

Apple

2017 Pest Management Guide for the Willamette Valley

EM 8418 · Revised April 2017

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The chemicals, formulations, and rates listed for insect, mite, and disease control are among the best recommendations based on label directions, research, and orchard use experience. Only a thorough knowledge of the orchard, its cultivar, tree size and density, canopy characteristics, pest complex, and past pest problems will enable you to correctly select chemicals, rates, amount of water used per acre, and method of application for optimum pest control. Occasionally, different formulations of a product or like formulations containing a different amount of active ingredient also are registered and effective for use on the pests listed. These products also may be used; we do not intend to discriminate against them. You may wish to consult their labels and determine whether their use confers advantages over the products listed in this guide.

Always refer to the pesticide label for use instructions. It is the legal document regarding use patterns. Two questions frequently are asked about the chemical control of insects and diseases: “How much chemical do I use per acre?” and “What is the least amount of water I need per acre to apply in my concentrate sprayer?” Notice that the schedule below suggests an amount of formulated product (not active ingredient) to use per acre. This amount is based on a “typical” middle age and density orchard with moderate pest pressure. Common sense indicates that less material may be needed (than that given) for 1- to 4-year-old orchards. Conversely, more chemical (within label limits) may be required for large, mature trees experiencing heavy pest pressure from multiple pests.

Many insecticide labels today indicate the minimum amount of water needed per acre to apply concentrate sprays of insecticides, as well as how to calculate the amount of chemical needed per acre in a concentrate sprayer. **CHECK LABEL BEFORE SPRAYING!** Some label directions indicate dilute

applications only, such as the dimethoate labels for cherry fruit fly control.

Also:

1. Make sure any tank-mixes of pesticides are compatible. For example, the elevated pH of some boron spray solutions weakens many insecticides. Boron also is incompatible with water-soluble packets.
2. Use adjuvants and spreader stickers with caution.

Important information

1. Be aware of worker protection standards (WPS). All new pesticide labels will provide orchard reentry intervals and personal protection equipment information.
2. Diazinon is a restricted use pesticide due to bird toxicity. Maximum per-acre application rates have been reduced to 4 lb 50W, and the preharvest interval extended to 21 days.
3. *Orchard Pest Management, a Resource Book for the Pacific Northwest*, 1993 (edited by Beers, Brunner, Willet, and Warner, published by the Good Fruit Grower, Yakima, WA) provides a comprehensive list of the tree fruit insect and mite pests of orchards. Life histories, damage, detection, monitoring, and management of the pests are covered. It is one of our primary sources of information in developing this pest management guide and the most complete reference on orchard use of the principles of integrated pest management.

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides, and insecticides. Materials are not listed in order of preference.

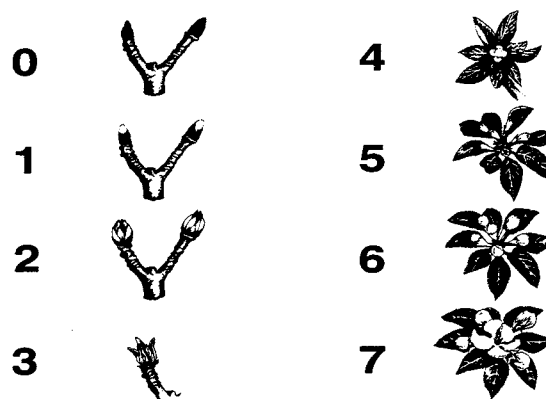
Stages

Delayed Dormant (Stages 1–2)
 Prepink or Green Bud (Stages 3–4)
 Pink or Preblossom (Stages 5–6)

Not shown

Calyx; Cover Sprays; Pre- or Postharvest

Illustration courtesy of Washington State University Extension.



Apple Pest Control Recommendations

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides, and insecticides. Materials are not listed in order of preference.

Delayed Dormant (Stages 1–2)

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval
European red mite eggs, scale, aphid eggs, and apple rust mite			
<i>Note:</i> Delayed Dormant Stage is the best time to control San Jose scale. See footnote 1, page 12.			
Apollo SC	Clofentezine	4–8 oz	Group 10A miticide. Do not use any combination of Apollo and any other group 10A in the same growing season. Ground applications only. 12-hour reentry.
Centaur WDG	Buprofezin	34.5–46 oz	Group 16 insecticide (IGR). No more than 2 applications per season. Do not tank mix with oil. 12-hour reentry.
Horticultural mineral oil (HMO) + one of the following:		4–8 gal	4-hour reentry.
Diazinon 50WP	Diazinon	4 lb	Group 1B insecticide. Restricted use. Limited to one dormant and one cover spray per season. Targets aphids, mites, leafrollers, and scale at this timing. Closed cab required. 24-hour reentry.
Esteem 35WP	Pyriproxyfen	4–5 oz	Group 7C (IGR). Limited to 3 applications per season. Targets leafroller and scale at this timing. 12-hour reentry.
lime sulfur	Calcium polysulfides	5–10 gal	OMRI approved for organic use. 2-day reentry.
Lorsban 4E	Chlorpyrifos	1.5–4 pt	Group 1B insecticide. Restricted use. Limited to one application during dormant season, foliage contact could cause leaf drop. Targets aphids, mites, leafrollers, and scale at this timing. 4-day reentry.
Onager	Hexythiazox	12–24 oz	Group 10A miticide. No more than one application per season of this or any other group 10A product (hethythiazox). 12-hour reentry.

Delayed Dormant continues on next page

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CONTINUED—Delayed Dormant (Stages 1–2)

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval
European red mite eggs, scale, aphid eggs, and apple rust mite (continued)			
Savey 50DF	Hexythiazox	4–6 oz	Group 10A miticide. One application per season. Do not use any combination of Apollo and any other group 10A in the same growing season. 12-hour reentry.
Sivanto 200SL	Flupyradifurone	10.5–14 oz	Group 4D insecticide. Targets San Jose scale at this timing. 4-hour reentry.
Supracide 2E	Methidathion	1–2 or 3–12 pt	Group 1B insecticide. Supracide may be used without oil for San Jose scale control. Do not apply when blossoms are open. Avoid residues by limiting to one application per season. 3-day reentry.

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval
Crown and collar rot		
<i>Note:</i> Aliette, Agri-Fos, Fosphite, OxiPhos, Phostrol, and Rampart also registered but may be more useful in the fall.		
Ridomil Gold SL	0.5 pt/100 gal water	Rates are based on tree size. Have rain or irrigation move material into root zone. 48-hour reentry.
MetaStar 2E	1 qt/100 gal water	Rates are based on tree size. 48-hour reentry.

Fire Blight – rare

Although not common in the Willamette Valley it can occur if bloom is warm as it was in 2016. Remove hold over cankers and any nearby hosts such as hawthorn trees in fence rows. *Note:* See copper-based materials listed for anthracnose post-harvest. This application will help delay the activation of missed hold over cankers and possibly reduce fungicide resistant scab isolates.

Prepink or Green Bud (Stages 3–4—little leaves separating just enough to expose blossom bud cluster)

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Scab (see footnote 5 and footnote 6, page 12, and Table 1, page 13)		
Captan 80WDG	2.5–5 lb	See footnote 3, page 12. 24-hour reentry. 0-day PHI.
Flint 50WG	2–2.5 oz	12-hour reentry. 14-day PHI.
Indar 2F	6–8 fl oz	Add a wetting agent. 12-hour reentry. 14-day PHI.
Inspire Super	12 fl oz	Group 3 + 9 fungicide. 12-hour reentry. 14-day PHI.
Lime Sulfur Ultra	0.75–1.25 gal/100 gal water	See footnote 2, page 12.
Luna Sensation	4–5.8 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 14-day PHI.
Luna Tranquility	12–16 fl oz	Group 7 + 9 fungicide. 12-hr reentry. 72-day PHI.
Mancozeb	3 or 6 lb	Do not use the 6-lb rate beyond bloom. 24-hour reentry. 77-day PHI.
Merivon	4–5.5 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 0-day PHI.
Omega 500F	10–13.8 fl oz	12-hr reentry. 28-day PHI.
Polyram 80DF	6 lb	Do not use this rate beyond bloom. 24-hour reentry. 77-day PHI.

Prepink or Green Bud (Stages 3–4—little leaves separating just enough to expose blossom bud cluster) continues on next page

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides, and insecticides. Materials are not listed in order of preference.

CONTINUED—Prepink or Green Bud (Stages 3–4—little leaves separating just enough to expose blossom bud cluster)

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Scab (see footnote 5 and footnote 6, page 12, and Table 1, page 13) (continued)		
Pristine	14.5–18.5 oz	Mix with an adjuvant. Group 7 + 11 fungicide. 12-hour reentry. 0-day PHI.
Procure	8–16 fl oz	See footnote 5, page 12. Should be tank-mixed with a product that has good protection activity. 12-hour reentry. 14-day PHI.
Rally 40WSP	5–8 oz	Do not apply more than 5 lb/A per season. Should be tank-mixed with a product that has good protection activity. 24-hour reentry. 14-day PHI.
Sovran	3.2–6.4 oz	See footnote 10, page 12. 12-hour reentry. 30-day PHI.
Syllit FL	1.5 pt	Mix with another fungicide. See footnote 4, page 12. Do not apply after pink bud.
TopGuard	8–12 fl oz	Mix with another fungicide. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Powdery mildew		
Aprovia	5.5–7 fl oz	Mix with an adjuvant. Group 7 fungicide. 12-hour reentry. 30-day PHI.
Flint 50WG	2–2.5 oz	12-hour reentry. 14-day PHI.
Fontelis	16–20 fl oz	12-hour reentry. 28-day PHI.
HMO such as JMS Stylet oil	1–2 gal/100 gal water	Do not use past second cover or near sulfur sprays or on wet foliage. 4-hour reentry.
Indar 2F	6–8 fl oz	Add a wetting agent. 12-hour reentry. 14-day PHI.
Inspire Super	12 fl oz	Group 3 + 9 fungicide. 12-hr reentry. 14-day PHI.
Lime Sulfur Ultra	0.75–1.25 gal/100 gal water	See footnote 2, page 12.
Luna Privilege	2.4–6.84 fl oz	Tank mix with another fungicide. 12-hr reentry. 7-day PHI.
Luna Sensation	5–5.8 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 14-day PHI.
Luna Tranquility	12–16 fl oz	Group 7 + 9 fungicide. 12-hr reentry. 72-day PHI.
Merivon	4–5.5 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 0-day PHI.
Oso SC	3.75–13 fl oz	4-hour reentry. 0-day PHI.
Ph-D WDG	6.2 oz	4-hour reentry. 0-day PHI.
Pristine	14.5–18.5 oz	Group 7 + 11 fungicide. 12-hour reentry. 0-day PHI.
Procure	8–16 fl oz	12-hour reentry. 14-day PHI.
Rally 40WSP	5–10 oz	Do not exceed 5 lb/A per season. 24-hour reentry. 14-day PHI.
Sovran	4–6.4 oz	See footnote 10, page 12. 12-hour reentry. 30-day PHI.
TopGuard	8–12 fl oz	Group 3 fungicide. 12-hour reentry. 14-day PHI.

Prepink or Green Bud (Stages 3–4—little leaves separating just enough to expose blossom bud cluster) continues on next page

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides, and insecticides. Materials are not listed in order of preference.

CONTINUED—Prepink or Green Bud (Stages 3–4—little leaves separating just enough to expose blossom bud cluster)

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval
Green fruit worm, leafrollers, aphids, plant bugs, tentiform leafminer			
<i>Note:</i> Tentiform leafminer is a concern only if it was a problem the previous season and low levels of parasitism were noticed.			
Altacor 35WDG	Chlorantraniliprole	2.5–4.5 oz	Group 28 insecticide. Targets moth larvae at this timing. 4-hour reentry.
Delegate 25WG	Spinetoram	4.5–7 oz	Group 5 insecticide. Targets moth larvae at this timing. 4-hour reentry.
Diazinon 50WP	Diazinon	4 lb	Group 1B insecticide. Restricted use. Limited to one dormant and one cover spray per season. Closed cab required. 24-hour reentry.
Entrust 2SC	Spinosad	1.25–2.5 oz	Group 5 insecticide. OMRI listed for organic use. No more than 4 applications or 29 oz per year. Targets moth larvae at this timing. Note Entrust 80 WP is an alternative formulation. 4-hour reentry.
Esteem 35WP	Pyriproxyfen	4–5 oz	Group 7C (IGR). Limited to 3 applications per season. Targets leafroller and scale at this timing. 12-hour reentry.
Lorsban 4E	Chlorpyrifos	1.5–4 pt	Group 1B insecticide. Restricted use. Limited to one application during dormant season, foliage contact could cause leaf drop. Potential to aggravate mites at this timing. 4-day reentry.
Proclaim 5SG	Emamectin benzoate	3.2–4.8 oz	Group 6 insecticide. Apply after egg hatch to target early larvae. Efficacy enhanced when applied in combination with horticultural spray oil or nonionic surfactant. 12-hour reentry.
Success 2L	Spinosad	4–8 oz	Group 5 insecticide. Leafroller and thrips only. 4-hour reentry.

Pink or Preblossom (Stages 5–6—just before blossoms open)

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval
Apple rust mite			
Envidor 2SC	Spirodiclofen	16–18 oz	Group 23 miticide. 12-hour reentry.
FujiMite 5EC	Fenpyroximate	2 pt	Group 21A insecticide. 12-hour reentry.

Scab and powdery mildew

See materials listed for Preenpink or Green Bud Stage.

Pink or Preblossom (Stages 5–6—just before blossoms open) continues on next page

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CONTINUED—Pink or Preblossom (Stages 5–6—just before blossoms open)

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval
Codling moth (mating disruption)			
<i>Note:</i> Many hand-applied pheromone dispenser products are available and all of them can work provided codling moth populations are moderate to low. Consider utilizing well-timed insecticide applications to bring populations of codling moth to a level that will allow mating disruption to work effectively. Aerosol pheromone dispensers (puffers) can also be used at the rate of 1–2 unit/acre, but hand-applied border treatments may still be necessary; check label recommendations. Do not use mating disruption on orchards less than 10 acres in size.			
Checkmate CM-XL	pheromone	200 ties	—
Isomate-C+	pheromone	400 ties	—
Isomate-CTT	pheromone	200 ties	—
No mate CM	pheromone	200-400 ties	—

Calyx (when three-fourths of petals have fallen; apply before calyx closes on central fruit cluster)

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Scab (See footnote 5 and footnote 6, page 12 and Table 1, page 13)		
Aprovia	5.5–7 fl oz	Mix with another fungicide and an adjuvant. Group 7 fungicide. 12-hour reentry. 30-day PHI.
Captan 80WDG	2.5–5 lb	See footnote 3, page 12. 24-hour reentry. 0-day PHI.
Flint 50WG	2–2.5 oz	12-hour reentry. 14-day PHI.
Fontelis	16–20 fl oz	Tank-mix with another fungicide and use after bloom. 12-hour reentry. 28-day PHI.
Indar 2F	6–8 fl oz	Add a wetting agent. 12-hour reentry. 14-day PHI.
Inspire Super	12 fl oz	Group 3 + 9 fungicide. 12-hr reentry. 14-day PHI.
Lime Sulfur Ultra	2 qt/100 gal water	See footnote 2, page 12.
Luna Sensation	4–5.8 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 14-day PHI.
Luna Tranquility	12–16 fl oz	Group 7 + 9 fungicide. 12-hr reentry. 72-day PHI.
Mancozeb	3 lb	24-hour reentry. 77-day PHI.
Merivon	4–5.5 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 0-day PHI.
Omega 500F	10 –13.8 fl oz	12-hr reentry. 28-day PHI.
Polyram 80DF	3 lb	24-hour reentry. 77-day PHI.
Pristine	14.5–18.5 oz	Group 7 + 11 fungicide. 12-hour reentry. 0-day PHI.
Procure	8–16 fl oz	12-hour reentry. 14-day PHI.
Rally 40WSP	5–8 oz	Do not apply more than 5 lb/A per season. Should be tank-mixed with a product that has good protection activity. 24-hour reentry. 14-day PHI.
Scala SC	5–10 oz	Tank-mix with another fungicide and use after bloom. 12-hour reentry. 72-day PHI.
Sovran	3.2–6.4 oz	See footnote 10, page 12. 12-hour reentry. 30-day PHI.
TopGuard	8–12 fl oz	Mix with another fungicide. Group 3 fungicide. 12-hour reentry. 14-day PHI.
Ziram 76DF	6 lb	2-day reentry. 14-day PHI.

Calyx (when three-fourths of petals have fallen; apply before calyx closes on central fruit cluster) continues on next page

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CONTINUED—Calyx (when three-fourths of petals have fallen; apply before calyx closes on central fruit cluster)

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Powdery mildew		
Flint 50WG	2–2.5 oz	12-hour reentry. 14-day PHI.
Fontelis	16–20 fl oz	Tank mix with another fungicide. 12-hour reentry. 28-day PHI.
Indar 2F	6–8 fl oz	Add a wetting agent. 12-hour reentry. 14-day PHI.
Inspire Super	12 fl oz	Group 3 + 9 fungicide. 12-hr reentry. 14-day PHI.
JMS Stylet oil	1–2 gal/100 gal water	Do not use past second cover or near sulfur sprays or on wet foliage. 4-hour reentry.
Lime Sulfur Ultra	2 qt/100 gal water	See footnote 2, page 12.
Luna Sensation	5–5.8 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 14-day PHI.
Luna Tranquility	12–16 fl oz	Group 7 + 9 fungicide. 12-hr reentry. 72-day PHI.
Merivon	4–5.5 fl oz	Group 7 + 11 fungicide. 12-hr reentry. 0-day PHI.
Oso SC	3.75–13 fl oz	4-hour reentry. 0-day PHI.
Ph-D WDG	6.2 oz	4-hour reentry. 0-day PHI.
Pristine	14.5–18.5 oz	Group 7 + 11 fungicide. 12-hour reentry. 0-day PHI.
Procure	8–16 fl oz	12-hour reentry. 14-day PHI.
Rally 40WSP	5–10 oz	Do not apply more than 5 lb/A per season. 24-hour reentry. 14-day PHI.
Sovran	4–6.4 oz	See footnote 10, page 12. 12-hour reentry. 30-day PHI.
TopGuard	8–12 fl oz	Group 3 fungicide. 12-hour reentry. 14-day PHI.

Cover Sprays (1–4 cover sprays may be needed)

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Codling moth, leafrollers			
Altacor	Chlorantraniliprole	2.5–4 oz	Group 28 insecticide. Apply prior to egg hatch for 10–17 days of protection. Do not use an adjuvant with Altacor. 4-hour reentry. 5-day PHI.
Assail 70WP	Acetamiprid	1.7–3.4 oz	Group 4A insecticide. No more than 4 applications per season. Combine with horticultural oil for increased efficacy on codling moth. 12-hour reentry. 7-day PHI.
Avaunt 30WDG	Indoxacarb	5–6 oz	Group 22 insecticide. For use against low codling moth populations. 12-hour reentry. 28-day PHI.
Granulosis virus	Virus	See label.	Group 11 insecticide. OMRI listed for organic use. Codling moth granulosis virus, multiple formulations available. Use non-chlorinated water with pH near 7. Make 2 applications per codling moth generation. 4-hour reentry. 0-day PHI.
Danitol 2.4EC	Fenpropathrin	16–21.3 oz	Group 3 insecticide/miticide. Restricted use. Apply at 250 degree days after biofix. 24-hour reentry. 14-day PHI.

Cover Sprays (1–4 cover sprays may be needed) continues on next page

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CONTINUED—Cover Sprays (1–4 cover sprays may be needed)

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Codling moth, leafrollers (continued)			
Delegate	Spinetoram	6–7 oz	Group 5 insecticide. Begin applications just prior to egg hatch, approx. 220 to 250 days after biofix. No more than 4 applications per year. 7-day PHI.
Diazinon 50WP	Diazinon	1 lb	Group 1B insecticide. Restricted use. Limited to 1 foliar application per season. Enclosed cab required. 4-day reentry. 21-day PHI.
Entrust SC	Spinosad	6–10 oz	Group 5 insecticide. OMRI listed for organic use. Targets larval stages. No more than 4 applications or 29 oz per year. 4-hour reentry. 7-day PHI.
Esteem 35WP	Pyriproxyfen	4–5 oz	Group 7 insecticide (IGR). Apply approximately 14 to 21 days after petal fall or at peak moth flight. 12-hour reentry. 45-day PHI.
Exirel 0.83SE	Cyantraniliprole	10–17 oz	Group 28 insecticide. Apply prior to egg hatch for 10-14 days of control. No more than 3 applications of Group 28 insecticides per year. 12-hour reentry. 3-day PHI.
Imidan 70WP	Phosmet	2.125–5.75 lb	Group 1B insecticide. A water-soluble bag formulation is also available. 7-day reentry. 7-day PHI.
Intrepid 2F	Methoxyfenozide	16 oz	Group 18 insecticide (IGR). Apply at or just prior to egg hatch. Suppression of codling moth only, appropriate for low infestations. 4-hour reentry. 14-day PHI.
Proclaim 5SG	Emamectin benzoate	3.2–4.8 oz	Group 6 insecticide. Restricted use. For codling moth, provides suppression only. Apply immediately after hatch. 12-hour reentry. 14-day PHI.
Rimon 0.83EC	Novaluron	30–50 oz	Group 15 insecticide (IGR). Apply at the onset of egg hatch to target small larvae. This occurs at approximately 50 to 75 degree days for the first generation and 1,000 degree days for the second generation. 14-day PHI.
Codling moth, aphids, leafrollers, scale crawlers			
Diazinon 50WP	Diazinon	4 lb	Group 1B insecticide. Restricted use. Limited to 1 foliar application per season. Enclosed cab required. 4-day reentry. 21-day PHI.

Cover Sprays (1–4 cover sprays may be needed) continues on next page

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CONTINUED—Cover Sprays (1–4 cover sprays may be needed)

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
Brown Marmorated Stink Bug			
<p>Brown Marmorated Stink Bug (BMSB) is an increasing problem in Willamette Valley apples. Feeding damage from adults and nymphs affects fruit cosmetics and quality, causing symptoms similar to bitter pit, with corky tissue below the skin of the fruit (slice below the skin to see damage). BMSB damage can be distinguished from bitter pit because the corky spots will only be near the fruit surface and not throughout the fruit. Monitor for BMSB using commercially available pheromone traps placed close to surrounding vegetation. Alternate hosts include many crop plants, as well as ornamental, naturalized, and native plant species such as English holly, bigleaf maple, tree of heaven, Oregon ash, and Himalayan blackberry. BMSB populations tend to build up during the latter portion of the season and move from surrounding vegetation into orchards. Many of the broad-spectrum materials listed below are known to aggravate secondary pest problems (mites, aphids); use them judiciously.</p> <p>See: “EMERGING PEST: Brown Marmorated Stink Bug—A Pending Threat to Pacific Northwest Agriculture” in <i>Pacific Northwest Insect Management Handbook, How to Recognize Brown Marmorated Stink Bug Damage in Commercial Hazelnuts</i> (EM 9102), and <i>How to Monitor for Brown Marmorated Stink Bug in Specialty Crops</i> (EM 9138); available through the OSU Extension Publications Catalog (https://catalog.extension.oregonstate.edu/). See StopBMSB.org for further insecticide recommendations and general information about this pest.</p>			
Admire Pro	Imidacloprid	1.2–2.4 oz	Group 4A insecticide. Can be applied as soil application through chemigation system, rates and restrictions differ for this application, see label. Generic labels available. 12-hour reentry. 7-day PHI.
Baythroid XL	Beta-cyfluthrin	2–2.4 oz	Group 3 insecticide. Restricted use. 12-hour reentry. 14-day PHI.
Belay	Clothianidin	6 oz	Group 4A insecticide. Restricted use. No more than 0.2lb AI per year. 12-hour reentry. 21-day PHI.
Cobalt	Chlorpyrifos + lambda-cyhalothrin	22–57 oz	Group 1B + 3A insecticide. Restricted use. Premix product, see label as both AIs have cumulative limits/season. 24-hour reentry. 14-day PHI.
Danitol	Fenpropathrin	10.6–21.3 oz	Group 3 insecticide. Restricted use. No more than 2 applications recommended, no more than 0.8 lb AI allowed per season. 24-hour reentry. 3-day PHI.
Declare	Gamma-cyhalothrin	1.02–2.05 oz	Group 3A insecticide. Restricted use. No more than 0.08 lb AI per year. 24-hour reentry. 14-day PHI.
Endigo ZC	Lambda-cyhalothrin + thiamethoxam	5–6 oz	Group 3A + group 4A insecticide. Restricted use. Premix product, see label as both AIs have cumulative limits/season. 24-hour reentry. 14-day PHI.
Mustang Maxx	Zeta-cypermethrin	3.2–4 oz	Group 3A insecticide. Restricted use. Applications must be 7 days apart. No more than 0.125 lb AI per season. 12-hour reentry. 7-day PHI.
Proaxis	Gamma-cyhalothrin	2.56–5.12	Group 3A insecticide. Restricted use. No more than 0.08 lb AI per year. 24-hour reentry. 14-day PHI.
Tombstone	Cyfluthrin	2–2.4	Group 3A insecticide. Restricted use. Maximum of 2.8 oz per season. 12-hour reentry. 14-day PHI.
Warrior II	Lambda-cyhalothrin	1.28–2.56 oz	Group 3A insecticide. Restricted use. Generics available. Do not apply more than 0.12 lb (7.68 fl oz or 0.48 pt of product)/acre post bloom. 24-hour reentry. 12-day PHI.

Cover Sprays (1–4 cover sprays may be needed) continues on next page

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CONTINUED—Cover Sprays (1–4 cover sprays may be needed)

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
White apple leafhopper			
Actara	Thiamethoxam	2–2.75 oz	Group 4A insecticide. Apply before leafhoppers reach damaging levels. Also targets aphids at this timing. 12-hour reentry. 35-day PHI.
Assail 70WP	Acetamiprid	1.1–1.7 oz	Group 4A insecticide. No more than 4 applications per season. 12-hour reentry. 7-day PHI.
Admire Pro	Imidacloprid	1.2–2.4 oz	Group 4A insecticide. Can be applied as soil application through chemigation system, rates and restrictions differ for this application, see label. Generic labels available. 12-hour reentry. 7-day PHI.
Mites			
Acramite 50WS	Bifenazate	0.75–1 lb	Unclassified mode of action. 12-hour reentry. 7-day PHI.
Apollo SC	Clofentezine	4–8 oz	Group 10A miticide. Do not use any combination of Apollo and Savey in the same growing season. Ground applications only. Will not control rust mites. 12-hour reentry. 45-day PHI.
Envidor 2SC	Spirodiclofen	16–18 oz	Group 23 miticide. 12-hour reentry. 7-day PHI.
FujiMite 5EC	Fenpyroximate	2 pt	Group 21A miticide. Do not rotate with Nexter. 12-hour reentry. 14-day PHI.
Kanemite 15SC	Acequinocyl	21–31 oz	Group 20B miticide. No aerial applications. No more than 2 applications per year. Targets spider mites. 12-hour reentry. 14-day PHI.
Nealta	Cyflumetofen	13.7 oz	Group 25 miticide. Do not make successive applications without rotating action groups. Will not control rust mites. 12-hour reentry. 7-day PHI.
Nexter 75W SB	Pyridaben	6.6–10.67 oz	Group 21A miticide. Do not rotate with Fujimite. 12-hour reentry. 7-day PHI.
Savey 50DF	Hexythiazox	4–6 oz	Group 10A miticide. One application per season. Do not use any combination of Apollo and Savey in the same growing season. 12-hour reentry. 28-day PHI.
Vendex 50WP	Fenbutinoxide	1–2 lbs	Group 12B miticide. Restricted use. No more than 2 applications per season. 48-hour reentry. 14-day PHI.
Zeal	Etoxazole	2–3 oz	Group 10B miticide. No more than 1 application per year. 12-hour reentry. 28-day PHI.
Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)	
Bull's eye rot and scab			
Captan 80WDG	2.5–5 lb	24-hour reentry. 0-day PHI.	
Mancozeb	3 lb	24-hour reentry. 77-day PHI.	
Ziram 76DF	6 lb	2-day reentry. 14-day PHI.	

Cover Sprays (1–4 cover sprays may be needed) continues on next page

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides, and insecticides. Materials are not listed in order of preference.

CONTINUED—Cover Sprays (1–4 cover sprays may be needed)

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
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Scab and powdery mildew

Note: See materials listed for Calyx Stage. Apply scab sprays before wet weather is expected to occur and stop when dry weather prevails. Powdery mildew sprays can be stopped when terminal growth stops.

Anthracnose

Note: Scout for cankers in trees. Remove and destroy cankers during dry weather.

Pest or disease/ Material	Active ingredient (AI)	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
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Apple maggot

Note: Sprays used for codling moth will control apple maggot. However, 1 or 2 additional sprays for apple maggot may be required later in the season.

Assail 70WP	Acetamiprid	1.7–3.4 oz	Group 4A insecticide. No more than 4 applications per season. 12-hour reentry. 7-day PHI.
Belay	Clothianidin	6 oz	Group 4A insecticide. 12-hour reentry. 7-day PHI.
Delegate	Spinetoram	6–7 oz	Group 5 insecticide. No more than 4 applications per year. 7-day PHI.
Imidan 70WP	Phosmet	3–5 lb	Group 1B insecticide. A water-soluble bag formulation (70WSB) also is available. 24-hour reentry. 7-day PHI.

Pre- or Postharvest (before fall rains—see footnote 9, page 12)

Pest or disease/ Material	Amount of product per acre	Comments/Reentry interval/Preharvest interval (PHI)
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Anthracnose, Nectria canker, Bull's eye rot

Bordeaux 6-6-100	—	Do not use on yellow-colored cultivars before harvest.
Captan 80WDG	3.75 lb	Do not apply more than 64 lb/A per year. 24-hour reentry. 0-day PHI.
Copper-Count-N	10 qt	Postharvest only. 48-hour reentry.
Cuprofix Ultra 40 Dispers	8–20 lb	Postharvest only. 48-hour reentry.
Kocide 3000	5.25–7 lb	Do not use on yellow-colored cultivars before harvest. 48-hour reentry.
Nu-Cop 50DF	12–16 lb	Do not use on yellow-colored cultivars before harvest. 48-hour reentry.
Ziram 76DF	6 lb	48-hour reentry. 14-day PHI.

Crown and collar rot

Note: Ridomil is also registered but may be more useful in the spring.

Agri-Fos	1.25–2.5 qt	Do not use with copper materials. 4-hour reentry.
Aliette WDG	2.5–5 lb	Do not use with copper materials. 12-hour reentry. 14-day PHI.
Fosphite	1–3 qt	Do not use with copper materials. 4-hour reentry.
OxiPhos	1.3–5 pt	Use as a foliar spray. 4-hour reentry.
Phostrol	2.5–5 pt	4-hour reentry.
Rampart	1–3 qt	Do not use copper products within 20 days of treatment. Can also be trunk injected. 4-hour reentry.

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Footnotes

1. Use oil emulsion, 3.2% actual oil, plus bordeaux 6-6-100. This spray will control all other pests listed except blister mite. Bordeaux is not compatible with lime sulfur or polysulfide.
2. Lime sulfur may injure Delicious and Delicious strains during hot weather and causes yellow foliage on Braeburn. Lime sulfur will help control apple rust mite.
3. Captan may cause minor leaf spotting to 'Delicious' under certain conditions.
4. Syllit is not compatible with lime and should not be combined with oils or oil emulsions.
5. Apple scab forecasting is useful when spring rains become less frequent and drier weather prevails. Several materials can be applied within a certain time limit after the start of an infection period. Keep to a protection schedule throughout the bloom period. All ascospores will have matured and be ready for dispersal once 865 degree days (base 32°F) have accumulated since bud break. Group 11 materials such as Flint and Sovran are best used **prior** to infection periods.
6. To delay or prevent the development of resistant strains of apple scab or powdery mildew, alternate or tank-mix materials with different modes of activity (or from different fungicide groups).
7. Codling moth: spray timing. CALENDAR APPROACH: First spray at 15 to 21 days after petal fall followed by another in about 3 weeks. Third spray for second generation usually is made in early July followed by another in about 3 weeks. PHEROMONE TRAPS TO TIME SPRAYS: Mid-May place one trap for every 3 acres in upper one-third of the tree canopy. Inspect once weekly or more frequently. Make first spray when two or more moths are caught in one or more of the traps for 2 weeks in a row. Repeat spray when first application has weathered off and two or more moths are caught in one or more of the traps. Spot treatments may be sufficient in parts of blocks. Continue trapping through September. DEGREE DAY ACCUMULATION: first spray at 250 degree days following first consistent catch of codling moths in pheromone traps (50°F lower threshold).
8. White apple leafhopper has become a serious problem for some growers in the Willamette Valley. It is best controlled during the first generation after egg hatch is complete but before there are a large number of mature, winged adults. Larger nymphs and adults are difficult to control. Note that timing of the first cover spray for codling moth may be too late to control leafhoppers. Also the commonly used codling moth insecticides are not that effective on leafhoppers. An application of Sevin (carbaryl) directed at the second-generation nymphs, which should be present in August, usually provides sufficient control of leafhoppers to prevent picker annoyance problems. **DO NOT USE CARBARYL (SEVIN) DURING PETAL FALL (FIRST LEAFHOPPER SPRAY) AS FRUIT THINNING WILL OCCUR.**
9. Use Captan or Ziram preharvest for control of Bull's eye rot. Focus on early- and mid-leaf fall for control of Nectria canker. Do not use Topsin as it is toxic to earthworms, which help decompose scab-infected leaves.
10. Sovran drift may injure some sweet cherry cultivars such as Van. Please be extra careful when spraying near cherry orchards.

Table 1. Approximate Hours of Wetness at Indicated Temperatures Required for Leaf Scab Infection and Days Required for Lesions to Appear

Average temperature (°F)	Hours of wetness required for infection* From primary and secondary inoculum			Days required for lesions to appear**
	Light	Moderate	Heavy	
78	13	17	26	—
77	11	14	21	—
76	9.5	12	19	—
63–75	9	12	18	9
62	9	12	19	10
61	9	13	20	10
60	9.5	13	20	11
59	10	13	21	12
58	10	14	21	12
57	10	14	22	13
56	11	15	22	13
55	11	16	24	14
54	11.5	16	24	14
53	12	17	25	15
52	12	18	26	15
51	13	18	27	16
50	14	19	29	16
49	14.5	20	30	17
48	15	20	30	17
47	15	23	35	—
46	16	24	37	—
45	17	26	40	—
44	19	28	43	—
43	21	30	47	—
42	23	33	50	—
41	26	37	53	—
40	29	41	56	—
39	33	45	60	—
38	37	50	64	—
37	41	55	68	—
33–36	48	72	96	—

From W.D. Mills, Cornell University.

*Leaves remain wet for varying lengths of time after the rain stops, depending on conditions. Add together wetting periods from intermittent showers. Add together any wet periods with less than 8 hours dry time between them. Determine average temperature for the period from hourly readings. Lesions may not be apparent for 2–4 weeks.

**Days required for conidia to appear once infection has been established. No further wetting is required. For this column, daily maximum and minimum temperatures are adequate for determining the average.

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides, and insecticides. Materials are not listed in order of preference.

Table 2. Effectiveness of Fungicides for Apple Disease Management*

Fungicide	Fungicide group #	Apple scab	Powdery mildew	Bull's eye rot
Aprovia	7	Fair to Good	Slight–Fair	??
Captan	M4	Excellent	None	Good
Flint	11	Excellent**	Good–Excellent**	Slight–Fair
Focus	3	Good**	Excellent**	??
Fontelis	7	Fair–Good**	Good**	??
HMO***	Not classified	??	Good	??
Indar	3	Good**	Excellent**	??
Kaligreen	Not classified	None	Slight–Fair	??
Lime sulfur	M2	Excellent	Good	??
Luna Privilege	7	Fair–Good**	Good**	??
Mancozeb	M3	Good	None	Slight–Fair
Omega	29	Good	None–poor	??
Oso	19	??	Fair–Good	??
Ph-D	19	??	Fair–Good	??
Polyram	M3	Good	None	??
Procure	3	Good**	Excellent**	Slight–Fair
Rally	3	Good**	Fair–Good	??
Scala	9	Fair	None	??
Sovran	11	Excellent**	Good–Excellent**	??
Sulfur	M2	Fair	Good	??
Syllit	U12	Good**	None	??
TopGuard	3	Good**	Excellent**	??
Topsin	1	Fair**	Fair–Good**	Excellent**
Vanguard	9	Fair**	None	??
Ziram	M3	Fair	None	Fair–Good
Combination products				
Inspire Super	3 + 9	Good	Excellent	??
Luna Sensation	7 + 11	Excellent	Excellent	??
Luna Tranquility	7 + 9	Good	Excellent	??
Merivon	7 + 11	Excellent	Excellent	??
Pristine	7 + 11	Good**	Excellent**	Good

*These ratings are relative rankings based on labeled application rates, good spray coverage, and proper spray timing. Actual levels of disease control will be influenced by these factors in addition to cultivar susceptibility, disease pressure, and weather conditions.

**Resistant pathogens will lower the effectiveness of these fungicides.

***Horticultural mineral oil.

Follow the “Rules” for fungicide stewardship:

Rotate or mix fungicides of different chemical groups.

Use labeled rates.
 Limit total number of applications.
 Educate yourself about fungicide activity, mode of action, and class—as well as resistance management practices.
 Start a fungicide program with multisite mode of action materials.

For more information about fungicides registered for use on apples and their specific modes of action, consult OSU Extension publication EM 8950: *How to Reduce the Risk of Pesticide Resistance in Apple Pests in Oregon*.

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides, and insecticides. Materials are not listed in order of preference.

Table 3. Quick Reference Guide for Herbicides Labeled for Use in Fruit and Nut Crops

- Shaded boxes indicate the herbicide is labeled for use in that crop.
- Nonbearing (NB) indicates the herbicide is labeled only for crops that will not be harvested for 1 year (365-day preharvest interval).
- Herbicides in **bold, italic** type are recommended for new plantings.
- For more complete information, please refer to the *PNW Weed Management Handbook*: <http://pnwhandbooks.org/weed/>.

Ingredient common name (herbicide mode of action)	Product name example	Nuts			Pome fruits		Stone fruits						Rates
		Chestnut	Hazelnut	Walnut	Apple	Pear	Apricot	Cherry	Nectarine	Peach	Plum	Prune	
Applications that are soil active (herbicides in italics and bold are recommended for new plantings)													
diuron (7)	Karmex												1.6–3.2 lb ai/A (2 to 4 lb/A Karmex 80DF)
dichlobenil (20)	Casoron												4–6 lb ai/A (100–150 lb/A Casoron). Apply in cold, wet weather.
<i>isoxaben</i> (21)	<i>Trellis, Gallery</i>				NB	NB	NB	NB	NB	NB	NB	NB	0.5–1 lb ai/A (0.66–1.33 lb/A product)
indaziflam (29)	Alion												0.046–0.085 lb ai/A (3.5–6.5 oz/A product) depending on soil texture
<i>napropamide</i> (3)	<i>Devrinol</i>												4 lb ai/A (8 lb/A)
norflurazon (12)	Solicam												1.95–3.98 lb ai/A (2.5–5 lb/A Solicam)
<i>oryzalin</i> (3)	<i>Surflan</i>												2–6 lb ai/A (2–6 qt/A Surflan)
<i>pendimethalin</i> (3)	<i>Prowl</i>												Prowl H ₂ O: 1.9–6 lb ai/A (2–6.3 qt/A) depending on desired length of weed control and crop
<i>pronamide</i> (3)	<i>Kerb</i>												1–4 lb ai/A (2–8 lb/A). Rate depends on species present and soil texture.
simazine (5)	Princep												See product labels for rates. Princep Caliber 90 is a Special Local Needs label (OR-080038) for sweet cherries only.
sulfentrazone (14)	Zeus XC												0.25–0.375 lb ai/A (8–12 oz/A) depending on soil classification; established 3 years
terbacil (5)	Sinbar						NB	NB				NB	0.4–0.8 lb ai/A (0.5–1 lb/A), newly established; 2–4 lb/A Sinbar, bearing, depending on soil type
<i>trifluralin</i> (3)	<i>Treflan 4L/EC</i>		NB										0.5–1 lb ai/A (1–2 pt/A Treflan 4L)
trifluralin (3) + isoxaben (21) + oxyfluorfen (14)	Showcase	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	2.5–5 lb ai/A (100–200 lb/A Showcase)
Applications that are soil and foliar active													
flazasfuron (2)	Mission												0.033–0.045 lb ai/A (2.14–2.85 oz/A)
flumioxazin (14)	Chateau SW/WDG												0.188–0.38 lb ai/A (6–12 oz/A Chateau WDG). Slight differences in rates and uses in SW and WDG labels.

Table continues on next page

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides, and insecticides. Materials are not listed in order of preference.

Ingredient common name (herbicide mode of action)	Product name example	Nuts			Pome fruits		Stone fruits					Rates	
		Chestnut	Hazelnut	Walnut	Apple	Pear	Apricot	Cherry	Nectarine	Peach	Plum		Prune
CONTNUED—Applications that are soil and foliar active													
oxyfluorfen (14)	Goal											1.25–2 lb ai/A (5–8 pt/A Goal 2XL)	
oxyfluorfen (14) + penoxsulam (2)	Pindar GT											1.47 lb ai/A oxyfluorfen + 0.015 lbs ai/A penoxsulam 1.5–3 pints/A	
rimsulfuron (2)	Matrix											0.063 lb ai/A (4 oz/A Matrix FNV per year)	
saffluenacil (14)	Treevix											0.045 lb ai/A (1 oz/A Treevix)	
Postemergence contact and translocated herbicides													
2,4-D (4)	Saber											Green sucker control in hazelnuts: 0.7–0.95 lb ai/A (1.5–2 pints/A Saber)	
acetic acid	WeedPharm												
carfentrazone (14)	Aim											Green sucker control in hazelnuts: 0.031 lb ai/A (2 fl oz/A Aim EC)	
clethodim (1)	Select Max		NB	NB	NB	NB	NB	NB	NB		NB	NB	0.06–0.125 lb ai/A (6–8 fl oz/A Select Max)
clopyralid (4)	Stinger												Apples: 0.094–0.25 lb ae/A (0.25–0.66 pt/A Stinger) Others: 0.12–0.25 lbs ae/A (0.33–0.66 pt/A Stinger)
diquat (22)	Reglone		NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	0.375–0.5 lbs ai/A (1.5–2 pt/A)
fluzafop (1)	Fusilade DX		NB	NB	NB	NB							0.25–0.375 lb ai/A (16–24 oz/A Fusilade DX). Refer to specific grassy weeds listed on label.
glufosinate (10)	Rely 280												0.88–1.5 lb ai/A (1.5–2.5 qt/A Rely 280); sucker control 1.75 qt/A
glyphosate (9)	Roundup												General weed control and grass suppression in row middles. Read label carefully for crops listed and geographic location.
halosulfuron (2)	Sandea												Apples: 0.035–0.094 lb ai/A (0.75–2 oz/A) Nut crops: 0.031–0.063 lb ai/A (2/3–1 1/3 oz/A)
paraquat (22)	Gramoxone Inteon												Green sucker control in hazelnuts: 0.625–1 lb cation/A (2.5–4 pt/A Gramoxone Inteon; 1.7–2.7 pt/A Firestorm)
pyraflufen (14)	Venue												0.001–0.006 lb ai/A (0.7–4 fl oz product/A)
sethoxydim (1)	Poast										NB	NB	Grass suppression in row middles: 0.28–0.47 lb ai/A (1.5–2.5 pt/A product)

Use only one material except where a combination is indicated. Follow label precautions when tank-mixing oils, fungicides, and insecticides. Materials are not listed in order of preference.

OSU Internet Resources for Plant Protection

Information regarding plant protection is available from several sources at OSU. The following listings are excellent examples:

- OSU Integrated Plant Protection Center. Online weather data and degree day information for insect pests and diseases (<http://uspest.org/wea/>)
- Codling moth development information (<http://ippc2.orst.edu/cgi-bin/ddmodel.pl?clm>)
- Apple scab infection season information (<http://ippc2.orst.edu/cgi-bin/ddmodel.pl?spp=asc>)
- Fire blight risk information (<http://ippc2.orst.edu/cgi-bin/ddmodel.pl?fbl>)
Directions for the use of each model are available at each site.
- Pacific Northwest Plant Disease Management Handbook (<http://pnwhandbooks.org/plantdisease>)
- Pacific Northwest Insect Management Handbook (<http://pnwhandbooks.org/insect>)
- Pacific Northwest Weed Management Handbook (<http://pnwhandbooks.org/weed>)

Using Pesticides Safely

Always Read the Label

The single most important approach to pesticide safety is to read the pesticide label before each use and then follow the directions. If still in doubt after reading the label, contact a person qualified to help evaluate the hazard of the chemical and its use. Qualified people include extension specialists, county educators, pesticide product representatives, and retailers.

Pesticides are toxic and should be handled with care—but can be used safely if you follow recommended precautions. Follow all label requirements, and strongly consider any

Oregon Poison Center

The Oregon Health & Science University
3181 S.W. Sam Jackson Park Road
Portland, OR 97239
Phone: 1-800-222-1222

If a person has collapsed or is not breathing, dial 911.

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recommendations for additional personal protective clothing and equipment. In addition to reading and following the label, other major factors in the safe and effective use of pesticides are the pesticide applicator's qualifications, common sense, and positive attitude. Always take all safety precautions when using pesticides.

In case of accidents involving pesticides, see your doctor at once. It will help your doctor to know exactly which pesticide is involved. The label on the container gives this information. Take to the physician the pesticide label or information from the label, such as the product name, registration number of the U.S. Environmental Protection Agency (EPA), common name and percentage of active ingredient, and first aid instructions. If the label cannot be removed, take along the pesticide container (if not contaminated), but do not take it into the hospital or doctor's office.

Pesticide Safety Checklist

- Use pesticides only when necessary and as part of an Integrated Pest Management (IPM) program.
- Always read the label and follow the instructions.
- Do not allow children to play around sprayers or mixing, storage, and disposal areas.
- Wear appropriate protective clothing and equipment.
- Never eat, drink, or smoke while handling pesticides.
- Avoid drift into non-target areas and pesticide runoff into streams, rivers, lakes, irrigation ponds and canals.
- Avoid spilling materials on skin or clothing.
- Have access to clean water, soap, and first aid supplies.
- Keep pesticides in a dry and locked storage area away from food and feed.
- Triple rinse or pressure rinse empty containers and dispose or recycle in accordance with state and local regulations.
- Stay out of recently sprayed areas until the spray has dried, and observe the restricted entry intervals (REI) specified on the pesticide label.
- Follow the pre-harvest interval (PHI) on the pesticide label before harvesting crops or gardens and before allowing livestock to graze fields.

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