Apple Sprays for Gardeners

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This is a summary of plant protection materials (pesticides) useful for managing important diseases and insect pests common to apples in the Midwest. The normal treatment windows for effective management of the most common diseases and insect pests are provided for general reference at the end of this bulletin in Figures 11 and 12. Other diseases and insect pests not covered here may be important in some locations and years. In combination with good cultural practices (e.g., selecting disease resistant varieties, using proper techniques when planting, pruning, irrigating, fertilizing and disposing of diseased plant material), a basic spray program can help reduce damage by diseases and insect pests for maximum production of high-quality apples in Midwest gardens. However, overuse or misuse of chemical sprays can damage the environment and reduce plant health and productivity. When applying plant protection materials, it is critical to follow the instructions on the product label to minimize harm to the applicator and the environment.

DISEASE MANAGEMENT

Apple scab is the most common disease affecting apples in the Midwest, infecting both leaves and fruit (Figure 1). The best apple disease management programs focus on fungicide applications timed to prevent apple scab, thereby supporting production of high-quality fruit. Even apple varieties that have been bred for disease resistance can benefit from a minimal spray program. To be thorough, sprays should begin at green tip, when apple buds show green tissue in the spring. Ideally, fungicides should be reapplied every 7 to 10 days to cover and protect the new leaves and flowers as they emerge. Reapplication may be needed after a heavy rain. A bare minimum spray program for scab would be to apply fungicides at green tip, pink, bloom, petal fall and one week after petal fall.

Remember that captan and other sulfur-containing fungicides are not compatible with oil and should not be applied two weeks before or after an oil application (see Table 1 for more information about compatibility issues).

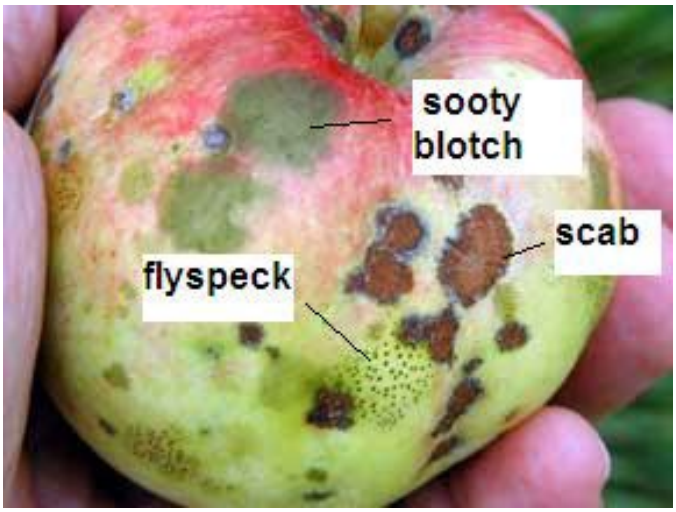

Figure 1. Common apple fruit diseases, photo by Bill Shane

Rust is a problem for apple plantings near eastern red cedar and other junipers, which are alternate hosts for the disease. Rust is generally a leaf disease (Figure 2). Apple trees can have a heavy infestation without affecting yield, so treating for the disease is typically unnecessary. However, there are several materials that work both for scab and rust (Table 1).

Figure 2. Cedar apple rust lesions on apple leaves, photo by Bill Shane

Powdery mildew is a problem on certain apple varieties such as Cortland, Gala, Ginger Gold, Idared, Jonathan, Mutsu (Crispin), Paulared and Rome. Severe infestations can stunt shoot growth (Figure 3) and russet fruit of susceptible varieties. If fruit russeting is acceptable, minor infestations may be of little concern in older plantings. Materials that control powdery mildew may not control other diseases (see Table 1).

The fungal diseases **sooty blotch** and **fly speck** are common cosmetic problems of apple fruit skin that also can reduce storage life of fruit. It is more common in older trees with thick foliage (Figure 1) and in shaded areas next to woods. Using captan or mancozeb in cover sprays in the summer months, especially during wet seasons, can help keep these diseases at bay.

Figure 3. Powdery mildew can stunt shoot growth and russet fruit, photo by Bill Shane

Summer fruit rot diseases such as bitter rot (Figure 4), black rot and white rot tend to be an issue on older trees with trunk and limb cankers. Pruning out dead wood and removing rotten or mummified fruit helps to remove sources of infection. Summer treatment with captan, mancozeb or sulfur helps keep these diseases in check.

Figure 4. Bitter rot of apple, one of several rot diseases affecting fruit, photo by Bill Shane

Table 1. Partial list of materials for backyard disease control for apples (check label)			
Trade name*	**Common name**	**Diseases managed**	**Comments**
Sulforix	Lime-sulfur	Scab, powdery mildew, summer diseases	Lighter version of lime sulfur with surfactant. Not compatible with oil, can cause russeting of leaves and fruit under hot conditions.
Kocide, COCS	Copper	Scab	Short spray cover duration, can cause green tissue burning under some conditions. Generally used silver tip to green tip. Several copper products are labeled for use on apple.
Captan	Captan	Scab, sooty blotch and fly speck, rust, summer rots	Generally not prone to resistance problems. Not compatible with oil. Can cause russet on tender plant tissue.
Dithane, Mancozeb	Mancozeb	Scab, rust, sooty blotch and fly speck, summer rots	Generally not prone to resistance problems, long days to harvest restriction.
Sulfur	Sulfur	Scab, powdery mildew, summer diseases	Short duration, not compatible with oil, can be tough on beneficial insects.
Immunox	Myclobutanil	Scab, powdery mildew	May be prone to pathogen resistance problems if used repeatedly over several seasons.

*Other products with the same ingredients may be available.

INSECT MANAGEMENT

Sprays to protect against damage from insect pests of apples include some older materials containing organophosphates (e.g., malathion or Imidan) and newer materials containing pyrethroids, neonicotinoids or kaolin clay (Table 2). Many of these materials are broad-spectrum and will be effective against multiple insect pests. However, in addition to paying attention to safety instructions, **when choosing any insecticide, it is important to read the product label to be sure both apples and the target pest(s) are listed on the label.** A general spray program starting when fruit is 0.5 inch in diameter, with reapplication every 10 to 14 days, should prevent most primary insect damage. Some materials may need to be reapplied more frequently depending on weather conditions and how long the material is expected to be active after application (see comments in Table 2). For trees with a history of European red mite or scale insect damage, a dormant oil spray may be warranted (see Table 2 for more details).

Two insect pests that are common early in the season and can cause fruit damage are **plum curculio** and **tarnished plant bug**. **Plum curculio** are small weevils that overwinter as adults in the soil and plant litter in orchards and surrounding areas. When evening temperatures exceed 60 degrees Fahrenheit, plum curculio move into orchards and begin feeding on leaves as they emerge. Their feeding activity expands to include blossoms, stems and fruit as they become available (Figure 5). In a backyard orchard, insecticide treatment to prevent fruit damage by this pest should generally start when fruit reach about 0.5 inch in diameter. **Tarnished plant bug** has a piercing mouthpart that causes uniform indentations tapering to a pinhole size. Tarnished plant bugs are active in the first month after bloom. The insects also feed on flowering broadleaf weeds common in lawns and orchard row middles, from which they move upward into apple trees and feed on fruit, where they cause damage (Figure 6). Insecticide treatment windows for plum curculio and tarnished plant bug largely overlap.

Table 2. Insecticide options for backyard apple production.			
Trade name*	**Common name**	**Insects managed**	**Comments**
Superior oil, dormant oil	Spray oil	San Jose scale, European red mite	High grade petroleum oil. Avoid use when temperatures are below 40 F. Dormant oils are heavier than summer oils.
Neem oil	Azadirachtin	Leafrollers, fruit worms, codling moth, oriental fruit moth, stink bug	Short shelf life, can cause damage to foliage under hot conditions.
Sevin	Carbaryl	Tarnished plant bug, plum curculio, codling moth, oriental fruit moth, apple maggot, stink bug	Tough on beneficial insects including bees, can thin fruit if applied when fruit are small.
Permethrin (various names)	Permethrin	Codling moth, oriental fruit moth, leafrollers, tarnished plant bug, plum curculio	Rapid action, general category is pyrethroid (synthetic), loses effectiveness when hot, can be harmful to beneficial organisms.
Malathion	Malathion	Codling moth, oriental fruit moth, stink bug, yellowjackets	Short duration of activity.
Ortho Bug-B-Gone Max	Bifenthrin	Codling moth, oriental fruit moth, leafroller, fruit worm, stink bug, tarnished plant bug	Pyrethroid, loses effectiveness quickly when hot, can be tough on predatory insects.
Entrust, Monterey Garden Insect Spray, Green Light Lawn & Garden Spray and others	Spinosad	Leafrollers, codling moth, oriental fruit moth	Entrust is an organic product, other Spinosad products may not be.
Assail	Acetamiprid	Plum curculio, codling moth, oriental fruit moth, apple maggot	Broad spectrum neonicotinoid, absorbed into tissue so is long lived.

Table 2. Insecticide options for backyard apple production.			
Trade name*	**Common name**	**Insects managed**	**Comments**
Imidan	Phosmet	Broad spectrum, weak on tarnished plant bug	Organophosphate, spray water should be pH of 5.0 to avoid breakdown.
Intrepid	Methoxyfenozide	Leafrollers, fruit worm, codling moth, oriental fruit moth	Insect growth regulator, must be ingested by insect.
Pyganic	Pyrethrum	Leafrollers, fruit worms, codling moth, tarnished plant bug, plum curculio	From chrysanthemum, not the same as pyrethroid, short duration.
Bacillus thuringiensis (Bt)	Microbial insecticide	Leafrollers, weak on codling moth and oriental fruit moth	Slow acting, relatively safe, must be ingested by insect.
Surround	Kaolin clay	Apple maggot, tarnished plant bug, somewhat weak on curculio	Repellant.

*Other products with the same ingredients may be available.

Figure 5. Egg laying scars caused by the plum curculio, photo by Bill Shane

Figure 6. Tarnished plant bug damage to fruit, photo by Bill Shane

The most significant insect pest on apples in most orchards is **codling moth** (Figure 7). Codling moth is a major apple pest in Michigan and has two generations most years in mid-Michigan. Larvae (caterpillars) of the first generation attack the fruit when it is about an inch in diameter in early June to early July. The second generation of larvae is active from early August to late August. Some orchards, especially those close to large peach plantings, may have similar damage caused by the larvae (caterpillar) of **oriental fruit moth**. The treatments for codling moth and oriental fruit moth are very similar.

If the apple planting is approximately 4 acres or more, pheromone disruption is a useful method for managing codling moth and oriental fruit moth. Pheromone dispensers release a synthetic attractant which confuses the male moths and disrupts their mating, resulting in reduced egg laying by the females.

Figure 7. Codling moth larva in the core of an apple slice with characteristic dark head and pinkish body, photo by Bill Shane

Another group of apple insect pests are the **leafrollers** and **fruit worms**, all caterpillars. These feed on foliage and on fruit (Figure 8). Unlike codling moth, this group tends to be surface feeders, often webbing a leaf onto the apple or webbing a leaf edge for protection. These are a less predictable group of insects than codling moth or oriental fruit moth. Monitoring the tree may be helpful to know when a problem is starting.

Figure 8. Surface feeding by a leafroller caterpillar, photo by Bill Shane

Apple maggot is a pest of apples and other fruit in some orchard sites, usually in sandy areas. The adult fly generally emerges in July, laying its eggs in fruit. Legless larvae hatch and feed within the fruit, causing the flesh to brown and rot (Figure 9).

Picking up fallen fruits daily starting in July and sealing them in a plastic bag helps to reduce future infestations. If using an insecticide, apply mid-July and repeat every 10-14 days until a few weeks before harvest.

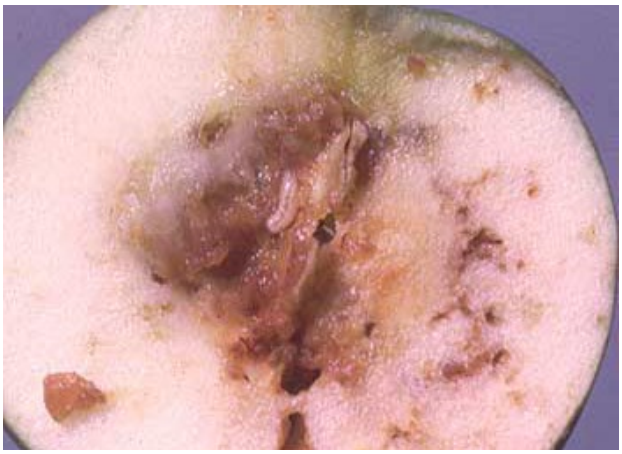

Figure 9. Apple maggot larvae tunneling in apple, photo: https://www.canr.msu.edu/resources/apple-maggot

Brown marmorated stink bug is an occasional pest at the end of the growing season, usually starting in mid- to late August (Figure 10). The piercing mouthpart of this insect causes sunken areas on the surface of the fruit, with discolored, cork-like flesh under the sunken skin. Late season feeding damage can show up on fruit after harvest. The insect is very mobile. Insecticide sprays generally need to contact the insect directly to be effective. Again, monitoring can help to know when treatment is needed.

Figure 10. Brown marmorated stink bug adult, photo by Bill Shane

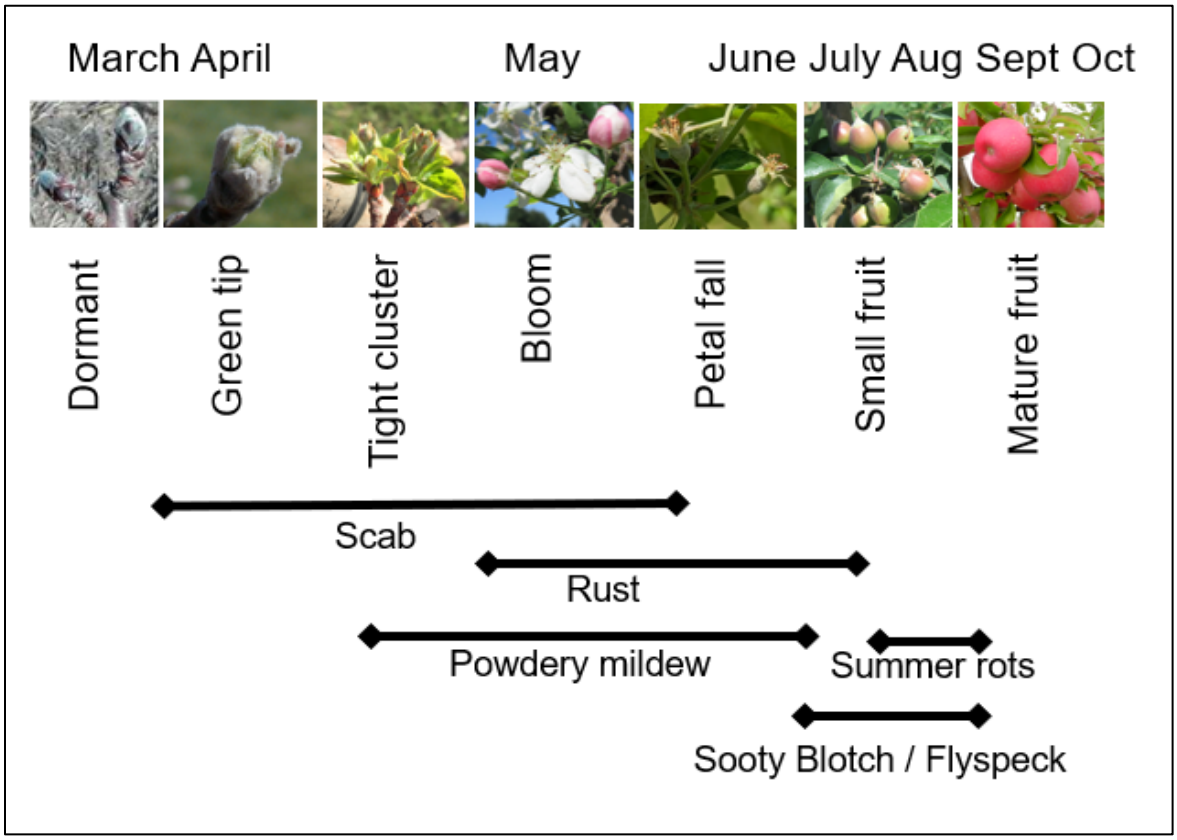

Figure 11. Management windows for primary diseases of apples.

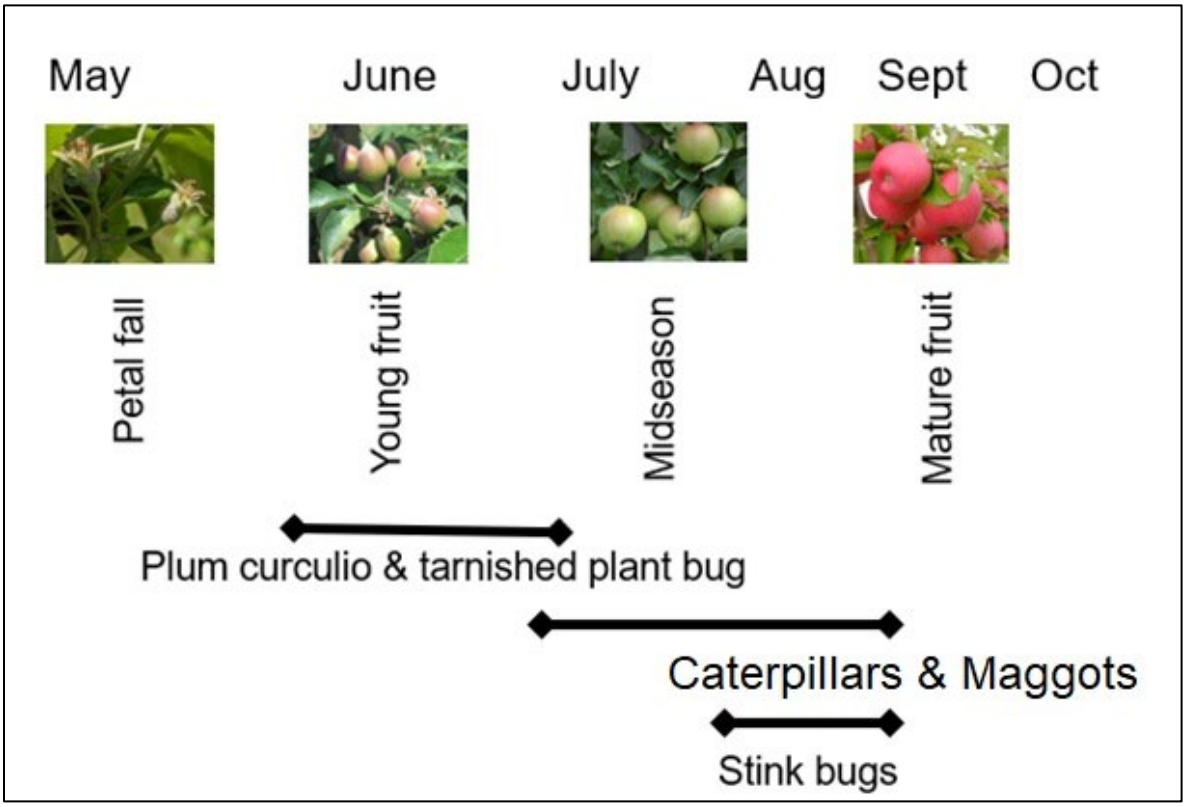

Figure 12. Management windows for primary insect pests of apples.