

Traditional orchards: fruit tree health

This information note provides information on identifying, and managing for, the main pests, disease and nutrient deficiencies that may affect a traditional orchard. Other information notes provide guidance on site and tree selection, planting and establishing fruit trees, an introduction to pruning, formative pruning of young trees, maintenance pruning, the restoration and management of mature and neglected orchards, and orchards and wildlife. For an explanation of terms used in this leaflet see the information note *Orchard glossary*.

Key points

- The addition of nutrients is usually unnecessary and may harm trees by disrupting their mycorrhizal associations.
- Where applied, fertilisers should be confined to beneath tree canopies rather than across the whole sward.
- Pesticides and fungicides should only be used to control specific recorded pests and diseases.
- Organic methods should be used where possible.
- Extensively managed, traditional standard orchards are less likely to suffer from significant pest and disease infestations or nutrient deficiencies than commercial bush tree orchards. However, problems can still occur.

Weed competition

Weed competition for water and nutrients can severely restrict growth and cropping of fruit trees, particularly young trees. The area around the base of a new tree should be kept weed free for at least three years after planting.

Rampant weed growth, especially dominant perennials such as bramble and other scrub, can also affect mature trees. These should be kept under control and not allowed to overwhelm the orchard. In areas that need to be cleared the first step is to physically remove the growth, by hand or mechanically. Subsequent control of re-growth may be by hand, machine or grazing.

Chemical control through the use of herbicides should only be practised when absolutely necessary.

Nutrient status

The nutrient status of the soil can be determined by having it analysed. The pH, a measure of soil acidity, should ideally be between 6.0 and 6.5 for optimum fruit tree growth and production. If it falls outside this range, nutrient deficiencies may be a problem. Where trees show signs of deficiencies, they can be remedied by the application of fertilisers, preferably organic. The most common nutrient deficiencies are detailed below.

Nutrient applications

The use of fertilisers should be considered carefully. Large and/or frequent applications will result in a decrease in the species diversity of grassland and may harm trees over time by interfering with their mycorrhizal associations. Applying nutrients can also stimulate soft, weak growth that is vulnerable to pests and disease. If fertilisers are used, slow release and organic fertilisers are better than instant-boost chemical fertilisers. Well-rotted farmyard manure is the best fertiliser.

Fertiliser application to unimproved grassland should be avoided as it may damage the botanical interest. Swards identified as having a particularly low organic content (often a result of hay cutting over a number of years) may benefit from an application of

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farmyard manure. Unimproved grasslands on neutral soils should receive an application of well-rotted farmyard manure not exceeding 20 tonnes/hectare every five years, and only 5 tonnes/hectare or less annually. To protect the specialised floras on unimproved acidic and calcareous grasslands, farmyard manure should not be used at all. Where trees show signs of nutrient deficiency on species-rich grassland, apply nutrients only underneath the tree canopy and leave the bulk of the sward unfertilised.

Fruit trees and mycorrhizae

A tree's root system extends a long distance and, over time, develops associations with fungi called mycorrhizae. These beneficial fungi colonise the roots and help the tree by extending its root system into the surrounding soil, via an extensive network of thread-like filaments (up to 20 metres per teaspoon of soil). They extract nutrients and other elements from a large soil volume and exchange these for carbon from the plant. Mycorrhizae help maintain tree vigour by making nutrients and water available at times of stress, as well as acting as natural blocks to the passage of root pathogens.

The application of fertiliser can result in the loss of these mycorrhizal fungi as the trees abandon their associations in response to the temporary abundance of nutrients. Where an orchard has a history of being fertilised the mycorrhizae associations may not be established and in these situations fertiliser may continue to be used. Mycorrhizal fungi operate within certain pH regimes, so liming (which raises the pH) can have damaging effect on the mycorrhizae and should be avoided.

Nutrient deficiencies

Nutrient shortages show as recognisable signs on the foliage which indicates the need to correct the problem. If a deficiency is suspected, samples of typical leaves should be shown to an expert so they can advise on the appropriate fertiliser to apply.

Nitrogen deficiency

Cause This is not usually a problem, as atmospheric nitrogen and nitrogen fixed by legumes maintain soil nitrogen levels. This deficiency can occur when woody material such

as bark chippings is added to the soil. Soil organisms will utilise any nitrogen in order to break down this material, thus making it temporarily unavailable to growing plants. This is more likely to be a problem on light soils and those with a low organic matter content.

Symptoms A pale greenish colour of the leaves, which turn yellowish in extreme cases. This is seen first on the older foliage (which is often smaller than usual). Growth may be poor or stunted and flowering and fruiting delayed. Fruits will be small, although highly coloured.

Remedy This shortage may be corrected by applying a nitrogen-containing fertiliser during the growing season, or a composted mulch such as well rotted farmyard manure, and in the longer term by building up levels of organic matter in the soil. Foliar sprays can also be applied.

Phosphorus deficiency

Cause This is primarily caused by leaching and is therefore most common in areas of high rainfall, especially on poor soils.

Symptoms These include poor growth and the foliage turning a dull blue-green or purplish colour (not yellow), older leaves being affected first. Fruits are small and acid tasting.

Remedy It can be controlled by applying organic sources of phosphorus such as rock phosphate, or superphosphate fertiliser.

Potassium deficiency

Cause Most common on light, sandy soils and chalky or peaty soils with a low clay content. It is also found on heavy clays with a poor structure.

Symptoms This deficiency is indicated by the edges of the leaves curling up and going brown as if scorched, with brown patches on the undersides, and yellowing of leaf veins. Purple spots may also appear on the leaf undersides.

Remedy This can be remedied by applying bonfire ash, seaweed meal, composted bracken, comfrey liquid or other organic potassium-rich fertilisers. An excess of potash, however, can upset the balance so that fruit is produced at the expense of young growth. In the longer term the

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soil structure should be improved by adding plenty of well-rotted compost or manure. Wood ash has a high potassium content but should be composted first, as it is in a highly soluble form.

Manganese deficiency

Cause This is sometimes a problem on poorly drained soils with a high organic content. Manganese may be unavailable to plants where pH is high.

Symptoms Shown by a yellowing between the veins of older leaves. Brown spots may also appear on leaf surfaces and younger leaves may be rolled upwards. Severely affected leaves turn brown and wither.

Remedy This can be remedied by improving soil structure and drainage.

Diseases

Trees may be affected by various diseases which can reduce yield, damage or even kill them. Regular inspection of an orchard is important. Most common diseases such as scab, fireblight, silverleaf, bacterial canker of cherries and cobnuts, and canker of apple and pear are best controlled by pruning and removing affected branches and leaves at the first signs of infection. Perimeter hedges and trees should also be checked for these diseases. All infected material should be removed and burnt (well away from the canopy of any fruit or hedgerow trees). Potential problems can be reduced by growing a mixture of varieties and planting those that are adapted to local conditions or those that are naturally disease-resistant.

Creating good site conditions helps to reduce the risk of diseases as stressed trees are more vulnerable to infection. Well-spaced trees that are pruned to allow in plenty of air and light are much less likely to suffer from disease than over-crowded trees. A combination of regular mulching, watering and weeding helps prevent trees from becoming stressed, particularly when they are young. Pruning in the right conditions (ie avoiding wet and frosty weather, and only pruning stone fruits in summer) will also help to reduce the chances of infection.

Pests

Defoliation is often a sign of insect pests. These may include aphids or winter feeding caterpillars. Codling moths, whose caterpillars can cause maggoty apples, are a common pest. In a traditional orchard, most pests will be controlled by predators before they reach unacceptable levels. Where necessary, many pests can be controlled using biological or organic methods.

Chemical pest and disease control

Traditional orchards managed without pesticides provide the richest wildlife habitat. Using any insecticide, herbicide or fungicide, whether modern or traditional (such as sulphur washes) will be detrimental to wildlife. Their use will alter the natural balance of habitats and species present, often removing beneficial predators as well as pests and leading to the need for further spraying. Therefore, pesticides should be used sparingly, or preferably not at all. Orchard management aimed at maximum wildlife conservation will inevitably affect fruit production to some degree.

Broad-spectrum sprays should be avoided as they also eliminate beneficial predatory and pollinating insects. Where commercial considerations make the use of pesticides necessary, targeted use of specific pesticides can still allow orchards to support a diverse range of wildlife by restricting the impacts on natural predators such as predatory bugs, lacewings, ground beetles, ladybirds, hoverflies, midges, parasitic flies and wasps, predatory mites (such as *Typhlodromus pyri*), spiders and soil living nematodes. Maintaining these and other 'neutral' invertebrate species, which are neither directly harmful nor beneficial, will provide alternative food for predators and will contribute to the increased diversity of invertebrates and vertebrates.

Organic production and biological pest and disease control

Modern intensive bush orchards receive, on average, eighteen spray applications each year. However, fruit can be grown without the use of chemicals if a certain amount of interference from pests and diseases and the odd blemished skin can be tolerated. Organic control depends largely on prevention rather than cure. Instead of

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resorting to chemicals, birds and natural invertebrate predators can be encouraged by providing suitable habitats, for example, areas of tall herb vegetation and nectar-rich flowers that provide food and overwinter cover. Ladybird and lacewing 'nest boxes' in which insects overwinter can be put in the trees. Mosses and lichens left undisturbed on trees provide ideal habitat and protection for insects. Birds can be encouraged by additional feeding and, if there are no mature trees with suitable nesting sites, provided with bird boxes.

Biological pest controls such as pheromone traps can be used in spring from late May onwards to control pest species such as codling moth. It may also be possible to apply sprays containing naturally occurring diseases and parasites specific to a range of pests.

If time allows, one of the best ways to control pests such as aphids, particularly on young trees, is to remove or rub them off by hand. Grease bands can be placed round the trunks of the trees to prevent moths and other insects climbing up into them to overwinter or to feed in the spring. Codling moths can be controlled by tying cardboard or sacking around the trunk in the summer when the caterpillars are looking for somewhere to pupate; in the winter these materials can be removed and destroyed.

Grey squirrels are a severe pest in cobnut plants. Where trees have a clear stem, baffles may prevent squirrels from accessing the tree.

Further information

This note is aimed at managers of traditional orchards and agri-environment scheme land management advisers. Other Natural England Technical Information Notes include:

- *Traditional orchards: a summary*
- *Traditional orchards: site and tree selection*
- *Traditional orchards: planting and establishing fruit trees*
- *Traditional orchards: an introduction to pruning*
- *Traditional orchards: formative pruning of young trees*
- *Traditional orchards: maintenance pruning*
- *Traditional orchards: restoration and management of mature and neglected orchards*
- *Traditional orchards: orchards and wildlife*
- *Traditional orchards: glossary*

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