

Apple

Malus domestica (Rosaceae)

Fast Facts:

Acres in Washington: bearing and nonbearing acres:165,215
Yield per Acre (lbs): 37,900
Average price: \$506 per ton
Value per harvested acre: \$9,082 in 2009
Number of Growers: 3052
Value of Production in Washington: \$1.28 Billion
Percent of Value of U.S. Production: 59.4 %
*Statistics Provided by the Washington Agriculture Statistics Service (NASS).

Apples are the number one most valuable commodity in the state

Description of crop:

Apple trees are propagated by budding or grafting onto rootstocks. Rootstocks are used for resistance to disease and insects as well as to control the size of the mature tree. With traditional spacing and pruning, trees take eight to ten years to reach full commercial production. However, in high density, intensively managed orchards, trees generally are in full production in four years. In 1997, just under 470,000 acres of apples nationwide produced 10.2 billion pounds of apples. In 2006, just over 370,000 acres produced 10 billion pounds. This substantial change reflects the move to higher density orchards.

Trees are pruned winter and summer. Pruning ensures good fruit bud development, controls tree size and minimizes damage to fruits due to abrasion. Winter pruning directs growth in specific areas of the tree. Summer pruning removes unwanted growth and allows light to reach all parts of the tree. Other horticultural practices necessary for production include thinning (removing fruit early in the season), irrigation, fertilization, tree training and weed control. Promilin is applied to Red Delicious types to elongate the apple providing the characteristic shape of this apple. Chemical applications of potassium formulations, NAA, Ethrel, or Rex lime sulfur and oil are used for chemical thinning. NAA is also used to prevent fruit abortion. Pollination is an important aspect of apple production affecting costs, crop load, planting plans and chemical applications. Also, many apple producers use some type of climate modification for frost protection and sunscald preventions. Kaolin applications are made in some areas for sunburn protection. There is some indication however that kaolin can repel beneficial insects. Trellis systems have become common to support high density plantings, to provide structure to aid pruning and to reduce abrasion to the apples.

Apple harvest generally begins in mid-August with Gala and continues into November with the later varieties such as Fuji and Cripps Pink. Red Delicious

apples are harvested from mid-September through the first part of October, depending on the strain and the growing region. All apples are harvested by hand. With proper care, trees can remain in production easily for 30 or more years. With industry emphasis on new varieties and higher density plantings, orchards may be replaced as often every 10 years.

Key pests:

Weeds are a primary problem, especially for young trees, because they compete with the trees for water, sunlight and nutrients. Weeds cause three additional problems. They can block sprinkler heads, making irrigation difficult, or provide alternated host sites for harmful insects. They also encourage mice to populate the orchard, often necessitating chemical control of rodents. Common annual weed problems include mustards, pigweeds, lambsquarter and grasses. Common perennial weeds include quackgrass, field bindweed and dandelion. The most common diseases are fireblight, powdery mildew, apple scab and collar rot. Pressure from apple scab has declined in recent years due to a substantial reduction in the number of Red Delicious blocks. Collar rot has also declined as a problem due to more effective treatments. Insects are the most damaging pests. In order of importance, these include codling moth, leafrollers, aphids (rosy apple aphid, green apple aphid and apple grain aphid), mites, and lygus bugs. Apple maggot is a serious pest. Essentially all of the west side of the state is under apple maggot quarantine and on the east side of the state parts of both Yakima and Kittitas counties are also under quarantine. Apple maggot is relatively susceptible to chemical control but the timing of its emergence can be problematic to its control. Apple maggot invades late in the season when the pre-harvest intervals of most chemicals prohibit their use.

Key pesticides:

Grass is used as a cover crop to help minimize competition from weeds for sunlight, moisture and nutrients. A standard herbicide program might include Princep, Solicam, and Roundup. Care must be taken to protect green bark or young trees from contact with herbicides. Gramoxone is used less frequently due to its higher cost but can be an only option for young trees. 2, 4-D is not frequently used because of its potential to damage the trees and the fact that other herbicides are more effective. Goal is effective on sandy soil. Surflan and Prowl are also used. A new herbicide that has shown good broad spectrum efficacy is Chateau. Also Matrix used as a pre-emergent can control broadleaf weeds. Fireblight is controlled with Fireban, Blightban, Teramycin and Streptomycin. Powdery mildew is controlled with alternations of Procure, Flint, and Rally. Kaligreen, a potassium carbonate, can be effective and can be used in both conventional and organic blocks.

Insect pests are controlled as follows: Codling moth is controlled with mating disruption, Success, Entrust, neonicotinoid insecticides, Imidan and granulovirus. Delagate is also used for coddling moth, leaf rollers and thrips. For organic control of codling moth, a combination of oil and Entrust is used. Leafrollers are controlled using Bacillus Thuringensis for organic growers. Leafrollers have

shown definite resistance to insecticides in some areas so it is important to use control options in rotation to prevent further resistance development. Success, Proclaim, Intrepid and Rimon are all used to control leafrollers. Campyloma and leafminers are controlled with the leafroller applications. Mites are a chronic problem that is often flared by inadvertent or unavoidable beneficial insect population reductions due to chemical applications. Mites were controlled with biological control programs for decades but recent changes in thinning programs and increased use of neonicotinoids have caused sporadic problems. Control methods include Nexter, Envidor, Acramite and Fujimite. Aphids are a problem especially the wooly apple aphid. Wooly apple aphids are an emerging critical problem. Provado and Assail or neonicotinoids are used for aphid control. Thrips are controlled with Thiodan or Success. Apple maggot is controlled with chloronicotinoids and spinosads. An Assail equivalent is available under an emergency exemption for use by horticultural pest boards in public places to control apple maggot in such venues. Work is being done to adapt GF120 which is a spinosad fruit fly bait to make it more attractive to apple maggot.

**Critical pest
control issues:**

Weed control is important in orchards because bees can be attracted to weeds in bloom. Growers may apply insecticides harmful to bees when the tree crop is not in bloom; however, bees may be harmed if they are in the orchard pollinating blooming weeds.

An industry shift toward more susceptible varieties such as Fuji, Gala, Braeburn and Cripps Pink has shifted fireblight into the lead of apple diseases. Fireblight is an important quarantine issue with Japan. Fireblight is controlled with Fireban, Blightban, Teramycin and Streptomycin. The use of antibiotics in crop protection is becoming an item of concern in some consumer groups. Some European countries prohibit the use of antibiotics on food crops that they import. Industry members are concerned about several issues regarding insect control. Codling moth is an ongoing overriding issue of concern. Control is now an issue at all of the life stages of the insect. Mating disruption is used as are adulticides, ovicides and granulovirus is used on the neonate larvae. There is great need for additional products at all of these stages. In 2009, WSU implemented a new codling moth model that did not rely on a Biofix. They created a codling moth model based on the accumulation of degree days from January 1, which they feel can accurately predict the occurrence of codling moth life stages. Wooly aphids have no effective control. Diazinon and Thiodan which are the only tools post bloom have never been very effective on this pest. Lorsban which is effective can only be used pre-bloom and does nothing to address the aphid which emerge and ascend from the root zone. Wooly apple aphid is a quarantine pest in some markets. Due to the intensive hand labor needed for apple production, farm

worker safety is important. Airblast applications of enosulfans in apples require a closed cab but if this is not feasible applicators should wear chemical resistant headgear and maxium PPE clothing.

The cost of hand labor for tree fruit production is very high. A more effective chemical thinner would be a great help to the apple industry.

An issue that faces growers in the US is a bit of a paradox. In responding to the concern for softer chemicals and new approaches to pest control, our growers are out in front of many export markets. Countries that are potential markets for apples may not have efficacy or toxicity data for the latest, softest chemicals that could be used. If the importing country doesn't have adequate information on a chemical, their reaction is to block its use in the production of fruit imported to their country. Growers in the U.S. may be forced to use older technology in order to have their fruit eligible for export. Information necessary to assure importing countries of the safety of new chemicals needs to be done in order for the best practices to be followed and allowed for export.

A significant issue for apple growers is the apples grown by homeowners that are within insect flying distance of commercial orchards. Washington State laws prohibit homeowners from growing fruit, especially apples and cherries, unless pests are controlled or the fruit is removed. The reality of the situation is that many insects are allowed to flourish in backyards which then infect neighboring commercial orchards. This problem increases insect control costs to the grower and can in fact cause huge economic damage if the insects interfere with marketability of the crop due to quarantine issues. Apple maggot is increasing its spread through just such means in addition to transport of larvae in home grown fruit. Apple maggot is also spreading through its alternate host, the native hawthorn. A critical issue is to find effective bait for control of apple maggot in order to control its spread. On November 16, 2006, the U.S. Environmental Protection Agency (EPA) finalized details of its proposed phase-out of azinphosmethyl (Guthion) on apples, pears and cherries. Changes went into effect in 2008. Under this decision azinphosmethyl applications will be prohibited on apples, cherries, and pears after September 30, 2012.

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**Location
of production:** Apples are produced in all counties



Apples

Apple Production in Washington State



■ Area of Apple Production