

NOTES ON INSECTICIDES and MITICIDES

Acramite (bifenazate): 50% WS. 12-16 ozs. per acre. For European red mites and two spotted spider mites. Effective against eggs and motile forms. Provides quick knockdown. For optimum coverage, add an organosilicone spray adjuvant, like Silwet L-77, Silgard 309 or Kinetic. Apply in minimum of 50 gals. water per acre. Maximum of 1 application per year. Relatively safe on most beneficials. **Restricted entry interval 12 hours. Preharvest interval 7 days.**

Actara (thiamethoxam): 25% WG For (prebloom) aphids, leafminers, mullein bug: 4.5 oz./A. For leafhoppers postbloom: 2.0-2.75 ozs./A. **Note: Apples will be removed from the label for the 2003 season. However, growers who previously purchased this product can use according to original product label until supply exhausted.** For European apple sawfly, plum curculio, leafminers and aphids postbloom: 4.5-5.5 ozs./A. Make no more than 1 prebloom application. Do not exceed 8 ozs./A. for the season. Allow minimum of 10 days between applications. Has rapid local systemic activity. Relatively safe on beneficial arthropods. Toxic to bees exposed to direct treatment or to residues on blooming weeds. Use minimum of 50 gals. water per acre. Closely related to imidacloprid (Provado). **Restricted entry interval 12 hours. Preharvest interval 35 days if rate is over 2.75 ozs./ A. and 14 days if rate 2.75 ozs./A. or less.**

Agri-Mek (abamectin): 0.15EC. 2.5 fl. ozs./100 gals. Higher rate on label (up to 5 ozs./100) is for special cases such as application beyond prime foliar absorption or when control of the target pest has been less than satisfactory at the 2.5 oz. rate, such as may be the case with twospotted spider mite. Effective against leafminers (eggs and sap-feeding larvae), European red mites, and twospotted spider mites. Apply in combination with horticultural summer spray oil or with a suitable adjuvant. Oil rate should be minimum of 1 quart oil / 100 gals. dilute. Penetrants such as LI 700 or Regulaid, or organosilicone surfactants such as Silwet L-77, Sylgard 309 or Kinetic may be substituted, but efficacy may not be quite as good as with oil. Consider potential effect on thinning before tankmixing thinner and AgriMek adjuvant.

Effective AgriMek application requires no more than 6X concentration. Optimum timing for control of first generation spotted tentiform and apple blotch leafminers and European red mites is in the first two weeks after petal fall. Applications made after two weeks past petal fall will likely result in less leaf absorption and less residual efficacy. Leaf surface toxicity typically lost within six hours of application. Toxic action on pest species is due to

translaminar movement of abamectin into leaf tissue. Hence, AgriMek has long residual activity even under high rainfall. Highly toxic to bees. Do not apply while bloom remains on trees. Do not exceed 2 applications per season. See Mite Management section for additional information. **Restricted entry interval 12 hours. Preharvest interval 28 days.**

Ambush (permethrin): Effective against green fruit worms, leafminer adults (and eggs if coverage is thorough), rosy apple aphid, tarnished plant bug. 2 lbs./gal. EC (1.6–6.4 fl. ozs./100 gals.); 25% WP (1.6–6.4 ozs./100 gals.). **Not labeled for use after petal fall. Restricted entry interval 12 hours.**

Pyrethroid use is discouraged if alternatives are available. Pyrethroids are highly toxic to important predator species. In addition, predatory mites are repelled for many weeks by the persistent residue. Using pyrethroid after pink is especially discouraged because the negative effects are more likely and/or pronounced with later use. Certain pest species may develop resistance if pyrethroids are used too frequently. Limiting use to situations difficult to manage with other insecticides, and to no more than once per season, will help prevent resistance. Effectiveness may be decreased by temperatures over 80°F. Pyrethroids are extremely toxic to fish. Do not contaminate bodies of water with runoff, drift or rinse water.

Apollo (clofentezine): 42% SC. 1–2 fl. ozs./100 gals.; but, no less than 4 ounces per acre. Effective against eggs and immature European red mites. Not effective against adult mites. Efficacy enhanced by combination with oil. Low impact on insect and mite predators. Mite strains with cross resistance to Apollo and Savey have developed. To help prevent resistance, growers should alternate with other strategies so that a member of the Apollo/Savey pair is used no more frequently than once every other year in the same block. See Mite Management section for additional information. **Restricted entry interval 12 hours. Preharvest interval 45 days.**

Asana (esfenvalerate): Effective against same pests as Ambush, plus apple maggot, codling moth, leafhoppers and plum curculio; 0.66 lb./gal. EC (2–5.8 fl. ozs./100 gals.). Labeled for full season use, but not recommended after pink. See Ambush for more general information on pyrethroids. **Restricted entry interval 12 hours. Preharvest interval 21 days.**

Assail (acetamiprid): 70% WP. Use 1.1-1.7 ozs. per acre. against aphids, leafminers and leafhoppers; 1.7-3.4 ozs. per acre against codling moth. Belongs to neonicotinoid class of insecticides (as do imidacloprid and thiamethoxam) and offers systemic, translaminar activity. Toxic to bees exposed to direct treatment or foraging on flowering understory plants. Comparatively safe on beneficials. Thorough coverage essential for optimal control. No more than 4 applications per season. Must allow 12 days between applications. **Restricted entry interval 12 hours. Preharvest interval 7 days.**

Avaunt (indoxacarb): 30% DG. 5-6 ozs. per acre. For tarnished plant bug, plum curculio, European apple sawfly, codling moth, oriental fruit moth, lesser appleworm, leafrollers, apple maggot, and leafhoppers. Maximum of 4 applications per year at no more than 24 ozs. total annual per acre. No more than 3 applications prior to hand thinning. No hand thinning after 4th application. For best results, apply in 50-150 gals. water per acre and never more than 200 gals. water per acre. Performs well against plum curculio, some leafrollers, and leafhoppers. Performance against apple maggot has been variable. Represents a new class of compounds (oxadiazines). More toxic when ingested than by contact alone. Toxic effects not immediate but gradual, sometimes requiring 3 or more days. Not systemic and does not protect new growth. Does not redistribute readily on foliar surfaces once sprayed. Residual activity lasts 7-14 days depending on conditions. Safe on most beneficials. **Avaunt cannot be used after a 'Pick-Your-Own' site is opened for public entry. Restricted entry interval 12 hours. Preharvest interval 28 days.**

Aza-Direct (azadirachtin): 1.2% EC. For beetles and weevils: 12.5-42 ozs. per acre. For true bugs (like tarnished plant bugs), leafhoppers, aphids, leafrollers, flies (like apple maggot), mites: 11.5-42 ozs./A. It is an extract from neem oil and acceptable for organic growers. Repellent and antifeedant action on moths and caterpillars, toxic and growth suppressant on moths, caterpillars, aphids, leafhoppers. Maximum effectiveness requires 2-3 applications at intervals of 7-10 days. Safe on beneficials and bees. Toxic to fish. Generally lower efficacy than required by most growers. **Restricted entry interval 4 hours. Preharvest interval 0 days.**

Azinphos-M (azinphosmethyl): See Guthion.

Botanicals (azadirachtin, pyrethrins, rotenone): Insecticides extracted from plant materials. Many formulations are available containing one or more of the botanicals. Synergists may be added to increase

effectiveness. Limited amount of efficacy data are available for apple pests, but some studies indicate the following may be effective against the pests listed: azadirachtin for leafhoppers and leafminers; Pyrethrin (pyrethrins plus synergist) for white apple leafhopper; and rotenone for Japanese beetle. Botanical insecticides may require more precise timing, lower thresholds, and more frequent application than more persistent synthetic insecticides, and are usually more expensive. Product availability varies by state registration. **Restricted entry interval 4 or 12 hours. Preharvest interval typically 0 days, but some products may have longer PHI.**

B.t. (*Bacillus thuringiensis* endotoxin). Agree, Biobit, Condor, Crymax, Dipel, Javelin, Xentari: Refer to labels for rates. Effective against the larval stage of green fruitworms, obliquebanded and redbanded leafrollers, and other caterpillars. May not be as effective against codling moth larvae as alternative insecticides. Must be ingested by larvae to provide control. Nontoxic to humans and beneficial insects. **Restricted entry interval 4 hours. Preharvest interval 0 days.**

Carbaryl: See Sevin.

Carzol (formetanate hydrochloride): 92% SP, 2-4 ozs./100 gals. for white apple leafhopper. Also kills spotted tentiform leafminer adults and mullein plant bugs. Maximum of one application per year at no more than 20 ozs. per acre. Carzol is fast acting on mites at 4-5 ozs./100 gals., but it can only be used until petal fall. Carzol has a relatively short residual and is sensitive to high pH, losing half of its effectiveness in 14 hours at pH 7.0, in 3 hours at pH 9.0. It is toxic to predatory mites. Pest mites in some orchards have developed resistance to Carzol. See Mite Management section for additional information. **Restricted entry interval is 10 days for low contact activities (weeding, irrigation, tree propping), 16 days for high contact activities (pruning, harvesting). Prebloom use only.**

Confirm (tebufenozide): 2 lbs./gal. F. Registered for codling moth, leafrollers, eyespotted budmoth, lesser appleworm, and green fruitworm at 5 fl. ozs./100 gals. Confirm is an insect growth regulator, so it does not affect adult insects and is not as fast acting as organophosphate insecticides. It is safe to beneficial insects and mites. **Restricted entry interval 4 hours. Preharvest interval 14 days.**

Danitol (fenpropathrin): 2.4 lbs./gal. EC. Pyrethroid for rosy apple aphid, tarnished plant bug, white apple and potato leafhoppers, and spotted tentiform leafminers at 2.7 – 5.3 fl. ozs./100 gals.; and European apple sawfly, plum curculio, apple maggot, codling moth, European red mite, twospotted spider mite, Green fruitworms, redbanded and obliquebanded leafrollers and other pests at 4 – 5.3 fl. ozs./100 gals. Do not apply within 25 feet of ponds, permanent streams and other bodies of water. **Restricted entry interval 24 hours. Preharvest interval 14 days.**

Diazinon: Effective against apple maggot, codling moth, mullein plant bug, San Jose scale. 50% WP and WSB (1 lb./100 gals.), 56% WBC (12.75 fl. ozs./100 gals.). Highly toxic to an important aphid predator. May have shorter residual activity than Guthion or Imidan. Has caused russetting on Golden Delicious, R.I. Greening and Baldwin. Do not combine with copper. May cause poor finish or russetting if used under poor drying conditions or before second cover on sensitive cultivars. **Restricted entry interval 24 hours. Do not apply 56% WBC (D-z-n AG600) after Petal Fall. Preharvest interval 21 days for WP and WSB formulations.**

Note: A new label is pending at time of publication. This information is from the existing label. Product in original package may be used according to original label directions.

Dicofol: See Kelthane.

Digon, Dimate (dimethoate): 4 lbs./gal. EC. Use 12 fl. ozs./100 gals. against aphids, 1 pt./100 gals. against apple maggot, leafhoppers. We suggest it be applied no later than half-inch green for TPB control, to avoid possible reduced pollination. Highly toxic to predatory mites and an important aphid predator. Special applicator requirements apply in New Hampshire for pests not listed on the label (i.e. TPB). **Restricted entry interval 48 hours. Preharvest interval 28 days.**

Distance (pyriproxyfen): 0.86 lbs./gal. L. 6-8 fl. ozs./100 gals. For aphid suppression on **non-bearing trees**; 8-12 fl.ozs./100 gals. for San Jose scale and spotted tentiform leafminer on **non-bearing trees**. Active ingredient (same as Esteem) is an insect growth regulator. **Restricted entry interval 12 hours. Preharvest interval: non-bearing trees only.**

Entrust (spinosad) - 80% WP. Effective against tentiform leafminers at 0.375-0.75 ozs./100 gals. Dose range for codling moth, obliquebanded leafroller, tufted apple budmoth, and oriental fruit moth is 0.5-0.75 ozs./100 gals. Low impact on beneficial species. Similar to SpinTor, but formulated for organic growers. Do not exceed 9 ozs. per acre per season. **Restricted entry interval 4 hours. Preharvest interval 7 days.**

Esteem (pyriproxyfen): 0.86 lbs./gal. EC; 35% WP. Registered for codling moth, obliquebanded leafroller and San Jose scale at 3.25 - 4 fl. ozs./100 gals. for EC; 1-1.25 ozs./100 gals. for WP. Registered for spotted tentiform leafminer, rosy apple aphid, spirea aphid and green apple aphid at 2.5 - 4 fl. ozs./100 gals. for EC; 0.75 - 1.25 ozs./100 gals. for WP. Esteem is an insect growth regulator, so it does not affect adult insects and is not as fast acting as organophosphate insecticides. Do not exceed 2 applications per season. **Restricted entry interval 12 hours. Preharvest interval 45 days.**

Guthion, Azinphos-M, (azinphosmethyl): Effective against apple maggot, codling moth, plum curculio, redbanded leafroller and European apple sawfly. Not effective against aphids, leafminers or leafhoppers. 50% WP and WSB (8–10 ozs./100 gals.). Maximum of 4.5 lbs active ingredient per acre per year. Highly toxic to an important aphid predator, but low toxicity to predatory mites. **Restricted entry interval 14 days or 48 hours. 14 days for hand thinning, hand harvesting, 48 hours for propping, mowing, irrigation, scouting and other activities. Preharvest interval 14 or 21 days. 14 days if the last application does not exceed 16 ozs. active ingredient per acre. Otherwise, 21 days.**

Note: A new label is pending at time of publication. This information is from existing label. Product in original package may be used according to original label directions.

Imidan (phosmet): Effective against apple maggot, codling moth, plum curculio, redbanded leafroller; not effective against leafminers or leafhoppers; 70% WP or WSB (3/4 – 1 lb./100 gals.). Use higher rate against plum curculio. Low toxicity to predatory mites. Imidan is sensitive to high pH, can lose half of its effectiveness in less than 12 hours at pH 7.0, in less than 4 hours at pH 8.3. **Restricted entry interval 24 hours. Preharvest interval 7 days.**

Note: A new label is pending at time of publication. This information is from existing label. Product in original package may be used according to original label directions.

Insecticidal Soap (Safer's, M-Pede): For control of aphids, leafhoppers, mites, use 49% solution at 2 gals./100 gals. Provides contact kill only, no residual effect. Good spray coverage is essential for effectiveness. May cause fruit russeting under poor drying conditions. May not provide adequate summer mite control. May be toxic to the mite predator *Stethorus punctum*. Conditioner or defoamer may be necessary (see label). **Restricted entry interval 12 hours. No preharvest interval required.**

Intrepid (methoxyfenozide): 2 lbs./gal. F. Effective against codling moth, oriental fruit moth, lesser appleworm, leafrollers and leafminers. See label for rates specific to each pest. Do not apply more than 64 fl. ozs. of material per acre per year. Performs best in conjunction with an adjuvant to maximize deposition, redistribution, and weatherability. Belongs to diacylhydrazine class of insecticides. Has novel mode of action that mimics action of molting hormones of moth larvae. Must be ingested by larvae to be effective. Works best against internal feeders when application is just prior to egg hatch. To avoid resistance, do not use against more than 3 consecutive generations of a pest. Very safe on beneficials. **Restricted entry interval 4 hours. Preharvest interval 14 days.**

Kelthane (dicofol): Mites only; 50% WS (2 lbs./100 gals.). Contact material, works best if mites are hit directly by the spray. Effect should be evident within one or two days. Manufacturer recommends combining with spreader-sticker. Good residual of 7–10 days, possibly longer without rain. More likely to be effective if temperature is over 65°F. Adjust water pH to 7.0 or lower to prevent rapid decomposition of Kelthane. Fruit injury reported on McIntosh and Cortland under slow drying conditions. Combination of Kelthane and summer oil may improve efficiency, but has also caused fruit spotting and enlarged lenticels when applied during poor drying conditions. Kelthane-resistant mite populations have developed in some orchards. Do not make more than two applications per season. See Mite Management section for additional information. **Restricted entry interval 48 hours. Preharvest interval 7 days.**

Lannate (methomyl): Effective against apple maggot, codling moth, green fruitworms, leafhoppers, sap-feeding stage of leafminers, leafrollers. 2.4 lbs./gal. L (6–12 fl. ozs./100 gals.); 90% SP (2–4 ozs./100 gals.). The lower rate should be adequate for apple aphid, rosy apple aphid, green fruitworm and

tarnished plant bug. Higher end of the rate range is for white apple leafhopper, leafminers and leafrollers. Methomyl has relatively short residual activity (5–7 days) which makes it less effective than Guthion, Imidan and some other insecticides against fruit feeders, such as plum curculio, codling moth and apple maggot. If tankmix pH is above 7, use as soon as possible to prevent loss of insecticidal activity. Highly toxic to predatory mites and an important aphid predator. Hazardous to aquatic organisms, do not contaminate bodies of water with runoff, drift, or rinse water. Do not apply to Early McIntosh or Wealthy. **Lannate cannot be used after a 'Pick-Your-Own' site is opened for public entry. Restricted entry interval 72 hours. Preharvest interval 14 days.**

Lorsban (chlorpyrifos): 4 lbs./gal. EC (8-16 fl. ozs. with or without 1-2 gals. oil/100 gals.); 50% WSB (1 lb./100 gals.). Used as a dormant or delayed dormant spray against climbing cutworms, rosy apple aphid, San Jose scale. When in possession of the supplemental borer label, growers can apply Lorsban 4E (1 1/2 qrts./100 gals.) or 50 WSB (1.5 lbs./100 gals) to the lower 4 feet of trunk for borers. A maximum of 2 borer applications can be made, and research in New York has demonstrated that the treatment (for dogwood/apple bark borers) can be effective applied as early as pre-bloom. **This method (trunk spray) has a preharvest interval of 28 days. 4EC and 50% WSB not labeled for foliar postbloom use. Restricted entry interval 4 days.**

Neemix (azadirachtin): 4.5% and 0.25% EC. Insect growth regulator derived from seeds of the neem tree, *Azadirachta indica*. Limited trials have demonstrated efficacy against leafhoppers, leafminers and possibly apple maggot. As an insect growth regulator, Neemix does not affect adult insects and is not as fast acting as organophosphate insecticides. Product availability varies by state registration. **Restricted entry interval 4 or 12 hours. Preharvest interval 0.**

Oil (petroleum distillate), Damoil, Volck Supreme, others: Physical pesticide that is effective as a smothering film on European red mite eggs and young nymphs, and several other pests. Because of changes in petroleum refiner practices, a viscosity range of 60–70 seconds is not a reliable indicator of the suitability of an oil for orchard spraying. In order to insure pest control effectiveness without phytotoxicity, oil with a 50% distillation temperature of 412 +/- 8°F is preferred.

When tankmixing spray oil fill the tank 1/4 full with water, add the wettable powder or liquid pesticides, resume adding water while adding the oil. Do not let oil mixtures stand without agitation and keep them vigorously agitated while spraying.

Prebloom oil application is highly recommended. Mite tolerance to oil is unlikely because it acts in a physical manner by suffocating eggs and nymphs.

An application of 2–3 gallons oil per 100 gallons dilute is most effective between half-inch green and tight cluster. It is important that oil be applied during weather that is favorable for good spray coverage. Complete wetting of mite eggs requires thorough spray coverage, and is essential for good control with oil. Applications at 1X – 3X (full dilute to 1/3 dilute spray volume) are more likely to be effective than lower volume sprays at 4X or greater. Even if spray concentration is greater than 3X, do not multiply the amount of oil per 100 gallons of spray water by more than 3 times the recommended dilute rate.

A repeat prebloom oil application will add to the efficacy of European red mite suppression. However, weather for application and other operational constraints may make it impractical to make two oil applications between green tip and late tight cluster/early pink. If two oil sprays are planned, use oil at a rate that is fully effective each time it is applied.

Prebloom oil application can injure trees, causing swollen and cracked lenticels and/or bark blistering. Oil injury is caused by double deposit (allowing one side to dry before the other side is sprayed), by concentrate spray or by application when low temperatures (below 38°F and particularly below freezing) occur within 24 hours before or after application, especially on Delicious. Both the mites and the apple trees are more susceptible to oil damage after tight cluster. Reduce the oil rate to 1 gallon/100 gallons dilute if prebloom oil is applied after tight cluster.

Postbloom oil. Specially formulated “summer oil” products labeled for postbloom use are available (Stylet Oil, Ultra-Fine). In blocks where the mite population has been suppressed with prebloom control, application of summer oil at petal fall and in 2 subsequent high volume-low concentrate cover sprays at 2 to 3 week intervals can effectively continue mite suppression, and perhaps give season-long control. Summer oil will not control an established mite infestation as effectively as a

chemical miticide. Summer oil can work to prevent a mite problem, but is not a mite eradicator.

There is a high potential for phytotoxicity and fruit finish damage with summer oil use. Cultivar, adequate moisture, and spray drying conditions should be considered before using summer oil to minimize detrimental effects on fruit finish. Moisture stress and/or temperatures over 80°F increase risk of foliar damage. Concentrate mixing such that the spray tank contains more than 1 gallon of summer oil in each 100 gallons of water increases the likelihood of foliar or crop damage and is not recommended. Yellowing leaves are the first sign of oil phytotoxicity, and is an indication that the rate should be reduced if there is to be any subsequent application.

Combining a low rate of summer oil (maximum of 1 quart per 100 gals. of finished tankmix) with Kelthane or Vendex can improve mite suppression.

A major concern with postbloom oil is incompatibility with captan and sulfur; and questionable or formulation-limited compatibility with Guthion and Sevin. Check with product manufacturers and Extension for information on possible interaction between oil and thinning agents, foliar nutrients, and growth regulators. Spray timing should be adjusted so that captan and oil are not used within 10 days of each other. Experiment with summer oil on a small area before wider use.

Important: See Tables 18 and 19 on phytotoxicity hazards and pesticide compatibility before tankmixing and applying oil.

Oil Miscibility. Spray oil should be tested before use to make sure it will stay mixed with water. Add 10 ml (2 teaspoons) of the spray oil to a glass jar containing water. Cap the jar and shake it 15 times to mix it well. Let the jar stand for 5 minutes. If the oil is good, it will produce a milky white suspension with a thin layer of bubbles at the top. In 5 minutes there will be no significant change. Bad oil, however, will quickly separate when agitation stops. Even though the water may be cloudy, it will gradually become clearer. Below the layer of bubbles at the top will be a distinct whitish layer of oil. Before using such oil, call your supplier for additional emulsifier. In lieu of special emulsifier, Ivory dishwashing liquid (1 to 2 fl. ozs. Ivory per gallon of oil) has been used satisfactorily in limited trials. See Mite Management section for additional information.

Restricted entry interval for prebloom and postbloom oil products varies, 4 or 12 hours. Preharvest interval also varies by product.

Phaser (endosulfan): See Thiodan.

Pounce (permethrin): Effective against same pests as Ambush. 3.2 lbs./gal. EC (1-4 fl. ozs./100 gals.); 25% WP (1.6-6.4 ozs./100 gals.). Not labeled for use after petal fall. **Restricted entry interval 12 hours.** See Ambush for more general information on pyrethroids.

Provado (imidacloprid): 1.6 lbs./gal. F. Effective against leafminers (eggs and sap-feeding larvae), leafhoppers (nymphs), and aphids (except wooly apple aphid). Use 2 fl. ozs./100 gals. for leafminers and aphids; use 1-2 fl. ozs./100 gals. for leafhoppers. A northeast study showed good control of white apple, rose and potato leafhoppers even at 1/4 rates. Is locally systemic; good coverage is essential. Safe to predator mites. Postbloom application only. For leafminer control, apply during sap-feeding stage, no later than 10% of mines developing into tissue-feeding stage. Treat once for first generation, 1 or 2 times for second generation. Provado is highly toxic to bees. Do not apply allow Provado to drift onto blooming crops or weeds if bees are visiting the treatment area. Allow at least 10 days between applications. **Restricted entry interval 12 hours. Preharvest interval 7 days.**

Pyramite (pyridaben): 60 WS (2.2 ozs./100 gals.) Effective against European red mite. If twospotted spider mite (TSM) is the dominant pest, consider an alternative miticide. For use against TSM, use the high end label rate (3.3 ozs./100 gals.). Immature motile stages are most susceptible. Thorough coverage is required for optimum control. Allow 30 days between applications. Do not exceed two applications per year. Should not be applied when bees are actively foraging. See Mite Management section for additional information. **Restricted entry interval 12 hours. Preharvest interval 25 days.**

Pyrenone (pyrethrin): Insecticide derived from *Chrysanthemum cinerariaefolium* flowers. : EC contains 0.5 lbs. pyrethrins plus 5.0 lbs. piperonyl butoxide per gallon. Labeled against many pests, but among major apple pest species, high efficacy demonstrated apparently only against white apple and potato leafhoppers. May cause allergic reaction in people allergic to ragweed pollen. Toxic to fish. **Restricted entry interval 12 hours. Preharvest interval 0 days.** See Botanicals for more information.

Rotenone: Derived from the roots of *Derris* or *Lonchocarpus* plants. Formulation may include pyrethrins and/or the synergist piperonyl butoxide (PBO). At least somewhat effective against apple maggot, codling moth, European apple sawfly, European red mite, plum curculio, tarnished plant bug, and twospotted spider mite. Toxic to ladybird beetles and predatory mites. Highly toxic to fish, used as a fish poison. More toxic to mammals (including humans) than the other botanical insecticides. Product availability varies by state registration. **Restricted entry interval and preharvest interval 12 or 24 hours.** See Botanicals entry for more information.

Savey (hexythiazox): 50% DF AND 50% WP. Label allows 3-6 ozs. per acre. The 3 ozs. rate has been effective in New England. Less than 3 ozs. may give poor performance and contribute to resistance. Mite thresholds are defined in relation to miticides that control adult mites. Savey gives contact and residual control of eggs and immature ERM and TSSM. While it can prevent a low population from increasing for up to 60 days, it does not control adult mites and thus is not suitable as a rescue treatment from a high mite population. **Restricted entry interval 12 hours. Preharvest interval 28 days.**

Sevin (carbaryl): Effective against codling moth, leafhoppers. 4 lbs./gal. F, 4 EC (XLR Plus) (1 pt./100 gals.); 80% S (2/3 lb./100 gals.). Effective residual control of apple maggot at higher rates. **Highly toxic to bees, do not use just before bloom.** Application within 30 days of full bloom can cause thinning. Foliar injury may result when used at petal fall and first cover on McIntosh and Cortland. Questionable compatibility with oil. Useful for apple maggot control when preharvest intervals of other insecticides are a problem. Toxic to important mite and aphid predators. **Restricted entry interval 12 hours. Preharvest interval 3 days.**

SpinTor (spinosad): 2 lbs./gal. SC. Effective against tentiform leafminers at 1 - 2.5 ozs./100 gals. Use in combination with a penetrating surfactant, such as LI 700. Dose range for codling moth, obliquebanded leafroller and tufted apple budmoth is 1.25 - 2.5 ozs./100 gals. No more than 10 days residual activity against codling moth. Low impact on beneficial species. SpinTor is also effective against apple maggot, but residual effect is about half as long as Imidan or Guthion. (NH growers note that apple maggot is not listed as a target pest on the label.) Do

not exceed 3 applications per season or 29 ozs. per acre, per season. **Restricted entry interval 4 hours. Preharvest interval 7 days.**

Supracide (methidathion): 25WP (1–3 lbs./100 gals.); 2 lbs./gal. EC (1-2 pts./100 gals.). San Jose Scale, Rosy Apple Aphid. **Apply only during dormant or delayed dormant period.** For rates less than 1.5 lbs./100 gals., tankmix with oil. **Restricted entry interval is rate-dependent, 48 hours or 14 days (see label).**

Surround (kaolin clay): 95% WP. Moderately to very effective against plum curculio, codling moth, leafrollers, apple maggot, leafhopper and thrips at 25 lbs./100 gals. Scale insects may flare under repeated use. No known disrupting effects on health of foliage or fruit. Clay particles form a white film on treated surfaces and disrupt activities of target insects through particle attachment to feet and body. Apply every 7–14 days during time when target pest is active. Maximum benefit requires thorough and uniform application to dry foliage before pest damage occurs. Generally, two or more coatings required for full effect. Shorter reapplication interval may be required if heavy rain or rapid growth depletes coating. Longer interval (14–21 days) may be adequate later in season as new growth diminishes. Application with some (less dilute) equipment may result in coatings that are easily washed off by rain.

Chance of noticeable clay residue at harvest is reduced if use is discontinued when fruit diameter exceeds about 1 inch. Later season use may require fruit washing with packing line brushing and forced water spray. A food grade packing line washing detergent may be needed. Do not tankmix with sulfur or Bordeaux fungicide. May not be compatible with rotenone, pyrethrin or insecticidal soap due to curdling or uneven film distribution. **Restricted entry interval 4 hours. Preharvest interval 0.**

Thiodan, Thionex, Phaser (endosulfan): Effective against green fruitworms, leafhoppers, rosy apple aphid, woolly apple aphid. 50% WP and WSB (1 lb./100 gals.); 3 lbs./gal. EC (2/3 qrt./100 gals.). Also used against apple aphid, leafminer adults and tarnished plant bug. Low toxicity to predator mites. Toxic to fish, do not use near or contaminate bodies of water with runoff, drift or rinse water. Do not exceed 3 lbs. active ingredient per acre per year. **Restricted entry interval 24 hours. Preharvest interval 21 days.**

Valero (cinnamaldehyde): 30% L. 1 gal./100 gals. For control of aphids and spider mites. Make phytotoxicity check before treating to ensure safety for your varieties. Kills through direct contact mite eggs, nymphs and adults but effect is immediate and short-lived. Little or no residual activity. Thorough coverage essential for control. Cinnamaldehyde is a component of cinnamon, the ground inner bark of certain tropical trees. Spray water should have pH 3.5-7.5 or product degradation may result. **Restricted entry interval 4 hours. Preharvest interval 0 days.**

Vendex (fenbutatin-oxide, hexakis): Miticide. 50% WP (4–8 ozs./100 gals.). Temperatures over 70°F improve performance. May take several days to see full effect on mite population. Efficacy may be improved by combination with a low rate of summer oil. Do not apply more than 2 times per season or more than 4 lbs./acre per year. Agitation is required during mixing and spraying. Nontoxic to honeybees and low toxicity to important mite and aphid predators. Toxic to fish, do not contaminate bodies of water with runoff, drift or rinse water. Vendex is corrosive and may cause skin and respiratory irritation or eye damage. Use protective gear as described on label. See Mite Management section for additional information. **Restricted entry interval 48 hours. Preharvest interval 14 days.**

Vydate (oxamyl): Effective against leafminer adults and sap-feeding larvae, apple aphid, rosy apple aphid, leafhoppers and mites. 2 lbs./gal. L. Use 1/2–1 pint/100 gals. for leafminers and white apple leafhopper and 1–2 pints/100 gals. for aphids. Do not use more than 8 pints per acre per season. May cause fruit thinning if used after early pink or before 30 days after petal fall. Has systemic activity, is translocated throughout leaves and into roots. As a mite suppressant it requires back to back applications for effective control. Highly toxic to predatory mites. Toxic to fish, do not contaminate bodies of water with runoff, drift or rinse water. Susceptible to rapid breakdown in water with pH above 7. **Vydate cannot be used after a ‘Pick-Your-Own’ site is opened for public entry. Restricted entry interval 48 hours. Preharvest interval 14 days.**