

The Oklahoma Cooperative Extension Service Bringing the University to You!

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

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

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education

for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.

- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.



Home Tree Fruit Production and Pest Management

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This fact sheet is designed to reflect the changing attitudes of most growers who produce fruit in neighborhood settings. Concerns about pesticide residues, drift, toxicity and application methods may dictate how and when chemicals are used. Pesticide spray schedules are normally developed for worst-case scenarios and large-scale production under severe pest pressure.

Production of fruit for personal consumption allows the homeowner (grower) to decide how much cosmetic damage he or she is willing to accept. With the proper selection of well adapted varieties that have good resistance to insect and disease problems, application of pesticides may be reduced or modified to provide adequate control of pest numbers while preserving beneficial organisms. Homeowners wishing to use this modified approach of pest management should understand that closer observation and monitoring will be required and some tolerance for lower quality fruit may be inevitable. Each grower should ask him or herself, "What is my goal: to produce blemish-free perfect fruit, or to provide my family with an edible and safe product for consumption, canning and preserving or for the pure enjoyment of 'growing it myself'?" For those who desire the perfect fruit, pest control can account for 25 to 60% of the total cost of production.

This fact sheet includes information on the growth, care and treatment of fruit trees commonly grown in residential areas of Oklahoma. Refer to the color plates (pages 4 and 5) for the various stages of pome (apple) and stone (peach) fruits to determine when to apply pesticides and when to expect the occurrence of certain pests. Early spray applications are timed according to the development of the fruit buds. The key stages of fruit tree development include:

- **Dormant:** Just before buds begin to swell in spring.
- **Green tip:** Buds are open at tips and green tissue is exposed.
- **Half-inch green:** When one-half inch of green tissue is projecting from buds.
- **Tight cluster:** blossom buds are exposed but tightly oppressed; stems are short.
- **Pink:** All blossom buds are pink; stems are fully extended.

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are also available on our website at:
<http://osufacts.okstate.edu>

- **Bloom:** First opening of blossoms until petal-fall stage. Do not use insecticides during this time.
- **Petal-fall:** Three-fourths of petals on the blossom have fallen.
- **Shuck-split:** Outer shuck has split and base of fruit is exposed.
- **Fruit set:** Shuck has fallen and only the small developing fruit remains.

When using the calendars that appear on pages 4 and 5, remember that a range of information is presented. This range represents the variability among varieties and the developmental rates for insects and diseases. Generally, seasonal cycles and tree development dictate the timing for controlling diseases and insects. For this reason, the list presented represents the most effective periods for managing pests. Insect and disease developmental rates may fluctuate due to environmental influences that include temperature, moisture and relative humidity. While pesticides are widely used in fruit production, other strategies can be employed to reduce use of chemicals or to more carefully time applications so that they coincide with peak incidence. Details on alternative insect and disease control will be covered later in this fact sheet.

Home tree-fruit growers, like commercial growers, should be aware of the differences between growing pome and stone fruits. Pome fruits have a central core consisting of several small seeds and a firm outer flesh. Pome fruits include apples, pears and quince. These fruit types can tolerate clay soils, have fewer insect and disease problems and bloom later than stone fruits. Therefore, they are less likely to suffer damage from spring frosts.

Stone fruits have a stoney, hard pit surrounded by a juicy flesh. Stone fruits include peaches, plums, nectarines, cherries and apricots. In general, stone fruits require better attention to pest control, site location and varietal constraints. Because stone fruits can bloom early (February), they are susceptible to damage from spring frosts. Some stone fruit types, like apricots, are more susceptible to frost and more difficult to manage. Therefore, they are not recommended for most areas of Oklahoma. Before planting any variety of fruit tree, research its adaptability to Oklahoma's conditions. A helpful resource is OSU Extension Fact Sheet HLA-6222, "Home Fruit Planting Guide."

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Pollination and Fruit Production

Specific requirements for fruit tree pollination are also detailed in OSU Fact Sheet HLA-6222, "Home Fruit Planting Guide." Generally, all fruit trees need insects for pollination. These pollinators include honeybees, bumblebees, mason bees and other insects that are commonly found near homes. Although fruit trees have perfect flowers (containing both male and female parts), the pollen is not always compatible and some varieties may be pollen sterile or may require crosspollination in order to set fruit adequately. Irrespective of the varieties present, insects are still needed for moving the pollen efficiently from the anthers to the stigma. The products of good pollination include nicely shaped produce, tasty fruit and good seed (number and size) production. Often, a lack of these products is attributed to other factors (for example, water, cold, etc.); however, pollination may play a major role in determining the expression of these characteristics. It is essential that pollinators be protected from insecticides early in the season. In addition, the use of certain insecticides during the bloom period can adversely effect pollination and subsequent fruit set.

Pesticides

When chemical pesticides must be used, there are two alternatives: use one of several general-purpose home fruit spray mixtures, or use specific pesticides for each particular pest. Home fruit spray mixtures are convenient, but seldom control all insects and diseases on all tree fruit crops. In addition, they may include chemicals that are unnecessary but included in the prepared mixture.

Although the drawbacks to using general-purpose treatments may limit control in some instances or may be wasted in other cases, this approach is generally satisfactory for homeowner situations. Assuming that home-growers using this guide have one to five trees and the neighborhood is not overpopulated with fruit trees, use of general-purpose premixed treatments should keep the majority of pest problems in check. Homeowners should be highly encouraged to read any pesticide label thoroughly and accurately diagnose their specific problems to ensure that these premixes will be effective for their particular pest problems. Note that controls for specific plant pathogens often serve as protectants that coat the plant or plant parts (fruits or leaves) and guard against disease. Fortunately, not all fruit growers in Oklahoma encounter every disease. Since disease problems often develop because of environmental causes, growers should attempt to identify those conditions that encourage disease problems and develop an understanding of the risks for the local area before embarking on an aggressive spray schedule. Growers who want to produce blemish-free fruit, regardless of cost, should consider their goals in relation to the cost of purchasing supermarket or fresh-market produce. If they still insist on producing blemish-free fruit, they should obtain information from fact sheets that address commercial fruit production and pest management.

Spray Equipment

To adequately control pests, thoroughly cover the tree or plant parts with pesticides according to the label. Use a sprayer that is powerful enough to reach all parts of the plants that need treatment. Compressed air sprayers range in size from one to ten gallons. Because of cost and handling ease,

most homeowners prefer the two- to three-gallon sizes. Hose-end sprayers are less expensive but require a high volume of water, moderate pressure and a convenient water outlet. Applying wettable powders with a hose-end sprayer is difficult and proper calibration of the expensive models is extremely difficult. Dusters are convenient, make a visible application and require little or no mixing; however, they are inefficient and increase risks associated with inhalation of pesticides. Materials must also be kept dry. Trombone sprayers are quite portable, but the spray pattern is intermittent because it relies on the applicator to keep pumping. Air pressure sprayers provide a variable pattern depending on the nozzle tip and pressure level during operation. Home-growers commonly use this type of sprayer, but should be encouraged to take more time and effort in cleaning, caring for and maintaining them.

Thorough cleaning is required after each use. One to two tablespoons of household ammonia per gallon of water will neutralize corrosive effects and prolong sprayer life. In addition, oiling the plunger rod and allowing the tank to dry completely will reduce abrasive effects and prevent rust formation. While residual insecticides or fungicides will not present a serious threat in most fruit tree situations, herbicide residues could be very detrimental. Do not use the same sprayer for herbicides and insecticides.

Accessory Equipment

Home fruit growers need some additional pieces of equipment to make things run smoothly. These include (1) a one-quart graduated measuring container, preferably a clear one and (2) a set of measuring spoons. Keep this equipment separate from any similar household materials and mark them "For pesticide use only." Store all mixing, measuring and application equipment with the pesticides in a secure place and inaccessible to children. Do not store pesticides where they will be exposed to drastic changes in temperatures, flames (like a gas water heater or heating unit), or ventilation ducts.

How Much Pesticide to Purchase or Use

Often the philosophy for pesticide treatment is: if a small amount will control the pest, then twice that amount will give twice as much control. This is not a wise approach and can pose unwarranted hazards, not only to the applicator, but also to the plants being treated and even to the environment.

Recommended rates of pesticides are based on amounts needed for control. Applications in excess of recommended rates contribute unnecessarily to environmental contamination without increasing the level of control. When you purchase a pesticide for use around your home, buy small quantities, always keeping in mind your most significant pest problems. Large quantities of pesticides will present problems associated with storage, odor, cost and ultimately disposal. When an excessive amount of pesticide is purchased or mixed up and not used, store it temporarily until the remainder can be used according to label directions. Do not attempt to pour left over pesticides down any drainage system. This can contaminate the water supply. Do not attempt to "double-up" the rate to dispose of extra pesticides. Use of excess amounts in a well-landscaped (homeowner) environment may result in run-off into non-target points or unnecessary exposure of humans and pets to high levels of pesticides. All factors increase the

Borer Control of Fruit Trees

Peachtree borer control

This clear-winged moth is common in Oklahoma. Its larvae can kill trees (particularly seedlings) by feeding in the trunk, near or below ground level. It can survive on wild plum, cherry and related plants. Peachtree borer larvae overwinter under the bark or below ground level and become active (feeding on the inner bark) when soil temperatures reach 50 F. Pupation usually occurs during early May and moth emergence may begin in mid-May and continue through early June. Within 30 minutes from emergence, females have mated and begin laying eggs. The majority of eggs (85%) are deposited around the bases of trees or on the trunk. Each female can deposit 200 to 600 eggs during the short six to seven days she is alive. Approximately nine to 15 days later the eggs hatch and the small larvae begin to bore their way into the bark at the base of the tree. Once beneath the bark, they feed in the cambium and inner bark. Pheromone traps for monitoring adult males are available; however, these pheromones are not species specific and will attract other clear-winged moths such as oak borer. If initial emergence can be monitored accurately then treatment can be timed for approximately eight to 10 days after first emergence or when one to two larvae per tree are noticed.

Control of peachtree borer must begin when planting young trees and continue for the life of the planting. Control can consist of one or more of the following approaches: For homegrowers with only one to two trees, simply locate the larvae at the base of the tree and use a knife or flexible wire to remove the insects. Avoid any mechanical injury to the tree trunks (mowers, weedeaters, etc.); this attracts adult borers. Formulations of Chlorpyrifos (Dursban), Diazinon, Dimethoate (Cygon) and Lindane can no longer be used in residential environments or purchased by homeowners. For all these products; however, it is legal to use existing stocks for residential locations -- if it is in the possession of the end-user (homeowner) it can be used according to label directions. Additional materials that may be used by homeowners for fruit and nut tree pests include the following:

Bayer Advanced Tree and Shrub Insect Control (Imidacloprid 1.47%) is labeled on apple, crabapple, loquat, mayhaw, oriental pear, pear, pecan and quince.

Bonide Borer-Miner Killer (2.5% permethrin) is labeled for borers (lesser peachtree borer and peach twig borer) on peach trees. This material is also effective for peach twig borer on pecan.

Ortho Bug-B-Gone Multi Purpose Garden Dust (0.25% permethrin) is labeled for lesser peachtree borer and peach twig borer on fruit and nut trees.

Spectracide® Triazicide® Insect Killer for Lawns & Landscapes Concentrate (0.08 % Gamma-Cyhalothrin) is labeled against peach twig borers on fruit and nut trees.

Pyganic 1.4 EC (1.4% pyrethrins) is labeled for nearly all pests on all home garden crops and fruit and nut trees.

Flatheaded Borers

The flatheaded apple tree borer and similar species attack unhealthy or recently transplanted apple, pear and other trees. They burrow into the bark and sapwood of large branches and the trunk. Their presence is indicated by the appearance of darkened, depressed areas in the bark from which traces of frass (excrement) may protrude. When these portions of bark are removed, shallow winding burrows packed with sawdust may be observed. Burrows usually are on the sunny side of the trunk or branch, but may encircle and penetrate the wood to a depth of two inches. The insect may girdle young trees.

Keep trees in a healthy, vigorous condition by proper fertilization and watering. On young or transplanted trees, wrapping the trunks with burlap or other similar materials in early spring before adults appear provides effective control. Observe the tree regularly to see that twine or other wrapping or tying material does not girdle the tree. Dead branches and trees; particularly if killed by the borers the past season; are sources of infestation and should be destroyed prior to May 1. In addition, topping or dehorning trees always leaves dead wood that provides a breeding site for borers. On older trees, apply insecticides if needed from the ground line to the first branches on May 15, June 15 and July 15.

liability of homeowners who simply intended to grow fruit for the family. For fruit trees with heavy infestations, pesticide applications may be repeated every 10 to 14 days to protect new growth. Follow all label directions when using any pesticide and observe harvest intervals (waiting periods) from the last spray.

Seven Tips for Good Control

1. Mix fresh spray for each application. Add spray materials to a little water in a clean container. Smooth out all the lumps before you pour the materials into the sprayer. Straining the spray mixture through a screen when filling the sprayer helps to prevent a clogged nozzle.
2. Stir the spray mixture or shake the sprayer often to prevent chemicals from settling out.
3. Dormant sprays are important because some pests attack before visible growth begins. A dormant oil spray is applied to control over-wintering pests. Certain fungicides are applied during the dormant period to control some diseases such as peach leaf curl. Apply dormant sprays only when the temperature is above 40 F.
4. Spray soon after rain to help prevent diseases from seriously infecting foliage and fruit. Heavy rain may wash protective chemicals from the plant.
5. Wash out sprayer immediately each time spraying is completed. A 24-hour delay may result in a clogged nozzle and a corroded tank.
6. Do not use sprayers that have been used to apply weed control chemicals. Label and use a separate sprayer for weed control purposes only.
7. Spray carefully and thoroughly to cover all parts of wood, leaves and fruits. Spray until a noticeable amount is dripping from the tree. Approximate amounts for various size fruit trees with full foliage are shown in Table 1.

Table 1. Approximate amount of spray to adequately cover fruit trees.

<i>Tree height in feet</i>	<i>Spread (feet)</i>	<i>Gallons to Apply</i>
5 – 8	3 – 6	½ to 1
8 – 12	6 – 9	1 to 3
12 – 18	9 – 15	4 to 8
15 – 20	15 – 25	8 to 10

Alternative Means to Suppress or Control Insects and Diseases

The first means of combating pest problems in fruit trees should be selecting well-adapted, resistant varieties. While few fruit varieties have been selected to resist insects, stone and pome fruits have been selected to resist diseases such as bacterial spot, black knot, cedar apple rust, fireblight and scab. When selecting a variety for planting be aware of the most common disease problems for your area. For instance, early-maturing peach varieties are more likely to have brown rot than late-maturing varieties, but late varieties are often damaged by peach scab.

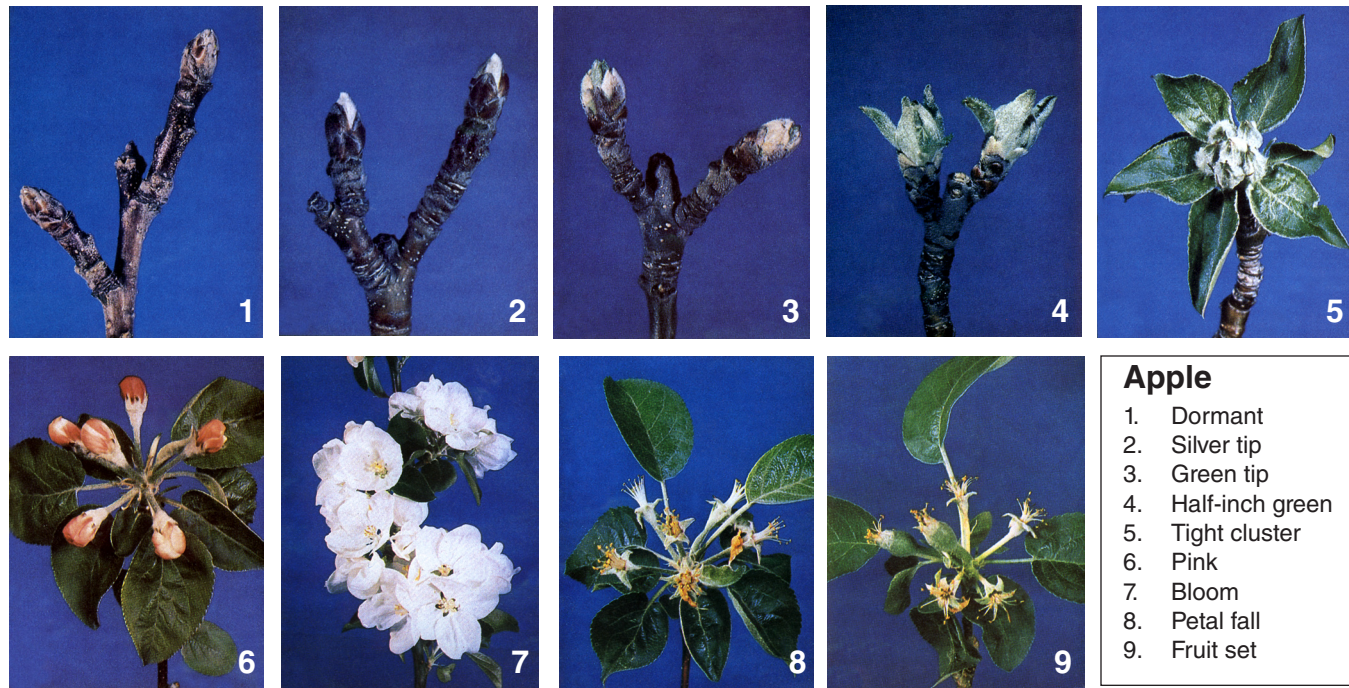
In addition to using resistant cultivars, several cultural practices may be used to combat pest problems. Disease problems are often associated with moisture (usually excessive). Planting fruit trees on well-drained soils will help to reduce the risks from fireblight. Proper spacing and pruning can also improve air movement within a group of trees. Sanitation (pick up and disposal) of infected or infested branches, leaves, or fruit can help reduce carryover of disease and insect problems.

Foresight when planting can nearly eliminate a problem before it begins. Avoid planting stone fruits and pome fruits together. The presence of stone fruits can often encourage plum curculio problems in pome fruits, which otherwise is not a significant pest. Remove any cedars grown near apples, since they serve as alternate hosts for cedar apple rust. Do not overwater trees or apply nitrogen late in the season, because such practices can encourage lush growth creating disease problems. Apply dormant oils or superior summer oils before the pink stage of tree development, particularly where mites, scales, or aphids have been a chronic problem. With good coverage, it is possible to kill as much as 80% of the eggs of European red mites; therefore, the oil should be diluted as much as possible. A 2% rate is needed at the half-green stage, but at tight cluster a 1% rate is adequate.

Protecting young trees from insect injury is critical. Because trees are not expected to bear fruit for a few years, people often plant them and then ignore them. In addition, the grower will prematurely unwind the tree wrap attached to the seedling. This material should be left on during the winter dormant period and then removed when spring growth begins. The tree wrap helps reduce problems associated with sunscald. In addition, if spring cankerworm is a threat in the area (particularly on apple) a three- to four-inch band of Tree Tanglefoot Pest Barrier can be added to the wrap before spring growth begins. This sticky substance traps female cankerworms that crawl up the tree to begin laying eggs. By using traps to monitor insect populations, growers can detect building problems or anticipate a treatment threshold. Information on the construction and use of some of the more effective traps for monitoring plum curculio are presented in OSU Fact Sheet EPP-7190, "Monitoring Adult Weevil Populations in Pecan and Fruit Trees in Oklahoma."

Use of Pheromones in Fruit Culture

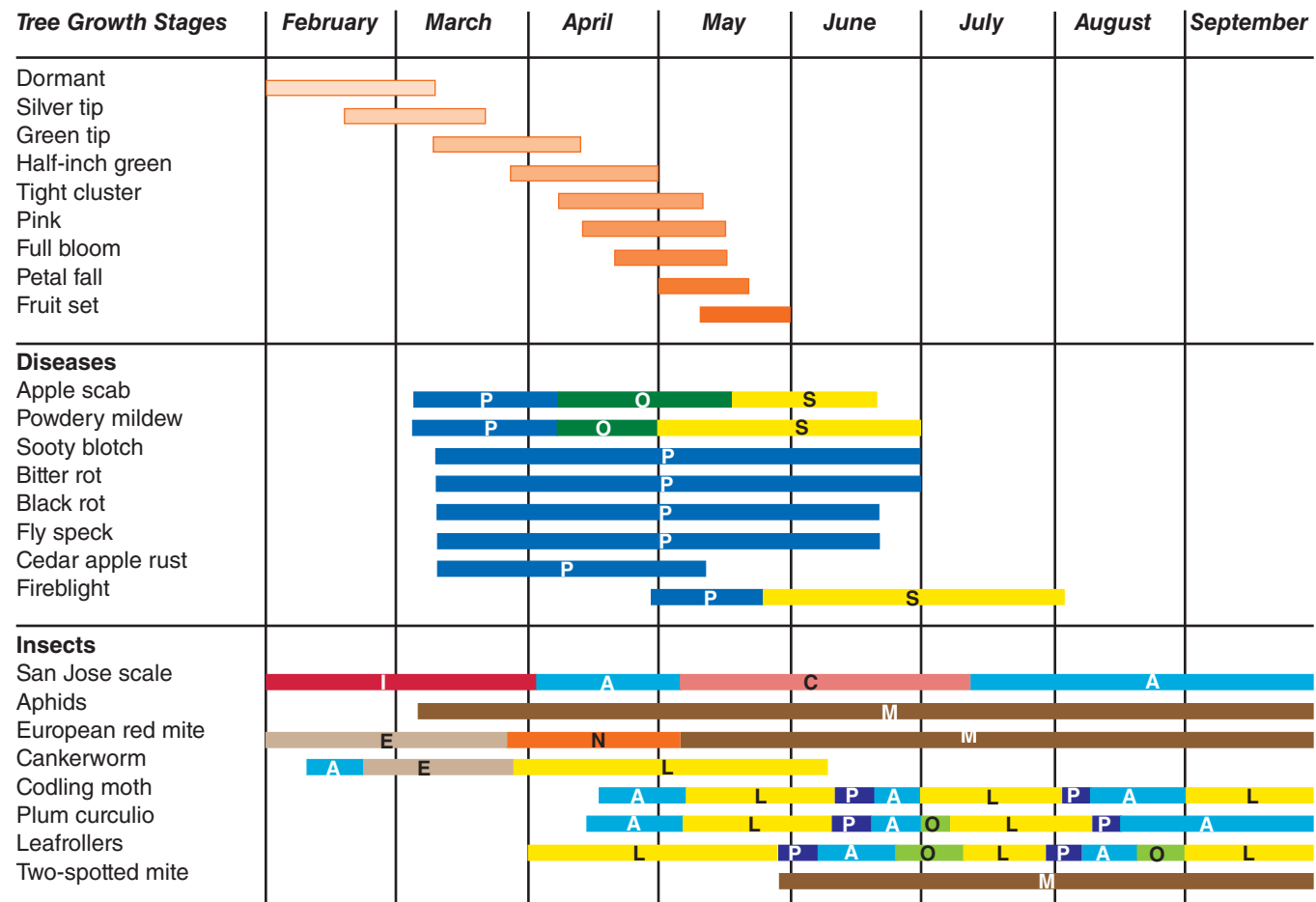
Many insect species emit mating attractants (pheromones) that are released by one sex and perceived by the other. These pheromones are carried by wind currents and help these tiny arthropods locate each other chemically. Synthetic versions of these chemicals are commercially available and because of their specificity, have proven quite useful in disrupting the mating and subsequent oviposition cycle of many moth species such as oriental fruit moth (OFM) and codling moth (CM). While this approach has been mildly successful, reliable control is definitely influenced by orchard size and isolation. Small orchards (less than 10 acres) or plantings do not provide sufficient sites for dispensers and may actually serve to attract moths to small isolated areas where the only hosts for miles around are readily available. The cost of mating disruption is also higher than chemical control, at least short term. Costs may approach 50% more than an average chemical control program. In addition, there are no guarantees that secondary pests, such as aphids or leafminers, will not flourish under a reduced spray program based on mating disruption.



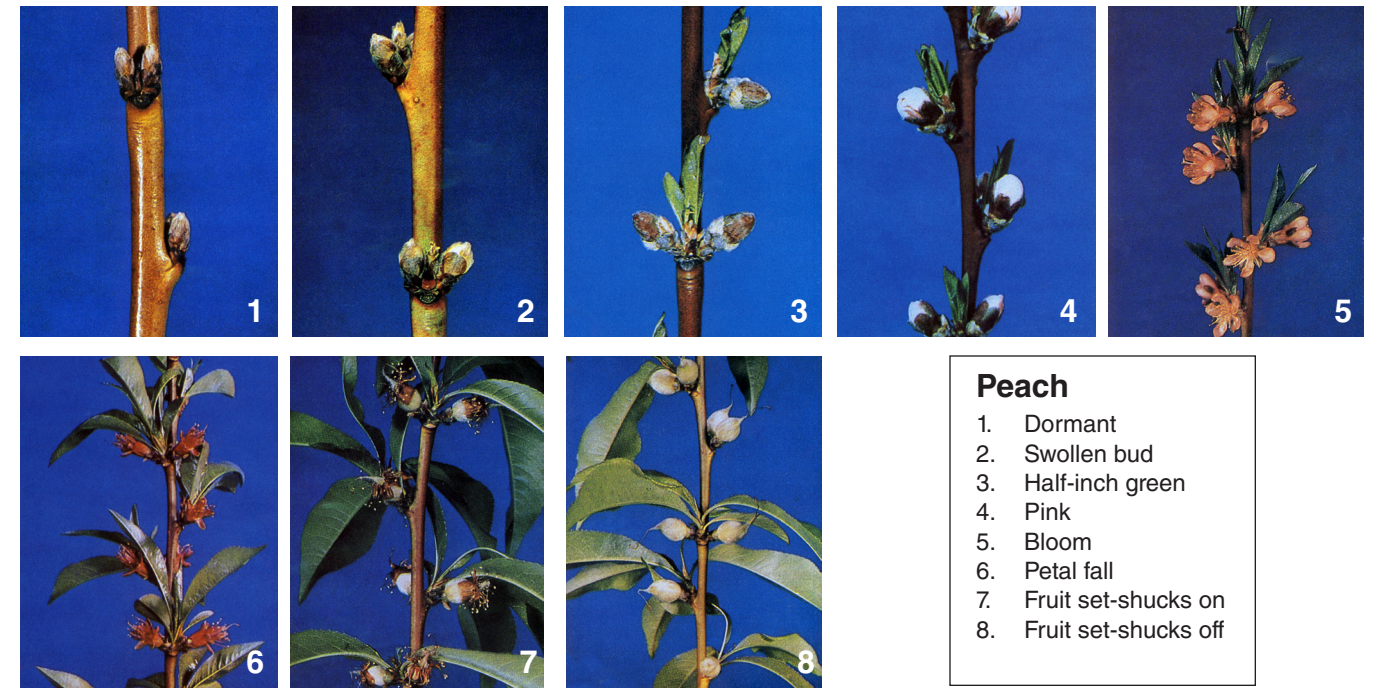
Apple

1. Dormant
2. Silver tip
3. Green tip
4. Half-inch green
5. Tight cluster
6. Pink
7. Bloom
8. Petal fall
9. Fruit set

Calendar of Events of Apple (pome fruit) in Oklahoma.



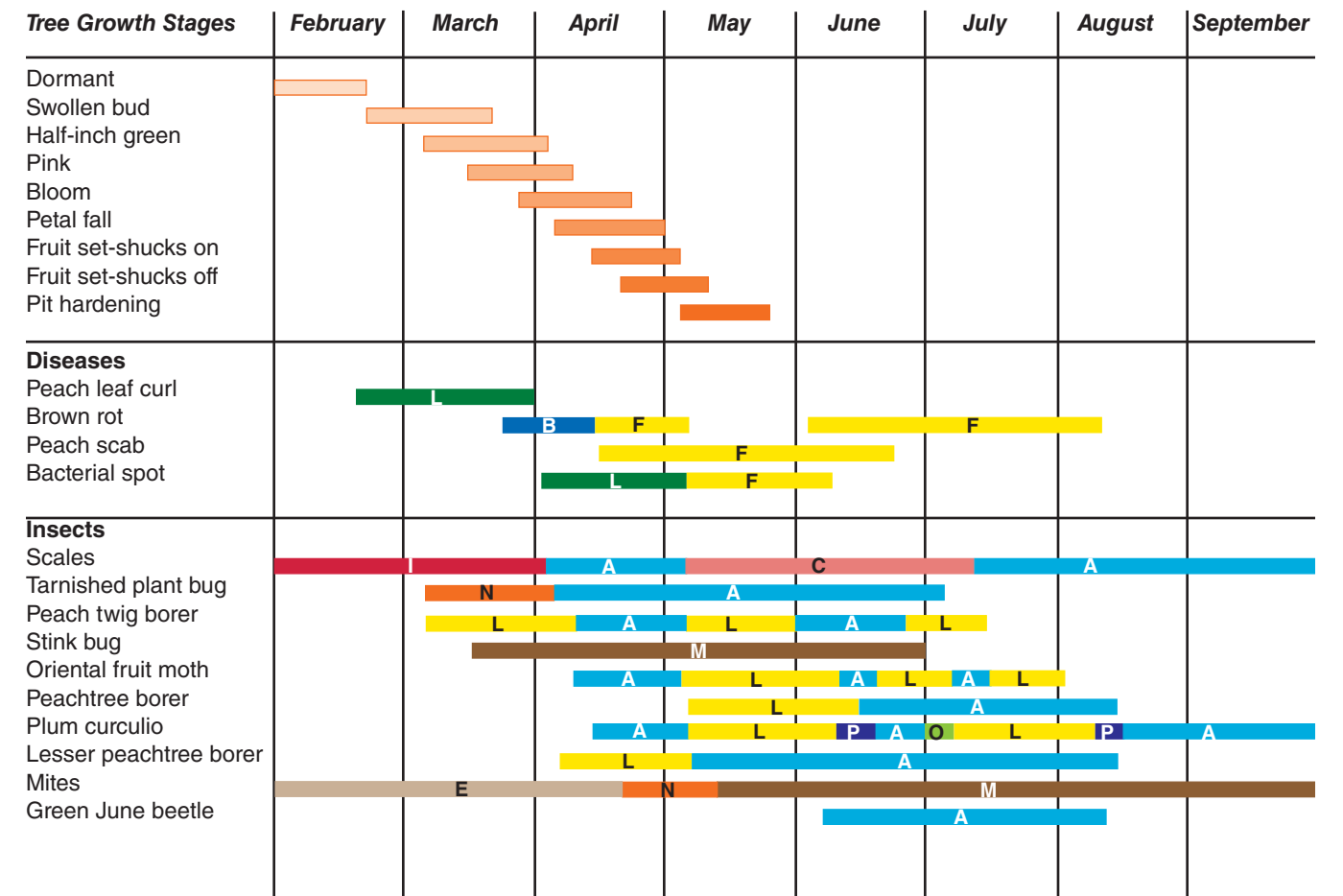
Diseases: Primary (Blue), Secondary (Yellow), Overlap (Green)
Insects (predominant stage): Adult (Blue), Larva (Yellow), Egg (Brown), Nymph (Orange), Pupa (Dark Blue), Crawler (Red), Mixed (Dark Brown), Immature (Red), Overlap (Green)



Peach

1. Dormant
2. Swollen bud
3. Half-inch green
4. Pink
5. Bloom
6. Petal fall
7. Fruit set-shucks on
8. Fruit set-shucks off

Calendar of Events of Peach (stonefruit) in Oklahoma.



Diseases: Blossom (Blue), Fruit (Yellow), Leaves (Green)
Insects (predominant stage): Adult (Blue), Larva (Yellow), Egg (Brown), Nymph (Orange), Crawler (Red), Mixed (Dark Brown), Immature (Red), Overlap (Green)