Environmental Reasons Why Fruit Trees Fail to Bear

The picture above shows a live apple bloom and a bloom killed by frost.

Photos by Mark Longstroth, Michigan State University Extension

Sometimes you need to tear apart the flower to check and see if the inside is brown. This apple flower was killed by frost and you can see that the inside of the flower is black.

Most hardy fruit trees need a certain amount of cold winter weather to end their dormancy and to promote spring growth. When winters are too mild, spring growth is delayed, irregular and slow, the period of blooming is extended and the possibility of frost injury increased.

Extreme cold during winter dormancy, however, may kill the fruit buds. Winter weather rarely threatens apple, pear, plum and sour cherry varieties. Sweet cherry trees are relatively sensitive to cold until they become dormant. Peach trees are very vulnerable to cold weather; peach buds can be killed by mid-winter temperatures of 10 degrees F below zero. The stone fruits–cherry, peach, plum and nectarine–can lose cold hardiness due to extended mid-winter warm periods. Damage to the flower buds can be extensive, especially if the warm period is followed by a very cold period.

As the fruit buds grow and open, they become more susceptible to frost injury. The exposed buds can usually withstand temperatures near 24 degrees F, but blossoms of practically all fruit trees will be killed if the temperature drops below 24 degrees F. When a heavy frost is expected, covering the trees will sometimes prevent bud or blossom injury, provided temperatures do not fall too low and the cold weather is of short duration. Cheesecloth and even old bed sheets may be used.

During spring frosts, some commercial growers heat their orchards, but this method is impractical for most home gardeners. An alternative method is to sprinkle the trees with water. Start when the temperature falls to the low 30's F. Keep the water running until all the ice is melted. Water must be dripping off the ice at all times or the plant will suffer from frost damage. After a severe frost, injured blossoms may appear normal, but if the pistils (center part of the blossoms) are killed, the tree will not bear fruit.

Fruit trees need full sunlight for best production. Inadequate sunlight delays the beginning of flowering and may reduce the amount and size of fruit. Avoid placing fruit trees where they will be shaded by buildings or by other trees. Trees will grow more vigorously and bear better if they have adequate space to develop their root systems. Do not plant where roots of trees or large shrubs will compete for water and plant nutrients. Cultivate or mulch as necessary to reduce competition from weeds or grasses.

Apply adequate amounts of fertilizer to produce strong growth. Avoid excess fertilizer, which will produce weak, leggy growth and delay the setting of flower buds. Prune young apple trees to develop a strong framework with a central leader and horizontal branches. Excessive upright growth will delay fruit bearing and reduce the quantity of fruit produced.

Renovate Windbreaks to Improve Effectiveness

Over time it isn't unusual for windbreaks to thin and loose the capability to block strong winds. However, proper renovation efforts can keep any windbreak in top-notch condition.

According to Rich Lodes, district forester, Lower Platte South NRD, "Some landowners choose to renovate a windbreak because it has become aesthetically unappealing while others are forced to take action in order to keep out strong winds. If this is the case, there are particular signs to look for that indicate a windbreak is in need of renovation."

During winter, an effective windbreak should prevent snow from blowing through to locations where it can block driveways and houses. However, an ineffective windbreak is evident during other seasons of the year. For example, corn stalks and leaves often are found near buildings and in corners where debris normally isn't seen. The ability to see previously unseen objects through a stand of trees usually is a good indication that the windbreak needs renovation as well.

There are four methods commonly used for windbreak renovation.

- Cut down the entire stand of trees and start new. Although this method is the easiest way to regain a clean look, it is expensive and provides no protection in the meantime.
- Remove and replace half of the stand. This method allows the introduction of new growth but still provides some protection against wind.
- Add a row or two inside or outside of the existing stand. This method allows the introduction of new growth as well. However, many landowners are reluctant to give up either lawn space or farm ground.
- Establish shade-tolerant species within the stand. This method often seems undesirable because it creates a stand with trees of multiple ages and heights. Even so, it greatly increases the density of the windbreak and prevents more wind from getting through.

Lodes says it is important to remember that renovating a windbreak, regardless of method, can be a difficult task. Wildlife species that exist in the established windbreak make growing new trees and shrubs especially difficult. Even so, cages can be set around trees to prevent rabbits and deer from eating the plant.

Establishing a Vineyard

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Note: This is part of a series of articles related to commercial vineyards in Nebraska.

Site Selection

Selection of an appropriate site is essential to the success of the grape production enterprise. In the Midwest, three main factors are critical to selection of an acceptable vineyard site: cold temperatures, air movement and soil drainage. Low winter temperatures may directly damage the vines and buds or even kill the grape plants, while abrupt temperature drops in the fall or spring may also cause severe injury.

Of special concern are temperature fluctuations in late winter/early spring that lead to early bud break and subsequent bud damage. Sites that facilitate air drainage and air movement will aid in diminishing the negative effects of frost and disease, respectively.

Of equal importance is good soil drainage. The old adage that grapevines cannot stand "wet feet" is on target; that is, poor soil drainage reduces available air to the roots. This lack of air means that oxygen is not available to the root cells and may lead to root death.

Climate

Climatic characteristics are generally broken down into macroclimate, mesoclimate and microclimate. Macroclimate is primarily dictated by geography, e.g. eastern Nebraska vs. western Nebraska. Minimum winter temperatures, length of growing season, growing degree days and rainfall amount and distribution are all macroclimatic factors.

Microclimate is the climate in the immediate vicinity of the grapevine, its roots, stems and especially in the plant canopy. The microclimate in the canopy can be modified by vineyard practices such as training/trellising system, pruning practices, fertilizer applications, leaf removal and shoot positioning. Disease severity and fruit quality can be improved dramatically by practices that influence microclimate. Microclimate is mostly a result of mesoclimate factors, including topography and slope, elevation above surrounding land, soil type and aspect or direction of slope. Generally speaking, the best vineyard site is one with full sun exposure, good air drainage, good soil drainage, freedom from late spring frosts and harsh winter temperatures.

Winter temperature minima vary greatly from eastern Nebraska to western Nebraska and from south to north. For most grapes grown in the Midwest, temperatures should not fall below -20 degrees F (-28 degrees C) for an extended period of time or the plant may be killed. Cultivars (varieties) vary greatly in their tolerance of cold winter temperatures. Therefore, cultivars should be carefully selected to match their cold-hardiness to the site selected. (For further notes on choosing cultivars, see NebFact on Selecting Cultivars for Nebraska Vineyards.)

Choosing a site that is likely to offer freedom from spring frosts is determined by the mesoclimate or vineyard site characteristics. Ideally, the site should be gently sloping and at a higher elevation than surrounding areas. Because cold air is heavier than warm air, cold air flows downhill to lower areas, thus reducing frost risk. In addition, air drainage during the growing season leads to rapid drying of foliage following rain or heavy dew. This in turn reduces conditions conducive to disease development. Steep slopes should be avoided because of potential soil erosion problems.

Furthermore, obstructions such as wooded areas and windbreaks at the edges of the vineyard site should be avoided so that the cold air will not "pond" into frost pockets in the lower parts of the vineyard. Such areas may also harbor damaging wildlife such as birds, deer and other pest species.

Aspect of slope is also important in site selection. Although a south-facing slope is warmer, it causes early bud break in the spring which may lead to bud damage from late frosts. Early fruit maturation will often occur on southern slopes, which may lead to ripening during excessively hot periods resulting in undesirable fruit characteristics for winemaking. Eastern slopes dry faster in the morning following dew or rain, thus, reducing disease problems. North slopes will have later bud break in the Spring, but will be colder in the winter. Winds may have potentially damaging impacts on western or southwestern exposures, depending on direction of the prevailing winds. Choice of slope may relate to cultivar selection, that is, cultivars exhibiting early bud break will benefit from north or eastern exposures.