Orange

ContentContent

See questions about Orange

Description

Orange, *Citrus sinensis*, is an evergreen tree in the family Rutaceae grown for its edible fruit. The orange tree is branched with a rounded crown and possesses elliptical or oval leaves which are alternately arranged on the branches. The leaves have narrowly winged petioles, a feature that distinguishes it from bitter orange, which has broadly winged petioles. The tree produces white flowers singly or clustered on a raceme. The fruit is a spherical berry with a green-yellow to orange skin covered in indented glands and a segmented pulpy flesh and several seeds. Orange trees can grow to a height of 6–15 m (16–49 ft) and can live for periods in excess of 100 years. Most plantations have an economic lifespan of around 30 years. Orange may also be referred to as sweet orange or navel orange and is believed to have originated from a wild ancestor in the border between Vietnam and China.

Close-up of orange skin

Orange slices

Orange blossoms

Tree branch heavy with oranges

Orange grove in California

Orange fruits and blossoms

Oranges ripening on the tree

Uses

Oranges can be consumed as a fresh fruit and are commonly pressed or squeezed to produce orange juice.

Propagation

Requirements Orange is a subtropical plant and the trees grow best in regions with a pronounced change in season. They will grow best at temperatures between 12.8 and 37.8°C (55–100°F) during the growing season and 1.7 to 10°C (35–50°F) during dormancy. Mature orange trees can survive short periods of freezing, whereas young trees will be killed. Trees should be protected from frosts and freezing conditions to prevent damage. The trees will also tolerate drought conditions but perform poorly in water-logged soil. Trees will grow best when planted in a well-draining sandy loam with a pH between 6.0 and 7.5. Soil must be deep enough to permit adequate root development. Orange trees require full sun and should be protected from wind which can cause damage to the trees. **Orange propagation** Orange seedlings are usually produced by grafting or budding to an appropriate rootstock as seeds will not produce fruit true to type. Grafting is the process by which a scion from one plant is joined to the rootstock of another to produce a new tree. Budding is a special type of grafting where the scion that is joined to the rootstock consists of a single bud. Budding is commonly used in citrus propagation as it is the easier of the two processes and works very well. **Budding** Budding should be carried out when seedling stems have reached roughly the diameter of a pencil (6–9 mm/0.25–0.36 in) and at a time when the bark of the rootstock tree is slipping (this is the term used to describe a period of active growth when the bark can be easily peeled from the plant). Twigs (budwood) should be collected from the previous growth flush or the current flush so long as the twig has begun to harden. The twigs should have well developed buds and should be as close as possible to the diameter of the rootstock onto which it will be joined. It is extremely important to only collect budwood from disease-free trees. The use of diseased budwood can cause the spread of many serious citrus diseases which can kill trees. The budwood to be used for propagation should be trimmed to create budsticks which are 20–25 cm (8–10 in) by removing any unwanted wood and leaves. These budsticks can be stored for 2–3 months under the correct conditions but it is best to use them as soon as possible after cutting. The simplest way to join the budwood the the rootstock is by T-budding. The area to be joined should be pruned to remove any thorns or twigs and the cut made approximately 15 cm (6 in) from the ground. Using a sharp knife, a 2.5–3.8 cm (1–1.5 in) vertical cut should be made in the stem of the rootstock, through the bark. A horizontal cut should be made at either the top or the bottom of the vertical cut to produce a “T-shape” The horizontal cut should be made a slightly upward-pointing angle and should reach through the bark. Remove a bud from a budstick by slicing a thin, shield-shaped piece of bark and wood from the stem, beginning about 1.25 cm (0.5 in) above the bud. This piece should measure 1.9–2.5 cm(0.75–1.0 in) in length. Immedietely insert the piece of bud into the cut on the rootstock by sliding it under the opened bark so that the cut surface lies flat against the wood of the rootstock plant. Finish the join by wrapping the bud with budding tape. When the union is made and the tape is removed, the bud is forced to grow by cutting the rootstock stem above the join about 2/3 of the way through the stem. This cut should be made 2.5–3.9 cm (1.0–1.5 in) on the same side as the join. The top of the seedling should then be pushed over towards the ground. This process, known as “lopping” allows all of the nutrients to be diverted to the bud Once the bud begins to grow and reaches several inches in lengthe, the lop can be removed completely from the seedling. **Planting seedlings** Orange trees can be purchased as seedlings which have already been grafted and only require planting in the garden or orchard. The best time to plant citrus trees is in Spring after all danger of frost has passed in your area. Standard sized trees should be spaced 3.7–7.6 m (12–25 ft) apart in an area that receives full sunlight, but is protected from strong winds which can damage the trees. Planting against a south facing wall will help protect the tree in cooler climates. **General care** Newly planted trees require proper irrigation to ensure they become established. During the first year, water should be applied at the base of the trunk so that the root ball is kept moist to allow

the roots to establish in the soil. Newly planted trees should be provided with water every 3–7 days. The soil should be moist, but not wet. Trees planted in sandy soils will require water more frequently. Young trees will also require a light application of fertilizer every month in the first year.

T-budding showing shield shaped piece of budwood inserted into stem of rootstock

References

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Common Pests and Diseases

Diseases

Category : Fungal

Anthracnose *Colletotrichum gloeosporioides*

Symptoms

Leaves dropping prematurely; leaves covered in dark fungal spores; red to green or black streaks on the mature fruits

Cause

Fungus

Comments

Disease common during wet Springs or long periods of wet weather late in season

Management

If disease is damaging then appropriate fungicides should be applied to whole tree

Armillaria root rot (Mushroom root rot) *Armillaria mellea*

Symptoms

Trees may wilt suddenly and collapse or decline slowly; leaves become chlorotic and drop from tree; if large parts of root are destroyed then whole canopy is affected; trunk may have area of rotting bark at the base; lesions on the trunk resemble Phytophthora gummosis; clusters of mushrooms may be present at the bottom of the tree and fan shaped mycelial mats are often present between the bark and the wood

Cause

Fungus

Comments

Healthy trees are usually infected by infected pieces of wood or tree stumps which have been left in the ground after an orchard is cleared

Management

Disease is difficult to control once it becomes established in an orchard; affected trees showing signs of decline should be removed along with as much of the roots system as possible; area where infected tree was should not be replanted with health citrus for a period of at least one year; fumigating soil can help to reduce soil inoculum but is not always completely effective

Black root rot *Thielaviopsis basicola*

Symptoms

Small brown-black lesions on roots which may coalesce and turn entire root black; root cortex may slough off to reveal the vascular tissue below; leaves of plant may be chlorotic

Cause

Fungus

Comments

Serious disease of glasshouse grown citrus trees; pathogen usually drops to non-damaging levels after tree is transplanted to the field

Management

Keep glasshouses well lit and warm during winter to encourage vigorous root growth; use good quality potting soil which provides goo aeration

Blast *Pseudomonas syringae*

Symptoms

Water-soaked or black lesions on leaf petioles;which rapidly expand along the leif midrib; cankers on twigs and branches; twigs may be girdles and die; leaves turning black and dying; black lesions may be present on fruit

Cause

Bacterium

Comments

Symptoms most severe on south facing side of tree exposed to winds

Management

In areas where disease is severe, copper fungicides should be applied in Fall and WInter prior to the first rains

Brown rot *Phytophthora* spp.

Symptoms

Water-soaked lesions on fruit close to maturation; leather tan to dark brown lesions on fruit; lesions with a pungent smell; leaves, twigs and flowers may be turning brown

Cause

Oomycete

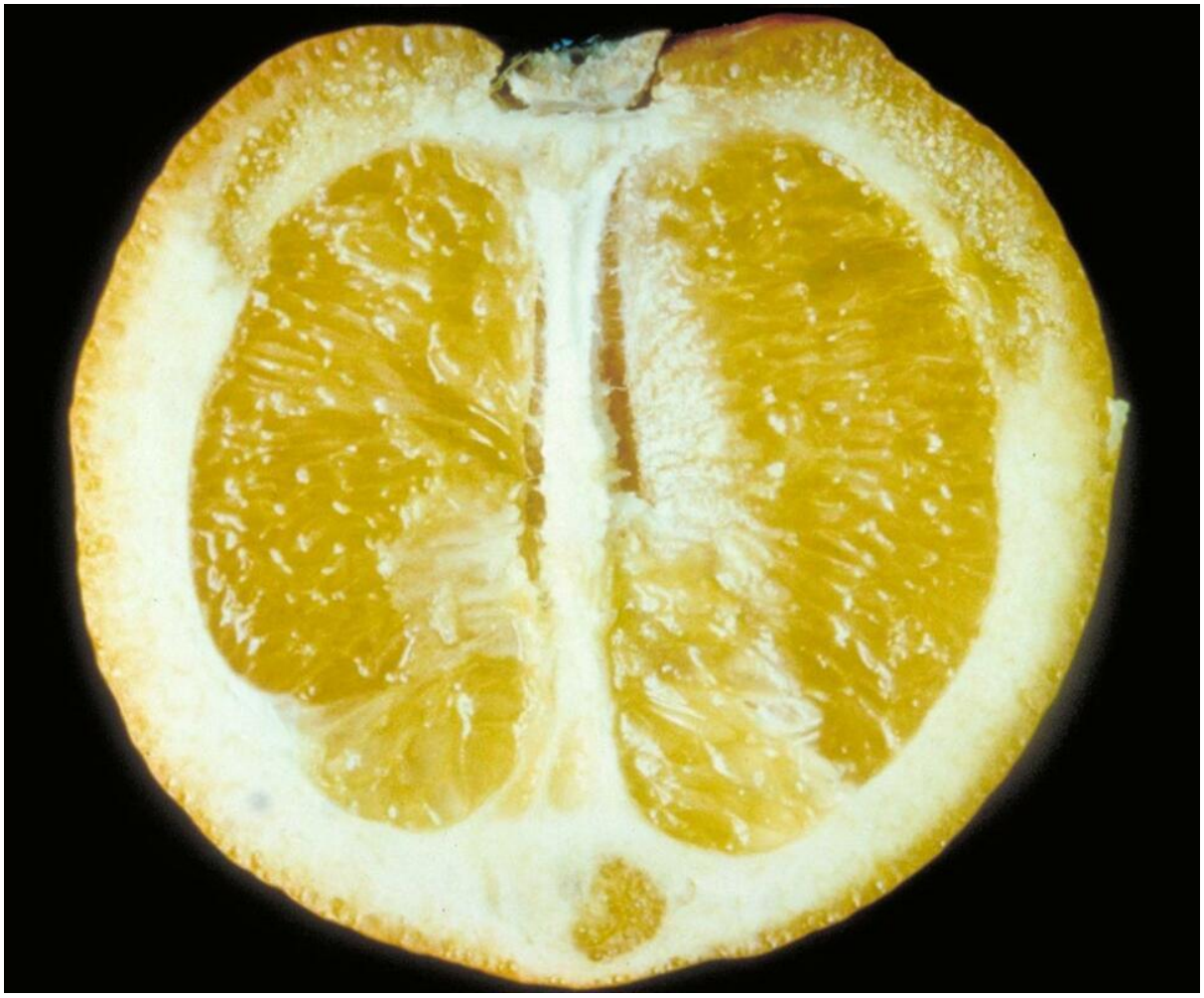
Comments

Disease emergence favored by cool, wet conditions

Management

Cultural control methods should focus on reducing leaf wetness e.g. mowing around trees to prevent grasses growing too long, proper irrigation management, pruning branches hanging low to the ground etc.; if fruit become infected, harvest should be delayed to allow all infected fruit to drop to the ground and minimizing contamination in the harvest; applications of copper fungicides to foliage can help protect the trees

Melanose *Diaporthe citri*



Melanose symptoms on orange fruit

Melanose symptoms on orange fruit

Symptoms

Small brown sunken spots which become raised and surrounded by a yellow halo; lesions eventually turn corky in texture; severe infections can cause newly emerging leaves to be crinkled and distorted; if infection of fruit occurs soon after petal fall, the pathogen causes large lesions on the fruit surface which may coalesce to produce large patches; late infection of fruit causes discrete pustules on the fruit

Cause

Fungus

Comments

Disease is spread short distance through splashing water or over longer distances by wind

Management

If young trees become infected, it is possible to control the disease by pruning but this is not usually feasible for older trees; fungicides must be applied frequently in order to control the disease

Category : Bacterial

Citrus canker *Xanthomonas axonopodis*

Symptoms of citrus canker on leaves and fruits

Symptoms

Raised lesions on leaves, often at leaf margin or tip; lesions may also be present on twigs and fruits; young lesions are usually surrounded by yellow halo; depressed brown craters formed from collapse of lesions

Cause

Bacterium

Comments

Bacteria survive in lesions; the main method of spread is via wind driven rain; bacteria may enter through pruning wounds

Management

If the disease is introduced to an area, all infected trees should be removed and destroyed; in areas where disease is endemic, windbreaks can help to reduce disease severity; cultural control of the disease should focus on controlling leaf miner populations, utilizing wind breaks and applications of copper sprays

Huanglongbing (Citrus greening) *Candidatus* Liberibacter *asiaticus*
Candidatus Liberibacter *africanus*
Candidatus Liberibacter *americanus*

Areas of quarantine for citrus greening and Asian psyllid in the USA

Symptoms of citrus greening on sweet orange

Symptoms of citrus greening on orange tree

Symptoms

Leaf symptoms of citrus greening include yellowing of one limb or one area of canopy, yellowing of leaf veins; blotchy mottling and/or green islands (spots) surrounded by completely yellow leaf tissue; twig and limbs begin to die back; fruits may drop prematurely and are often mishappen and lopsided; fruit has a bitter, salty taste

Cause

Bacteria

Comments

History *Origins and spread* Huanglongbing, or citrus greening, was first reported from Southern China in 1919 by American botanist Otto August Reinking who described a “yellow shoot” disease of citrus while evaluating diseases of economic plants in Southern China. A subsequent field survey conducted between 1941 and 1955 on citrus plants in the provinces of Guangdong, Fujian and Jiangx by Chinese plant pathologist Lin Kongxiang (Kung Hsiang) determined that that the disease likely originated in Chaozhou county in Guangdong as early as the 1870s. Lin adopted the name the local farmers had given to the disease of “huang long bing”, which translates to “yellow dragon disease”, a reference to the yellow coloration of new shoots on the infected trees. By 1936 Huanglongbing was considered a serious disease of citrus in China and it subsequently spread across Southeast Asia reaching Indonesia in 1948 and Taiwan in 1950 before spreading to the Philippines, Thailand and Malaysia in the 1950s, 60s and 70s respectively. The disease has been known by various names in different countries - “greening” in South Africa, “mottle leaf” in the Philippines, “dieback” in India and “vein phloem degeneration” in Indonesia - but in 1995 the disease was officially named Huanglongbing by the International Organization of Citrus Virologists (IOCV) and this name is now widely used to describe the disease in Africa, America and Asia. **Biology and ecology** The organism that causes Huanglongbing is a Gram-negative bacterium that is limited to the plant phloem - the

plant system responsible for the delivery of sugars from the leaves to the growing parts of the plant. The bacteria involved have so far not been isolated and cultured but the disease is believed to be caused by bacteria belonging to the genus *Candidatus* Liberibacter. It is believed that there are at least two different forms of the disease, an African heat-sensitive form, *L. africanus* which survives in cool areas with temperatures below 30-32 C, and an Asian heat-tolerant form which occurs in areas where temperatures greatly exceed 30C. A third species, *L. asiaticus*, found in .A third species, *L. americanus* was detected in citrus trees in Sao Paulo, Brazil but there is presently little information on its climatic requirements. As this species is found in the same areas as *L. asiaticus* it seems likely that is has similar requirements. **Transmission** Huanglongbing can be transmitted by citrus psyllids or by grafting. The Asian citrus psyllid, *Diaphorina citri* is responsible for the spread of the disease in Asia and Oceania, Brazil and North America whereas the African citrus psyllid, *Trioza erytreae* is the main vector in Africa and Madagascar. Both psyllid species are present the Indian Ocean islands of Reunion and Mauritius, *Citrus psyllids* Citrus psyllids are tiny (3-4 mm) sap-sucking insects that excrete a sticky, sugary substance called honeydew. Both the Asian and African citrus psyllids are mottled brown in color but the Asian citrus psyllid possesses a brown head and the African species has a black head. Adult citrus psyllids will jump and/or fly for a short distance when they are disturbed. They are usually found on the undersides of leaves, often in high numbers. When a psyllid feeds on an infected plant, it acquires the disease after 15 to 30 minutes and feeding and is able to transmit the disease to new hosts after a period of 21 days. In order to transmit the disease successfully, the psyllids need only feed on a new host for a period of 15 minutes in order for successful transmission to occur. It is hypothesized that the bacterium multiplies within the body of the psyllid prior to transmission but this theory requires validation through experiments. *Grafting* Although the primary method of spread of the Huanglongbing bacterium is via the movement of citrus psyllids, the disease can also be transmitted through grafting practices. The ability of Huanglongbing to be transmitted by grafting was first demonstrated by Lin Kongxiang through experimental work which was published in 1956. The disease in not transmitted at high rates through grafting as as not all buds on infected trees contain the bacterium.

Management

Control (i) Cultural control Once a tree becomes infected with HLB, it cannot be cured. Control is therefore reliant on preventing the disease occurring in the first place and this is achieved through strict quarantining to prevent the introduction of citrus psyllids to areas which are currently free of the pest. Areas which are subject to quarantine have restrictions placed on the movement of citrus plants, fruit, equipment and items made from citrus. Infected trees should be removed as quickly as possible from plantations and destroyed. Identification of infected trees should be achieved through several surveys to ensure that infected trees which are not yet showing symptoms are identified. In Florida, the recommendation is to scout groves at least 4 times a year for disease symptoms. **(ii)** Control of citrus psyllids Citrus psyllid populations can be controlled through the application of chemical sprays. Insecticides have proved very effective at controlling *T. eryreae* in South Africa where systemic insecticides are applied to the tree at the base of the trunk. In areas of the USA, Citrus health management areas (CHMAs) have been created to encourage neighbouring growers to work together to prevent the disease. Control strategies which have been implemented by the program include scouting, mapping and large-scale spraying to control citrus psyllids.

Stubborn disease *Spiroplasma citri*

Orange infected with stubborn disease

Orange tree infected with stubborn disease (left) beside a healthy tree (left)

Symptoms

Stunted trees; leaves shorter and broader, cupped and upright; may be chlorotic or have a mottled appearance; stunted, malformed fruits and low yield

Cause

Bacterium

Comments

Transmitted by leafhoppers; can cause serious losses in hot, dry conditions

Management

Plant only material from disease-free budwood; if disease is endemic to the are then nursery trees should be grown in an enclosure to protect the trees from vectors; if a young orcahrd becomes infected, it should be removed and replanted with healthy material

Category : Oomycete

Phytophthora gummosis *Phytophthora* spp.

Symptoms

Sap oozing from cracks in bark; bark cracking, drying and falling off; lesions girdling trunk; severely infected trees have pale green leaves with yellow veins

Cause

Oomycete

Comments

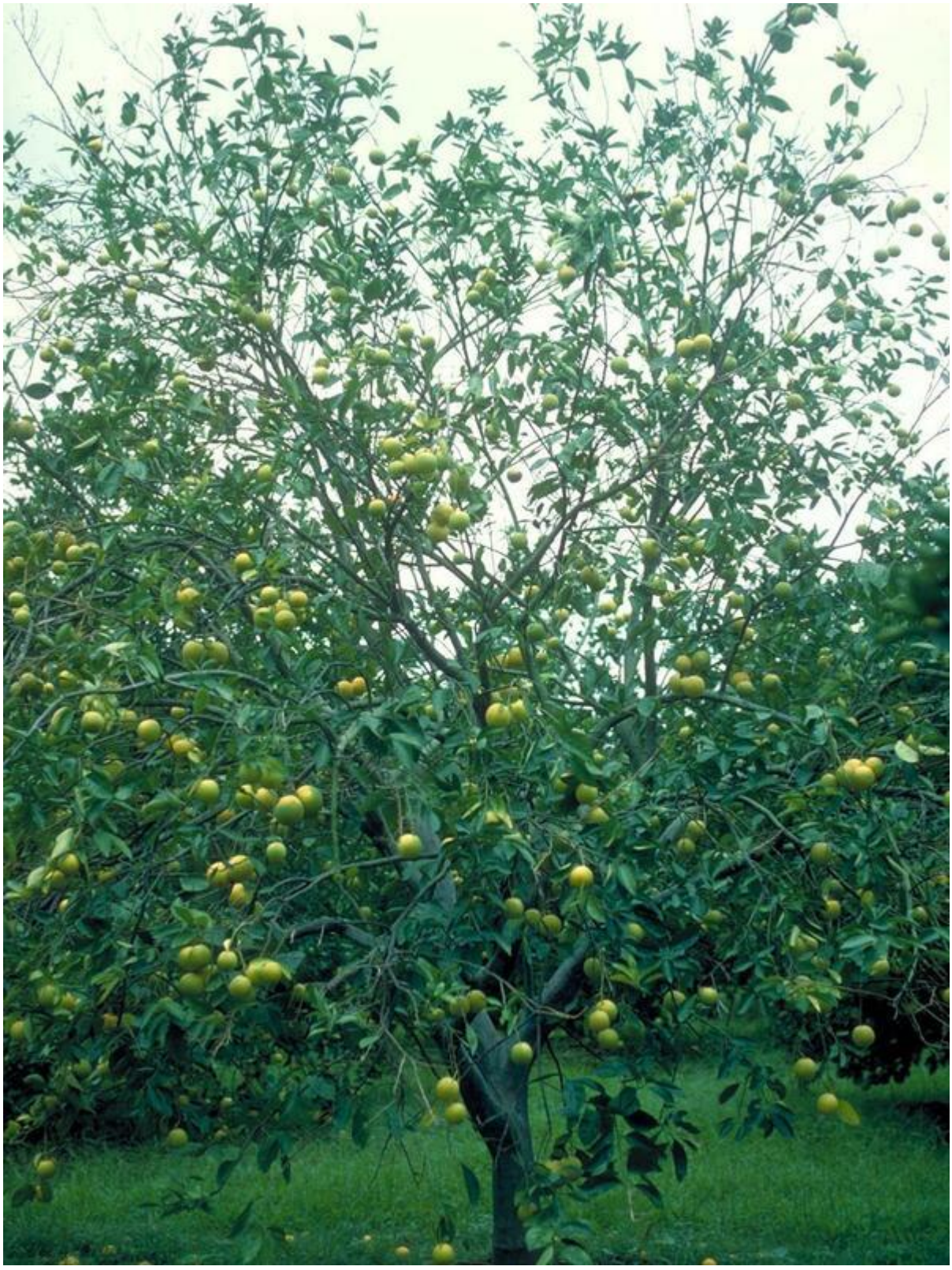
Disease can develop rapidly in moist, cool conditions; spread by water splash

Management

Only plant disease-free nursery stock; plant trees in well-draining soil and avoid injuries to bark on trunk; trunk wraps can provide protection from freezing

Category : Viral

Tristeza disease Citrus tristeza virus (CTV)



Orange tree infected with tristeza virus

Elongated pits under bud union caused by Tristeza virus infection

Orange tree infected with tristeza virus

Symptoms

Light green foliage; poor new growth; leaves may be dropping from tree; young trees blooming early; severely infected trees are stunted and bushy in appearance with chlorotic leaves and brittle twigs; some strains of the virus cause elongated pits in the trunk and branches which give the wood a rope-like appearance

Cause

Virus

Comments

Disease spread from infected grafting material or by aphids

Management

Quarantine procedures are used to control tristeza and prevent the pathogen from entering areas which are currently free of the disease

Pests

Category : Insects

Aphids (Black citrus aphid) *Toxoptera aurantii*

Symptoms

Leaves curling; leaves and twigs covered in sticky substance which may be growing sooty mold; trees may show symptoms of tristeza (see entry); insects are small and soft bodied and are black in color

Cause

Insect

Comments

Aphids transmit tristeza virus on citrus

Management

Aphid numbers tend to naturally decline as leaves harden off but can be a problem on young trees or varieties which continually produce flushes of new growth; pesticides are not generally recommended due to resistance and trees can withstand a high degree of leaf curling

Asian citrus psyllid *Diaphorina citri*

Asian citrus psyllid

Asian citrus psyllids on orange blossom

Symptoms

Tips of leaves in new growth flushes are twisted and affected leaves do not expand properly; trees may show symptoms of citrus greening (see disease entry); the insect is tiny (4 mm in length) and has a mottled brown appearance; it feeds by inserting its mouthpaarts into the plant and sucking plant sap and as well as injecting toxins into the plant, it also transmits the deadly citrus greening disease; the insect feeds at an angle to the plant which makes it resemble thorns on the plant leaves

Cause

Insect

Comments

The Asian citrus psyllid attacks all varieties of citrus

Management

In the home garden, frequent applications of organic pesticides can be used to control the Asian citrus psyllid; applications must be frequent to be effective as these chemicals are usually very short lived in the environment; parasitic wasps have been released in California to control the psyllid in residential areas; in commercial orange production insecticides should be applied to control the insects as the spread of citrus greening has the potential to devastate commercial citrus production