

## **FRUIT & VEGETABLE INDEX**

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# FRUIT & VEGETABLES

## INTRODUCTION TO FRUIT CULTIVATION

### Introduction

Growing your own fruit is pleasurable and rewarding. It also enables you to grow organically if you choose. Many fruit such as raspberries always seem to be expensive in the shops so they are always a welcome treat. Fruit trees such as apples and cherries can be highly ornamental in their own right making it possible to incorporate them into an ornamental garden. If space is limited many types of fruit respond well to container growing.

### Types of fruit

Fruit can be divided into two groups:

- Soft fruit
- Tree fruit

### **Soft fruits include:**

- Bush fruits such as currants and gooseberries
- Cane fruit such as raspberries, blackberries and hybrid berries such as loganberries
- And lastly strawberries, which are in a group of their own

### **Tree fruits (sometimes known as top fruit) include:**

- Pome fruits such as apples and pears
- Stone fruits such as plums, peaches, nectarines and apricots

### The cultural requirements of fruit

**Aspect.** The majority of fruit requires a sunny position. A light shade will be tolerated by some such as the bush and cane fruit but it may reduce the yield. Stone fruit such as peaches and apricots must have a sunny site in order for the fruit to ripen. A site faces south or southwest is generally best.

**Shelter** is very important to encourage pollinating insects, which are essential for fruit development. Fruit can be damaged on the bush or blown off the tree prematurely if the site is exposed and windy. Frost pockets should be avoided as many fruit blossom early in the season and if the blossom is damaged the fruit will fail to develop. A semi-permeable barrier is preferable to a solid one as it may cause turbulence. A solid barrier may also trap frost.

**Soil.** Fruit require a good depth of topsoil – about 50cm or more. The soil should be fertile, well drained loam, which is rich in organic matter. Even if you do not start with such soil the addition of plenty of well-rotted organic matter and careful cultivation can improve it enormously. A slightly acid soil with a pH of around 6.5 is preferable.

### Soil Preparation

Thorough soil preparation is essential, as the fruit garden will be a permanent feature. Pay particular attention to the incorporation of well-rotted organic matter, as this will increase both the soil fertility and the soil structure.

### Buying plants

It is preferable to purchase fruit trees or bushes from specialist nurseries. Mail order is still one of the best ways to purchase fruit trees and bushes. Tree and bush fruit are generally available as bare root or container grown specimens. Cane fruit are usually bought in bundles with the roots wrapped in polythene. It is wise to purchase younger plants, as they tend to establish better. Autumn and Spring are the most suitable times for planting.

### **Rootstocks**

Many fruit trees are grafted onto rootstocks of closely related plants. These rootstocks impart qualities such as health and they help to control the size of the tree. When purchasing a fruit tree the label should state the type of rootstock it is on.

### **Tree forms**

**Unrestricted** tree fruit are grown as bush, standard or half standards. They receive formative pruning to develop this shape.

**Restricted** are grown in a highly trained manner and require thorough formative pruning to develop the shape and form.

### **Protection**

**Fruit cages** are useful for protecting fruit from birds and other animals. They are usually only used for the soft fruit such as strawberries and currants. **Horticultural fleece** is invaluable for protecting fruit blossom from frosts. **Hessian** or sacking may be draped over wall trained specimens when frosts are forecast. See below.

Individual fruit can be protected with **paper or muslin bags**, which are secured around the fruit.

### **Weed control**

Weeds compete for moisture, space and nutrients and should be controlled. Total herbicides such as Glyphosate can be used but care must be taken, as they will not discriminate between weeds and desirable plants. Hand weeding or hoeing is often a better choice.

### **Pests and diseases**

Fruit is a food source for pests as well as humans. Diseases will proliferate from time to time. Thorough hygiene is important and will go along way towards reducing the occurrence of pests and diseases.

### **Pruning**

Regular pruning will promote the health of the overall plant and the development of fruit. Pruning will also be dealt with later.

## **FRUIT & VEGETABLES**

### **APPLES (*Malus sylvestris* var. *domestica*)**

#### **Introduction**

Apples are one of the commonly grown fruit. There are varieties suitable for cooking, eating and for cider making. Apples can be grown as restricted and unrestricted forms (see 'Introduction to Fruit' for further details). They can also be grown in containers.

All apple trees require another apple to pollinate them. Some apples are sold as 'self pollinators' e.g. 'James Grieve' but they will produce a better crop if cross pollinated. Apples are divided into pollinating groups of cultivars that flower at the same time and can therefore pollinate each other. Some apples are self-sterile and will not pollinate others. Triploid varieties are also not suitable as pollinators e.g. 'Bramley's Seedling'.

Apples produce fruit either on spurs (clusters of fruiting buds on the main branches) and are referred to as **spur bearers**. Alternatively they can bear their fruit near to the tips of branches, in which case they can be referred to as **tip bearers**. This makes an enormous difference when pruning and selecting apples. Tip bearing apples are not suitable for growing as restricted forms such as an espalier or cordon due to the manner in which they are pruned.

#### **Apple rootstocks**

Apples are always grafted onto rootstocks. The rootstock controls the eventual height and spread on the tree making harvesting easier and ensuring the health and vigour of the tree. The most commonly used rootstocks are prefixed with the initials M and MM. This stands for Malling and Malling Merton – these are research stations where the rootstocks were developed.

There are many different rootstocks available, all of which have different qualities. Some are very dwarfing and others semi dwarfing. Vigorous rootstocks are available but are not commonly used. The choice of rootstock used will depend on several things:

- The space available
- The form of the tree. Is it a restricted form or not?
- The type of soil. A tree on poor soil will require a more vigorous rootstock.
- The vigour of the apple cultivator chosen. Triploid cultivators will be more vigorous than diploids and should be grafted onto a less vigorous rootstock.

When purchasing trees the rootstock should always be recorded on the label. For the average allotment plot situation. M9 & M27 are recommended for a very dwarf tree, M26 for a dwarf tree and MM106 for a semi dwarf tree.

#### **Recommended apple cultivars**

##### **Dessert apples**

Dessert apples tend to be sweeter than those for cooking or pressing. They also require more sun to ripen. There are many to choose from.

Here are a few suggested cultivars:

Cultivar	Pollinating group	Spur bearer = SB Tip bearer = TB	Qualities
George Cave	2	SB	An early cropper with a firm texture and a pleasant taste. A heavy cropper.
Beauty of Bath	2	SB	An early apple with a softer texture. Cropping can be irregular.
James Grieve	3	SB	Crops in mid season producing a softer apple with a refreshing flavour. Crops well.
Worcester Pearmain	3	TB	A firm apple with a very good flavour. Crops well. Fairly resistant to mildew but prone to scab.
Jonagold	4	SB	A <b>triploid</b> cultivar which produces late season apple with good flavour. Crops well. Not suitable as a pollinator.
Orleans Reinette	4	SB	A late apple that produces crisp well flavoured fruit. Fair cropper.
Laxton's Superb	4	SB	A late season apple with an aromatic flavour. Sometimes biennial.

### **Culinary apples**

Culinary apples or cooking apples tend to be a little more acidic and generally do not require as much sun.

Cultivar	Pollinating group	Spur bearer = SB Tip bearer = TB	Qualities
Arthur Turner	3	SB	An excellent cropper that produces acidic fruit. An early cropper.
Bramley's Seedling	3	TB	A heavy cropper which produces excellent acidic fruit. Self sterile so not suitable as a pollinator. Late cropping.
Lane's Prince Albert	3	SB	A late season cropper which produces a lot of acidic fruit.
Monarch	4	SB	A late apple with excellent flavour. Tends to bear biennially.
Lord Derby	4	SB	A late season apple with good flavour that crops well.

See 'harvesting' for a rough guide to early, mid season and late apples.

### **Site and soil**

Apples require an **open sunny site** with shelter from both frost and excessive wind to encourage pollinators. Culinary apples tolerate a light shade but dessert apples require sun in order to ripen.

Apples prefer a **deep fertile loam**. It should be moisture retentive yet well drained. It is important to carry out thorough soil preparation prior to planting an apple tree, as it is a permanent feature on your allotment plot. A pH of between 6-6.5 is ideal.

## Planting

Apples can be purchased either as container grown or as bare root specimens. Ready trained apple trees are available at a variety of growth stages.

## Cultivation

Many of the cultivation tasks are the same as for other trees and shrubs. The following information is for cultivation of an established apple tree.

Protect the blossom from **frost**. Drape old sheets or horticultural fleece over smaller trees when frost is forecast. Remove during the day. Keep the base of the **tree weed** free. Weeds and grass compete for nutrients and water, which is undesirable, when the tree is young. The ground under a tree may be grassed over when it is mature to control the vigour of a tree.

The tree can be **mulched** with material such as well rotted manure or well rotted garden compost to conserve moisture. Ensure that irrigation is regular when rain has not fallen. Water supply at the time of fruit set is particularly important. Dryness at the roots can cause failure to set. Water is best delivered at ground level. Water supply at the time of fruit set is particularly important. Dryness at the roots can cause failure to set. Irregular watering may lead to poor uptake of calcium resulting in 'Bitter pit'.

**Fertilise** the tree annually. For dessert apples apply:

- 20g/m<sup>2</sup> of Potassium sulphate in late January.
  - 35g/m<sup>2</sup> of Ammonium sulphate in late February.
- Every three years apply:
- 70g/m<sup>2</sup> of Superphosphate in late January.

For culinary apples **double the quantity of Ammonium sulphate**. Larger trees should be fertilised from the 'drip line' inwards. Check for individual nutrient deficiencies and treat accordingly. **Check tree stakes** and loosen tree **ties** if necessary. Dwarf and semi dwarf trees will require staking all their life, as dwarfing rootstocks do not tend to put down anchorage roots. **Thin the fruit**. In June the tree will lose a certain amount of fruitlets naturally. This is known as the **June drop**, it is thought to be nature's way of getting rid of any malformed fruit. It is beneficial to carry out additional thinning after the June drop in order to give the fruit room to develop.

Remove sufficient fruitlets to allow **10-15cm between dessert** apples and **15-20cm between culinary apples**. Fruit thinning can help prevent a heavy crop one year followed by little or no crop the following year (**biennial cropping**).

## Pruning

Pruning of fruit trees is carried out to form the shape of the tree, to promote the production of fruit and to maintain the health and general vigour of the tree. There are two kinds of pruning that are carried out:

- **Formative pruning** to develop the shape and form.
- **Routine pruning** to promote the fruiting as well as general health and vigour.

The manner in which both types of pruning are carried out depends on whether the tree is a **restricted form or not** and also the way in which it bears fruit – whether it is a **tip bearer or a spur bearer**.

### **The formative pruning of a bush**

Choose a feathered maiden (a one year old with side shoots).

1. After planting cut back the leader to about 65cm above ground level.
2. Leave 2-3 well spaced out laterals that radiate outwards, these laterals will form the basis of the branch system.
3. Shorten these laterals by two thirds to an upward facing bud.
4. Remove all other laterals.

1. The following winter there will be short growths arising from the laterals selected the first winter, shorten these by a half to build up the framework.

2. At the same time remove any weak, crossing or damaged growth.

### **Spur thinning**

The spurs may require thinning to maintain productivity. This involves the removal of some of the spurs on a 'spur system' and should be carried out in winter.

### **Routine pruning of an unrestricted form**

When pruning restricted forms it is essential to first establish whether it is a tip bearer or a spur bearer. This can be done by looking up the cultivar in a book. If you do not know which cultivar you have you could send some fruit for analysis to a specialist centre or you could make an educated guess after observing the fruit habits for a season. Pruning takes place in winter between November and January.

### **Pruning spur bearers**

Prune back all laterals to between two to six buds from their base (depending on their vigour). The leader should be shortened by about one third.

### **Pruning tip bearers**

Lightly trim excessively long laterals but keep pruning to a minimum focusing on thinning out any over crowded laterals.

### **Harvesting and storage**

A rough guide to the timing of harvest. This will of course vary from year to year.

Early apples = late July

Mid season = August/mid September

Late season = mid September/October

Early ripening apples should be picked just before they are fully ripe. Late maturing apples for storage must not be picked too soon, as they will shrivel in storage.

Wrap the individual fruits in greaseproof and store in slatted wooden boxes in a cool dark place.

### **Pests and diseases**

Apples fall prey to a number of pests and diseases. These include:

- Codling moths
- Red spider mites
- Powdery Mildew
- Bitter pit

**Codling moth** (*Cydia pomonella*)

**Type:** a chewing pest

**Symptoms:** the caterpillar of this moth eats into the flesh of the apple producing extensive tunnels within the mature fruit.

**Life cycle:** the adult female lay flat single eggs on fruits and leaves in June/July. These eggs hatch in two weeks and immediately tunnel into the fruit often through the remains of the flower leaving no visible point of entry. The caterpillars feed in the fruit for about a month working toward the core. When they have finished feeding they leave the fruit and spin cocoons under loose bark or inside tree ties. Most caterpillars stay in the cocoons until the following season but some pupate and form a second generation of adults in September.

**Control:** Cultural: encourage birds especially blue tits. These will help to reduce infestations and will seek out over wintering cocoons. Chemical methods are also available.

## FRUIT & VEGETABLES

### PLUMS (*Prunus* spp.)

#### Introduction

There are various different types of plums commonly grown. They include European plums, gages and damsons amongst others. There are plums suitable for both eating (dessert plums) and culinary purposes. Gages tend to be eaten fresh, as they are sweet and palatable whereas damsons are generally used for culinary purposes.

#### Pollination

Some plums are self-compatible and do not require cross-pollination. Others will require cross-pollination. See the table below for further information.

#### Rootstocks

Plums are grafted to control their eventual height. The most common rootstocks are dwarfing Pixie and the semi-dwarfing St Julien A. A plum on the rootstock Pixie will reach about 2m whereas a plum on St Julien A will reach about 4m.

#### **Recommended dessert cultivars**

Cultivar	Flowering group	Self fertile = SF Self sterile = SS Partly self fertile = PSF	Season of harvest	Qualities
Early Laxton	3	PSF	Early	A dual purpose plum with sweet juicy yellow fruits. A heavy cropper. Not too vigorous.
Victoria	3	SF	Mid	Another dual purpose plum with good flavour. Large pale red fruits that are oval in shape.
Old Green Gage	5	SS	Mid	Excellent sweet flavour. Small yellow-green fruits. Vigorous.
Late Transparent	5	SS	Late	A gage with large round juicy greenish-yellow fruits.

#### **Recommended culinary cultivars**

Cultivar	Flowering group	Self fertile = SF Self sterile = SS Partly self fertile = PSF	Season of harvest	Qualities
Early Rivers	3	PSF	Early	Small round fruits that are purple-blue in colour. Good flavour, crops well.
Purple Pershore	3	SF	Mid	Juicy fruits that are purple-blue in colour. Crops regularly.
Marjorie's Seedling	5	SF	Late	Large purple-blue fruits with yellow flesh. Vigorous yet upright.
Prune syn Shropshire	5	SF	Late	A damson with small oval blue-black fruits with yellow flesh.

**See harvesting information for a rough guide to harvest times.**

### **Site and soil**

Plums flower earlier than other tree fruits and may therefore require protection from frosts. They will require a sunny sheltered site to promote ripening and to encourage pollinators. As with many fruit the dessert cultivars require more sun than the culinary ones. Gages on particular require a sunny site.

The soil should be a deep fertile loam that is free draining yet moisture retentive. Plums are not overly fussy and will tolerate a wide variety of soils as long as they are not chalky and are well drained.

### **Planting**

Plums can be grown as bush, half standards, standards or fans. Gages are suited to fan training on a south or west-facing wall. Plums are available as bare root or container grown specimens. Plums on St Julien A will require staking for the first two to three years, those on Pixie will require permanent staking.

### **Formative pruning**

The formative pruning will depend on the form of tree grown. Pruning should not be carried out in winter as this increases the risk of silver leaf disease. Formative pruning is carried out in the spring and once established the routine pruning is carried out in summer. Choose a feathered whip with a good selection on lateral branches.

**The first spring** – select 3 or 4 evenly spaced laterals – the highest should be 90cm above the ground. Trim these by two-thirds. Remove the leader above the topmost lateral and remove any other laterals.

**The second spring** – select 3 or 4 of the strongest sub-laterals and prune these back by half. Remove all other sub-laterals.

### **Cultivation**

**Protect from frost. Check the stake** and loosen the tie as and when necessary. Keep the base of the tree **weed free** (plums on St Julien A and Pixie should not be grassed down). Take care not to damage roots near the surface as this may cause suckering. **Mulch** regularly with well-rotted manure.

Apply an annual top dressing of fertiliser. In early spring apply a balanced fertiliser such as Growmore @ 100g/m<sup>2</sup> or Blood, Fish and Bone @ 70g/m<sup>2</sup>. An additional application of a nitrogenous fertiliser such as Ammonium sulphate @ 35g/m<sup>2</sup> is beneficial in late March.

**Irrigate** when rain has not fallen. The period after fruit set while the fruit is developing is particularly important. Ensure a regular supply of water otherwise the fruit will burst. Apply 20 litres/m<sup>2</sup>.

**Thin the fruit** if (only if it is a particularly heavy cropper) to give the individual fruit room to develop and to help reduce the weight on the branches. Thinning will also improve the flavour of the crop and will help to prevent biennial cropping. Thinning should be carried out once the stones have formed, thin about 8cm apart.

**Protect against birds**, draping netting or the growing in fruit cages is the only way to ensure birds do not damage the fruit.

### **Routine pruning**

The routine pruning of plum trees is carried out in summer. It is not complicated. Simply removed excessively vigorous and awkwardly placed growth. Mature trees may require some thinning.

### **Harvesting**

A rough guide to cropping times:

**Early** = early August

**Mid** = late August/early September

**Late** = October/early November

Fruits will not all ripen at the same time and it will be necessary to go over the tree several times. Dessert plums and gages for eating are left on the tree to fully ripen. Culinary plums and damsons for cooking and preserving are best picked under ripe. Pick plums with the stalks intact. Fresh plums do not keep well. Culinary plums and damsons may be bottled or made into jam.

### **Pests and diseases**

Plums are susceptible to attack from:

- Aphids
- Winter moth caterpillars (see the section on 'Sweet Cherries')
- Silver leaf
- Bacterial canker (see the section on 'Sweet Cherries')

### **Mealy plum aphid** (*Hyalopterus pruni*)

A green aphid with a blue tinge and a powdery wax coating.

### **Silver leaf** (*Chondrostereum purpureum*)

**Hosts:** apples, cherries, apricots and plums.

**Type:** a common and widespread fungal disease.

**Symptoms:** leaves develop a silvery sheen, which is usually confined to a single branch but soon spreads. The wood of affected branches displays a dark brown discoloration. Entire branches die back. In the late summer affected branches that have died back may produce small purple crust like fruiting bodies.

**Control:** do not prune in winter, as this is when infection is most likely to take place.

The use of sealant plants is recommended. Remove infected limbs, cutting 15cm below the stained wood and burn – trees can often survive attack from silver leaf.

If silver leaf is known to be a problem avoid susceptible cultivars such as 'Victoria'. Gages and damsons seem to be more resistant than European plums.

The rootstock Pixie offers some resistance to silver leaf.

There is no effective chemical control.

## FRUIT & VEGETABLE

### SWEET CHERRIES (*Prunus avium*)

#### Introduction

The sweet or dessert cherry is derived from *Prunus avium*, which is native to Europe and Western Asia. *Prunus avium* is an attractive tree that is covered with white cherry blossom in the spring. The fruits range in colour from yellow and red to almost black. The fruits are sweet and suitable for eating raw, the one draw back is the room that sweet cherry trees take – they can reach 7m in height and spread. If space is a problem acid cherries should be considered – they can take up less room but are really only suited to culinary use.

#### Pollination

Most cherries require cross-pollination. The pollination requirements can be confusing. Cherries are divided into groups, which **will not** pollinate each other. These are known as incompatibility groups. The good news is that there are several self-pollinating sweet cherries available and several 'universal pollinators' that will pollinate any cherries that flower at the same time.

Sweet cherries are also grouped according to when they flower, so when choosing two cherries to cross-pollinate each other they should be in **different** incompatibility groups but in the **same** flowering group.

#### Rootstocks

Sweet cherries are grafted onto either 'Colt'; a semi-dwarfing rootstock, or Malling F12/1; a vigorous rootstock. Two new dwarfing rootstocks are being developed, look out for 'Inmil' and 'Camil'.

#### Suitable cultivars

Cultivar	Flowering group	Incompatibility group	Season of harvest	Other info	Qualities
Early Rivers	1	1	Early – mid June	Self sterile	Very good quality fruit with excellent flavour. Reliable heavy cropper.
Noir de Guben	1	Universal pollinator	Early – late June	Self sterile	Juicy dark red almost black fruits. Resistant to canker.
Merton Glory	2	Universal pollinator	Mid season Mid July	Self sterile	Large round pale fruits with yellow flesh. Regular cropper.
Merton Favourite	2	2	Late Late July		Excellent flavour, large dark red almost black fruits. Fairly compact.
Stella	4	Self fertile	Late Late July	Self sterile	Crops well and the fruits have good flavour.

#### Site and soil

Sweet cherries prefer a deep fertile loam with a pH of 6.7 – 7.5. The soil should be well drained to help prevent bacterial canker. They require a sunny sheltered site to encourage pollinators. Cherry blossom is very prone to frost damage so avoid frost pockets.

## **Planting**

Sweet cherries are particularly suited to being fan trained against a wall or fence. The wall or fence must be sturdy and at least 2.5m in height and 5m in width. Erect a support system of stout wire spaced 15cm apart prior to planting to train the cherry on.

They can also be grown as a bush, half standards and standards. Allow 5.5m between fans, 7m between bush and 10m between half standards and standards.

Sweet cherries are available as bare root or container grown specimens. Follow the usual advice for preparing the soil and planting the tree.

## **Formative pruning of a fan trained sweet cherry**

All pruning should be carried out in spring just as the buds burst to help prevent infection from bacterial canker. Choose a feather maiden with at least two strong laterals growing each side of the main stem.

**The first year** – trim the leader back to just above the second lateral. Remove all other laterals. Attach these to canes held at 35°.

**The second year** – shorten each leader to 30cm cutting just above a bud.

**The third year** – cut back all the leaders leaving 45cm of growth.

## **Cultivation**

Protect the blossom **against frost** by draping horticultural fleece over the tree when frost is forecast. Keep the base of the plant **weed and grass free** for the first four or five years. After this it may be grassed over and this will help curb the vigour of the tree.

**Mulch** young trees with well-rotted garden compost. Apply a dressing of **balanced fertiliser** such as Growmore @ 100g/m<sup>2</sup> or blood, Fish and Bone @ 70g/m<sup>2</sup> in early spring.

**Irrigate** when rain has not fallen. The period after fruit set while the fruit is developing is particularly important. Ensure a regular supply of water otherwise the fruit will burst. Apply 20 litres/m<sup>2</sup>.

## **Routine pruning of an established tree**

Sweet cherries fruit mainly on spurs of two-year-old wood. The routine pruning is carried out in summer (about July) and involves cutting back the new growth (that seasons growth) to five leaves in length. The developing cherries will be visible at the end of last season's growth.

## **Pests and diseases**

Sweet cherries will fall prey to:

- Cherry Blackfly (Aphid)
- Winter Moth Caterpillars
- Bacterial canker
- Silver leaf (this is covered in the section on 'Plums')

**Cherry Blackfly (Aphid)** *Myzus cerasi*

**Winter Moth Caterpillars** *Operophtera brumata*

**Type:** Chewing pest 30mm in length

**Symptoms:** the leaves, buds and shoots are eaten during the spring and early summer. Characteristic irregular holes appear in the leaves (often formed while they were in bud). Fruit blossom may also be attacked. Repeated attack weakens the tree making it susceptible to diseases such as bacterial canker.

**Life cycle:** the wingless females emerge from pupae in the soil in winter or early spring. After mating with the male they crawl up the stems to lay about 200 eggs. The eggs hatch about March and begin feeding on the tree. The caterpillars finish feeding in mid-May they then go to the soil to pupate. They can often be seen at this time of year hanging from trees on long silken threads.

**Control:** Cultural: grease bands can be applied to tree trunks to prevent the singles female climbing up to lay her eggs. The bands can be painted on using special grease or ready-made grease bands can be purchased, they need to be 10cm above the ground level. Chemical: *Bacillus thuringiensis* a bacterial insecticide can be sprayed on to control the caterpillars.

**Bacterial canker** *Pseudomonas syringae*

**Hosts:** cherries, plums, apricots and almonds

**Type:** a common wide spread bacterial disease

**Symptoms:** cankers (shallow depressions that elongate as they age) appear on branches and crotches of tree. They often bear blobs of amber coloured gum. As they enlarge they will exude 'bacterial ooze'. Leaves on affected branches yellow and the branches die back. The other symptom to watch for is the development of dark brown circular leaf spots in the late spring the centre of the hole dies and falls out leaving a 'shot hole' effect.

**Control:** bacterial canker infections usually occur in the winter. Bacterial infections usually require a wound or opening to enter the plant. It is therefore important to avoid pruning in the winter and the use of sealant paint can help. It is encouraged by damp conditions so adequate drainage will also help prevent this disease. Remove and burn any infected material.

## FRUIT AND VEGETABLES GOOSEBERRIES (*Ribes uva crispa*)

### Introduction

Gooseberries are a thorny deciduous shrub. They are native to the cooler areas of Europe and in order to crop well a cool climate is required, but they are generally easy to grow. They are closely related to red, white and black currants – they are in the same genera – *Ribes*. The fruits may be hairy or smooth and they range in colour from yellow or white to red or green. Unlike many other fruits they are grown on their **own roots** and are **self fertile** – so they can be planted singly.

### **Recommended cultivars**

Cultivar	Season of harvest	Qualities
May Drake	Early	Red fruit that has good flavour when cooked. Can be picked when green for cooking.
Leveller	Mid	Yellow fruit with excellent flavour. Very good cropper but requires fertile soil. Has tendency to grow in a drooping manner.
Invicta	Mid	Green fruits with good flavour. Offers some resistance to mildew.
Lancashire Lad	Late	Dark red juicy fruit. A heavy cropper that has some resistance to powdery mildew.

### Site and soil

Gooseberries are tolerant of a light shade and if summer temperatures are hot they may perform better in the shade rather in an open situation. If summer temperatures do not rise above the mid twenties (Celsius) a sunny position is preferable. Gooseberries prefer a heavy soil that is fertile yet well drained. It should be lightly acid in pH. Avoid alkaline or very wet soils.

### Planting

Gooseberries can be grown as bush, standards, cordons or fans. To achieve a long stem standards are grafted onto *Ribes odoratum* or *R. divaricum*. They will require permanent staking. Gooseberries are available as container grown or bare root specimens. Some certified disease free stock are available.

Space bush and standard specimens 1.5m apart, single cordons 35 cm apart. Fan trained specimens will require a spread of about 1.5m. Cordon and fan trained plants will require a wall or support system of stout wire for supports. Remove all buds below ground level when planting to help prevent suckering.

### Formative pruning of a bush trained gooseberry

Plant a one-year-old specimen – it should have 3-5 evenly spaced lateral shoots. Bush gooseberries are grown on a 'leg' – a length of stem at the base of the plant is kept free of shoots. The idea is to develop a vase shaped bush with an open centre – this promotes ripening and helps to prevent powdery mildew.

**The first winter** – select four or five suitable leaders. Trim them by a half cutting to upward facing bud.

**The second winter** – shorten all of the laterals by half cutting to an upward facing bud.

**The third winter** – shorten all the sub-laterals by half cutting to an upward facing bud.

## **Cultivation**

Protect from frost. Gooseberries flower in April when there is a risk of frost, cover with horticultural fleece or sacking – remove during the day to provide access for the pollinating insects. **Check the stake** on standard gooseberries and loosen the tie as and when necessary. Keep the base of the gooseberry **weed free**. Gooseberries are shallow rooted so care must be taken not to damage roots near the surface as this may cause suckering.

**Mulch** regularly with well-rotted manure. Apply an annual top dressing of **fertiliser**. In early spring apply a balanced fertiliser such as Growmore @ 100g/m<sup>2</sup> or Blood, Fish and Bone @ 70g/m<sup>2</sup>. Gooseberries have a high potassium requirement and will also benefit from a top dressing of Potassium sulphate @ 35g/m<sup>2</sup>.

**Irrigate** when rain has not fallen. The period after fruit set while the fruit is developing is particularly important. Ensure a regular supply of water otherwise the fruit will burst. Apply 20 litres/m<sup>2</sup>. **Thin the fruit** of large fruiting cultivars to give the individual fruit room to develop. Remove every second fruit – the thinnings may be used for cooking. Medium and small cultivars will not require thinning.

**Protect against birds**, draping netting or the growing in fruit cages is the only way to ensure birds do not damage the fruit.

## **Routine pruning**

Gooseberries flower on the base of laterals produced that year. They are pruned once in summer to direct the plants energy into the developing fruit and again in winter to maintain productive wood.

As stated earlier, the idea is to develop and then maintain a vase shaped bush with an open centre – this promotes ripening and helps to prevent powdery mildew.

**In summer** – prune laterals that have produced fruit back to five leaves. Do not prune the leader.

**In winter** – cut back the leaders by one half. Trim all laterals that produced fruit back to two buds.

## **Pests and diseases**

Gooseberries are susceptible to attack from:

- Birds
- Aphids
- Gooseberry sawfly
- American gooseberry mildew

### **Gooseberry sawfly** (*Nematus ribesii*)

**Host:** Gooseberries and currants

**Type:** Chewing pest

**Symptoms:** the larva of this sawfly is responsible for the damage. They are a small (about 2cm) and have a green body with black spots and a black head. They eat the leaves and can defoliate a plant in a matter of days. The main veins of the leaves are not usually eaten giving the defoliated plant a 'skeletonised' look.

**Life cycle:** the pest over winters as a pupa. The adult sawfly emerges from a cocoon from April onwards. The females lay eggs on the under side of the leaf and the eggs hatch a week later. The larvae feed for about a month and then pupate in the soil. A second generation emerges three weeks later and the cycle is repeated. Three generations usually occur in a season, the last pupa will over winter.

**Control:** Cultural: inspect regularly and remove by hand. Encourage birds into the allotment. Chemical methods are also available.

**American powdery mildew** (*Sphaerotheca mors-uvae*)

**Host:** gooseberries and currants.

**Type:** an increasingly widespread fungal disease that originated in North America.

**Symptoms:** a white powdery coating appears on young growth in the spring. This fungal bloom affects mainly the stems and the fruit – the leaves are the least affected. The stems become malformed and the fruits small and tasteless.

**Life cycle:** American powdery mildew is encouraged by warm damp weather. Attacks occur from spring and then throughout the growing season. Spores over winter in the soil and mycelium over plants winter in the dormant buds.

**Control:** Cultural: improve airflow: prune to maintain an open shape, ensure the site is open and space plants well apart. Avoid damp conditions.

Plant resistant cultivars such as Invicta, Jubilee and Pax. Cut out infected shoot tips in early autumn and burn. Avoid excessive use of nitrogenous fertilisers. Chemical methods are also available.

## FRUIT & VEGETABLES

### CURRANTS (*Ribes spp.*)

#### Introduction

Currants are classed as bush fruit. Blackcurrants are cultivars of *Ribes nigrum* a native of central and Eastern Europe. Red and white currants are cultivars of *Ribes sativum*. In the wild they grow in damp wooded areas. Currants are a cool climate crop and in hot climates they will benefit from some shade.

Currants are grown on their own roots and are self-fertile so they can be planted singly.

Blackcurrants are multi stemmed at ground level, whereas red and white currants are grown on a 'leg' or short stem.

#### **Recommended black currant cultivars**

Cultivar	Season of harvest	Qualities
Blackdown	Early	Large sweet berries. Crops well. Not too vigorous. Resistant to American gooseberry mildew.
Wellington XXX	Mid season	Sweet berries with good flavour. Vigorous growth and a slight tendency to droop.
Baldwin	Late	Popular variety. Acid in flavour, rich in vitamin C. Moderate vigour – suitable for allotment plots.

#### **Recommended red & white currant cultivars**

Cultivar	Season of harvest	Qualities
Laxton's No.1	Early	Medium to large red berries. Vigorous upright bush.
White Grape	Mid season	White berries with excellent flavour. Easy to pick. Moderately vigorous.
Wilson's Long Bunch	Late	Red berries with good flavour. Moderate vigour.

#### Site and soil

Currants prefer a **well-drained, fertile, moisture retentive loam**. Red and white currants are more tolerant of a poorly drained soil.

Choose a **sunny or lightly shaded site**. Red and white currants are more tolerant of shade and can be grown on north facing walls – but the yield will be reduced. A pH of 6.5-7 is preferable. Protection from frosts will be necessary.

#### Planting

When planting blackcurrants choose certified disease free stock. In Britain only two-year-old certified stock is available. They will usually have three or four stems arising at ground level.

There is no certification scheme for red and white currants so purchase from a reliable source. The plants will usually have a short stem or 'leg' and four or five strong stems. Black currants can be planted deeper than they were in the nursery to encourage multiple stems to arise at ground level. Both are pruned immediately after planting. Black currants are pruned back hard to one bud above ground level whereas the stems on red and white currants are pruned back by half.

Currants are available as bare root or container grown specimens.

## **Cultivation**

**Protect from frost.** Black currants flower early when there is a risk of frost damage, cover with horticultural fleece or sacking – removed during the day to provide access for the pollinating insects. Red and white currant flowers are hardier. Keep the base of the bush **weed free**. Do not cultivate deeply around the plant, as currants are shallow rooted.

**Mulch** regularly with well-rotted manure. Apply an annual top dressing of **fertiliser**. In early spring apply a balanced fertiliser such as Growmore @ 100g/m<sup>2</sup> or Blood, Fish and Bone @ 70g/m<sup>2</sup>. Currants have a high potassium requirement and will also benefit from a top dressing of Potassium sulphate @ 35g/m<sup>2</sup> in mid spring.

**Irrigate** when rain has not fallen. The period after fruit set while the fruit is developing is particularly important. Ensure a regular supply of water otherwise the fruit will burst. Apply 20 litres/m<sup>2</sup>.

**Thin the fruit** of large fruiting cultivars to give the individual fruit room to develop. Remove every second fruit – the thinnings may be used for cooking. Medium and small fruiting cultivars will not require thinning.

**Protect against birds**, draping netting or the growing in fruit cages is the only way to ensure birds do not damage the fruit.

## **Pruning of black currants**

Black currants flower on strong stems formed the previous year. Pruning takes place in winter (November – December) and involves the removal of a third of the stems that have fruited (these will be two years old). Do not remove the strong stems produced that season, as these will bare fruit next year.

This system of pruning ensures a fresh supply of two-year-old stems on which the black currant will fruit.

**The first year (autumn)** – immediately after planting cut back all stems to one bud above ground level. There will be no fruit in the first year.

**The second year (November)** – the strong pruning will have resulted in 5 or 6 strong stems. These will bare fruit next year.

**The third year (November)** – thin out thin, weak shoots.

**Subsequent years (November/December)** – every winter remove one third of the stems that have fruited. Retain this season's growth, as it will fruit next year.

## **Pruning of red and white currants**

Red and white currants are spur pruned – they bear fruit on spurs that form along the length on the stems. The pruning of red and white currants is very different from black currants; the aim is to establish a permanent goblet shaped bush, which is open in the centre. The laterals are then pruned back to encourage fruiting spurs to develop.

**The first year after planting** – after planting prune each stem by half cutting to an outward facing bud.

**The second year** – shorted all leaders and side shoots by half. Remove any shoots crowding the centre of the bush.

**Subsequent years (winter)** – prune all side shoots to one bud. Lightly trim all leaders.

### **Harvesting and storage**

Harvest the fruits when they are ripe yet still firm. Pick the whole bunch rather than single berries. Fruits can be eaten whilst fresh or bottled, frozen or made into jam.

### **Pests and diseases**

Currants are susceptible to attack from:

- Birds
- Aphids
- Bug bud mite
- Winter moth caterpillars (see 'sweet cherries')
- American gooseberry mildew (see 'gooseberries')

## FRUIT & VEGETABLES

### RASPBERRIES (*Rubus idaeus*)

#### **Introduction**

Raspberries are a cane fruit along with Blackberries, Logan berries and Boysenberries. Cane fruit make a good addition to a fruit garden, as they do not take up much room, they are easy to grow; they crop early in their life and crop well. In addition cane fruit do not store well and are expensive to buy in the shops.

All raspberry cultivars are derived from *Rubus idaeus*, a European native. The raspberry is a hardy shrub with a lax habit, which is at home in a cool moist woodland environment. As well as the familiar red raspberries there are yellow and black varieties.

Raspberries are divided into summer and autumn fruiting varieties. The majority are summer fruiting. The two groups have to be treated differently when it comes to cultural requirements. The summer fruiting varieties flower in the spring on previous seasons and the fruit ripen in summer. Autumn fruiting varieties flower on current seasons wood in summer and the fruit ripens in the autumn.

#### **Recommended summer fruiting varieties**

Cultivar	Season of harvest	Qualities
Delight	Early	Good flavour, large crumbly berries that are pale orange red in colour. Susceptible to botrytis and spur blight. Some resistance to aphids.
Malling Orion	Mid	Good flavour, firm medium sized bright red berries. A heavy cropper with a vigorous growth habit. Susceptible to botrytis and spur blight. Some resistance to aphids.
Malling Admiral	Late	Good flavour. Large firm conical red berries. Crops well. Some resistance to spur blight, botrytis and virus infection.

#### **Recommended autumn fruiting varieties**

Cultivar	Season of harvest	Qualities
Autumn Bliss	August	One of the first autumn fruiting raspberries. Large dark red fruit. Heavy cropper. Resistant to raspberry aphid but prone to attack from raspberry beetle.
September	August/Sept	Conical dark red berries with a fair flavour. Produces a moderate crop.
Fallgold	September	Sweet mild flavour medium to large yellow berries. A vigorous plant.

#### **Site and soil**

Raspberries prefer a sheltered position in sun or light shade (in hot climates a light shade may be an advantage). Shelter will encourage pollinating insects. The soil should be moisture retentive yet well drained. A pH of 6 to 6.5 is preferable. They dislike poor stony and alkaline soils.

#### **Support**

Raspberries need support, this is usually in the form of post and wire fencing, but can be single posts. Good air conditioning is required so avoid solid structures such as

walls. They are best erected prior to planting and soil preparation. If planting several rows ensure they run north south so that one row does not shade another.

### **Soil preparation**

Raspberries are usually purchased as bare root specimens. They will be bare rooted canes with no side shoots.

### **Planting**

Purchase certified virus free stock to plant in the autumn. Plant the dormant canes 7cm deeper than they were previously planted to encourage a multi-stemmed bush to develop. The canes should be spaced 40cm apart. Spread out the roots when planting and gently firm them in. Immediately prune the canes back to 25cm above ground level cutting just above a bud. In the spring new canes will grow from ground level, once this happens cut the original cane down to the ground, this prevents the first seasons crop but produces healthy strong plants.

### **Cultivation**

**Fertilise** with Potassium sulphate at a rate of 35g/m<sup>2</sup> in the January. Apply an additional dressing of Ammonium sulphate in late March at a rate of 20g/m<sup>2</sup>. Every three years apply Superphosphate at a rate of 60g/m<sup>2</sup>. **Mulch** in March with well rotted manure. Keep the mulch material clear of the base of the canes. **Tie the canes** into the support system as they grow. Keep the soil around the canes **weed free**.

Raspberries are shallow rooted so take care not to damage the roots when weeding.

**Remove any suckers** that grow more than 20cm from the main row. Keep well **watered**. When rain does not fall apply 20 litres of water per plant every week. Avoid overhead watering as this increases the risk of fungal diseases such as botrytis. Irregular irrigation should be avoided, as this will cause the fruit to split. **Protect from birds**. This is best achieved with the use of a fruit cage.

### **Pruning**

#### **Summer fruiting varieties**

After harvest cut all the stems that have fruited down to ground level. Retain up to eight of the current seasons stems (they will be the fresh green stems) and tie them in to the support system spacing them out regularly.

At the end of the growing season some of these new canes will have reached the tops of the support wires – bend them over and tie them in. The following spring cut them back to 15cm (6in) above the support wire.

#### **Autumn fruiting varieties**

In late winter before growth starts cut the fruited canes (unusually all the canes) down to the ground, this stimulates new canes the following season on which it will flower and fruit.

### **Pests and disease**

Raspberries are susceptible to attack from:

- Raspberry beetles
- Birds
- Botrytis
- Spur blight
- Virus

### **Raspberry beetle** (*Byturus tomentosus*)

**Host:** raspberries, blackberries, loganberries and other hybrid berries.

**Type:** yellow brown larvae with brown heads about 8mm in length, which feed inside the fruit.

**Symptoms:** the ripe fruit have dried up patches near the stalk.

**Life cycle:** the adult beetle over winters in the soil near the host plants. They emerge in April/May and feed on the flowers of hawthorns and apples – they move to the host plants mentioned above as soon as they come into flower. In June/July the female beetles lay eggs on the floral parts of the raspberries. The larvae emerge two weeks later. The developing larvae tunnel into the fruit and feed. This feeding continues for a month and then the larvae move down to the soil to pupate. They turn into adults in the autumn but remain in the soil until the following year.

**Control:** chemical controls are also available.

### **Botrytis** (grey mould) (*botrytis cinerea*)

**Host:** wide range of fruit, vegetables and ornamentals including raspberries, strawberries.

**Type:** fungal disease.

**Symptoms:** a grey fungal bloom on leaves and fruit, fruit rapidly deteriorate once infected.

**Life cycle:** prevalent in the growing season in hot damp weather.

**Control:** Cultural: keep plants open to allow good ventilation, remove any infected material. Chemical controls are also available.

### **Spur blight**

**Host:** raspberries and loganberries

**Type:** fungal disease.

**Symptoms:** purple discoloration around the nodes in late summer, they increase in size and turn silvery-grey. Tiny sclerotia develop in the centre of each blotch. The buds and shoots that arise from them may die.

**Life cycle:** occurs in summer.

**Control:** Cultural: cut out infected material at the first sign of this disease. No chemical controls are available.

### **Virus**

**Host:** wide range.

**Type:** virus.

**Symptoms:** mottled or blotched leaves and stunted growth.

**Life cycle:** apparent in growing season.

**Control:** Cultural: ensure affected plants are quickly removed and burnt. Chemical: control vectors such as aphids.

### **Disorder**

#### **Iron deficiency**

**Host:** wide range of ornamentals and fruit.

**Symptoms:** irregular interveinal chlorosis.

**Life cycle:** occurs during the growing season.

**Control:** Cultural: add acidic OM to the soil. Chemical: fertilise using sequestered iron or ammonium sulphate.

## FRUIT & VEGETABLES

### STRAWBERRIES (*Fragaria x ananassa*)

#### Introduction

Strawberries are hardy herbaceous perennials. Commercial hybrids are descendants of two American varieties, *Fragaria chiloensis* and *F. virginiana*.

#### **Strawberries are divided into three groups:**

- Summer fruiting
- Perpetual fruiting
- Alpine strawberries

**Summer fruiting** strawberries have a short cropping season. They produce all their fruit over a period of several weeks from late May to mid July. Summer fruiting strawberries are usually propagated vegetatively by runners.

**Perpetual fruiting** strawberries crop irregularly from summer to autumn. Some cultivars may stop fruiting for several weeks in mid summer but they usually start to crop again in early autumn. Perpetual fruiting strawberries are usually propagated vegetatively by runners or division.

**Alpine strawberries** are much smaller than the other types mentioned above. They bear fruits continuously from June to November. They are usually grown from seed and are grown for one of two years before being discarded.

#### Recommended cultivars

##### **Summer fruiting:**

- Tamella. A **mid season** fruiting strawberry that produces large dark red fruits with orange flesh. A very heavy cropper.
- Cambridge Late Pine. A **late season** strawberry with excellent flavour. Fruits are sweet and aromatic. Heavy cropper.

##### **Perpetual fruiting**

- Aromel. Excellent flavour. Suitable to grow as an annual crop.
- Gento. Produces bright crimson fruits with good flavour. Crops better in the second year.

##### **Alpine strawberries**

- Alpine Yellow. Produces small strongly flavoured yellow fruits. A moderate crop.
- Baron Solemacher. Produces masses of tiny dark red fruits. Readily available. Prefers light shade.

#### Site and soil

Strawberries are best grown as a short-term crop; they are sometimes replanted every year and are left in one place for a maximum of four years. This is done in order to reduce soil borne pests and diseases.

Strawberries prefer:

- Sun or light shade.
- Any well drained soil apart from a chalky or poorly drained soils.
- A pH of 6-6.5.
- Crop rotation should be practised to cut down on soil borne pests and diseases.

Strawberries respond well to container growing. They can also be grown in cold frames or heated glasshouses for an early crop. This chapter will focus on strawberries grown in the open ground.

### **Soil preparation**

Strawberries are usually planted in late summer. This means that the soil preparation must be done in early to mid summer. Cultivate the soil in the usual manner incorporating plenty of organic matter left sitting on the top after preparation as it can encourage fungal diseases. Form the soil into slightly raised rows about 75cm apart.

### **Planting**

Strawberry plants are usually purchased as container grown specimens. If possible choose certified virus free stock. Plant the strawberries at a spacing of 45cm apart in rows that are 75cm apart.

Strawberries can also be planted through plastic sheeting trenched into the ground. The plastic should be about 30cm wide. The strawberry plants are planted through cross-shaped cuts made in the plastic. The plastic acts as a mulch smothering weeds and helping to retain moisture.

### **Routine care**

**Water regularly.** The period for several weeks after planting is crucial in order to help the plants establish well. Watering may also be necessary during the growing season if rain does not fall but take care to avoid overhead watering as this encourages fungal diseases such as botrytis.

**Keep weed free.** Weeds will compete for water, nutrients and light. They may also harbour aphids, which act as a vector for viral diseases.

**Place straw** under the plants once the fruit have begun to develop. Barley straw is preferable, as it is softer. It is worthwhile scattering slug pellets prior to 'strawing down' to prevent serious slug infestations later on.

Strawing down lifts the fruit off the ground keeping them clean and helping to prevent botrytis. Do not straw down until the fruit start to develop as it prevents warmth being re-emitted from the soil at night. This warmth protects the flowers from frost. If the crop has been planted through plastic, there is no need to straw down. Strawberry mats can also be used instead of straw.

**Place nets over the fruit** to protect from birds. Cloches can be used as an alternative.

Check **P & D** and treat accordingly. Harvest the fruit regularly to prevent the spread of Botrytis. Once the fruiting has finished gather up the straw and cut off all the leaves and burn. This will help prevent re-infestation of pests and diseases.

### **Pests & diseases**

Strawberries are susceptible to attack from:

- Aphids
- Slugs
- Red spider mite
- Botrytis (grey mould)
- Virus

### **Botrytis**

**Host:** wide range of fruit, vegetables and ornamentals including raspberries, strawberries.

**Type:** fungal disease.

**Symptoms:** a grey fungal bloom on leaves and fruit, fruit rapidly deteriorate once infected.

**Life cycle:** prevalent in the growing season in hot damp weather.

**Control:** Cultural: keep plants open to allow good ventilation, remove any infected material. Chemical methods are also available.

### **Virus**

Strawberries are susceptible to several viruses and symptoms are likely to be induced by a combination of viruses acting together.

**Symptoms:** stunted growth and reduced yield, yellowing leaf margins, yellow spots on the leaves, which become necrotic and mosaicing of the leaves.

**Control:** purchase virus free stock. Control vectors such as aphids. Only propagate from healthy runners. Practise crop rotation. Remove and burn any infected plants.

## FRUIT & VEGETABLES

### THE GENERAL PRINCIPLES OF VEGETABLE GROWING

#### Is it worthwhile?

With the large range of vegetables now available from supermarkets or greengrocers, most of which is of high quality, it could be expected that production of vegetables on the allotment might be in danger of dying out. However, this does not seem to be the case and some of the reasons may be: -

- Most people find fresh vegetables from their plot superior in taste.
- Many people do not like the idea of eating vegetables that have been produced with the aid of chemicals.
- Old fashioned or unusual varieties may not be available from the shops.
- It is very satisfying!

#### Vegetable Groups

It is convenient to group vegetables into broad categories because some are closely related and have similar cultivation requirements, which are different from other groups.

#### **We can identify five groups:**

##### **1. Permanent plants**

Most vegetables are grown as annual plants. That is, we plant and harvest them within one year. There are however, some that are perennial, such as rhubarb, artichokes and asparagus. These plants need to be assigned a permanent position on your allotment plot.

##### **2. Brassicas**

Brassicas come from the genus *Brassica* and include cabbage, cauliflower, broccoli, brussels sprouts, Swedes and turnips.

##### **3. Legumes**

Legumes come from the family *Leguminosae* and include beans and peas. Legume actually means a pod and a characteristic of the family is that the seeds are contained in a pod, which is the fruit. Another characteristic of legumes is that they have a symbiotic relationship with the bacteria *rhizobium*, which results in nitrogen being fixed in nodules on the roots of the plants.

##### **4. Alliums**

Alliums are bulbs and come from the family *Alliaceae* and include onions, leeks, garlic and shallots.

##### **5. Root Crops**

This group includes those plants with swollen taproots, such as beetroot, carrots and parsnips.

There are some vegetables that do not fit into the above categories and will be covered separately. These are potatoes, which are stem tubers, and salad crops like lettuce, tomato and cucumber.

#### Principles of Crop Rotation

One reason for dividing the vegetables into groups is because it is beneficial to grow the groups on different pieces of land each year. This process is called crop rotation and is usually done on a three or four year cycle. The longer the cycle the better.

**The reasons for crop rotation are:**

**1. To minimise plant problems**

If crops are grown in the same area each year this can lead to a build up in the soil of harmful pests and diseases and to a depletion of the nutrients required by the crop. This is given the general name of ‘soil sickness’ and it can cause the yield from the crop to deteriorate.

**2. One crop can benefit from the previous one**

Legumes fix nitrogen in the soil, which can then be utilised by brassicas, which require a good supply of nitrogen. Potatoes help to suppress weeds because of their dense foliage, which can then be followed by alliums, which are poor weed suppressers.

**A Traditional Three Year Cycle**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
<b>Plot 1</b>	Brassicas	Roots	Legumes
<b>Plot 2</b>	Roots	Legumes	Brassicas
<b>Plot 3</b>	Legumes	Brassicas	Roots

Alliums and salad crops should be included with the legumes. Potatoes require soil rich in nitrogen and benefit from being grown after the legumes. Do not grow potatoes in with brassicas as the lime applied to control club root may well induce potato scab. Treating alliums or potatoes as a separate group could create a four-year-cycle. When we discuss ground preparation, we will see that the preparation for each group is different.

**Limitations of Crop Rotation**

In a commercial situation, and particularly in agriculture, there is no doubt that crop rotation is important. However, in an allotment plot it must be said that it is not always easy since the personal preference of the grower will dictate what they grow, which could be all of one group. Also, the argument about pests and diseases is not so relevant since they are mobile over a small area and some can survive years in the soil.

In these circumstances more practical advice would be:

- Do not grow the same crop in the same place for two years running.
- Maintain good soil fertility.
- Maintain a pH pf 6.5-7.
- Practise good hygiene.

**Choosing your allotment plot**

If one has the choice, choose a plot taking into account the following factors. But do not despair – if you cannot choose the site to suit the vegetables, then choose the vegetables to suit the site.

**Aspect**

- **Sunny** – the majority of vegetables require full sun, a couple of exceptions being lettuce and runner beans. South, Southeast or Southwest facing is best.
- **Soil** – a fertile well-drained loam is ideal. Topsoil of at least 30cm. An ideal pH is 6.5-7.
- An **open but sheltered** site is required. This will facilitate pollinating insects.
- **Avoid frost pockets.** A number of vegetables are tender, such as runner beans and tomatoes, and cannot be planted outside until the danger of frosts has passed.

- **Level** – avoid a sloping site if possible since this may lead to soil erosion. If it cannot be avoided plant across the slope or consider forming flat terraces.
- **Good access** – ensure there is reasonable access for wheelbarrows or other equipment, or for deliveries of manure and other bulky materials.

### **Orientation**

Rows of vegetables or the beds in a bed system should be orientated north-south so one crop does not cast shade over another.

### **Planning the layout**

Traditionally, vegetable plots have consisted of a few beds that can accommodate a large number of vegetables arranged in rows across the bed. To cultivate such a bed necessitated walking on it and so there were fairly large gaps between the rows. A more modern approach is to have what is called a bed system, where the garden is divided into a number of narrow beds separated by paths, so that the beds can be cultivated **without the need to walk on them**.

### **Constructing a bed system**

The beds should be 1-1.25m wide to allow cultivation from the paths but they need not be rectangular. Any form is acceptable as long as it can be reached from the paths. Assuming basic ground preparation has been done, mark out the layout. If possible the beds should be run north/south so all plants receive the same amount of sun. Double dig the beds incorporating compost or manure at the rate of 5kg/m<sup>2</sup> to provide a reservoir of nutrients and humus. If the beds are to be raised add some form of edging to contain the soil. The edging can be anything that will do the job. Timber boards are particularly useful. Make the paths wide enough to take a wheelbarrow. The paths can be left as earth but can be of any suitable material. Bark chippings are a good option.

### **Advantages of a bed system**

1. Planting can be denser since there is not need to walk between the rows. Even allowing for the paths overall productivity should be higher.
2. Cultivation can be carried out in all weather conditions.
3. Crop rotation is easier.
4. If raised beds are used a greater depth of topsoil and better drainage can be achieved.
5. Crop protection with cloches or crop covers is easier.
6. Compost, manures and fertilisers can be applied to just the areas in which the crops are to be grown.
7. The natural structure of the soil is preserved as the soils is not walked on and consolidated.
8. The bed system lends itself to the no-dig system.

### **Disadvantages of a bed system**

It is not suitable for cultivation on a large scale since it does not lend itself to the use of machinery for cultivation, sowing or harvesting. It is a system for the amateur gardener.

### **The no-dig system**

The no-dig system involves minimum disturbance of the soil. The idea is to build up the topsoil by adding layers of organic matter such as garden compost or sedge peat to the surface of the soil. Green manure crops are used to keep the ground covered at all times thus protecting the surface from capping and erosion. The organic matter increases the worm population and their activity improves the soil structure. The mulch is added to each autumn and the crops are planted through this. When they are

harvested they will be simply pulled out or cut off rather than dug out. One of the benefits of this technique is that it avoids any damage to soil structure that may occur as a result of continual cultivation. It is not such a revolutionary idea as most permanent borders are only dug once prior to being planted and they generally exhibit good soil structure if regularly mulched.

It will take a while for the soil to develop when a no-dig system is introduced and patience will be needed whilst it does so, difficult soils such as clay and sandy soils will take even longer. If a soil is very compacted it may be necessary to double dig prior to implementing this system.

### **Advantages of the no-dig system**

1. Soil organisms are not disturbed
2. Weed seeds are not brought to the surface
3. Moisture loss is reduced
4. Less hard work and time is required

### **Disadvantages of the no-dig system**

1. Pests may build up in the soil
2. It may be difficult to maintain humus levels since organic matter can only be added as a mulch

### **Physical protection from pests**

In this context protection means protection of the whole or significant parts of the vegetable plot. Protection of specific crops is covered in a later topic in this section. Protection may be required against birds or larger animals such as rabbits, cats or foxes. Some protection against birds can be provided by 'buzz lines'. This is a form of tape that is stretched tightly across the plot and gives off a noise when moved by the wind. Growing all vegetables within a cage as is often done with fruit would provide better protection. The vegetables and fruit could be grown in the same cage. Protection from rabbits, cats and foxes can only be achieved by some form of fencing. Rabbits are one of the worst pests in rural areas and the fence should be buried 15cm in the ground to prevent burrowing.

### **Green manures**

Green manuring is the technique of growing a crop, which is then dug into the soil. It has two advantages:

- It returns nutrients to the soil. Particularly the leguminous green manures.
- It protects the soil surface preventing soil capping, erosion and reduces the leaching of nutrients.

Green manures are sown in situ and dug into the soil before they flower. They can be cut and left to come again if required for longer and then dug into the soil. There are some that are suitable for over wintering and others that are only suitable for spring or summer sowings.

### **Green manures suitable for over wintering**

Essex red clover (*Trifolium pratense*) a leguminous plant that will enrich the soil with nitrogen

*Phacelia tanacetifolia* – good for weed suppression

### **Green manures suitable for spring and summer sowing**

Mustard (*Sinapsis alba*) – good quick source of nitrogen

*Phacelia tanacetifolia* – good for weed suppression

## **VEGETABLE SOWING, PLANTING AND AFTERCARE**

### **Ground preparation**

If there are distinct beds and a formal crop rotation plan is to be followed, the preparation of the soil for each group of plants can be tailored to those plants.

<b>BRASSICAS</b>	<b>ROOTS</b>	<b>LEGUMES etc</b>
Lime the soil during winter if necessary. The pH should be 6.5-7.  Rake in a general fertiliser 2 weeks before sowing or Planting at the recommended rate	Rake in a general fertiliser 2 weeks before sowing or planting at the recommended rate	Add manure or compost when digging.  Rake in a general fertiliser 2 weeks before sowing or planting at the recommended rate

Suitable fertilisers include Blood, Fish and Bone @ 70 g/m<sup>2</sup> or Growmore @ 100 g/m<sup>2</sup>.

### **Sowing and planting**

Vegetables can be sown under cover, in a seedbed or in situ.

#### **Under cover**

- Some vegetables, such as tomatoes or cucumbers, may be grown under cover for the whole of their life.
- Some may be started under cover because they are tender, such as runner beans, and cannot be planted out until the danger of frost has passed.
- Some may be started under cover to give them a longer growing season or to obtain an earlier crop.

#### **In a seed bed**

- A seedbed is used for the initial growth of plants while the space they will eventually occupy contains another crop.
- It also makes it easier to care for the plants during the critical part of their growth.

#### **In situ**

Plants are sown in situ where the seeds are large and easy to handle, such as peas and beans, or where they would not transplant easily, such as with root crops.

### **Planting for continuity**

To derive the maximum benefit from the vegetable garden it is desirable to utilise all the space and have crops for harvesting all year round. Some techniques for achieving this are:

#### **Successional sowing**

This is either

- Sowing the same variety at intervals of time so that the whole crop does not reach maturity together.
- Sowing different varieties of the same crop. Many crops have early and late varieties.

#### **Intercropping**

This is the practice of growing a quick maturing crop in the space between slower growing plants, e.g. lettuce between brassicas, radishes between parsnips or spring onions between sweetcorn.

The intercrop should not deprive the main crop of water or nutrients and it may be advisable to space the main crop a little further apart.

### **Catch crops**

This is a quick maturing crop that is planted in an area that will be required later for a main crop. Plants suitable for intercropping are also suitable for catch crops. Green manures may be used as a catch crop to enrich the soil and keep it covered.

### **Aftercare**

The following tasks may be required: watering, feeding, weed control, mulching, pest and disease control.

### **Watering**

For vegetables the critical times for watering are:

1. At the seeding stage
2. At transplanting
3. At flowering and during fruit development, when the vegetable is a fruit or seed, such as tomatoes, cucumbers, peas and beans
4. At regular intervals for leafy and root vegetables

Seep hoses and automatic watering systems are particularly useful in the vegetable garden.

### **Feeding**

If organic matter and fertiliser are applied as part of the ground preparation it should not be necessary to feed any further, with the exception of nitrogen. Because some vegetables have a high requirement for nitrogen and it is easily lost by leaching, applying a top dressing or liquid feed during the growing season will be beneficial for leafy crops such as potatoes, brussel sprouts, cabbage, leeks, beetroot and rhubarb.

### **Weed control**

Weed control is important on the vegetable plot, particularly among seedlings and young plants, as they compete for water, nutrients and light. Mulching, hoeing or hand weeding are the best methods of control.

Use of chemical sprays is not recommended, as it is too easy to damage the vegetables. Spot treatment with a herbicide can be used for perennial weeds. If a chemical is used it should be one that is deactivated on contact with the soil, like **Glyphosate**.

### **Mulching**

Black polythene mulches or floating mulches are particularly useful in the vegetable garden. Floating mulches allow plants to be planted out earlier and will provide a degree of protection against pests and diseases. Loosely draped horticultural fleece can be used as floating mulch.

### **Pest and disease control**

The following are some specific points relating to vegetable pests and diseases:

- Good hygiene is essential
- Crop rotation will help
- Physical protection may be needed against larger animals and birds
- Floating mulches may be effective against some insects

**Specific pests and diseases are covered in the details for particular vegetables.**

## FRUIT & VEGETABLES

### RUNNER BEANS (*Phaseolus coccineus*)

#### **Introduction**

Runner beans are tender perennials from South America. They were first introduced into Europe in the 16<sup>th</sup> century as an ornamental plant; it was not until the 19<sup>th</sup> century that they were eaten as vegetables. They bear pretty pink, red, white or bicour flowers, which are followed by flat-podded beans from July to October. Plants will generally grow to over 3m in height, although some dwarf cultivars are available.

Runner beans are also known as string beans in reference to the 'strings' that run along one side of the pod. Many modern cultivars no longer have strings. The pods, which can reach up to 25cm in length and 2cm wide, can be eaten whole when harvested young or podded and the beans inside eaten when more mature. Runner beans are a cool season crop and grow best at temperatures between 14-29°C, at high temperatures the flowers can abort and the pods fail to set.

#### **Recommended cultivars**

- **Enorma** – produces long slim pods of prize winning quality
- **Painted Lady** – an attractive bean with red and white bi-colour flowers. Freezes well.
- **Gulliver** – a stringless dwarf bean that crops well
- **Polestar** – a stringless bean that flowers and crops early. Do not plant in frost prone areas.

#### **Site and soil**

Runner beans need a warm sheltered site – avoid frost pockets, as they are frost tender, the shelter will also encourage pollinating insects. A light shade may be advantageous to prevent flowers aborting which results in failure to set fruit. The soil should be deep, fertile and moisture retentive. Avoid growing in the same site every year – runner beans are a legume and as such they should follow on from the roots or possibly potatoes in a crop rotation system. Runner beans can also be grown in containers such as half barrels.

#### **Soil preparation**

The site should ideally be prepared in autumn prior to sowing the following spring. The traditional way to do so is to dig a trench one spit deep into which organic matter placed. Well-rotted stable waste is ideal but garden compost would suffice. This will rot down further over the winter and will improve the water holding capacity of the soil.

#### **Sowing**

Runner beans are usually sown in situ (sown where they will grow) but they can be started off inside in early May. The following advice is for beans sown in situ.

Wait until the soil has warmed to 10-12°C (when weed seedlings just begin to germinate) and danger of frost has past before sowing runner beans. This will usually be around **May**. Erect a support – a wigwam of strong 2.5m bamboo canes tied at the top is ideal. The beans should be sown at the base of each cane at a depth of 5cm and cover with soil. They should germinate in 2-4 weeks. Protect the seedlings from frost with cloches or horticultural fleece used as a floating mulch.

## **Cultivation**

Once the seedlings have germinated keep a careful eye for **pests and diseases**. See pest and disease section further on. Apply a **mulch** of well-rotted garden compost to keep weeds down and retain moisture. Keep a careful eye on **watering**. The critical time for watering with all fruiting crops is when the flower buds appear, if crops do not receive adequate water at this stage the fruit will fail to set (develop). Apply 5-11 litres/m<sup>2</sup> twice a week.

Fruit set can be a problem with runner beans. Failure to set is usually caused by high temperatures causing the flowers to abort; dryness at the roots seems to add to the problem. This can be overcome by growing them in a lightly shaded area. Alternatively watering the base of the plant at night will reduce the temperature around the plant and help prevent the flowers aborting.

## **Harvest**

They will be ready approx. 13-17 weeks after sowing. Pick the pods when they are 17cm in length, continue picking as this prolongs the cropping period. Runner beans freeze well.

## **Pests and diseases**

Runner beans are not particularly prone to pests and diseases, but they do suffer from attacks from the following: -

- Slugs
- Red spider mite.
- Pollen beetles – these are tiny black beetles that move from rapeseed once it is harvested. They do no real harm but they do deter pollinators. Crops can be grown under fine mesh if pollen beetles are particularly problematic.

## **Diseases**

### **Halo blight (*Pseudomonas savastanoi*)**

**Host:** a wide range of plants, in particular *Phaseolus coccineus*

**Type:** bacterial disease

**Symptoms:** small water soaked spots appear on the leaves of seedlings. The lesions darken and then develop the characteristic yellow halo. Interveinal chlorosis soon follows. Seedlings may die in severe attacks or just become stunted. The lesions may also appear on the stems and pods if the plants survive long enough to fruit.

**Lifecycle:** bacterial disease that can be present on bean seeds. Once sown it soon spreads to other bean seedlings. Particularly prevalent in damp conditions.

**Control:** Cultural: do not pre soak beans, as this will spread the disease. If pre-germination is required do so on damp paper. Avoid overhead watering and remove infected material. Chemical methods are also available.

### **Bean Yellow Mosaic Virus**

**Host:** broad, dwarf and runner beans

**Type:** a common and widespread virus

**Symptoms:** the leaflets curl and turn downward with gradually extending mosaic pattern. The plant is stunted and pod production is reduced

**Life cycle:** transmitted by aphids during the growing season. Other host plants include gladioli.

**Control:** Cultural control: do not grow gladioli nearby. Remove and burn any infected plants to prevent spread. Grow plants under fine mesh to prevent vectors such as aphids transmitting the virus. Chemical control: control vectors such as aphids.

**FRUIT & VEGETABLES**  
**BRUSSEL SPROUTS**  
**(BRASSICA OLERACEA GEMMIFERA GROUP)**

**Introduction**

Brussel sprouts are biennials that are grown as annuals. They are able to survive temperatures as low as -10°C. They are fairly long-term crop taking 20 weeks to mature; this makes them suitable to intercrop with quick growing crops such as radish. They are brassicas and as such follow on from legumes in the crop rotation system. Brassicas benefit from the nitrogen enriched soil left behind by the legumes. Brussel sprouts are grouped according to maturity as early, main crop or late varieties, all of which are sown between March and April.

**Site and soil**

They prefer well drained, moisture retentive fertile soil. As with all brassicas, brussel sprouts require a firm seedbed. A dressing of garden lime (calcium carbonate) at a rate of 300-400g/m<sup>2</sup> applied prior to cultivation will help to prevent club root disease.

Prepare the soil well in advance, as brussel sprouts do not like freshly manured soil. Two plots will have to be prepared – a relatively small nursery or seedbed and the plot into which they will be transplanted. Dig the soil and incorporate well-rotted or organic matter in the autumn. The seedbed should be worked to a fine tilth to promote germination.

**Recommended cultivars**

Most of the cultivars grown today are F1 hybrids. The old fashioned or open pollinated types are not as common as they once were. F1 hybrids are sturdier as they have a stronger root system and are more productive.

**Early:** Peer Gynt – a smaller plant with a good flavour

**Main:** Diablo – exceptional quality, good flavour with smooth round buttons

**Late:** Fortress – stands the cold weather well.

**Sowing**

Sowing commences in the spring (from mid March to mid April) once the soil has warmed up. Do not fork over the soil as you would with other crops, all brassicas prefer a firm seedbed. Remove any weeds, rake level and apply a base fertiliser such as Growmore at 100g/m<sup>2</sup> or Blood, Fish and Bone at 70 g/m<sup>2</sup>. Having raked this in make drills in which to sow the seed with the edge of a draw hoe and a string line.

Sow the seed thinly 1-2cm deep in rows 15cm apart. Thin the seedlings to 7cm apart once large enough to handle. This will give them room to grow on into strong healthy transplants.

**Transplanting**

When the seedlings are about 10-15cm in height (about 6-7 weeks after being sown) they are ready to be transplanted. Water well the night before and using a dibber to ease them out of the seedbed and transplant them into the plot that has been prepared the previous autumn. Do not leave the roots exposed to sun whilst transplanting.

Space the seedlings 40 to 60 cm apart – depending on their vigour. They should be planted fairly deeply (the first leaves should sit just above the soil level) to ensure a stable upright plant. The plants must be firmed in well – when pulled the leaves should

tear rather than the plant coming out of the soil, this encourages the sprouts to 'heart up'. Water immediately after transplanting to settle the plant in.

### **Cultivation**

- Irrigation – pay particular attention to young plants; keep them well watered until they get established. Once established apply 20 litres/m<sup>2</sup> every week in dry weather.
- Keep plants weed free
- Apply a nitrogenous fertiliser such as Hoof and Horn at 130q/m<sup>2</sup> or Nitro-chalk at 110g/m<sup>2</sup> during late summer
- Protect the crop from birds with netting secured over the entire crop
- Earth up (pulling soil up around the stems) to encourage sturdy plants
- Mulch with garden compost if the soil does not hold moisture well
- Remove yellowing leaves and 'blown' buttons (loose sprouts)
- Stake over wintering varieties to prevent damage from wind rock

### **Harvesting**

Sprout will be ready for harvesting from September onwards (roughly 20 weeks after sowing); the flavour is improved by exposure to frost. They should be about the size of a walnut and firm to the touch. Discard and loose 'blown' sprouts as you are picking. Start picking from the base of the plant, the tops can also be eaten when the plant has reached the end of its cropping season. Brussel sprouts freeze well.

### **Pests & diseases**

#### **Mealy bug**

**Host:** all parts of the plant – particularly around the base of sprouts and leaves

**Type:** 2mm long sap sucking insect that resembles a small woolly white wood louse

**Symptoms:** reduced vigour, honeydew & sooty mould

**Life cycle:**

**Control:** Cultural: remove minor infestations by hand. Biological: introduce *Cryptolaemus montrouzieri* a predatory ladybird. Chemical methods are also available.

#### **Club root**

**Host:** all brassicas – particularly in the seedling stage.

**Type:** a slime mould (sometimes listed as a fungal disease).

**Symptoms:** reduced vigour, chlorosis (yellowing) of the leaves and wilting. Swollen distorted roots and revealed when the plant is pulled up.

**Life cycle:** symptoms strike in the growing season.

**Control:** Cultural: improve the drainage – this will discourage the disease, as it prefers damp conditions. Raise the plants in modules and plant out when stronger. Application of lime will help prevent club root. Chemical methods are also available.

#### **Whip tail**

**Host:** all brassicas

**Type:** a non-biological disease (a disorder) caused by molybdenum deficiency.

Molybdenum deficiency tends to occur on acidic soils

**Symptoms:** plants grow abnormally long and narrow leaves.

**Life cycle:** during the growing season.

**Control:** apply garden lime (calcium carbonate) at rates between 300 to 400 g/m<sup>2</sup> to reduce the acidity of the soil.

## **FRUIT & VEGETABLES ONIONS (ALLIUM CEPA)**

### **Introduction**

Onions are biennials that are grown as an annual crop. They are a cool season crop preferring temperatures between 13 to 24°C, but many are frost tolerant and can over winter outside. There are two main types that are commonly grown – traditional European types and Japanese types. Traditional types are the classic onion shape and Japanese types tend to be more flattened.

Onions can be raised from sets (specially raised small onions) or from seeds. Onions from sets mature before those from seed and they are more resistant to mildew and onion fly. Sets however tend to 'bolt' (go to flower) but this can be avoided by using heat-treated sets – the heat kills the immature flower bud preventing it from growing. Seed is a cheaper option and there are more cultivars to choose from.

### **Site and soil**

Onions prefer a site that is open and sunny with well-drained fertile soil. Prepare the soil well in advance. Dig the soil and incorporate plenty of well-rotted organic matter. Onions do not like freshly manured ground. They have a low nitrogen requirement.

### **Sowing/planting**

There are two main times for planting or sowing onions. Traditional types are generally sown/planted in spring and both the traditional and Japanese are sown/planted in late summer/early autumn.

1. Sow or plant in spring (March/April) for harvesting in autumn. These onions will take 12 to 18 weeks to mature.

#### **Suitable cultivars from seed:**

Caribo – a brown skinned onion suitable for use fresh or for storing

Red Baron – a red onion also suitable for use fresh or for storing

#### **Suitable cultivars from sets:**

Sturon – large round bulbs

Stuttgarter Giant – mild flavour with good keeping qualities

2. Sow or plant in late summer/early autumn for harvesting the following summer. The onions take up to 42 weeks to mature and over winter outside.

#### **Suitable cultivars from seed:**

Imai early yellow – a globular yellow onion

Reliance – one of the best standard varieties, keeps very well

#### **Suitable cultivars from set:**

Unwins First Early

### **Onions from seed**

Prepare the seedbed for forking it over (having dug in autumn) consolidating and raking it to a fine tilth. The stale bed technique (leaving for two weeks to let weed seeds germinate and hoeing them off) will help with weeding later on.

Sow seed very thinly in drills 1-2cm in rows 30cm apart.

Hot weather may hinder germination; this can be overcome by covering the seedbed with white reflective plastic. Once germinated, thin to 4cm apart.

### **Onions from sets**

Plant sets in a well-prepared seedbed placing them so that the nose of the set just pokes out of the ground. Birds find the tops of the onion sets irresistible and like to pull them out of the ground so cover with mesh if this has proven to be a problem in the past.

### **Cultivation**

Onions do not like competition from weeds so keep them weed free. They do not generally require irrigation unless conditions are very dry.

### **Harvesting**

Onions can be lifted for immediate use at any time, if they are to be stored let the foliage die down naturally. Once ripened onions for storing should be lifted and dried in the sun until they rustle (two weeks). They are then platted or placed in single layers in raised wooden boxes, which should be stored in a dry shed. Do not store thick-necked onions, as they tend to rot.

### **Pests & Diseases**

#### **Onion fly (*Delia antiqua*)**

**Host:** seedlings in particular

**Type:** white burrowing larvae 9mm in length that eats the bulbs.

**Symptoms:** yellowing of the leaves and possible death. Tunnels in the bulbs.

**Life cycle:** the female lays her eggs around the base of the plants in May and August. When the larvae hatch they burrow down and pupate in the soil – feeding on the bulbs. There are several generations per year.

**Control:** Cultural – place collars around the plants in May and August. Biological – none. Chemical – apply insect granules such as **Carbofuron** when planting.

#### **Downy mildew**

**Hosts:** onions

**Type:** fungal disease

**Symptoms:** pale oval areas on the leaves, the tips develop a grey fungal bloom and may die.

**Life cycle:** during the growing season

**Control:** Cultural – improve the ventilation and avoid poorly drained soils  
Chemical methods are also available.

## FRUIT & VEGETABLES

### CARROTS (*DAUCUS CAROTA*)

#### Introduction

Carrots are biennials that are grown as annuals. They prefer cool temperatures and grow best at around 16°C. They are classified according to when they mature – early or main crop and according to shape.

There are also several different groups or types into which they can be divided. They are:

- Paris market
- Amsterdam
- Nantes
- Chantenay
- Berlicum
- Autumn King

#### Selection of cultivars

For the purposes of this discussion they have been grouped according to maturity.

**Earlies** are usually smaller and are eaten straight away. They are relatively quick to grow (7 to 9 weeks from seed to harvest). Earlies can be round as well as long and tapered (round carrots are good for stony soil).

Recommended earlies

Types	Cultivars	Qualities
Early Nantes	(Nantes express)	Reliable and tender
Paris market	(Kundulus)	A round carrot good for small plots and stony soil

**Main crop** carrots are eaten fresh or stored. They take longer from seed to harvest – 10 to 11 weeks. They are generally bigger and are long and tapered.

Recommended main crop carrots

Types	Cultivars	Qualities
Berlicum	(Berjo)	Stores and crops well
Autumn King	(Vita Longa)	Healthy long carrots that are late maturing. Stores well.

#### Site & soil

Carrots prefer light, fertile well-drained soil. They do not like stony, compacted or damp soils. Grow in a sunny sheltered spot. They have a low nitrogen requirement.

#### Cultivation

Dig and add OM in the autumn (not manure as it is too heavy – sieved garden compost is suitable). Do not consolidate the soil, as they prefer light soils. Raised beds are suitable for carrots as the topsoil can be easily improved. Carrots can also be grown in containers – choose a deep container with adequate drainage and grow in John Innes No.2 potting compost.

#### Sowing

Sow in situ – the soil can be warmed prior to sowing with a cloche. The first sowing can be in March, when the soil is about 7°C. Choose a sheltered site.

Sow earlies in March – April. Sow main crop from April through June. Fork over the soil and work to a fine tilth – do not consolidate. Apply a base dressing of Growmore at 100g/m<sup>2</sup>

The 'stale seed bed' technique can be used. Prepare the plot and leave it for a few weeks to allow the weed seeds to germinate, hoe them off on a sunny day. This will cut down on the amount of weeding required as the carrot seedlings develop. Sow seed thinly 1-2cm deep in rows 15cm apart. Mix seeds with sand or vermiculite to enable thin sowing. Thin sowing will mean less thinning out (thinnings attract carrot root fly). Erect a carrot fly barrier around the crop, this can be done with fine mesh or plastic and must be around 90cm in height. It can be a mesh tunnel right over the top of the crop.

### **Cultivation**

Thin out carrots to 5-7cm apart when large enough to handle. This is best done after watering in the evening to prevent the smell of the leaves attracting carrot fly. Remove weed seedlings when the carrots are young – their foliage will suppress weed growth later on in the season. Avoid disturbing the foliage, as the aroma will attract the dreaded carrot fly. Water every couple of weeks – try not to let them dry out and then flood them as this will result in splitting. Apply 20 litres/m<sup>2</sup> every two weeks. Carrots can be mulched to conserve moisture.

### **Harvesting**

Pull earlies when required from June till August. Lift main crop carrots to be stored October – November. Store in boxes in layers of peat or sand in a stout box. Keep in a dry shed. Make sure they do not touch. Inspect regularly and remove any rotten carrots.

### **Pests & Diseases**

#### **Carrot fly**

**Type:** slender creamy white maggots (8mm), which burrow into the roots.

**Symptoms:** seedlings die, plants become stunted and the foliage reddish. Maggots can be found in the roots.

**Life cycle:** two generations per year – one in April/May and the other in August/September. The flies lay eggs in the soil and the resulting larvae (maggots) burrow down into the soil and feed on the roots.

**Control:** Cultural: Erecting netting or plastic barrier (90cm in height). Thin at night after watering. Grow in between onions the smell disguises the carrot aroma or other aromatic companion plants such as *Helichyrsium angustifolium*. Hygiene – do not leave carrot thinnings lying around or on top of compost. Use resistant cultivars such as 'Fly away'. Biological: none. Chemical methods are also available.

**Aphid** – aphids cause loss of vigour, as they are 'sap suckers' they can also transmit viruses such as carrot motley dwarf virus.

**Green top** – the tops of the carrots turn green as they are exposed to light – earth up the crop to cure this problem.

**Fanging** – forking of the roots, this is usually caused by some obstruction in the soil such as stones or heavy use of manure. Amend the problem or grow in containers.

**Splitting** – this is caused by irregular water supply, try to ensure that carrots do not dry out and then get heavy irrigation.

## FRUIT & VEGETABLES

### POTATOES (SOLANUM TUBEROSUM)

#### Introduction

Potatoes are a frost tender perennial originating from South America. They grow best at temperatures between 16° and 18°C. Potatoes are a long season crop – they require between 90 to 140 frost-free days to reach maturity. They are grouped according to the season of lifting as earlies, second earlies and main crop. Both early crops produce lower yields than main crops but have several advantages – they take up less space, they generally do not suffer from potato blight and they crop when the potatoes in the shops are still quite expensive. Main crop potatoes produce higher yields but they are a little more trouble to cultivate and require a lot more space. If space is limited opt for early potatoes.

#### Earlies

Earlies, or new potatoes as they are known, are planted in March and will produce a moderate crop in June/July. They are best eaten straight away. It is essential to chit the first earlies prior to planting (see purchasing and chitting potatoes). First earlies can be planted under plastic sheeting – this eliminates the need to earth up the crop. The plastic is laid over the soil prior to planting to warm up the soil and the seed potatoes are planted through the plastic (an 'x' is cut in the plastic sheeting to enable planting). The potatoes can be harvested by simply lifting up the plastic sheeting.

Recommended first earlies

- **Maris Bard.** This is an oval shaped heavy cropping first early. It is virus resistant.
- **Pentland Javelin.** An oval potato with white flesh. It is resistant to attack from eelworm.
- **Arran Pilot.** An old favourite. A kidney shaped potato with white flesh.

#### **Second earlies**

Second earlies are planted slightly later in April. They are harvested in July. They also have to be chitted and may also be grown under plastic sheeting. Second earlies are generally eaten straight away rather than stored.

Recommended second earlies

- **Estima.** A relatively heavy cropper with pale yellow flesh. It is resistant to blight.
- **Great Scot.** A round potato with white flesh. Excellent baking potato.
- **Wilja.** An oval potato with pale yellow flesh that produces a good yield. Good cooking qualities.

#### Main crop

Main crop potatoes are planted in late April and harvested in August/September. They produce maximum yields and many are suitable for storage, others such as the salad potatoes are best eaten fresh.

Recommended main crop potatoes

- **Desiree.** A pink skinned potato with yellow flesh. Good drought tolerance. Pleasant waxy texture.
- **Pink Fir.** A rather nobly shaped potato. Tubers are good eaten hot or cold.
- **King Edward.** Excellent flavour but rather low yields, quality rather than quantity!

## **Site & Soil**

Potatoes are not fussy but they do prefer an open site – particularly for early crops, which must be protected from frosts. They also prefer a neutral to slightly acid soil (pH5 to 6). They must be rotated to prevent build up of soil borne pests such as eelworm.

They are a useful crop to grow when breaking in land as they help to develop a good crumb structure. Potatoes can also be used to impoverish a soil in preparation for sowing a wild flower meadow.

## **Soil preparation**

Prepare the plot by digging in plenty of organic matter the autumn before planting. Potatoes can follow on from legumes in the crop rotation cycle. They will benefit from the extra nitrogen in the soil.

## **Purchasing and chitting seed potatoes**

Seed potatoes are specially raised small potatoes. Certified disease free seed potatoes should be used. Try to choose small seed potatoes – about the size of a hens egg is best. Staining of seed potato flesh could indicate the presence of potato blight – try one from each batch. Mail order companies are often the best way to purchase seed potatoes.

First and second early potatoes should be chitted. This involves placing the seed potatoes in a seed tray (the end with the most eyes upwards) and placing them in a dry, light and frost free environment. This encourages shoots to grow giving them a head start when planting. Chitting usually takes around three weeks; the sprouts should be roughly 2cm in length when planted.

## **Planting**

Planting starts in March with the first earlies. Wait until the soil has warmed up (7°C) and the danger of heavy frost has passed. Cloches and plastic sheeting can be used to warm the soil prior to planting. Apply a base dressing of Growmore at 100g/m<sup>2</sup> or Blood, Fish & Bone at 70g/m<sup>2</sup>.

Make a wide drill 10 to 15 cm in depth and place the tubers in the drill pulling the soil back over them. Earlies are planted about 35cm apart and main crop 40cm apart. Allow 45cm between rows of earlies and 75 between main crop varieties. Chitted potatoes need to be handled carefully so the shoots do not break off, place them in the drill with their shoots facing upward.

## **Cultivation**

Early crops will need **protection from frost** – this can be provided with the use of horticultural fleece. The fleece can be left in place until all danger of frost has past.

Start **earthing up** (pulling the soil up and around the plants) when the plants are around 23cm in height. Always leave 10cm of leaf above the ground to photosynthesis. Continue to earth up as the plant grows. Earthing up encourages tuber production and prevents tubers near the surface becoming green.

**Weed** between the rows until no longer necessary. Potatoes are leafy and once established they prevent most weed seeds germinating.

**Irrigate** – regular water supply when the tubers are forming improves both the yield and the health. Apply 20 litres of water every two weeks during dry spells. Avoid overhead

irrigation as this washes potato blight spores down into the soil where they spread to the tubers.

**Feed** main crop potatoes with a high nitrogen feed such as Sulphate of Ammonia at a rate of 70g/m<sup>2</sup>. As with all crops do not apply fertiliser to dry soil as it may burn the roots.

### **Harvesting and storage**

Earlies can be harvested as soon as the plants are flowering. Main crop potatoes for immediate eating can be treated in a similar way, but if they are to be stored leave them in the ground to bulk up. The foliage will die down when they are mature – usually around September. Cut off the stems and leave them in the ground for another two weeks to allow the skins to mature. They can then be lifted on a fine sunny day and spread out on the ground to dry. Do not store until thoroughly dry. Store in paper sacks or wooden boxes in a dark, dry shed.

### **Pests & diseases**

- **Slugs** – attack on potatoes begin in August. Over manuring can exacerbate the problem.
- **Aphids** – problematic as they can spread mosaic virus.

### **Potato cyst eelworm**

**Host:** Solanum tuberosum

**Type:** Nematode

**Symptoms:** the plant turns yellow (chlorosis) and starts dying at the base. Tubers remain small and brown cysts will be present on the roots.

**Life cycle:** Nematode eggs remain viable in cysts for many years and are stimulated to hatch by chemicals released by plant roots. They are most problematic to potato crops in mid to late summer.

**Control:** Cultural: practice crop rotation to prevent build up of the pest in the soil. Choose resistant varieties such as Maris Piper or Nadine. Good hygiene is important – throw away any infected material. Biological: none. Chemical: none.

### **Potato blight**

**Host:** potatoes and tomatoes

**Type:** fungal disease that is prevalent during warm wet seasons

**Symptoms:** brown patches appear on the leaves, the underneath of which has a white fungal fringe. The foliage eventually browns and dies completely. The spores can be washed down to the tubers causing brown sunken lesions and reddish brown staining of the flesh. Secondary infections often mean the tubers rot in the ground.

**Life cycle:** mid summer onwards

**Control:** Cultural: avoid overhead watering, earth up early – this helps to prevent the spores reaching the tubers, choose resistant varieties such as Cara. Chemical methods are also available.

### **Mosaic virus**

**Host:** potatoes and tomatoes

**Type:** virus

**Symptoms:** yellow mottling on leave, reduced vigour

**Life cycle:** vectors (insect pests that carry viruses) are present during the growing season

**Control:**

Cultural: remove and burn any infected plants to prevent spread.

Chemical: none. Vectors such as aphids should be controlled.

## **FRUIT & VEGETABLES**

### **LETTUCE (*Lactuca sativa*)**

#### **Introduction**

Lettuce has been cultivated for many centuries, the Egyptians are known to have grown them – they thought the milky white sap was an aphrodisiac. The Romans grew the Cos lettuce that originates from the Greek island of Cos.

Lettuces are annuals or biennials most of which are tender but a few such as the Butterhead 'Arctic King' and the Cos lettuce 'Winter Density' can over winter outside. Consult a seed catalogue for suitable cultivars for sowing at different times of the year.

Lettuces are excellent as a 'catch crop' to make use of an area of ground reserved for a late crop. They are also suited to successional sowings. Sow a row every two weeks for a continual supply throughout the season.

#### **There are several different types of lettuce:**

- Butterhead
- Crisphead
- Cos
- Loose leaf

#### **Butterhead lettuce**

Butterhead types have soft rounded leaves and moderately firm hearts. The modern cultivars such as 'Dolly' have good resistance to fungal diseases such Downy mildew.

#### **Recommended Butterheads**

- Arctic King – suitable for outdoor sowings in autumn to over winter.
- Sabine – suitable for sowing outdoors in the summer. Good resistance to root aphid.
- Buttercrunch – a tasty lettuce with a dense heart. Does not bolt easily. Suitable for sowing outdoor in summer.

#### **Crisphead lettuce**

Crisphead varieties produce large dense hearts of crisp leaves. The well-known Iceberg lettuce typifies this type. They are more resistant to bolting than butterhead types.

#### **Recommended crispheads**

- Webb's Wonderful – a classic lettuce, large hearted, reliable and not prone to bolting in hot weather. Recommended for summer sowing.
- Beatrice – medium sized crunchy heads. Excellent vigour. Resistant to both Downy mildew and root aphid. Recommended for spring, summer and early autumn sowings.
- El Toro – a quick growing cultivar that stands well until October. Suitable for cool wet climates.

#### **Cos lettuce**

Cos lettuces are upright thick leafed lettuces that produce an oblong heart. Modern cultivars have sweet tasting leaves. Cos lettuce are a good choice for hot sunny plots as they cope a little better with the conditions than other lettuce. They are also tolerant of cold conditions.

### Recommended Cos lettuce

- Jewel – an upright green lettuce with a good heart. Resistant to downy mildew. Recommended for summer sowing.
- Corsair – sweet solid heads with a butter yellow heart. Recommended for sowing in summer or early autumn. Resistant to mosaic virus.
- Winter Density – a winter hardy Cos that will crop in spring. The heads are crisp and sweet.

### **Loose leaf lettuce**

These produce a rosette of leaves rather than a heart. The leaves are generally curly and are picked a few at a time. They are extremely ornamental and have attractive shaped and/or coloured leaves.

They can be grown as a 'cutting lettuce'. A technique of growing where the seedlings are grown as a 'cut-and-come-again' crop. Loose leaf lettuces are sown in spring through to late summer. They can be grown over winter with protection.

### Recommended loose leaf lettuce

- Salad Bowl – an endive like plant with intricately curled leaves.
- Marvel of four seasons – a Lollo Rosso type lettuce with decorative leaves. Wide growing season as the name suggests.
- Saladisi – quick to crop (6-8 weeks) and will continue to produce leaves for six months.

### **Site and soil**

The soil should be light fertile moisture retentive loam, slightly alkaline in pH. Choose a sunny site in winter and a slightly shaded site in summer, as the leaves will scorch and the heat will encourage bolting of the hearting lettuce. Heat may also cause 'heat induced seed dormancy' which results in germination failure; Butterhead types are particularly susceptible to this phenomenon. Lettuce can be grown inside in a glasshouse, polytunnel or cold frame; they can be grown either in the ground or in containers such as 'Grow bags'.

### **Soil preparation**

If growing outside, the soil should be single dug in the autumn and plenty of organic matter such as spent mushroom compost added to increase the water holding capacity of the soil. Two weeks prior to sowing a general fertiliser such as Growmore should be incorporated into the soil @ 100g/m<sup>2</sup>.

### **Sowing**

There are many different ways in which to approach the sowing of lettuce. They can be started off in modules or sown in situ. The sowing time will differ according to the type of lettuce sown.

### **Crop timings**

- Mid February to late March (under cloches)
- Main crop – April to July (outside)
- August to October (in a glasshouse or frame)

### **For an early season crop:**

Warm the soil with cloches for several weeks prior to sowing. Remove the cloches and fork over and lightly firm the soil. The seed is then thinly sown 1cm deep in drills 30cm apart. Pelleted seed makes thin sowing easier. The cloches may be replaced over the

seed once sown. They should germinate in little over a week. Thin as soon as possible to about 7cm and then again later to 25cm. The second thinnings are good for eating.

**Note:** sowings later in the summer may be affected by heat-induced dormancy – cover the seedbed with white plastic once the seed has been sown to reflect the heat. Sowing in the evening will also help overcome this problem.

### **Cultivation**

Lettuce must have a regular supply of water. A check in the supply of water may lead to bolting. In dry conditions irrigate with porous pipe – aim to deliver about 22 litres/m<sup>2</sup>. Mulching will help to conserve moisture but do not mulch up to the 'collars' of plants as this may cause them to rot.

Keep the site free of weeds such as *Stellaria media* and *Cardamine hirsute*, which will compete for nutrients and light. If growth is slow a liquid nitrogenous fertiliser such as diluted comfrey fertiliser can be applied.

Protect from birds if problematic with a floating mulch of Horticultural fleece. Low tunnels of environmesh are also useful. Watch for attack from pests and diseases and treat accordingly.

### **Harvest**

The lettuce will be ready to harvest in approx. 10-12 weeks. Hearting lettuce are ready to harvest as soon as a firm heart has formed. Loose leaf are continually harvested as soon as the leaves are large enough to eat. Lettuce vary in their ability to 'stand' (keep well in situ) Butterheads will stand only a few days after maturing before they start to deteriorate, Crispheads will last a week longer. Cos have the best 'standing' ability – (so long as it is cool). Lettuce must be eaten fresh, as they do not keep.

### **Pests & diseases**

Lettuce is unfortunately prone to a few pests and diseases.

#### **Slugs and snails** (*Arion* pp. *Helix* spp.)

**Type:** chewing pest

**Symptoms:** holes chewed in the leaves (in the centre as well as the margins but usually excluding the veins)

**Life cycle:** this pest over winters as an egg, these eggs hatch in the spring to re-infest the crop. There are many generations a year.

**Control:** Cultural: frequent cultivation exposes eggs, young and adult slugs to predators and weather. Garden hygiene is very important; this removes possible breeding sites and alters the environment to discourage them.

Traps such as grapefruit skins may be placed on soil surface. Warm humid evenings give best catches. Inspect traps after dark or early next morning and kill slugs by dropping into a bucket containing a strong solution of salt or hot water.

'Slug pubs' or beer traps may be sunk into the ground; the beer attracts the slugs, intoxicates and drowns them. Beer remains effective for 2-3 nights. Biological: the nematode, *Phasmarhabditis* is drenched onto the soil. The nematode seeks out slugs and enters their bodies. Once inside the slug the nematodes release infectious bacteria that eventually kills it. The nematodes then multiply in dead slugs and disperse to spread infections. This method is useful for treating small areas but is expensive and may not be effective when soils are too dry or too wet or when soil temperatures are below 5°C. It is, therefore, most likely to be effective when applied in spring and/or early autumn. Chemical methods are also available.

### **Lettuce Downy Mildew (*Bremia lactucae*)**

**Type:** fungal disease that affects crops grown in damp conditions.

**Symptoms:** a white or grey fungal bloom predominantly found on the underside of leaves. Corresponding yellow areas are found on the upper leaf surface. Plants become disfigured and stunted.

**Life cycle:** prevalent in spring on seedlings or in the late summer on mature plants. The disease over winters as spores in the soil.

**Control:** Cultural – practise crop rotation. Grow resistant varieties such as Dolly, Beatrice and Jewel. Improve the ventilation and avoid overhead watering. Remove badly infected plants. Chemical methods are also available.

Lettuces are also prone to attack from:

- Root aphid
- Aphids
- Caterpillars
- Botrytis
- Lettuce big vein virus

## **FRUIT & VEGETABLES**

### **TOMATOES (*Lycopersicon esculentum*)**

#### **Introduction**

Tomatoes are a short-lived annual plant, they originate from South America. Like many other introductions from South America they were originally grown as ornamental plants. For a long period after it was introduced in the 16<sup>th</sup> century it was thought to be poisonous; later it was thought to be an aphrodisiac and this earned it the name 'love apple'. Today it is a widely grown and consumed vegetable.

Tomatoes are frost tender and need a high intensity of light to ripen. Tomatoes grow best at temperatures between 21-24°C. They can be grown in containers or in the ground, either indoors or out.

This discussion will concentrate on cultivation of outdoor tomatoes.

#### **Types of tomatoes – cordon & bush**

**Cordon** (sometimes known as indeterminate)

**Bush & Dwarf** (sometimes known as determinate). These plants sprawl on the ground. Cover with a floating mulch of horticultural fleece in the early stages to protect the plants.

#### **Recommended varieties**

##### **Cordon type**

- Gardeners delight – a cherry tomato with small sweet fruits on a vigorous plant.
- Super sweet 100 – small fruits. Resistant to Verticillium wilt.

##### **Bush type**

- Super Marmande – a beef stake type tomato, quick to ripen with good flavour.
- Red Alert – a compact plant, quick to ripen.

#### **Soil preparation**

Single dig the soil adding plenty of organic matter such as well-rotted farm manure, firm and level. Add a base dressing of a general fertiliser such as Blood, Fish and Bone @ 70g/m<sup>2</sup> or Growmore @ 100g/m<sup>2</sup>. Cloches can be used to warm up the soil prior to planting enabling the plants to be planted earlier. Water plants well both before and after planting.

#### **Propagation**

Seed should be sown indoors about a month prior to the last frost. Using modules and loam-less compost sow the seeds about 2cm deep. They will require a germination temperature of 18°C. The seeds should germinate in 7-10 days.

Prick out into pots once the seedlings have three sets of leaves. Grow on in the protected environment making sure that they have plenty of light. (A heated glasshouse is really necessary for starting tomatoes successfully). Harden off the seedlings prior to planting outside, this can be done when the night temperature is over 7°C and the danger of frost has passed. Plant into soil that has been well cultivated and has had plenty of organic matter added to it.

#### **Planting out**

Wait until risk of frost has passed – probably about **June**.

- Plant cordon types about 45cm apart in rows 45cm apart.
- Plant bush types between 30cm to 80cm apart depending on the cultivar.

## **Cultivation**

Tomatoes are tolerant of a wide variety of soils but will benefit from well-cultivated soil with added O.M. If grown in containers use a mixture of peat based and John Innes composts. Tomatoes are **gross feeders** so add a base dressing of Growmore when planting and feed with a high potash feed once they begin to flower, this will promote the development of fruit.

**Pinch out side shoots** on cordon types. About August the apical bud will need to be pinched out; this will divert the plant energy from growth to fruit development. Bush types do not need pinching out.

**Water well** once planted and mulch once the soil is warm. This will conserve soil moisture and temperature. Tomatoes need plenty of water (11 litres/2 gallons per plant per week) in order for the fruit to swell, but it is important that the water supply is regular otherwise the developing fruit can burst. Too much water on the other hand can make them tasteless. It is difficult to get it just right!

**Remove the yellowing leaves** from around the base and **pinch out the side shoots** to encourage the energy to go into the development of the fruit. **Tie in cordons** as they grow and **pinch out the tip** when it reaches the top of the support.

## **Ripening & Harvesting**

Pick fruits as they ripen, this can be as early as seven weeks after planting with bush fruit and ten weeks for cordons types. In late summer the cordons can be removed from their supports and lain down on a bed of straw and covered with a cloche to promote ripening. Bush varieties can be pulled up and hung upside down indoors to ripen.

## **Growing in the protected environment**

This could be either a glasshouse or polytunnel. The plants can still be grown in pots and 'Long Toms' or in the soil, but there may be problems with soil borne pests & diseases (potato cyst eelworms and root rot) if they are repeatedly grown in the same soil. Ring culture is the growing of plants in bottomless pots that are stood on shingle. All the same cultivation techniques apply, but attention to watering and adequate ventilation is even more important in a glasshouse.

## **Pest and Diseases**

Tomatoes are susceptible to quite a few pests and diseases. They include:

### **Glasshouse whitefly** (*Trialeurodes vaporariorum*) (indoor crops)

This small (1mm in length) moth-like pest was originally introduced from the tropics and now causes serious problems on a range of glasshouse food and flower crops.

**Host:** a wide range of plants including *tomatoes*, *pelargonium*, *fuchsia* and *chrysanthemum spp.* It often over winters on chickweed growing in the glasshouse.

**Type:** piercing and sucking.

**Symptoms:** reduced vigour, distortion of growing tips, honeydew, sooty mould and virus.

**Life cycle:** the fertilised female lays 200 minute, white, elongated oval eggs in a circular pattern on the lower leaf surface. The eggs turn black and then hatch to produce nymphs. The nymphs then become flat immobile scales, the last instar of which is a thick walled '**pupa**' from which the adult emerges and three days later lays eggs again.

All stages after the egg have sucking stylets, which may cause large quantities of honeydew and sooty moulds on the leaf surface. The whole life cycle takes thirty-two days in spring and twenty-three days in the summer.

**Control:** Cultural: remove host plants such as *Stellaria media* (chick weed)

Biological: a minute wasp (*Encarsia formosa*) can be introduced to the crop. It lays an egg inside the scale of the whitefly, which is eaten away internally and turns black to release a wasp. Chemical methods are also available.

Biological chemical: **Verticillium lecanii** is also effective at controlling adults by causing a fatal fungal infection.

### **Cucumber Mosaic Virus**

**Host:** cucumbers (*Cucumis sativas*) and tomatoes (*Lycopersicon esculentum*).

**Type:** virus spread by vectors such as infected hands, but more commonly an aphid (e.g. peach-potato aphid) is involved.

**Symptoms:** mottling of young leaves occurs, followed by a twisting and curling of the whole foliage, and fruit may show yellow sunken areas. Infected tomato leaves are reduced in size.

**Life cycle:** present year round.

**Control:** Cultural: since there are no curative methods for control, care must be taken to carry out **preventative** methods. Choice of **uninfected stock** is vital when propagating plants vegetatively, e.g. Pelargonium. Careful control of **vectors** such as aphids may be important where susceptible crops (e.g. lettuce and cucumbers) are grown in succession. Removal of infected **weeds** such as fat hen (*Chenopodium album*), particularly from greenhouses, may prevent widespread infection.

### **Other important tomato pests & diseases include:**

- Potato/tomato blight (see 'potatoes' section for further details)
- Glasshouse Red Spider Mite
- Botrytis