO	4A	7.0-14.0 oz	Chemigation into root zone or subsurface side-dress shanked into root zone near emitter line. (Admire only)
	Apta	21A	17.0-27.0 oz	
	Asana XL[r]	3A	4.8-14.5 oz	
	Carbine 50WG	29	2.0-2.8 oz	40 day PHI for Carbine
	Centric 40 WG	4A	2-2.5 oz	Higher rate for Black Pecan Aphid (Centric & Closer)
	Closer SC	4C	1.5-2.75 oz	
	Cobalt Advanced[r]	1B+3A	22-57 oz	Do not use less than 22 oz of Cobalt Advanced for black aphid.
	Dimethoate 400 EC	1B	0.66 pt	
	Fulfill	9B	4.0 oz	
	Grandevo[OMRI]		2-3 lbs	
	Hero[r]	3A	10.3 oz	
	Lorsban 4E[r6]	1B	1-4 pts	
	Malathion 57EC	1B	1-2 pts	
	Movento	23	6-9 oz	
	Mustang-Maxx[r]	3A	3.2-4.0 oz	
	Nexter	21A	4.4 -10.67 oz	
	PQZ	9B	2.4-3.2 oz	
	Proaxis[r]	3A	2.56-5.12 oz	
	Warrior II[r]	3A	1.28-2.56 oz	
	Silencer[r]	3A	2.56-5.12 oz	
WEBWORM OR WALNUT DATANA When caterpillars appear feeding on leaves (June To late August)	Cobalt Advanced[r]	1B+3A	16-57 oz	
	Confirm 2F	18	8.0-16.0 oz	
	Dipel DF	11A	0.5-2 lbs	One or two applications. (Bt product)
	Entrust SC[OMRI]	5	4-10 oz	
	Grandevo[OMRI]		1-3 lbs	
	Intrepid 2F	18	4-8 oz	
	Intrepid Edge	18+5	4.0-6.4 oz	
	Invertid 2F	18	4-8 oz	
	Javelin WG[OMRI]	11A	0.25-4.0 oz	(Bt product) One or two applications.
	Lorsban 4E[r6]	1B	1.5-4oz	
	Sevin XLR Plus	1A	2-5 qts	
	SpinTor 2SC	5	4-10 oz	
	Troubadour 2F	18	4-8 oz	
	TurnStyle	18	4-8 oz	

Pest/Time To Spray	*Insecticide and Formulation[1]*	*MOA Group***	*Amount of Material Needed Per Acre[2]*	*Comments*
TWIG GIRDLER When damage first occurs- (late August or early Sept.)	Sevin XLR Plus	1A	2-5 qts	Dedicated sanitation of orchard floor (sticks) can dramatically reduce twig girdler and pruner populations.
STINK BUGS and LEAF-FOOTED BUG (True Bugs)	Baythroid XL[r]	3A	2.0-2.4 oz	In areas where legume crops are grown near pecan, true bug management can involve use of trap crops to draw these insects into small plantings of row crops (e.g. pearl millet) where control can be implemented on a much smaller scale. Stink bug only. (Silencer)
	BoteGHA ES[OMRI]	UNF	.25-1.0 qt.	
	Cobalt Advanced[r]	1B+3A	22-57 oz	
	Imidan 70-W[4]	1B	2.0-3.125 lb	
	Mustang-Maxx[r]	3A	3.2-4.0 oz	
	Proaxis[r]	3A	2.56-5.12 oz	
	Silencer[r]	3A	2.56-5.12 oz	
	Warrior II[r]	3A	1.28-2.56 oz	
MITES During hot, dry periods- Late in season.	Acramite 50WS	20D	.75-1.5 lbs	1 application per year.
	Dimethoate 400 EC	1B	0.66 pts	
	Envidor 2SC	23	14.0-18.0 oz	For pecan leaf scorch mite. Use 16.0-34.0 rate for brown mite, European red mite, Pacific spider mite and twospotted spider mite.
	Malathion 57EC	1B	1-2pts	
	Onager	10A	12-24 oz	1 application per year.
	Portal	21A	2 pts	1 application per growing season.
	Vendex 50WP[r]	12B	1-2.5 lb	Vendex is very effective against mites. Use higher rates on larger trees.
	Zeal	10B	2-3 oz	

r Restricted Use Pesticide

OMRI Organic Materials Review Institute (OMRI) listed for organic production.

1 See table at end for pre-harvest intervals and grazing restrictions.

2 Gal = gallon; lb = pound; pt = pint; qt = quart; oz = ounces.

3 The insecticides listed for casebearer control may be safely combined with some of the fungicides for scab control. Check label instructions for each product prior to use.

4 Imidan insecticidal activity is reduced when spray solution has a pH of 7 or higher. The pH of the spray solution can be corrected by adding a suitable buffering or acidifying agent (e.g., AG44M). The pH should be adjusted to 5.0 if possible, to increase residual activity.

5 Pecan Weevil: This insect is a serious problem in most sections of the state. The damage may be observed in two ways: (1) shedding of immature pecans prior to dough stage by feeding punctures of the adult weevils; and/or (2) mature pecans with larvae damage to the kernel. The most dependable method of monitoring pecan weevil populations is to use circle traps. Their use and utility are explained in Fact Sheet EPP-7190, Monitoring Adult Weevil Populations in Pecan and Fruit Trees in Oklahoma. A rainfall or irrigation event following a dry spell in July or through September can result in the emergence of large numbers of weevils from the soil. Traps should be placed on early ripening cultivars or where weevil are known to cause problems.

6 When Lorsban is used for aphid control, it should be combined with a synthetic pyrethroid (e.g., Asana XL, Ammo or Centric) for best results.

FUNGICIDE OPTIONS FOR SCAB PROTECTION

The number of fungicide applications needed may vary greatly depending on cultivar susceptibility, location and airflow in the orchard or grove, and other management, plus year to year depending on weather conditions.

All fungicides should be sprayed according to the schedule indicated by the label and/or by the aid of the OSU Pecan Scab Advisor. Sprays typically include: Bud Break, 2nd Pre-pollination, first - sixth cover sprays with the possibility of a seventh cover spray if needed in August before shucks begin to open.

Regardless of cultivar grown, over time scab resistance to fungicides can develop. Therefore, it is prudent to develop a good rotation system when making multiple applications of the various FRAC Groups below. As an example, start at bud break, spray with a Group 3, then 14 or more days later, based on the OSU Pecan Scab Advisor, rotate to a Group 1, followed another 14 or more days later, by another Group 3. Based on scab infection on leaves and shucks and information from the advisory, rotate to a Group 11, then finally consider finishing with something entirely different like Super-Tin, which is a Group 30. Other variations of this same scenario can be effective also, but the KEY POINT is DO NOT use the same FRAC Group two times consecutively. Do not make more than three (3) applications of QoI (strobilurin – FRAC code 11) fungicides in one season.

For other diseases, spraying for scab should take care of those diseases if choosing a fungicide that is effective on both. If no scab spray schedule is needed for resistant varieties but other diseases develop, choose a fungicide with that disease on the label and follow the spray timing listed for that disease. It is still important to follow rotation guidelines to prevent disease resistance from developing.

PRODUCT	*FRAC** CODE*	*ACTIVE INGREDIENT*	*RATE/ ACRE*[2]	*PHI*** (days)*	*REI*** (hours)*	*GRAZING/ FEED*	*COMMENTS*
Abound	11	Azoxystrobin	12.0 fl oz	45	4	Yes	Can also be used to control anthracnose. In addition to Abound, there are many generics available. Apply each according to own label.
Absolute Maxx	3+11	Tebuconazole+ Trifloxystrobin	5– 7.67 fl oz	30 DO NOT apply after shuck split.	12	No	Can also be used to control anthracnose.
Bumper 41.8 EC PropiMax EC Tilt	3	Propiconazole	4 – 8 fl oz 4 - 8 fl oz 4 - 8 fl oz	45 *** 30 *** 45 *** DO NOT*** Apply after shuck split.	12 12 12	No No No	Bumper, PropiMax, and Tilt: Can also be used to control downy spot, liver spot, vein spot, zonate leaf spot and powdery mildew Do not apply more than 32 fl oz/A/year. PHI for these products is the listed days or shuck split – whichever comes first.
Elast 400	U12	Dodine	3 pt (1.5 pt in tank mix)	DO NOT apply after shuck split.	48	No	Can also be used to control liver spot, brown spot, downy leaf spot, leaf blotch, and downy mildew. In case of tank mix with triphenyltin or fenbuconazole, use 1.5 pt Elast/acre. See label for pecan varieties susceptible to foliar injury from Elast. Do not make more than 6 applications/ year.
Enable 2F	3	Fenbuconazole	8.0 fl oz	28 DO NOT spot, apply after shuck split.	12	No	Also can be used to control downy leaf gnomonia leaf spot, leaf blotch, powdery mildew, and vein spot. Do not make more than 6 applications or apply more than 48 fl oz./A/season. Do not apply Enable 2F with polymer based spray adjuvants.
TebuStar 3.6 FL	3	Tebuconazole	4.0-8.0 fl oz	DO NOT apply after shuck split.	12	No	Also can be used to control brown leaf spot, downy spot, liver spot, vein spot, and zonate leaf spot. Apply higher rate to full-size mature trees, and lower rate to smaller trees. Use lower rate and do not use surfactant if tank mixed with Super-Tin. Do not apply more than 32 fl. oz/acre per season.
Headline	11	Pyraclostrobin	6 -7 fl oz	14	12	Yes	Scab only. Do not apply more than 28 fl oz/A/year.
Inspire Super	3+9	Difenoconazole+ Cyprodinil	16-20 fl oz	14	12	No	Can also be used to control downy spot and powdery mildew. Do not apply more than 80 fl oz/A/year.
K-Phite 7LP	P7	Phosphorus Acid	1-4 qts	0	4	yes	Supplemental label. Can also be used to control Alternaria, anthracnose, downy and powdery mildew. Minimum of 100 gallons water/a.
Miravis Top	3+7	Pydiflumetofen+ Difenoconazole	13.6 fl oz	45 DO NOT apply after shuck split.	12	No	Can also be used to control downy spot, liver spot powdery mildew, vein spot, and zonate leaf spot. Do not apply more than 54.4 fl oz/A/year.
Pristine	11+7	Pyraclostrobin + Boscalid	10.5-14.5 oz	14	12	Yes	Can also be used to control anthracnose. Do not apply more than 58 oz/A/year.
Helena ProPhyt		Potassium phosphite	2.0 – 3 pt	0	4	Yes	Can be used to control Anthracose. Do not apply in less than 100 gal/acre. Do not apply when plants are under water stress or at high or very low temperatures.
Quash	3	Metconazole	2.5-3.5 oz.	25	12	Yes	Can be used to control anthracnose, and powdery mildew. Do not make more than 4 applications/year. Do not apply more than 14 oz./A/year.
Quilt	3+11	Propiconazole+ Azoxystrobin	14 – 27.5 fl oz	45 DO NOT apply after shuck split	12	No	Can also be used to control anthracnose, downy spot, liver spot, powdery mildew, vein spot, and zonate leaf spot. Do not apply more than 122 fl oz/A/year.

PRODUCT	*FRAC** CODE*	*ACTIVE INGREDIENT*	*RATE/ ACRE*[2]	*PHI*** (days)*	*REI*** (hours)*	*GRAZING/ FEED*	*COMMENTS*
Sovran	11	Kresoxim-methyl	2.4 - 4.8 oz (rate varies)	45	12	Yes	Scab only. Do not make more than three applications of Sovran or other strobilurin (Qol) fungicides/season. Pre-pollination rate: 2.4-3.2 oz. Post-pollination rate: 3.2-4.8 oz.
Super Tin[r] Agri Tin[r]	30	Triphenyltin hydroxide	8-12 oz 5.0-7.5 oz	30 30	48 48	No No	Also can be used to control brown leaf spot, downy spot, powdery mildew, liver spot, sooty mold, and leaf blotch. Maximum rate differs from west and east of Interstate 35. **Apply with closed cab only.**
Stratego	3+11	Propiconazole+ Trifloxystrobin	10.0 fl oz	30 DO NOT apply after shuck split.	12	No	Also can be used to control anthracnose. Do not apply more than 30 fl oz/A/year. Can also be used to control brown spot, downy spot, liver spot, powdery mildew, stem end blight and zonate leaf spot.
Topsin M WSB[7] Topsin 4.5FL[7] T-Methyl 70WSB[7]	1	Thiophanate-methyl7	1.0 lb 20 fl oz 0.5-1.0 lb	DO NOT apply after shuck split.	3 days 3 days 3 days	Yes Yes Yes	Do not apply more than 3 lbs/A/season. Do not apply more than 60 fl oz/A/season. Do not apply more than 3 lbs/A/season. Follow resistance management guidelines.[7]
Viathon	3+33	Tebuconazole+ Potassium phosphite	2.0 – 2.5 pt	DO NOT apply after shuck split.	12	No	Can also be used to control anthracnose, brown leaf spot, downy spot, liver spot, vein spot, and zonate leaf spot. Do not apply more than 16.5 pt per season. Do not add surfactant when tank mixing.
Ziram 76 DF	M3	Ziram	6.0 – 8.0 lb	55	48	No	Can also be used to control anthracnose.
Ziram Granuflo			6.0 – 8.0 lb	55	48	No	Do not apply more than 48 lbs/A/crop cycle. Pre-pollination rate: 2.4-3.2 oz. Post-pollination rate: 3.2-4.8 oz

** For more information on fungicide/insecticide FRAC/MOA groups, see p. 56 of E-832.

*** PHI=Pre-harvest interval. REI=Restricted entry interval – the amount of time before a worker can enter the area without personal protective equipment.

r Restricted Use Pesticide Must have pesticide applicator's license to apply.

2 Gal = gallon; lb = pound; pt = pint; qt = quart; oz = ounces.

7 Widespread resistance to benzimidazole throughout the state restricts the use of fungicides such as Topsin M to new orchards. These fungicides must be alternated with other kinds of fungicides to help prevent development of resistance.

Recommended Intervals Between Last Application, Harvest and Other Restrictions

Insecticide & Formulation	*Active Ingredient*	*PHI (days)*	*REI (hours)*	*Grazing/ Feed*	*Other Comments/Restrictions*
Acramite 50WS	bifenazate	14	12	Yes	Only one application per year.
Admire Pro	imidacloprid	N/A	12	No	Do not exceed 32.0 oz/A/season. Do not apply after July 15. Do not apply pre-bloom or during bloom.
Altacor	chlorantraniliprole	10	4	Yes	Do not apply more than 9 oz./A/year. Do not apply in less than 30 gal water per acre.
Apta	tolfenpyrad	14	12	Yes	Do NOT make more than 1 application/season. Toxic to bees.
Asana[r]	esfenvalerate	21	12	No	
Baythroid XL[r]	cyfluthrin	14	12	No	Do not exceed 2.8 ounces per acre per season.
Belay	clothianidin	21	12	No	Do not apply more than 12 oz per acre per year. Do not use during bloom.
BoteGHA ES[OMRI]	*Beauveria bassiana*	0	4	Yes	Live spores of fungus, *Beauveria bassiana* Strain GHA.
Carbine 50WG	flonicamid	40	12	No	Do not apply more than 3 applications of 2.8 oz./A/season.
Centric 40WG	thiamethoxam	14	12	No	Do not use less than 50 gallons of mixed spray material/A when applied by ground equipment. Do not exceed 5.0 oz/A/ season.
Closer SC	sulfoxaflor	7	12	No	Do not apply more than 17 fl oz/A/year. No more than 2 consecutive applications.
Cobalt Advanced[r]	chlorpyrifos + lambda-cyhalothrin	28	24	No	
Confirm 2F	tebufenozide	14	4	No	
Damoil[OMRI]	mineral oil	N/A	4	Yes	Use during the dormant season (February to March). Use lower rate if trees are in weakened condition. Do not use during or immediately prior to hot (>95°F) or freezing (<32°F) temperatures.
Dimethoate 400EC	dimethoate	21	48	No	
Dipel DF[OMRI]	*Bt-kurstaki*	0	4	Yes	
Entrust[OMRI]	spinosad	1	4	Yes	Do not apply more than 29 oz./A/season.
Envidor 2SC	spirodiclofen	7	12	Yes	Only 1 application per season.
Esteem 0.86EC	pyriproxyfen	21	12	Yes	Do not exceed 32 oz/A/season. Two applications/season maximum.
Fulfill	pymetrozine	14	12	Yes	Do not exceed 8.0 oz. per acre per season.
Grandevo[OMRI]		0	4	Yes	Chromobacterium subtsugae strain PRAA4-1T
Hero[r]	zeta-cypermethrin+ bifenthrin	21	12	No	
Imidan 70-W	phosmet	14	3 days	No	Note long REI.
Intrepid 2F	methoxyfenozide	7	4	Yes	Do not apply more than 8 oz/A/app. 64 oz./A/season maximum.
Intrepid Edge	methoxyfenozide+ spinetoram	7	4	No	Do not apply more than 25.6 oz. per acre per year.
Invertid 2F	methoxyfenozide	14	4	Yes	Do not apply more than 8 oz/A/app. 64 oz./A/season maximum.
Javelin WG[OMRI]	Bt-kurstaki	0	4	Yes	
Lorsban 4E[r]	chlorpyrifos	28	24	No	Do not apply more than 4 qts/A (4lbs A.I./A) /season.
Malathion 57 EC	malathion	7	24	Yes	
Minecto Pro	cyantraniliprole+ abamectin	21	12	No	Do not make more than 2 sequential applications. Must be mixed with a spray adjuvant.
Movento	spirotetramat	7	24	Yes	Do not apply more than 21.5 oz/A/year. Apply after petal-fall.
Mustang-Maxx[r]	zeta-cypermethrin	7	12	No	
Nexter	pyridaben	7	12	Yes	Do not apply more than twice per year.
Onager	hexythiazox	7	12	No	
Portal	fenpyroximate	14	12	No	Do not make more than one application/growing season.
PQZ	pyrifluquinazon	7	12	No	Do not exceed 4.8 fl. oz/A/year. 2 applications/year maximum.
Proaxis[r]	gamma-cyhalothrin	14	24	No	
PureSpray Green	mineral oil	0	4	Yes	Use lower rate if trees are in weakened condition. Do not use during or immediately prior to hot (>95°F) or freezing (<32°F) temperatures. See label for possible interactions.
Sevin XLR Plus	carbaryl	14	12	Yes	
Silencer[r]	lambda-cyhalothrin	14	24	Yes	
SpinTor 2SC	spinosad	1	4	Yes	Do not apply treatments less than 7 days apart. Do not apply more than 29 total ounces/A/crop/year. Product is toxic to bees and aquatic invertebrates.
Troubadour 2F	methoxyfenozide	14	4	Yes	Do not exceed 8 oz/A/application. 64 oz./A/season maximum.
TurnStyle	methoxyfenozide	14	4	Yes	Do not exceed 8 oz/A/application. 64 oz./A/season maximum.
Vendex 50WP[r]	fenbutatin-oxide	14	48	No	Do not apply more than 4 lbs. per acre per year.
Warrior II[r]	lambda-cyhalothrin	14	24	Yes	Do not apply more than 10.24 fl oz./A/year.
Zeal	etoxazole	28	12	No	Do not make more than 1 application per season.

[r] Restricted Use Pesticide. Must have pesticide applicator's license to apply.

[OMRI] Organic Materials Review Institute (OMRI) listed for organic production.

The Oklahoma Cooperative Extension Service
Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President for Agricultural Programs and has been prepared and distributed at a cost of 20 cents per copy. Revised 12/2020 GH.