

Blueberry

2017 Pest Management Guide for the Willamette Valley

EM 8538 · Revised February 2017

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The chemicals, formulations, and rates listed here for insect, mite, and disease control are among the best recommendations based on label directions, research, and use experience. Only a thorough knowledge of the blueberry planting, its cultivars, bush 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.

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 recommendations below suggest an amount of formulated product (not active ingredient) to use per acre. This amount is based on a “typical” middle age and density blueberry planting with moderate pest pressure. Common sense indicates that less material may be needed for 1- to 4-year-old plantings. Conversely, more chemical (within label limits) may be required for large, mature bushes 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!**

Always refer to the pesticide label for use instructions. It is the legal document regarding rate and use pattern.

Resistance management

The Insect Resistance Action Committee (IRAC) and the Fungicide Resistance Action Committee (FRAC) each has helped to develop codes for insecticides and fungicides, respectively, based on their mode of action and target site. An IRAC code or a FRAC code appears on the front of each pesticide label. To better manage fungicide resistance, do not mix or alternate insecticides with the same IRAC number or fungicides with the same FRAC number in a spray program.

- To view a complete listing of IRAC codes: www.irc-online.org/documents/moa-classification/?ext=pdf

The FRAC codes for various blueberry fungicides are listed at the end of this publication. The FRAC code “M” indicates that the fungicide acts upon multiple sites and has low resistance risk.

- To view a complete listing of FRAC codes: <http://www.frac.info/docs/default-source/publications/frac-code-list/frac-code-list-2016.pdf?sfvrsn=2>

Important information

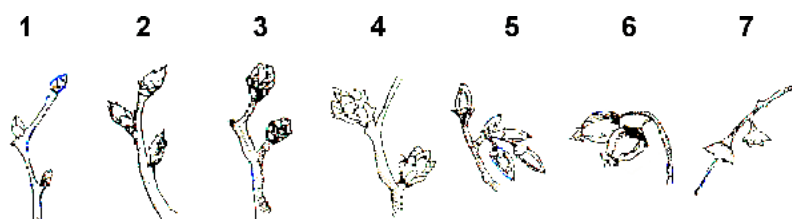
- **Worker Protection Standard (WPS):** Under the newly revised WPS (January 2, 2017), agricultural workers and pesticide handlers are required to take annual training by qualified WPS trainers. To mitigate spray drift, the application exclusion zone (AEZ) was recently established for aerial and ground applications. Agricultural employers are required to comply with the new AEZ rule. Handlers’ AEZ requirements are not effective until January 2, 2018. For more details about WPS, visit the following Oregon Department of Agriculture website: (<https://www.oregon.gov/ODA/programs/Pesticides/RegulatoryIssues/Pages/WPS.aspx>)

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- **Buffer regulations for the Oregon small fruit industry:** In August 2014, a District Court ruling resulted in the continuation of spray buffer regulations near certain bodies of water that were initially put into place in 2004. To obtain up-to-date information on this regulation and to learn whether your fields are close to affected

rivers or streams, visit the following Oregon Department of Agriculture website: <http://www.oregon.gov/ODA/programs/Pesticides/Water/Pages/Buffers.aspx>

- **Pacific Northwest Pest Management Handbooks** for Insect, Plant Disease, and Weed (<http://pnwhandbooks.org>)
- **Northwest Berry & Grape Information Network** (<http://berrygrape.org>)



Sequential stages of plant development

- 1 Dormant:** No visible swelling, bud scales completely enclose the inflorescence
2 Bud Swell: Visible swelling of bud, scales separating, flowers still completely enclosed
3 Floral Budbreak: Bud scales separated, apices of flowers visible
4 Floral Budbreak, Prebloom: Individual flowers distinguishable, bud scales abscised
5 Prebloom: Individual flowers distinctly separated, corollas unexpanded and closed
6 Bloom: Corollas completely expanded and open
7 Petal Fall: Corollas dropped

Stages and Pests

| Dormant (Stage 1) | Budbreak (Stages 3 and 4) | Prebloom (Stages 4 and 5) | Bloom (Stage 6) | Postbloom to Preharvest (Stage 7) | Preharvest/ Harvest (Stage 8) | Postharvest (Stage 9) |
|----------------------|------------------------------|------------------------------|--------------------|---|-------------------------------------|--------------------------|
| Mummy berry | Mummy berry | Mummy berry | Mummy berry | Anthraco-nose | Alternaria | Bacterial canker |
| Bacterial canker | Phytophthora root rot | Aphids | <i>Botrytis</i> | Alternaria | <i>Botrytis</i> | Root weevils (larvae) |
| Crown gall | Blueberry gall midge | Cherry fruitworm | Alternaria | Scorch virus | Silver leaf | Symphylan |
| Godronia canker | Symphylan | Winter moths | Anthraco-nose | Aphids | Spotted wing drosophila | |
| Scale insects | | <i>Botrytis</i> (stage 5) | Shock virus | Leafrollers | Birds | |
| | | | Scorch virus | Blueberry gall midge | | |
| | | | Phomopsis | Root weevils (adults) | | |
| | | | | Scale (crawlers) | | |
| | | | | Spotted wing drosophila | | |
| | | | | Yellowjackets | | |

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Blueberry 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.

| Dormant (Stage 1) | | |
|--|---|---|
| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
| pH | | |
| none | — | Sample the soil around the root zone annually to see whether pH is in the correct range for normal plant growth (4.5–5.5). |
| Godronia canker, bacterial canker, and crown gall | | |
| none | — | Prune plants out during dry weather and destroy affected canes when first noticed. |
| Mummy berry—primary infection | | |
| none | — | Destroy any cull piles near packing shed. Cultivate or rake between rows such that mummies are buried with a few inches of soil. Use 2 or more inches of mulch to cover mummies. |
| herbicides | — | Applications of diuron or simazine to the soil for weed control may help inhibit development of apothecia. |
| Scale insects | | |
| dormant oil | 3 gal/ 100 gal water | Use sufficient gallonage per acre to thoroughly coat plants. <i>Avoid applying oils during periods of freezing and subfreezing weather.</i> 4- to 12-hour reentry (depends on brand). Some brands of oil are approved for organic production. |
| Esteem 35WP or 0.86 EC | 5 oz or 16 fl oz | 12-hour reentry. 7-day PHI. |
| Budbreak (Stages 3 and 4) | | |
| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
| Phytophthora root rot | | |
| Aliette WDG | 5 lb | Do not use with copper materials. 12-hour reentry. 0-day PHI. |
| Fosphite | 1–2 qt | Do not use copper materials within 10 to 20 days of treatment. 4-hour reentry. 0-day PHI. |
| MetaStar 2E | 2 gal | Apply to the soil as a 3-ft-wide treated band. Apply in spring as growth resumes. 48-hour reentry. 0-day PHI. |
| OxiPhos | 2.5–5 qt | 4-hour reentry. |
| Phostrol | 2.5–5 pt | 4-hour reentry. |
| Rampart | 1–3 qt | Do not apply at intervals less than 3 days. Do not use copper materials within 20 days of treatment. 4-hour reentry. 0-day PHI. |
| Ridomil Gold SL | 3.6 pt or 0.25 pt/ 1,000 ft of row | Apply to the soil as a 3-ft-wide treated band. Apply in spring as growth resumes. 48-hour reentry. 0-day PHI. |

Budbreak continues on next page

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CONTINUED—Budbreak (Stages 3 and 4)

| Pest or disease/ Material | Amount of product per acre | Comments/RE-entry interval/Preharvest interval (PHI) |
|---|---------------------------------------|--|
| Mummy berry—primary infection | | |
| Actinovate AG | 12 oz | Use with surfactant. Approved for organic production. |
| Captan 80WDG | 1.25–3 lb | 2-day reentry. 0-day PHI. |
| CaptEvate 68WDG | 4.7 lb | Do not apply more than 2 consecutive applications or more than 21 lb/A/season. 2-day reentry. 0-day PHI. |
| Indar 2F | 6 fl oz | Tank-mix with a wetting agent. 12-hour reentry. 30-day PHI. |
| InspireSuper | 16–20 fl oz | 12-hour reentry. 7-day PHI. |
| Oquility | 13.6–27 fl oz | 12-hour reentry. 0-day PHI. |
| Omega 500F | 1.25 pt | Do not use with an adjuvant. 3-day reentry. 30-day PHI. |
| Proline 480 SC | 5.7 fl oz | 12-hour reentry. 7-day PHI. |
| QuadrisTop | 12–14 fl oz | 12-hour reentry. 7-day PHI. (see footnote 7, page 17) |
| Quash | 2.5 oz | Do not use with an adjuvant. 12-hour reentry. 7-day PHI. |
| Quilt Xcel | 14–21 fl oz | Use of propiconazole for mummy berry control has been associated with an increase in <i>Botrytis</i> severity. 12-hour reentry. 30-day PHI. |
| Regalia | 2–4 qt | 4-hour reentry. 0-day PHI. Approved for organic production. |
| Tilt/PropiMax/Bumper | 6 fl oz | Use of propiconazole for mummy berry control has been associated with an increase in <i>Botrytis</i> severity. 12-hour reentry. 30-day PHI. |
| Blueberry gall midge | | |
| Assail 30SG | 4.5–5.3 oz | Apply at egg hatch or to young larvae. 12-hour reentry. 1-day PHI. |
| Delegate WG | 3–6 oz | Suppression of midge. 4-hour reentry. 3-day PHI. |
| Diazinon 50W | 1 lb | Midge does not appear on label, but application is legal and may be effective. 5-day reentry. 7-day PHI. |
| Entrust | 1.25–2 oz | Midge does not appear on label, but application is legal and may be effective. Approved for organic production. 4-hour reentry. 3-day PHI. |
| Exirel | 13.5–20.5 fl oz | Provides suppression only. Note “Bee Advisory Box” and restrictions on the label. 12-hour reentry. 3-day PHI. |
| Imidan 70W (WSB) | 1.33 lb | Midge does not appear on label, but application is legal and may be effective. 1-day reentry. 3-day PHI. |
| Malathion 8 Flowable or Malathion 8 Aquamul | 1.25 pt | Midge does not appear on label, but application is legal and effective. 12-hour reentry. 1-day PHI. |
| Rimon 0.83EC | 20–30 fl oz | Midge does not appear on label, but application is legal and may be effective. Apply at egg hatch or to small larvae. 12-hour reentry. 8-day PHI. |
| Sivanto 200SL | 10.5–14.0 fl oz | Midge does not appear on label, but application is legal and effective. Toxic to bees through oral exposure. 4-hour reentry. 3-day PHI. |
| Success | 4–6 fl oz | Midge does not appear on label, but application is legal and may be effective. 4-hour reentry. 3-day PHI. |
| Symphylan | | |
| Mocap (nonbearing fields only) | 1.33 qt | SLN# OR-120020 allows use in newly planted, nonbearing fields. Broadcast or band (2-ft minimum) apply to the soil. Immediately apply 1 to 2 inches of overhead irrigation water to incorporate. Consult label for use with drip irrigation. 48-hour reentry. 365-day PHI. |

Budbreak continues on next page

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CONTINUED—Budbreak (Stages 3 and 4)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|--|---------------------------------------|---|
| Winter moths (spanworms, inchworms) (see footnote 1, page 15) | | |
| Altacor | 3.0–4.5 oz | Winter moth does not appear on label, but application is legal and may be effective. 4-hour reentry. 1-day PHI. |
| Assail 30SG | 4.5–5.3 oz | 12-hour reentry. 1-day PHI. |
| Avaunt | 6 oz | 12-hour reentry. 7-day PHI. |
| <i>Bacillus thuringiensis</i> | — | Many brands available. See label for rate. Approved for organic production. Multiple sprays usually necessary. Inspect buds in spring as scales separate. 4-hour reentry. 0-day PHI. |
| Confirm 2F | 1 pt | Apply at early egg hatch. 4-hour reentry. 14-day PHI. |
| Delegate WG | 3–6 oz | Winter moth does not appear on label, but application is legal and is known to be effective. 4-hour reentry. 3-day PHI. |
| Diazinon 50W | 1 lb | Winter moth may not be listed on label, but this is a legal application and is known to be effective. Do not use more than once per season. 5-day reentry. 7-day PHI. |
| Entrust | 1.25–2 oz | Winter moth does not appear on label, but application is legal and is known to be effective. Approved for organic production. 4-hour reentry. 3-day PHI. |
| Exirel | 10.0–13.5 fl oz | Winter moth does not appear on label, but application is legal and may be effective. 12-hour reentry. 3-day PHI. |
| Intrepid 2F | 10–16 fl oz | Apply at early egg hatch. 4-hour reentry. 7-day PHI. |
| Lannate LV | 1.5–3 pt | Restricted use pesticide. Winter moth may not be listed on label, but this is a legal application and is known to be effective. 2-day reentry. 3-day PHI. |
| Rimon 0.83EC | 20–30 fl oz | Apply at early egg hatch or to early instar larvae. 12-hour reentry. 8-day PHI. |
| Sevin XLR Plus | 1–2 qt | Winter moth may not be listed on label, but this is a legal application and is known to be effective. 12-hour reentry. 7-day PHI. |
| Success | 4–6 fl oz | Winter moth does not appear on label, but application is legal and is known to be effective. 4-hour reentry. 3-day PHI. |

Prebloom (Stages 4 and 5)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|--------------------------------------|---------------------------------------|--|
| Mummy berry—primary infection | | |
| Actinovate AG | 12 oz | Use with surfactant. Approved for organic production. 1-hour reentry (or until spray has dried). 0-day PHI. |
| Captan 80WDG | 1.25–3 lb | 2-day reentry. 0-day PHI. |
| CaptEstate 68WDG | 4.7 lb | Do not apply more than 2 consecutive applications or more than 21 lb/A/season. 2-day reentry. 0-day PHI. |
| Indar 2F | 6 fl oz | Tank-mix with a wetting agent. 12-hour reentry. 30-day PHI. |
| InspireSuper | 16–20 fl oz | 12-hour reentry. 7-day PHI. |
| Luna Tranquility | 13.6–27 fl oz | 12-hour reentry. 0-day PHI. |
| Omega 500F | 1.25 pt | Do not use with an adjuvant. 3-day reentry. 30-day PHI. |

Prebloom continues on next page

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CONTINUED—Prebloom (Stages 4 and 5)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|--|---------------------------------------|--|
| Mummy berry—primary infection (continued) | | |
| Pristine | 18.5–23 oz | Do not use with any other tank additive except Captan. Target the first open blossom. 12-hour reentry. 0-day PHI. |
| Proline 480 SC | 5.7 fl oz | 12-hour reentry. 7-day PHI. |
| QuadrisTop | 12–14 fl oz | 12-hour reentry. 7-day PHI. (see footnote 7, page 17) |
| Quash | 2.5 oz | Target the first open blossom. 12-hour reentry. 7-day PHI. |
| Quilt Xcel | 14–21 fl oz | Use of propiconazole for mummy berry control has been associated with an increase in <i>Botrytis</i> severity. 12-hour reentry. 30-day PHI. |
| Regalia | 2–4 qt | Late bloom applications have been associated with resetting. Approved for organic production. 4-hour reentry. 0-day PHI. |
| Tilt/PropiMax/Bumper | 6 fl oz | Use of propiconazole for mummy berry control has been associated with an increase in <i>Botrytis</i> severity. 12-hour reentry. 30-day PHI. |
| Aphids | | |
| Actara | 3–4 oz | Toxic to bees; do not apply if bees are foraging in the area. Note “Bee Advisory Box” and restrictions on the label. 12-hour reentry. 3-day PHI. |
| Admire Pro | 1–1.4 fl oz (foliar) | Do not apply prebloom, during bloom, or when bees are actively foraging. Note “Bee Advisory Box” and restrictions on the label. 12-hour reentry. 3-day PHI. |
| Assail 30SG | 2.5–5.3 oz | Toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 1-day PHI. |
| Diazinon 50W | 1 lb | For bee safety, do not apply to bloom or within 5 days of introducing bees. Do not apply more than once per season. 5-day reentry. 7-day PHI. |
| Esteem 35WP or 0.86 EC | 5 oz or 16 fl oz | Aphids do not appear on label, but application is legal and may be effective. Avoid direct application and/or spray drift to beehives. 12-hour reentry. 7-day PHI. |
| Exirel | 13.5–20.5 fl oz | Avoid use when bees are present. Exirel is non-lethal to bees once spray has dried for at least 3 hours. 12-hour reentry. 3-day PHI. |
| M-Pede | 2 gal | Insecticidal soap. Other brands available. Apply as full cover spray, 2 gal/100 gal water. Repeat applications are likely to be necessary. Approved for organic production. 12-hour reentry. 0-day PHI. |
| Malathion 8 Flowable or Malathion 8 Aquamul | 1.25 pt | Aphids do not appear on label, but application is legal and effective. Toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 1-day PHI. |
| Neem (Aza-Direct, Neemix, others) | — | Refer to label for rate, use pattern, and precautions. These, and most other brands of azadirachtin (neem), are approved for organic production. |
| Platinum | 5–12 fl oz | Applied to the soil and translocated to the leaves. Wait at least 5 days after application before placing beehives in a treated field. 12-hour reentry. 75-day PHI. |
| PyGanic 5.0 | 17 fl oz | Toxic to bees; do not apply when bees are foraging. Highly toxic to fish. Approved for organic production. 12-hour reentry. 0-day PHI. |
| Sivanto | 7–10.5 fl oz | Toxic to bees through oral exposure. 4-hour reentry. 3-day PHI. |

Prebloom continues on next page

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CONTINUED—Prebloom (Stages 4 and 5)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|--|---------------------------------------|---|
| Cherry fruitworm | | |
| Altacor | 3.0–4.5 oz | Cherry fruitworm does not appear on label, but application is legal and may be effective. 4-hour reentry. 1-day PHI. |
| Avaunt | 3–6 oz | Toxic to bees; do not apply when bloom is present. 12-hour reentry. 7-day PHI. |
| Confirm 2F | 1 pt | Apply at early egg hatch. 4-hour reentry. 14-day PHI. |
| Danitol | 10–16 fl oz | Restricted use pesticide. Toxic to bees; do not apply when bees are present. 24-hour reentry. 3-day PHI. |
| Delegate WG | 3–6 oz | Do not apply more than a total of 19.5 oz/season. Toxic to bees; do not apply when bloom is present. 4-hour reentry. 3-day PHI. |
| Diazinon 50W | 1 lb | For bee safety, do not apply to bloom or within 5 days of introducing bees. 5-day reentry. 7-day PHI. |
| Entrust | 1.25–2 oz | Approved for organic production. Toxic to bees exposed to treatment for 3 hours following treatment. 4-hour reentry. 3-day PHI. |
| Esteem 35WP | 5 oz | Avoid direct application and/or spray drift to beehives. 12-hour reentry. 7-day PHI. |
| Exirel | 10–13.5 fl oz | Avoid use when bees are present. Exirel is non-lethal to bees once spray has dried for at least 3 hours. 12-hour reentry. 3-day PHI. |
| Intrepid 2F | 10–16 fl oz | Apply at early egg hatch. 4-hour reentry. 7-day PHI. |
| Lannate LV | 1.5–3 pt | Restricted use pesticide. For bee safety, do not apply within 5 days of pollination. 2-day reentry. 3-day PHI. |
| Malathion 8 Flowable or Malathion 8 Aquamul | 1.25 pt | Highly toxic to bees; avoid application when bees are present. 12-hour reentry. 1-day PHI. |
| Sevin XLR Plus | 1–2 qt | For bee safety, do not apply within 5 days of pollination. 12-hour reentry. 7-day PHI. |
| Success | 4–6 fl oz | Toxic to bees exposed to treatment for 3 hours following treatment. 4-hour reentry. 3-day PHI. |
| Winter moths (spanworms, inchworms) (see footnote 1, page 15) | | |
| Altacor | 3.0–4.5 oz | Winter moth does not appear on label, but application is legal and may be effective. 4-hour reentry. 1-day PHI. |
| Asana XL | 4.8–9.6 fl oz | Restricted use pesticide. Toxic to bees; do not apply when bloom is present. 12-hour reentry. 14-day PHI. |
| Avaunt | 6 oz | Toxic to bees; do not apply when bloom is present. 12-hour reentry. 7-day PHI. |
| <i>Bacillus thuringiensis</i> | — | Many brands available. See label for rate. Approved for organic production. Multiple sprays usually necessary. Inspect buds in spring as scales separate. This pest usually requires a first Bt application prior to bloom. 4-hour reentry. 0-day PHI. |
| Brigade WSB | 8–16 oz | Restricted use pesticide. Do not apply when bloom is present. 12-hour reentry. 1-day PHI. |
| Confirm 2F | 1 pt | Apply at early egg hatch. 4-hour reentry. 14-day PHI. |

Prebloom continues on next page

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CONTINUED—Prebloom (Stages 4 and 5)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|--|---------------------------------------|--|
| Winter moths (spanworms, inchworms) (continued) | | |
| Delegate WG | 3–6 oz | Winter moth does not appear on label, but application is legal and is known to be effective. Toxic to bees; do not apply when bloom is present. 4-hour reentry. 3-day PHI. |
| Diazinon 50W | 1 lb | This pest may not be listed on label, but this is a legal application and is known to be effective. Do not apply to bloom or within 5 days of introducing bees. Do not use more than once per season. 5-day reentry. 7-day PHI. |
| Entrust | 1.25–2 oz | Winter moth does not appear on label, but application is legal and is known to be effective. Approved for organic production. Toxic to bees exposed to treatment for 3 hours following treatment. 4-hour reentry. 3-day PHI. |
| Intrepid 2F | 10–16 fl oz | Apply at early egg hatch. 4-hour reentry. 7-day PHI. |
| Lannate LV | 1.5–3 pt | Restricted use pesticide. This pest may not be listed on label, but this is a legal application and is known to be effective. Do not apply to bloom or within 5 days of introducing bees. 2-day reentry. 3-day PHI. |
| Rimon 0.83EC | 20–30 fl oz | Apply at egg hatch or to early instar larvae. To minimize effects on honeybee brood development, do not apply if bees are actively foraging. 12-hour reentry. 8-day PHI. |
| Sevin XLR Plus | 1–2 qt | This pest may not be listed on label, but this is a legal application and is known to be effective. Toxic to bees; do not apply to bloom or within 5 days of introducing bees. 12-hour reentry. 7-day PHI. |
| Success | 4–6 fl oz | Winter moth does not appear on label, but application is legal and is known to be effective. Toxic to bees exposed to treatment for 3 hours following treatment. 4-hour reentry. 3-day PHI. |

Bloom (Stage 6)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|---|---------------------------------------|--|
| Botrytis gray mold, Alternaria fruit rot, ripe rot (anthracnose) (see footnote 6, page 17) | | |
| Abound (or Willowood Azoxy) | 6–15.5 fl oz | For ripe rot control. Do not use more than 3 times per year or 2 consecutive applications or with a silicone-based surfactant. 4-hour reentry. 0-day PHI. (see footnote 7, page 17) |
| Captan 80WDG | 1.25–3 lb | Apply at early bloom and at 10- to 14-day intervals through petal fall. 2-day reentry. 0-day PHI. |
| CaptEvote 68WDG | 3.5–4.7 lb | Do not apply more than 2 consecutive applications or more than 21 lb/A/season. 2-day reentry. 0-day PHI. |
| Elevate 50WDG | 1.5 lb | For <i>Botrytis</i> control. 12-hour reentry. 0-day PHI. |
| InspireSuper | 16–20 fl oz | 12-hour reentry. 7-day PHI. |
| Luna Tranquility | 13.6–27 fl oz | 12-hour reentry. 0-day PHI. |
| Meteor | 1–2 pt | For <i>Botrytis</i> control. Tank-mix with another fungicide with a different mode of action. 1-day reentry. 0-day PHI. |
| Omega 500F | 1.25 pt | For ripe rot control. Do not use with an adjuvant. 12-hour reentry. 30-day PHI. |
| Oso SC | 3.75–13 fl oz | 4-hour reentry. 0-day PHI. |

Bloom continues on next page

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CONTINUED—Bloom (Stage 6)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|---|---------------------------------------|--|
| <i>Botrytis</i> gray mold, <i>Alternaria</i> fruit rot, ripe rot (anthracnose) (continued) | | |
| Ph-D WDG | 6.2 oz | Use with an adjuvant. Group 19 fungicide. 4-hour reentry. 0-day PHI. |
| Pristine | 18.5–23 oz | Do not use with any other tank additive except Captan. 12-hour reentry. 0-day PHI. |
| QuadrisTop | 12–14 fl oz | For ripe rot. 12-hour reentry. 7-day PHI. (see footnote 7, page 17) |
| Quilt Xcel | 14–21 fl oz | For ripe rot control. 12-hour reentry. 30-day PHI. |
| Switch 62.5WG | 11–14 oz | Do not use more than 2 consecutive applications or more than 56 oz/A/season. 12-hour reentry. 0-day PHI. |
| Ziram 76DF | 3 lb | Do not apply more than 3 weeks past full bloom. 2-day reentry. |
| Mummy berry—secondary infection | | |
| Captan 80WDG | 1.25–3 lb | 2-day reentry. 0-day PHI. |
| CaptEvate 68WDG | 4.7 lb | Do not apply more than 2 consecutive applications or more than 21 lb/A/season. 2-day reentry. 0-day PHI. |
| Indar 2F | 6 fl oz | Tank-mix with a wetting agent. 12-hour reentry. 30-day PHI. |
| InspireSuper | 16–20 fl oz | 12-hour reentry. 7-day PHI. |
| Luna Tranquility | 13.6–27 fl oz | 12-hour reentry. 0-day PHI. |
| Pristine | 18.5–23 oz | Do not use with any other tank additive. 12-hour reentry. 0-day PHI. |
| Proline 480 SC | 5.7 fl oz | 12-hour reentry. 7-day PHI. |
| QuadrisTop | 12–14 fl oz | 12-hour reentry. 7-day PHI. (see footnote 7, page 17) |
| Quash | 2.5 oz | 12-hour reentry. 7-day PHI. |
| Quilt Xcel | 14–21 fl oz | Use of propiconazole for mummy berry control has been associated with an increase in <i>Botrytis</i> severity. 12-hour reentry. 30-day PHI. |
| Tilt/PropiMax/Bumper | 6 fl oz | Use of propiconazole for mummy berry control has been associated with an increase in <i>Botrytis</i> severity. 12-hour reentry. 30-day PHI. |
| Phomopsis (if it has been a problem in the past) | | |
| Abound | 6–15.4 fl oz | Do not use more than 3 times per year or 2 consecutive applications or with a silicone-based surfactant. 4-hour reentry. 0-day PHI. (see footnote 7, page 17) |
| Captan 80WDG | 1.25–3 lb | 2-day reentry. 0-day PHI. |
| Indar 2F | 6 fl oz | Tank-mix with a wetting agent. 12-hour reentry. 30-day PHI. |
| Omega 500F | 1.25 pt | Do not use with an adjuvant. 12-hour reentry. 30-day PHI. |
| Pristine | 18.5–23 oz | Do not use with any other tank additive except Captan. 12-hour reentry. 0-day PHI. |
| Quash | 2.5 oz | 12-hour reentry. 7-day PHI. |
| Quilt Xcel | 14–21 fl oz | 12-hour reentry. 30-day PHI. |
| Switch 62.5WG | 11–14 oz | Do not use more than 2 consecutive applications. 12-hour reentry. 0-day PHI. |
| Shock and scorch virus | | |
| none | — | Look for symptoms and have suspected plants tested. Check with OSU as to when samples will be accepted for virus testing. |

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.

Postbloom to Preharvest (Stage 7)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|---|---------------------------------------|---|
| Anthracnose (ripe rot) and Alternaria fruit rot (see footnote 6, page 17) | | |
| Abound (or Willowood Azoxy) | 6–15.5 fl oz | Do not use more than 3 times per year or 2 consecutive applications or with a silicone-based surfactant. 4-hour reentry. 0-day PHI. (see footnote 7, page 17) |
| Captan 80WDG | 1.25–3 lb | 2-day reentry. 0-day PHI. |
| CaptEvote 68WDG | 4.7 lb | Do not apply more than 2 consecutive applications or more than 21 lb/A/season. 2-day reentry. 0-day PHI. |
| Luna Tranquility | 13.6–27 fl oz | 12-hour reentry. 0-day PHI. |
| Omega 500F | 1.25 pt | For ripe rot control. Do not use with an adjuvant. 12-hour reentry. 30-day PHI. |
| Pristine | 18.5–23 oz | Do not use with any other tank additive except Captan. 12-hour reentry. 0-day PHI. |
| QuadrisTop | 12–14 fl oz | 12-hour reentry. 7-day PHI. (see footnote 7, page 17) |
| Quash | 2.5 oz | 12-hour reentry. 7-day PHI. |
| Switch 67.5WG | 11–14 oz | Do not use more than 2 consecutive applications or more than 56 oz/A/season. 12-hour reentry. 0-day PHI. |
| Ziram 76DF | 3 lb | Do not use later than 3 weeks after full bloom. 2-day reentry. |
| Scorch virus | | |
| none | — | Remove plants that test positive for this virus. |
| Aphids | | |
| Actara, Admire Pro, Assail, diazinon, Esteem, Exirel, M-Pede, malathion, neem, Platinum, or Sivanto | — | See prebloom section for use, rates, and preharvest intervals. |
| Blueberry gall midge | | |
| Assail 30SG | 2.5–5.3 oz | Toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 1-day PHI. |
| Delegate WG | 3–6 oz | Suppression of midge. Do not apply more than a total of 19.5 oz/season. Toxic to bees; do not apply when bloom is present. 4-hour reentry. 3-day PHI. |
| Diazinon 50W | 1 lb | Midge does not appear on label, but application is legal and may be effective. For bee safety, do not apply to bloom or within 5 days of introducing bees. 5-day reentry. 7-day PHI. |
| Entrust | 1.25–2 oz | Midge does not appear on label, but application is legal and may be effective. Approved for organic production. Toxic to bees exposed to treatment for 3 hours following treatment. 4-hour reentry. 3-day PHI. |
| Exirel | 13.5–20.5 fl oz | Provides suppression only. 12-hour reentry. 3-day PHI. |
| Imidan 70W (WSB) | 1.33 lb | Midge does not appear on label, but application is legal and may be effective. Highly toxic to bees exposed directly to treatment. Do not apply if bees are foraging in the area. 1-day reentry. 3-day PHI. |
| Malathion 8 Flowable or Malathion 8 Aquamul | 1.25 pt | Midge does not appear on label, but application is legal and may be effective. Highly toxic to bees; avoid application when bees are present. 12-hour reentry. 1-day PHI. |

Postbloom to Preharvest continues on next page

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CONTINUED—Postbloom to Preharvest (Stage 7)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|---|---------------------------------------|--|
| Blueberry gall midge (continued) | | |
| Rimon 0.83EC | 20–30 fl oz | Apply at egg hatch or to early instar larvae. To minimize effects on honeybee brood development, do not apply if bees are actively foraging. 12-hour reentry. 8-day PHI. |
| Sivanto 200SL | 10.5–14.0 fl oz | Midge does not appear on label, but application is legal and effective. Toxic to bees through oral exposure. 4-hour reentry. 3-day PHI. |
| Success | 4–6 fl oz | Midge does not appear on label, but application is legal and may be effective. Toxic to bees exposed to treatment for 3 hours following treatment. 4-hour reentry. 3-day PHI. |
| Leafrollers (orange tortrix) (see footnote 2, page 15) | | |
| Altacor | 3.0–4.5 oz | Orange tortrix leafroller does not appear on label, but application is legal and may be effective. 4-hour reentry. 1-day PHI. |
| Avaunt | 6 oz | Toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 7-day PHI. |
| <i>Bacillus thuringiensis</i> | — | Many brands available. See label for rate. Approved for organic production. 2–3 sprays 7 days apart may be necessary for satisfactory control. 4-hour reentry. 0-day PHI. |
| Brigade WSB | 8–16 oz | Restricted use pesticide. Highly toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 1-day PHI. |
| Confirm 2F | 1 pt | Apply at early egg hatch. 4-hour reentry. 14-day PHI. |
| Danitol | 10–16 fl oz | Restricted use pesticide. Toxic to bees; do not apply when bees are present. 24-hour reentry. 3-day PHI. |
| Delegate WG | 3–6 oz | Do not apply more than a total of 19.5 oz/season. Toxic to bees; do not apply if bees are foraging in the area. 4-hour reentry. 3-day PHI. |
| Entrust | 1.25–2 oz | Approved for organic production. Toxic to bees exposed to treatment for 3 hours following treatment. 4-hour reentry. 3-day PHI. |
| Imidan 70W (WSB) | 1.33 lb | Toxic to bees; do not apply if bees are foraging in the area. OR 24c registration. 1-day reentry. 3-day PHI. |
| Intrepid 2F | 10–16 fl oz | Apply at early egg hatch. 4-hour reentry. 7-day PHI. |
| Lannate LV | 1.5–3 pt | Restricted use pesticide. Also will help suppress aphids. Highly toxic to bees; do not apply if bees are foraging in the area. 2-day reentry. 3-day PHI. |
| Mustang MAXX | 4 fl oz | Restricted use pesticide. Toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 1-day PHI. |
| Rimon | 20–30 fl oz | Apply at egg hatch or early instar larvae. To minimize effects on honeybee brood development, do not apply if bees are actively foraging. 12-hour reentry. 3-day PHI. |
| Sevin XLR Plus | 1–2 qt | Highly toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 7-day PHI. |
| Success | 4–6 fl oz | Toxic to bees exposed to treatment for 3 hours following treatment. 4-hour reentry. 3-day PHI. |

Postbloom to Preharvest continues on next page

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CONTINUED—Postbloom to Preharvest (Stage 7)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|--|---------------------------------------|---|
| Root weevils (adults) (see footnote 3, page 16) | | |
| Actara | 4 oz | Toxic to bees; do not apply if bees are foraging in the area. Note “Bee Advisory Box” and restrictions on the label. 12-hour reentry. 3-day PHI. |
| Asana XL | 9.6 fl oz | Restricted use pesticide. Toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 14-day PHI. |
| Brigade WSB | 8–16 oz | Restricted use pesticide. This pest does not appear on the label, but is a legal use and known to be effective. Toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 1-day PHI. |
| Exirel | 13.5–20.5 fl oz | Root weevil does not appear on label, but application is legal and may be effective. 12-hour reentry. 3-day PHI. |
| Malathion 8 Flowable or Malathion 8 Aquamul | 1.25 pt | Root weevil does not appear on the label, but application is legal and effective. Toxic to bees; avoid application when bees are present. 12-hour reentry. 1-day PHI. |
| Mustang MAXX | 4 fl oz | Restricted use pesticide. Toxic to bees; do not apply if bees are foraging in the area. 12-hour reentry. 1-day PHI. |
| Neem (Aza-Direct, Neemix, others) | — | Refer to label for rate, use pattern, precautions, reentry interval, and PHI. These, and most other brands of azadirachtin (neem), are approved for organic production. |
| Scale insects (crawler stage) | | |
| Diazinon 50W | 1 lb | Scale may not be listed on label, but this is a legal application and is known to be effective. Toxic to bees; do not apply if bees are foraging in the area. 5-day reentry. 7-day PHI. |
| Esteem 35WP | 5 oz | Avoid direct application and/or spray drift to beehives. 12-hour reentry. 7-day PHI. |
| Malathion 8 Flowable or Malathion 8 Aquamul | 1.25 pt | Scale does not appear on the label, but application is legal and effective. Toxic to bees; avoid application when bees are present. 12-hour reentry. 1-day PHI. |
| Spotted wing drosophila (SWD) (see footnote 4, page 16) | | |
| <i>Note: Even if SWD is not listed on a label, it is legal to use the following for SWD management. These products target the adult stage of SWD. Treatment is recommended when flies are present and fruit begins to color.</i> | | |
| Asana XL | 9.6 fl oz | Restricted use pesticide. For bee safety, do not apply within 7 days of pollination. Toxic to fish and aquatic invertebrates. Achieves 100% mortality and provides about 10–14 days residual control. 12-hour reentry. 14-day PHI. |
| Brigade WSB | 16 oz | Restricted use pesticide. Do not apply when bees are present. Toxic to fish and aquatic invertebrates. Achieves 100% mortality and provides about 10–14 days residual control. 12-hour reentry. 1-day PHI. |
| Danitol | 10–16 fl oz | Restricted use pesticide. Do not apply when bees are present. Toxic to fish and aquatic invertebrates. Achieves 100% mortality and provides about 10–14 days residual control. 24-hour reentry. 3-day PHI. |
| Delegate WG | 3–6 oz | Toxic to bees; do not apply when bloom is present. Achieves 100% mortality of SWD and provides about 5–7 days residual control. 4-hour reentry. 3-day PHI. |

Postbloom to Preharvest continues on next page

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CONTINUED—Postbloom to Preharvest (Stage 7)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|---|---------------------------------------|---|
| Spotted wing drosophila (SWD) (continued) | | |
| Diazinon 50W | 1 lb | One application per season allowed; consider other pests that may need to be managed with diazinon. Do not apply to bloom or within 5 days of introducing bees. Toxic to fish and most aquatic invertebrates. Achieves 100% mortality and provides about 7–10 days residual control. 5-day reentry. 7-day PHI. |
| Entrust | 1.25–2 oz | Approved for organic production. Toxic to bees exposed to treatment for 3 hours following treatment. Achieves 100% mortality of SWD and provides about 5–7 days residual control. 4-hour reentry. 3-day PHI. State labels OR-160013 and WA-140014 for Entrust SC formulation allow a 1-day PHI. |
| Exirel | 13.5–20.5 fl oz | Avoid use when bees are present. Exirel is non-lethal to bees once spray has dried for at least 3 hours. 12-hour reentry. 3-day PHI. |
| Imidan 70W (WSB) | 1.33 lb | Highly toxic to bees exposed directly to treatment. Do not apply if bees are foraging in the area. Toxic to most aquatic invertebrates. Achieves 100% mortality and provides about 7–10 days residual control. 1-day reentry. 3-day PHI. |
| Lannate LV | 1.5–3 pt | Restricted use pesticide. Do not apply to bloom or within 5 days of introducing bees. Toxic to fish and most aquatic invertebrates. Achieves 100% mortality and provides about 7–10 days residual control. 2-day reentry. 3-day PHI. |
| Malathion 8 Flowable or Malathion 8 Aquamul | 2.5 pt | Oregon SLNs (Section 24c registrations) for each of these products allow a maximum of two applications at 2.5 pt/A. The federal label (Section 3 registration) allows 3 applications at 1.25 pt/A. Residual effects in the field are expected to be longer at the 2.5 pt/A rate than the 1.25 pt/A rate. Bee, fish and aquatic invertebrate toxicity are concerns with use of malathion. 12-hour reentry. 1-day PHI. |
| Mustang MAXX | 4 fl oz | Restricted use pesticide. Toxic to bees; do not apply if bees are foraging in the area. Toxic to fish and other aquatic invertebrates. Achieves 100% mortality and provides about 10–14 days residual control. 12-hour reentry. 1-day PHI. |
| Pyrethrin products | Varies | Consult label for rate, use directions, reentry interval, and PHI. Toxic to bees; do not apply if bees are foraging in the area. Highly toxic to fish. Provides about 80% control of SWD but has no residual activity. The Pyganic brand of pyrethrin is approved for organic production. |
| Sevin XLR Plus | 1–2 qt | Toxic to bees; do not apply to bloom or within 5 days of introducing bees. Toxic to aquatic invertebrates. Achieves 100% control of SWD. 12-hour reentry. 7-day PHI. |
| Success | 4–6 fl oz | Toxic to bees exposed to treatment for 3 hours following treatment. Achieves 100% mortality of SWD and provides about 5–7 days residual control. 4-hour reentry. 3-day PHI. |
| Yellowjackets | | |
| Heptyl butyrate traps | — | See Washington State University publication EB 0643, <i>Yellowjackets and Paper Wasps</i> , for further use directions. |
| pressurized insecticide sprays | — | Numerous products. Apply as spray to entrance hole of aerial nests. Do not contaminate berries. |
| Growth regulator to promote and concentrate ripening | | |
| Ethrel and Ethephon 2 | 4–8 pt | Use 150–200 gal water/A. 48-hour reentry. |

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Preharvest/Harvest (Stage 8)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|--|---------------------------------------|---|
| Bird prevention | | |
| Labels for bird repellents include Bird Shield and ReJex-iT. | Consult label for rate. | Netting is the most effective alternative for control. Falconing techniques are very effective if used correctly. Reflective tapes also show some effectiveness. Other mechanical methods and noise devices are used under a variety of circumstances with varying levels of effectiveness. Consult your local Extension agent. |
| Botrytis gray mold | | |
| none | — | Adjust overhead irrigation so foliage and fruit do not remain wet for extended periods of time. |
| Alternaria fruit rot | | |
| none | — | Do not handle or pick fruit when fruit is wet. Clean debris from picking buckets and packing lines. Cool fruit rapidly after picking. |
| Silver Leaf (especially “Draper” fields) | | |
| none | — | Mark bushes with silver leaf symptoms for removal before fall rains. Prune in dry weather if possible. |
| Spotted wing drosophila (SWD) (see footnote 4, page 16) | | |
| See materials listed for Postbloom to Preharvest (Stage 7) | | |

Postharvest (Stage 9)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|--|---------------------------------------|--|
| Bacterial canker | | |
| <i>Note: Make an application following harvest and prior to fall rains; repeat in 1 month. The best time to apply is when leaves are falling off; this protects leaf scars. Some brands of copper are approved for organic production.</i> | | |
| Badge X2 | 1.5–7 lb | 48-hour reentry. |
| Bordeaux (8-8-100) | — | See footnote 5, page 17. |
| Copper-Count-N | 4–10 qt | Use an adjuvant. 48-hour reentry. |
| Cuprofix Ultra 40 Disperss | 3–4 lb | 48-hour reentry. |
| Kocide 3000 | 1.75–3.5 lb | 48-hour reentry. |
| Nordox 75WG | 6.5–10 lb | Use a spreader-sticker. Approved for organic production. 12-hour reentry. |
| Nu-Cop 50DF | 2–4.2 lb | Approved for organic production. 48-hour reentry. |
| Phyton 27 AG | 20–40 fl oz | 48-hour reentry. |
| Previsto | 1–2 qt | 48-hour reentry. |
| Phytophthora root rot | | |
| Aliette WDG | 5 lb | Do not use with copper materials. 12-hour reentry. |
| Fosphite | 1–2 qt | Do not use copper materials within 10 to 20 days of treatment. 4-hour reentry. |
| OxiPhos | 42.3 fl oz/100 gal water | 4-hour reentry. |
| MetaStar 2E | 2 gal | Apply to the soil as a 3-ft-wide treated band. Apply in spring as growth resumes. 48-hour reentry. |

Postharvest continues on next page

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CONTINUED—Postharvest (Stage 9)

| Pest or disease/ Material | Amount of product per acre | Comments/Reentry interval/Preharvest interval (PHI) |
|--|---|--|
| Phytophthora root rot (continued) | | |
| Phostrol | 2.5–5 pt | 4-hour reentry. |
| Rampart | 1–3 qt | Do not apply at intervals less than 3 days. Do not use copper materials within 20 days of treatment. 4-hour reentry. |
| Ridomil Gold SL | 3.6 pt or 0.25 pt/1,000 ft of row | Apply to the soil as a 3-ft-wide treated band. Apply in spring as growth resumes. 48-hour reentry. |
| Root weevils (larvae) (see footnote 3, page 16) | | |
| Neem (Aza-Direct, Neemix, others) | — | Applied to the soil in early fall. Refer to label for rate, use pattern, and precautions. These, and most other brands of azadirachtin (neem), are approved for organic production. |
| parasitic nematodes | — | Applied to the soil in early fall. Follow label directions for rate and irrigation requirements. |
| Platinum | 12 fl oz | This pest does not appear on the label, but this is a legal use. Platinum has been known to be effective in other crops for larvae control. 12-hour reentry. 75-day PHI. |
| Symphylan | | |
| Mocap (nonbearing fields only) | 1.33 qt | SLN# OR-120020 allows use in newly planted, nonbearing fields. Broadcast or band (2-ft minimum) apply to the soil. Immediately apply 1 to 2 inches of overhead irrigation water to incorporate. Consult label for use with drip irrigation. 48-hour reentry. 365-day PHI. |

Footnotes

1. WINTER MOTHS: There are four species of winter moths native to the Northwest. Their life histories are similar in that there is but one generation/year characterized by eggs that overwinter on the trunks and branches of deciduous trees and shrubs. The larvae (inchworms or spanworms) begin emerging as early as March, with egg hatch usually complete by mid-April. The larvae feed on many plants, particularly those of the rose family. Blueberry plantings become infested when moths deposit eggs on plants in late fall and winter and/or when larvae infesting host plants adjacent to the planting are blown in on silken threads. This larval migration often leads growers to believe that previously applied sprays failed to control the pest.

CONTROL: Recognize that larvae are active in March and can burrow into buds, causing damage prior to bud burst. Early-season control is necessary. Infestations of winter moth that are a result of in-field infestations (eggs having overwintered on trunks and limbs of blueberry plants) can be reduced by the dormant oil + insecticide spray during the winter. Careful inspection of buds and newly expanding plant growth from April through early bloom will indicate need for additional sprays. Because larvae are present into June and because the larvae can blow into blueberry

plantings from surrounding trees, you must monitor fields even after insecticides have been applied. Repeat sprays may be necessary. Use least-toxic alternatives when pollinators and/or bloom are present.

2. LEAFROLLERS: The most common leafroller in western Oregon blueberries is the orange tortrix. It does direct feeding damage to the berries, provides an entry route for fruit rots, and may become an insect contaminant at harvest. It overwinters as a larva under leaves plastered to the trunks and limbs and among leaf litter of host plants. Most infestations on blueberries occur when moths of the spring generation (flight beginning mid-April and peaking early to mid-June) fly in and deposit eggs on plants.

CONTROL OF LARVAE—PREBLOOM: In-field infestations of larvae should be evaluated and treated (if necessary) from late March to early April, with the April date being on the late side for effective control if mild winter/early spring weather occur.

CONTROL OF LARVAE—LATE JUNE/EARLY JULY: Use pheromone traps to monitor moth activity in individual plantings from May through harvest to help in deciding whether to control larvae. Sprays to control larvae in late June and early July are necessary

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in canberries when individual trap catches exceed 70 moths/week or more than 200 moths are caught in a trap by June 1. We do not have adequate information on blueberries at this time. Choice of insecticide will depend on presence of bloom or proximity of harvest. NOTE: If *Bacillus thuringiensis* is used, two and possibly three applications at 7-day intervals may be necessary to achieve adequate control of heavy infestations. Use of this product with this timing should begin about 3 to 4 weeks prior to anticipated harvest because of its relatively slow action.

CONTROL OF LARVAE—AUGUST THROUGH HARVEST: A second flight begins in late July or early August, with large numbers of moths active through September. Larvae from these flights may infest fruit of the blueberry varieties harvested from mid-August through September. Pheromone traps used as above will help in the decision-making process of whether or not to control orange tortrix.

NOTE: Obliquebanded leafroller adults occasionally are lured to orange tortrix traps. Be sure to distinguish between the two species, as obliquebanded leafroller seldom is a pest in blueberries.

Also, orange tortrix traps will “pull in” males of the orange tortrix from a long distance from the blueberry planting, giving the false impression at times that a large infestation of larvae will follow within 2 to 3 weeks. For this reason, we recommend the placement of “guard” traps a few hundred yards, and in the predominant downwind direction, from the planting. They will intercept moths coming from areas that do not pose a threat to the blueberry field. Do not consider these moths when evaluating the need to spray a given block, but try to identify the source of infestation for future reference.

Finally, always try to verify the presence of larvae in a planting to justify a spray application. Do this by placing a white sheet under a few plants and shaking limbs vigorously. The larvae will hang down on silk threads, eventually falling to the sheet. Rolled leaves and leaves plastered to berries also are indications of infestation.

3. **ROOT WEEVILS:** Several species of root weevils have been found damaging blueberries in Oregon. Black vine weevil, strawberry root weevil, and obscure root weevil are three of the most common species whose larvae girdle roots, setting back growth tremendously. Adult weevils, although causing negligible injury to the leaves, can be contaminants of fruit.

DETECTION: Depending on the species, adults begin emerging in early May, with 90% emergence usually

occurring by mid-June, depending on how warm spring temperatures have been, elevation and slope of the planting, and depth of the insulating sawdust layer. To determine when adults emerge and become active, inspect new sucker growth near crown for leaf notching. With the aid of a flashlight, you can most easily see the adult weevils when they are feeding on foliage on warm, still evenings after sunset.

CONTROL: All weevils are females and have the ability to lay more than 500 eggs during the course of the season. Applications of insecticides to control weevils are timed to 80% to 90% adult emergence but prior to egg laying. This usually is in June.

Weevils are difficult to control with insecticides. Therefore, it is necessary to time foliar sprays carefully. Weevils are active at night. Applications should be made after dark (usually 10 p.m. to after midnight) on warm, still evenings when weevils are on foliage. Two or three sprays approximately 1 week apart are necessary to begin to control an established infestation.

Obviously, you also must consider the presence of bloom and the damage caused by the sprayer to the bloom and by the insecticide to pollinators. Custom programs often must be devised for individual blocks, depending on emergence pattern of the adult weevils, blueberry variety, presence of bloom and pollinators, and proximity to harvest.

Neem, Platinum, or parasitic nematodes can be applied to the soil for control of the larvae in established plantings. Applications made in fall when larvae are young yield best results. Degree of control, however, depends on soil moisture and available irrigation or rainfall. Refer to label for use pattern and precautions.

4. **SPOTTED WING DROSOPHILA:** The spotted wing drosophila (SWD) is a new and exotic pest that attacks a wide variety of fruits and was first discovered in Oregon in 2009. Adult SWD flies resemble the common vinegar flies found in the kitchen, around compost piles, or on fallen, decaying, and rotting fruit in the fields. Unlike common vinegar flies, SWD flies prefer ripe to overripe fruit on the plant.

A female SWD lays one to three eggs in each fruit; a single female can lay several hundred eggs in her lifetime (each adult lives for an average of 3 to 4 weeks). The larvae feed inside the fruit for about 5 to 7 days until they are ready to pupate. The brownish-yellow pupa is a nonfeeding stage lasting 4 to 5 days. Pupae often remain inside fruit with their respiratory horns sticking out of the fruit for breathing purposes until adult fly emergence. The adult fly then emerges, mates,

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and begins a new generation of pests. It has been estimated that three to nine generations might occur in Oregon, depending on environmental conditions.

To recognize SWD damage on suspect fruit, look for the following: two hairlike filaments attached to each egg sticking out of fruit (the egg is within the fruit); scarring or spotting on the fruit surface; liquid exuding out of a scar (where eggs were laid) when fruit is squeezed; softening, collapsing, and/or bruising of fruit at the damage site; and small, white larvae and pupae inside the fruit (visible to the naked eye if fruit is opened). Adult flies can be monitored with apple cider vinegar traps, and fruit can be checked for larval infestation with a salt extraction method or a fruit dunk flotation method. For further information on identification and monitoring, visit OSU's spotted wing drosophila website at <http://spottedwing.com>

MANAGEMENT STRATEGIES: In addition to the chemical controls mentioned in this publication, the following cultural management strategies and biological control can help mitigate SWD infestations:

- Harvest in a timely manner. Pick fruit at regular intervals to prevent egg-laying opportunities. Avoid overripe fruit on plants.
- To prevent SWD populations from building, remove and dispose of leftover, fallen, and infested fruit.

- Reduce the amount of alternate hosts in surrounding areas. Potential perimeter and wildland hosts for SWD may include snowberry, dogwood, Himalayan blackberry, wild rose, flowering cherry, crabapple, and others.
- Biological control: Anecdotal observations suggest that predaceous bugs (e.g., minute pirate bugs, big-eyed bugs), parasitic wasps, and lacewing larvae may be important biological control agents. Use pesticides judiciously to protect natural enemies.

5. Bordeaux 8-8-100 means 8 lb copper sulfate plus 8 lb hydrated lime in 100 gallons of water. In any bordeaux formula, the ingredients always are listed in the same order—copper sulfate, hydrated lime, then gallons of water.

Bacteria resistant to various copper formulations have been detected throughout the Willamette Valley and in British Columbia. Resistant bacterial populations will reduce the effectiveness of copper-based products.

6. Although registered, Bravo and Aliette have not been shown to be consistently effective against ripe rot. Ziram was effective in 1998 field trials.

7. Do not use Abound or QuadrisTop or Willowood Azoxy near apple orchards, as even a minor amount of drift can be phytotoxic to certain apple cultivars. Even the minor amount left after triple rinsing can be damaging.

Effectiveness of Fungicides for Control of Blueberry Diseases*

| Fungicide | Fungicide group # | Mummy berry (primary) | Mummy berry (secondary) | Botrytis blight | Anthracnose fruit rot | Alternaria fruit rot | Pseudomonas bacterial canker | Phytophthora root rot |
|-----------------------------|-------------------|-----------------------|-------------------------|---------------------|-----------------------|----------------------|------------------------------|-----------------------|
| Abound | 11 | Poor–Moderate | Moderate | Moderate | Excellent | ?? | Not effective | Not effective |
| Actinovate AG | Biological | Moderate | Poor | ?? | ?? | ?? | ?? | ?? |
| Aliette | 33 | Not effective | Not effective | Not effective | Poor | ?? | Not effective | Good |
| Bravo | M5 | Moderate | Poor | Moderate | Moderate–Poor | Not effective | Not effective | Not effective |
| Captan | M4 | Poor | Moderate | Moderate | Moderate | Moderate | Not effective | Not effective |
| Copper-based products | M1 | Poor | Not effective | Moderate–Poor | ?? | ?? | Good** | Not effective |
| Elevate | 17 | Moderate | Moderate | Good** | Poor | ?? | Not effective | Not effective |
| Fosphite (OxiPhos, Rampart) | 33 | Not effective | Not effective | Not effective | Poor | ?? | Not effective | Good |
| Indar | 3 | Good | Good | ? | Poor | ?? | Not effective | Not effective |
| Luna Privilege | 7 | ?? | ?? | Good to Excellent** | ?? | ?? | Not effective | Not effective |

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—Effectiveness of Fungicides for Control of Blueberry Diseases*

| Fungicide | Fungicide group # | Mummy berry (primary) | Mummy berry (secondary) | Botrytis blight | Anthracnose fruit rot | Alternaria fruit rot | Pseudomonas bacterial canker | Phytophthora root rot |
|-----------------------------|-------------------|-----------------------|-------------------------|------------------|-----------------------|----------------------|------------------------------|-----------------------|
| Meteor | 2 | Moderate–Poor | Moderate–Poor | Good** | ?? | ?? | Not effective | Not effective |
| Omega | 29 | Good | Moderate–Good | Poor–Moderate | Good | ?? | Not effective | Not effective |
| Ph-D/Oso | 19 | Poor | Poor | Moderate–Good | Poor | Moderate–Good | Not effective | Not effective |
| Phostrol | 33 | Not effective | Not effective | Not effective | Poor | ?? | Not effective | Good |
| Proline | 3 | Excellent | Excellent | Poor | ?? | ?? | Not effective | Not effective |
| Quash | 3 | Excellent | Excellent | Moderate** | Good | ?? | Not effective | Not effective |
| Regalia | Plant extract P5 | Moderate | Poor | ?? | ?? | ?? | ?? | ?? |
| Ridomil/ MetaStar | 4 | Not effective | Not effective | Not effective | Not effective | Not effective | Not effective | Excellent** |
| Serenade | Biological | Poor–None | Poor–None | ?? | Not effective | ?? | Not effective | Not effective |
| Tilt/ PropiMax/ Bumper | 3 | Good | Moderate | Poor | Poor | ?? | Not effective | Not effective |
| Ziram | M3 | Poor | Poor | Moderate–Poor | Moderate | Moderate | Not effective | Not effective |
| Combination products | | | | | | | | |
| CaptEvate | M4 + 17 | Moderate | Poor | Good–Excellent | Moderate | Moderate | Not effective | Not effective |
| InspireSuper | 3 + 9 | Moderate–Good | Good | Moderate | ?? | Moderate | Not effective | Not effective |
| Luna Tranquility | 7 + 9 | Good | Good | Excellent | ?? | ?? | Not effective | Not effective |
| Pristine | 7 + 11 | Good | Good | Good** | Excellent | ?? | Not effective | Not effective |
| QuadrisTop | 3 + 11 | Moderate–Good | Good | ?? | Excellent | ?? | Not effective | Not effective |
| Quilt Xcel | 3 + 11 | Moderate–Good | Good | Moderate | Excellent | ?? | Not effective | Not effective |
| Switch | 12 + 9 | Good | Poor | Good–Excellent** | Good | ?? | Not effective | Not effective |

*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.

Blueberry Cultivar Susceptibility to Disease

| Cultivar | Mummy berry (primary) | Mummy berry (secondary) | Blueberry scorch | Bacterial canker | Ripe rot |
|----------|-----------------------|-------------------------|------------------|------------------|----------|
| Aurora | R | ? | ? | ? | ? |
| Berkeley | MR | S | S | ? | I |
| Bluecrop | S | MR | T* | MR | S |
| Bluejay | R | R | S | S | I |
| Blueray | S | S | S | S | S |
| Bluetta | R | MR | T | I | S |
| Chandler | I | S | ? | S | ? |
| Collins | S | I | S | ? | R |

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—Blueberry Cultivar Susceptibility to Disease

| Cultivar | Mummy berry (primary) | Mummy berry (secondary) | Blueberry scorch | Bacterial canker | Ripe rot |
|-----------------|----------------------------------|------------------------------------|-------------------------|-------------------------|-----------------|
| Concord | MR | I | T* | ? | I |
| Coville | S | MR | ? | S | S |
| Darrow | R | I | S | S | I |
| Dixi | R | I | S | ? | I |
| Draper | I | ? | ? | S | ? |
| Duke | I | MR | T* | I | I |
| Earliblue | S | S | S | ? | S |
| Elliott | D | I | ? | MR | R |
| Herbert | D | S | S | ? | S |
| Ivanhoe | ? | I | T | ? | I |
| Jersey | MR | I | T | S | I |
| Lateblue | MR | I | S | ? | I |
| Legacy | I | I | ? | ? | R |
| Liberty | R | ? | ? | MR | ? |
| Northland | S | S | * | ? | I |
| Olympia | R | MR | MR | ? | I |
| Ochlockonee | S | ? | ? | S | ? |
| Patriot | ? | MR | S | S | I |
| Pemberton | MR | I | S | ? | I |
| Powderblue | S | ? | ? | S | ? |
| Ranococas | S | I | T | R | I |
| Reka | I | MR | T | ? | I |
| Rubel | R | I | S | MR | I |
| Spartan | D | I | S | I | S |
| Toro | MR | I | ? | ? | I |
| Weymouth | S | MR | S | R | R |

MR = Moderately resistant; R = Resistant; I = Intermediate; S = Susceptible; T = Tolerant; ? = Unknown;
D = Described as resistant but unknown reaction in the Pacific Northwest relative to other cultivars.

*Susceptible to a strain of the virus found in British Columbia.

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.

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; strongly consider any 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.

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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