

<http://www.orangeippin.com/resources/general/own-roots>

Fruit trees on their own roots

Growing Apple Trees on their Own Roots

By Hugh F. Ermen (1928-2009)

Update: November 2008

An update based on the experience gained over 25 years propagating and fruiting own root fruit trees of many varieties.

Many fruit growers with long experience will know that growing a tree as naturally as possible is the best way.

Own root trees behave exactly as you would expect. Differences occur in trees on rootstocks due to the various degrees of incompatibility between stock and scion, which means there will be greater differences with dwarfing rootstocks.

Cropping will vary according to variety whether on own roots or rootstocks. I have found cropping more regular on own root trees, again as one would expect. Fruit size and quality at least as good but normally better.

It has sometimes been suggested that we need trials to establish whether own root trees are better than trees on rootstocks. Having given this much thought, I would suggest this would be a waste of time and money. A trial would be influenced by the person conducting the trial whether intentionally or not. Of course apple trees grow well on their own roots, are the natural forests of apples on rootstocks?

The vigour of own root trees must be considered if you have little space. Triploid varieties will need more space than diploid varieties but I have found if they get the space they perform very well.

There are many basic techniques from planting to pruning which can be used to help control vigour, with cropping being the best control.

For the newcomer to own root trees, I suggest starting with spur types and heavy cropping diploids. For the experienced person with enough space, the triploid varieties will not present a problem and you can always graft a fertile pollinator in the tree for the leader!

For the fruit tree nurseryman, the own root fruit tree should make propagation cheaper and reduce the risk of virus disease spread.

FRUIT ENTHUSIASTS - TRY OWN ROOT TREES!

Original article continues ...

Every variety of apple started life as a seed and in the past seedlings were selected growing on their own roots. Today the practice of apple breeders is to work the seedlings on to a dwarfing

rootstock to bring them into cropping quickly. It is now well known, but often ignored, that degrees of incompatibility can exist between varieties and rootstocks, especially with the dwarfing rootstocks. It is probable that some potentially good varieties have been discarded in the past because partial incompatibility caused the seedling to give a poor performance on dwarfing rootstocks. A better but not necessarily quicker alternative would be to keep seedlings for assessment growing on their own root system. There are many well known ways which could be used to bring such seedlings into crop quicker. As a general rule, the first seedlings to fruit from a batch of seeds are often flowering crabs, around year three to four. The next to flower are more likely to be good cropping diploid varieties. Seedlings that take six years or more to flower and fruit are usually moderate cropping diploid varieties. Triploid varieties are usually the last to flower and fruit which can take ten years.



Comparison of Cox's Orange Pippin trees growing on M9 dwarf rootstocks (left) own-roots (right) - the own-root trees have the same vigour as Cox on MM106 semi-dwarfing rootstock - 1991

Experience gained over the last thirty years has shown that assessing seedlings grown on their own roots gives more information to the apple breeder. It is very useful to know the natural vigour of a seedling, its' growth pattern, cropping habit, fruit quality and natural resistance to pests and diseases without any rootstock influence.

The realisation that a rootstock influence on a variety is greater than at first thought, gives grounds to have a collection of the main apple varieties propagated on their own roots. This would reveal the natural characteristics of each variety and although more land would be needed than a collection on dwarfing rootstocks, this would be offset by double the lifespan of the own trees roots.

About the author

Hugh Ermen is one of the UK's most successful modern apple breeders. He has raised Scrumptious, Red Devil, Winter Gem, Limelight, Herefordshire Russet and many others. He a leading exponent of the technique of growing apple trees on their own roots - rather than the standard practice of using dwarfing rootstocks.

Growing apples on their own roots is not new. A reference can be found in the Transactions of the Horticultural Society of London where Mr Arthur R Biggs F.H.S., read a paper in February 1807. Only a few apple varieties could be propagated by cuttings, until research showed the way with use of heated propagating bins and micro propagation. Further progress with own root apple trees has been very slow, due to the major cut backs in Research and Development.

However, there is now enough experience with own root apples to make further development work worthwhile and the breeding of compact varieties to exploit the benefits and overcome the drawbacks.

Advantages of Own Root Trees

1. Better tree health



Red Devil on own-roots, cropping heavily - 1992

Each variety differs in its precise nutritional requirements which can easily be achieved naturally, by growing a variety on its own roots. There is a difference between the uptake of nutrients by a rootstock and the exact requirements of the scion variety worked on it. This mismatch can lead to a reduction in the health of the scion variety and fruit quality.

2. Better fruit set

When a variety that comes into growth early is worked on a late starting rootstock and flowers before the rootstock becomes active, poor fruit set will result.

3. Better fruit quality and storage life
4. Better resistance to pests and diseases
5. Excellent for pot culture

Disadvantages of Own Root Trees

1. No rootstock vigour control
2. Insufficient development work at present on large scale propagation of own root trees.

A Vigour Guide To Own Root Trees

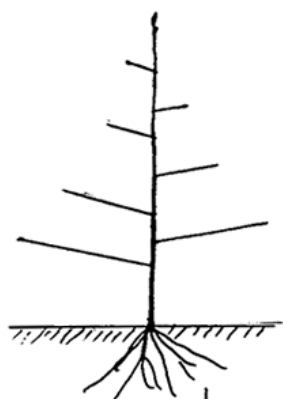
1. Dwarfing - semi dwarfing (M9 - M26)
Diploid compact spur type varieties and clones (e.g. Starkspur Golden Delicious)
2. Medium Vigour
The majority of diploid varieties (e.g. Cox's Orange Pippin)
3. Vigorous
The majority of triploid varieties (e.g. Bramley Seedling)

Tree Management Techniques

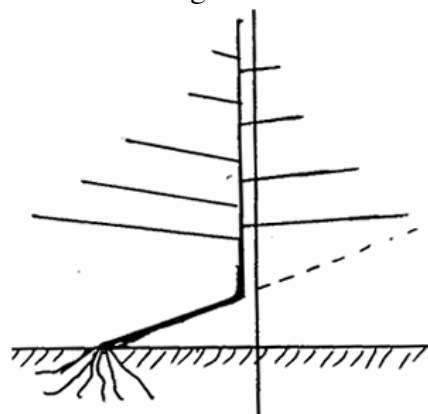
There is plenty of scope for innovation, especially for the amateur. The following drawings of possible tree shapes and planting systems will stimulate further innovation.

Tree forms

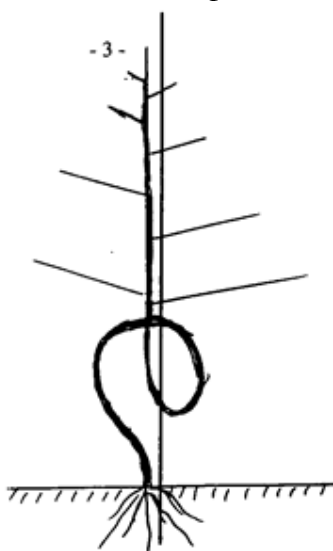
Centre Leader



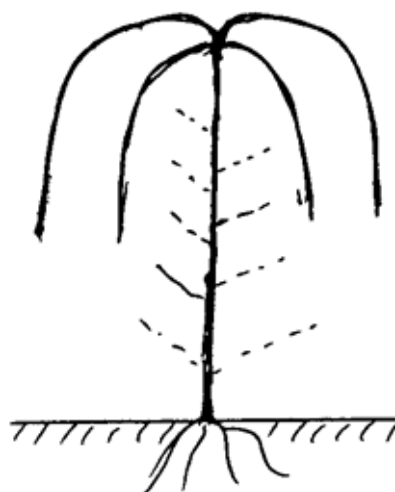
45 degree Plant



Stem Loop



The Umbrella

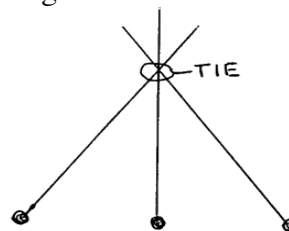


Zig Zag Stem



Tripods

No tree stakes required. Tripod trees withstood the hurricane in Kent without damage. Base of the triangle is 1m x 1m x 1m.



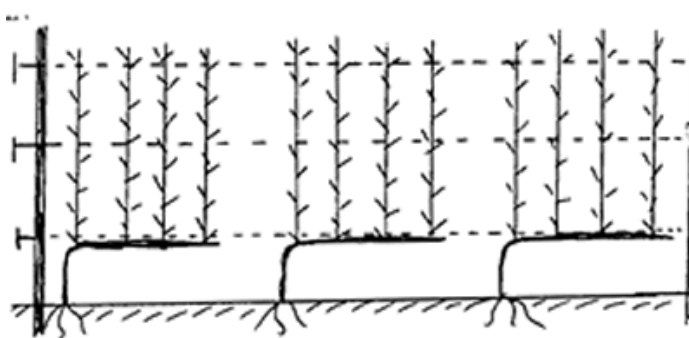
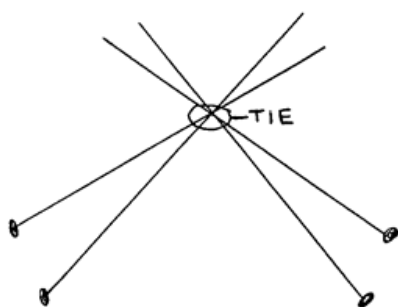
Tent

No tree stakes required. Tree vigour can be controlled by reducing or increasing

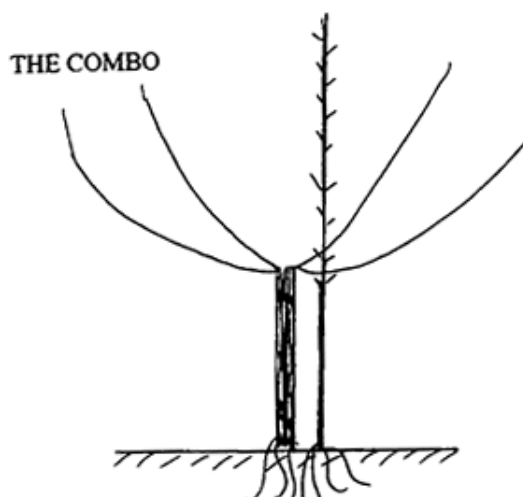
The Curtain

Posts and wires needed for support. This system requires some experience of spur pruning

the angle of the trees. Base of the square is 1m x 1m x 1m x 1m.



The Combo
Central tree is a Wijcik type pollinator.
An alternative is to graft a pollinator variety directly on to the tree.



3 x Cox's Orange Pippin own-root trees grown as a tripods to control vigour (1m between each tree) - 1998

Techniques to encourage early cropping

- Plant well feathered maidens or possibly 2yr old trees
- Plant at an angle of 45 degrees
- Tying down branches near horizontal
- Summer pruning
- Minimum winter pruning
- Bark ringing (not in year of planting)
- Bending over and tying down leading shoot in late June
- Root pruning
- Grassing down orchard
- Careful use of fertilisers, especially Nitrogen

In general, flowering and harvesting times will be similar to trees grown on MM106 rootstock. Fruit shape will be typical for the variety (MM106 produces a slightly more conical Cox fruit).

The culture of own root trees

- The Site
The same as for trees worked on a rootstock
- The Soil
Own root trees do not require the rich deep soils which are desirable for trees on dwarfing rootstocks. Cox's Orange Pippin is sensitive to soil pH and will not tolerate a pH below 6.5 and grows better in neutral soil.

The Prejudice Against Own Root Trees

Many Growers have experienced scion rooting in orchards of trees grown on the dwarfing rootstocks M9 and M27. These trees become vigorous as a result of scion rooting and receive hard pruning in winter to keep them confined to their allotted space. This practice causes the trees to grow more vigorously and become unfruitful. The conclusion reached is that trees on their own roots are vigorous and unfruitful, which they can be in these circumstances.



3 mature Cox's Orange Pippin own-root trees grown as a tripod - 1987

Some research workers, but not all, feel that own root trees are a retrograde step, after all the research that has gone into rootstocks. On the other hand, research work has made own root tree propagation a practical proposition and both England and Europe trial orchards were planted, but cutbacks in research terminated this work. Extended private observations of own root trees has indicated that further development work is worthwhile, especially with organic growing in mind.

Views have been expressed that uniformity of trees on rootstocks is much better. The author has not found this to be correct. Uniform planting material produces uniform trees, whether on rootstocks or own roots.

Years ago, some plum orchards were grown on their own roots and were repropagated from suckers. This led to a steady decline due to virus and other diseases, which were little understood by management at the time. With all fruit propagation it is essential to use virus free material whenever possible.

Reliable information from home and abroad has stated that Cambridge Gage used to grow and crop better on its own roots than worked on a plum rootstock. This is now being checked with trees growing on their own roots. Trees of Victoria are also being observed on their own roots.

The Propagation Of Own Root Trees

No large scale production of own root trees exists at the present time.

Micro-propagation

This should be the fastest method for large scale production. It has to be carried out with skill and care, to avoid the production of 'OFF' types. Trees raised in this way experimentally, have initially been more vigorous and slower to crop than trees from hardwood cuttings. No doubt with more development work these slight drawbacks can be overcome.

Hardwood Cuttings

Variable results have been obtained with hardwood cuttings placed in heated propagating bins. The optimum base temperature has to be worked out together with the air temperature of each variety. For example, Bramley Seedling roots well if cuttings are taken at leaf fall and placed in a propagating bin with base heat of 25° C and in an air temperature of 20° C. Many other varieties rooted with an air temperature around 5° C. There was also marked seasonal variation in rooting. The use of a rooting hormone (IBA) was essential with most varieties. The method is only used for easy rooting subjects commercially, such as rootstocks. New simpler techniques are being evaluated by F.P. Matthews of Tenbury Wells.

Nurse Root Cuttings

This method has proved reliable using M27 nurse roots. Many if not all, varieties can be rooted by this method with or without rooting hormone. Giving base heat in a propagating bin gives speedier rooting, or placing unheated bins under plastic or glass. Placing the cutting bins outdoors can also be successful. This method is used initially to get a variety on its own roots.

Root Cuttings

Roots from preferably young trees, about pencil thickness, can produce a whip about 50cm tall in one growing season in an outdoor bin. Feathered maidens have been produced from roots if the bins are placed under polythene or glass. Outdoor benefits from insulation against excessive cold or hot ambient temperatures. Bins are best raised off the ground and placed in good light conditions. It is an ideal method for small scale production.



Katy own-root apple trees, kept to the same size as M9 trees by allowing very heavy cropping - 1987

Propagating Pears, Peaches, Plums and Cherries

The same methods described for apples can be used for pears and plums. The author has limited experience with peaches and cherries. Peregrine peach raised by semi-hardwood cuttings under mist cropped very well indeed. A nurse rooted (using Colt) Stella cherry grew and fruited well. Peach root cuttings from Peregrine tried on a very small scale have not been successful. Roots from Colt cherry rootstocks grow very well.

Future Potential For Own Root Trees

The full potential for own root fruit trees will only be revealed when we have gained sufficient experience of the best methods of propagation and culture. Gaining this experience will be exciting for the dedicated fruit enthusiasts be they amateur or professional.

The biggest difference in fruit quality and flavour between own root trees and rootstock trees will be found between own root trees and trees on dwarfing rootstocks.

Trees growing on their own roots may not crop more heavily or have better fruit size than trees on M9 although better cropping and fruit size has been apparent with some varieties. What can be virtually guaranteed with the experience gained so far, is more regular cropping and better quality fruits which have a better storage life. Fruit flavour could well be more intense and with generally more seeds per fruit, better fruit shape. In the end it will be the grower who by his skill, can manage own root trees and obtain the full potential.

Pruning Guide for Own Root Apple Trees



Cox's Orange Pippin own-root trees grown as tripods to control vigour - 1987

The vigour of an own root apple tree depends on the variety or clone, not on a selected rootstock. The best way to control the vigour of an apple tree, whether on its own roots or a rootstock is by cropping.

The basic vigour range of rootstocks is:

1. Dwarf - semi dwarf Rootstocks M27, M9 and M26
2. Medium vigour Rootstocks MM106, M7 and MM111
3. Vigorous - very vigorous Rootstock M2, M16 and M25

The vigour of named fruiting varieties can also be grouped into three:

1. Dwarf - semi dwarf

- All Wijcik (Ballerina) varieties
- Starkspur Golden Delicious
- Granny Smith Spur
- Lord Derby Spur (culinary)
- Sunburn
- Cox Spur Type
- Discovery Spur Type

2a. Medium vigour (Dessert) mainly diploid varieties

- George Cave
- Discovery
- James Grieve
- Worcester Pearmain
- Lord Lambourne
- St. Edmund's Pippin (russet)
- Cox's Orange Pippin
- Sunset
- Golden Delicious
- Winston
- Pixie
- Sturmer Pippin

2b. Medium vigour (Culinary) mainly diploid varieties

- Early Victoria
- Grenadier
- Rev. W. Wilks
- Arthur Turner
- Golden Noble
- Bountiful
- Lane's Prince Albert
- Annie Elizabeth
- Edward VII

Vigorous - very vigorous -mainly triploid varieties

- Blenheim Orange
- Bramley Seedling
- Crispin
- Jonagold
- Jupiter
- Newton Wonder
- Orleans Reinette
- Ribston Pippin
- Suntan

Pruning apple trees

This is carried out in two stages.

1. At planting time to train the tree to grow into the desired shape.
 - Pyramid and Spindle Bush
 - Bush 3' leg
 - Half standard 4 1/2' leg
 - Standard 6' leg
 - Centre Leader
 - Cordon
 - Espalier
 - Fan
 - Tripod (three trees)
 - Step over

2. Growing tree

- To let light and air into mature trees to encourage flower buds, strong mature flowers and good quality fruit.
- To cut out damaged or diseased wood.
- To regular cropping by removing excess fruit buds especially by thinning complex spurs.
- To renew branches.
- To retain a balanced (stable) tree.
- To allow access for picking fruit.
- To maintain tree in space provided.

FAILURE to prune mature trees will lead to:

- Tangled and overcrowded growth.
- Excessive cropping which increases the risk of biennial bearing.
- Excessive shading causing small, inferior quality fruit.
- Difficult to pick fruit.
- Increased pests and disease.
- Harder to get good spray cover.
- More likelihood of unbalanced growth leading to a greater risk of tree instability, especially when carrying a heavy crop.

Growth characteristics of apple trees

Two kinds of buds can be found on apple shoots/branches. On one year old shoots there will be small wood buds. In the second year some wood buds will fatten up and become fruit buds. The terminal bud at the end of the shoot will normally continue the shoot extension although in a few varieties (tip bearers such as Worcester Pearmain) the terminal bud will often form into a fruit bud, and fruit in the 2nd year.

In the third year flowers will emerge from the fruit buds and if pollinated successfully, the flowers will grow into apples.

The fruit buds on two year old wood are in reality very short shoots called spurs. Some varieties called spur types grow further spurs as the apples are growing, instead of shoots. Normally each spur will terminate in a fruit bud. After a few years the spurs become numerous and the quality and size of fruits formed on them deteriorates due to competition. It is then necessary to thin the spurs in the winter, so that competition is reduced.

Apple varieties forming spurs readily are the easiest to manage on their own roots, as much as of the natural tree vigour goes into the production of apples. All the other varieties need to be pruned to encourage a good balance between growing and fruiting.

Time of pruning and effect

Winter

Pruning in winter reduces the aerial parts of the tree but not the roots. The effect will be to increase the vigour of shoots and branches and discourage formation of fruit buds. Winter pruning is ideal for trees that have too many fruit buds and little extension growth.

Pruning young trees where growth is needed and directed in to forming the tree, rather than fruit production, is carried out in winter.

When the trees are leafless in the dormant winter season, damaged, diseased or congested growth can easily be seen. If the tree is very vigorous, winter pruning is less desirable. In this case it is best to leave pruning until growth in the spring starts, or prune directly after picking and before leaf fall.

Summer pruning

At this time of year, pruning reduces the number of leaves which manufacture food materials. Summer pruning therefore reduces the vigour of the tree and improves the cropping potential. Summer is an ideal time to remove strong vertical shoots which are generally unfruitful and shoots growing underneath branches which get heavily shaded.

Pruning - apical dominance

The highest bud on a shoot, pruned or unpruned will be dominant and will grow out stronger than any other bud. The strongest growth will be at the top of a branch or tree.

When growing a centre leader tree (a tree with a central trunk up to the leading shoot) you control growth using the leading shoot of the stem. Cutting back the leader will increase growth in the lower branches. Leaving the leading shoot unpruned will reduce vigour in the lower branches. The harder the tree leader is pruned (ideally down to a well placed weak shoot) the greater the vigour increases in the lower branches.

Pruning methods

Pruning is best demonstrated in the orchard. Failing that, watch the response of the tree to pruning and react accordingly.

Regulated pruning

This is exactly what it says. Pruning to regulate the tree growth and cropping. Basically a tree is pruned to get balanced growth and branches to carry fruit in good light and air. Vertical growing vigorous shoots are usually unfruitful and shoots growing downwards underneath a branch get heavily shaded, both types should be removed. Shoots growing out from the sides of branches are ideal for carrying fruit. When these side shoots have grown too long they are best cut back to the main branch with a sloping cut, leaving more stub underneath to encourage a renewal shoot to grow from the stub at a nice wide angle.

The basic bush tree and centre leader tree should have about four main branches, arranged around the tree for good stability. The height of these branches from the ground will depend on the type of tree being grown. Bush trees have branches around 3' from the ground, half standards 4 1/2' and standard trees 6' from the ground. Centre leader trees normally have their main branches at waist height for easy harvesting of the fruits. Branches above these are renewed before they get too big, by cutting them back to the trunk with a sloping cut to avoid too much shading of the main branches.

Spur pruning

This method of pruning is mainly used for cordons, espaliers and other more formal shaped trees. The object is to create fruiting spurs close to the stem and main branches. Some varieties form spurs very easily (Starkspur Golden Delicious) and are known as spur types whilst others range from easy to difficult.

The difficult varieties are usually tip bearers (e.g. Worcester Pearmain) and vigorous triploid varieties (e.g. Bramley Seedling).

Spur pruning is mainly carried out in the summer and involves cutting back shoots growing directly from the stem or main branches to encourage fruit buds to form near the stem or branch. There are many ideas about how best to achieve fruiting spurs close to a stem or branch. The vigour of the tree can be used as a guide.

Weak growing trees

Prune young shoots when they reach 9" and cut back to an underneath bud around 6".

Moderate vigour trees

Prune young shoots when they have reached 12" back to an upward growing bud around 9". The shoot will almost certainly grow out from that top bud and can later be pruned back to the underneath bud behind the top bud which has grown out at a better angle.

Vigourous trees

Prune young shoots that have reached 18" back to top bud around 12" then continue as for medium vigour trees.

This can only be a rough guide and timing will differ due to weather, culture etc. Watch the tree's response to pruning and adjust accordingly. If the tree has not responded with fruit buds near stem or main branch it is best to cut the shoot back to the stem or branch with a sloping cut to encourage a further shoot to grow out at a wide angle and start again.



Cox's Orange Pippin own-root - 1987

Grafting shoots into strategic positions

If all else fails, there is a graft that can place a shoot in a branch or stem, provided the stem or branch is reasonably thick. This involves collecting dormant one year old shoots in early February and placing them upright in a pot of sand to a depth of 4-6" which is then placed in a cool shady part of the garden. Alternatively, shoots can be placed in a polythene bag (not airtight) and stored in the vegetable compartment of a refrigerator. In April when the sap rises and the bark will lift, the stored shoots can be used for slit grafts in the bark. This enables shoots to be placed in ideal positions on stem or branch. Length of grafts depends on the vigour of the tree. 4"grafts for weak growing trees, 6" for moderate vigour trees and 8-9" for vigorous trees. These grafted shoots normally form fruit buds easily.

Pruning should not be regarded as an isolated operation but as part of the tree culture and taken together with soil management and cropping.

For more detailed information about pruning, the R.H.S. Wisley Handbook on Pruning Hardy Fruits by Jack Woodward can be highly recommended.

H.F.Ermen. A.H.R.H.S., N.D.H.
Dip.Hort. Wisley
Dip.Hort. Writtle.

November 2000

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Cutting out rootstocks by R.D. Child, Long Ashton Research Station, Bristol. The Grower April 16th 1981.

For more information about fruit tree propagation see: [USEnglandA](#) or [UK](#).

We are also offering a small number of [own-root apple trees for sale in the UK](#). We are sorry to announce that Mr Ermen died in 2009. In March 2010 the UK Royal Horticultural Society recognised [Scrumptious](#), one of the most popular varieties raised by him, with the Award of Garden Merit - the first such award given to an apple variety for more than 10 years.