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Planting programmes should take into account the need for —

CROSS POLLINATION IN APPLES

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One of the main aims of the successful apple grower is to reduce seasonal variations in cropping. With this in view it has become apparent that provision for adequate cross pollination can be important in certain seasons, especially with Granny Smiths, if full advantage is to be taken of chemical thinning and other improved methods of orchard management.

- Cross pollination is essential for good setting in some varieties. Granny Smiths deserve special attention.

- Pollinators should flower at the same time as the main variety. More than one variety may be needed.

- They should be planted not more than two rows distant from trees of the main variety.

In this article the need for cross pollination is discussed together with the principles that should be kept in mind in planning an orchard to meet the minimum requirements.

Terms

The term cross pollination has been well known in fruit growing circles for many years.

Pollination is the transfer of pollen grains from the stamens or male parts of a flower to the stigma, the centrally situated female part of the flower. The transfer of pollen enables the union of male and female elements to take place and is usually carried out by bees or other pollinating insects. The union of male and female elements is known as fertilisation, and is essential for fruit set and seed formation.

Cross pollination means the transfer of pollen from the flowers of one variety to flowers of another variety of the same type of fruit. Trees producing pollen used in the pollination of another variety are known as pollinators or pollinisers.
Apple Varieties Vary in Their Pollination Requirements

Apple varieties generally fall into three main groups as far as their pollination requirements are concerned. These are—

- Varieties which can be relied on to set a commercial crop without special provisions being made for cross pollination. These varieties rely almost solely on self pollination. Cleopatra is a well known local variety in this group.

- Varieties which depend largely on cross pollination and are not likely to produce worthwhile crops unless suitable pollinating varieties are situated nearby. Delicious is a variety which depends almost entirely on cross pollination. Stayman's Winesap and Gravenstein are two rarely-grown varieties which also depend largely on cross pollination.

- Intermediate varieties, which are likely to produce better and more consistent crops if they are cross-pollinated. Most of our well known varieties, including Granny Smith, Jonathans, Golden Delicious, Yates and Dougherties fall into this group.

GRANNY SMITHS WARRANT SPECIAL ATTENTION

Where there is doubt about the need for cross pollination under local conditions, especially for the Granny Smith variety, consideration of the following aspects may be helpful. Later the choice of suitable pollinators and ways of tackling the problem are discussed.

The Changing Pattern of Apple Plantings in Western Australia

Before World War II, it was a common practice in Western Australia to plant mixed orchards, with many different varieties of apples planted together. Cross pollination was usually well provided for in these plantings. In recent years there has been a marked trend away from these mixed orchards to plantings confined mainly to a few popular varieties. Granny Smiths are often planted in fairly solid blocks.

In many of these newer plantings therefore there is limited scope for effective cross pollination of the Granny Smith variety.

Delayed Cropping

Many recent Granny Smith plantings are comparatively young so that no definite cropping pattern has so far emerged.
Others are not cropping as well as they should. Excessive vigour, especially in trees raised on Pomme de Neige and seedling rootstocks, is sometimes responsible for delayed cropping but this is certainly not so in every case. Some blocks of Granny Smiths have set only very light crops even after they have spurred up and blossomed strongly. These trees have been isolated from other varieties.

Cross Pollination in the “On” Year

It has often been suggested that at least during a heavy blossoming or “on” year cross pollination is not required for the Granny Smith variety. Sometimes this appears to be so, as in the 1960-61 season, when there was an exceptionally strong “on” year blossom on all varieties in most orchards. This was followed by a heavy setting even where trees were quite distant from another variety.

The position was different in the 1962-63 season, when many instances were noted in Hills and South-West orchards of mature Granny Smith trees isolated from another variety not setting as well as trees situated beside a suitable pollinator. In some cases the trees still set moderately heavy crops but in other cases the crops were much lighter than they should have been.

It was noticeable that a distance of more than two rows from a pollinator made all the difference to the crop set. The 1962-63 season was not a good flowering season, but it did demonstrate that even in an “on” year cross pollination can be important if conditions for setting are otherwise unfavourable.

Cross Pollination in the “Off” Year

During the 1961-62 season there was ample evidence to support the view that cross pollination can have an important bearing on the crop in the “off” year and that this applies particularly to trees which had not overcropped in the previous season.

One very clear-cut result was seen in an orchard where Granny Smith trees which had shown an excellent response to chemical thinning in the 1960-61 “on” year, produced a strong return blossom in the spring of 1961. Of these trees only those situated alongside a pollinating variety produced the expected follow-up crop. Other trees which had not been chemically thinned the previous year failed to produce a follow-up blossom and therefore did not set a crop even when situated beside a suitable pollinator.

In other words the only trees which produced a return crop were those which were spray thinned in 1960-61 and cross pollinated the following year.

Setting was again poor on trees which were more than two rows from trees of another variety.

Many similar examples were seen in the 1960-61 season, and the effect was not necessarily confined to the Granny Smith variety.

Aiding More Regular Cropping

The role of chemical thinning in reducing variations in cropping from year to year is becoming well accepted by fruit growers; irrigation is, of course, another valuable aid. But because adequate cross pollination is likely to enhance chemical thinning, it is clear that provision for adequate cross pollination can also be important in a controlled cropping programme.

Provision for sufficient cross pollination in an orchard must mean that in some years the crop is likely to be too heavy. Cross pollination must therefore work hand in hand with chemical thinning.

It is possible to remove fruitlets by thinning sprays during a favourable setting year but it is impossible to stick them on if the conditions are unfavourable. Chemical thinning sprays can also be used with much more confidence if adequate provision has been made for cross pollination. Crops should then be more regular, bringing increased average returns.

PLANNING FOR THE FUTURE

In any new planting in which Granny Smith is to be the main variety, there is a strong case for maintaining at least a minimum proportion of trees of a suitable pollinating variety or varieties. These trees should be spaced systematically throughout the planting as set out in this article.

The same applies to any large blocks of other varieties.
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In existing plantings where blocks of Granny Smiths or other varieties have been planted without adequate provision for cross pollination, it may be necessary to graft over a proportion of trees to suitable pollinating varieties.

**Selecting the Most Suitable Varieties for Cross Pollination**

Most apple varieties produce pollen which will effectively pollinate other varieties providing that the varieties flower at the same time and the conditions are favourable to the transfer of pollen.

*The main requirement for pollinating varieties is therefore that the blossoming period of the main variety and the pollinating variety should overlap.*

The variety should also be one which, with the help of crop regulation, will produce a fairly strong blossom from year to year.

Under West Australian conditions, the period of time during which there is likely to be an overlap in the blossoming period of any two varieties varies with the season and to some extent with the district. Mild winters in particular can play an important part in the blossoming pattern.

A variety selected as a pollinator must therefore be one which meets the requirements in most seasons.

**POLLINATORS FOR GRANNY SMITHS**

Varieties well known in Western Australia which can be used as pollinators for Granny Smiths are Jonathan, Delicious, Cleopatra, Yates, Golden Delicious and Dougherty.

The Jonathan is the variety which is most likely to flower over the same period as Granny Smiths. Under good management the Jonathan can also be relied on to blossom strongly in most years. It is the surest pollinator for the Granny Smith variety.

Delicious usually blossoms over much the same period as the Granny Smith. However it is naturally inclined to blossom strongly one year with a very light blossom the following year. When in blossom
Delicious is an excellent pollinator for Granny Smiths but during a light year it is a poor source of pollen for cross pollination. This presents a problem if a light year coincides with a year when cross pollination of Granny Smiths is important.

Where the Delicious variety is to provide the main source of cross pollination it is a sound idea to include trees of a second pollinating variety, spaced at intervals along the Delicious rows. This is the surest method of safeguarding the pollination requirements.

At the same time however if Delicious trees are chemically thinned in a strong flowering year to the point of slight over-thinning and this is combined with special attention to the method of pruning, it should be possible to reproduce a fairly strong blossom in most years. The Delicious variety should then serve quite well by itself as a pollinator for Granny Smiths.

A pruning system which has proved helpful with the Delicious variety is to encourage the development of fruit on laterals and to shorten back about a third of the laterals each year. The laterals to be shortened each year are mainly those which have made three years of growth. Generally these are cut back to the three-year-old wood. A few two-year-old and one year old laterals can also be shortened, depending on the vigour of the trees.

With this method, a replacement cycle is therefore initiated whereby the trees are producing new laterals each year and carrying approximately equal proportions of one, two and three year old lateral wood. This system is based on the tendency of the Delicious variety to carry a large proportion of the fruit borne on laterals on three year old wood. Some fruit will of course also be set on spurs on the older parts of the tree.

The system described does not overcome the need for effective chemical thinning.

Cleopatra normally blossoms a week or so before Granny Smiths, but quite often the blossom will overlap; when it does Cleopatra is an excellent pollinator for this variety. The Cleopatra variety flowers consistently but is at present rapidly losing favour as a commercial variety in Western Australia.

The Yates is a useful pollinator for Granny Smiths in most seasons. Although this variety is inclined to blossom a little later than the Granny Smith there is usually a period of overlap. Where due care is paid to the thinning requirements the Yates variety can be relied on to produce a blossom in most years.

As with Delicious, Yates could be inter-planted to advantage with a second pollinating variety.

The Dougherty blossoms over much the same period as the Yates variety. It is often favoured in the Hills area as a pollinator for Granny Smiths. However the Dougherty is inclined to blossom rather less regularly than the Yates and by itself is not generally as well suited as a pollinator for Granny Smiths.

The Golden Delicious is a variety which is also inclined to blossom later than Granny Smiths. It is generally less certain than the other varieties as a pollinator for Granny Smiths, especially in those areas where mild winters are common. This does not mean that it should not be planted as a separate variety on its own merit. In colder localities Golden Delicious can sometimes be used as a pollinator for Granny Smiths. Careful attention would then need to be paid to crop regulation, preferably by means of chemical thinning sprays so that the trees will reproduce a blossom in most years.

William Favourite is often planted on a small scale for the early local market. It is unreliable as a pollinator for Granny Smiths.

It will be seen that several different varieties can have a place as pollinators for the Granny Smith variety. A grower may prefer to plant more than one additional variety and to place these in different parts of a planting.

The cropping of the Granny Smith variety must often remain the first consideration. The final choice of a variety or varieties will depend to some extent on the suitability of a variety to a particular district, how well it fits in with the overall management programme, and on the market demands for the fruit.
EFFECT OF SPRAYS ON BLOSSOMING DATES

Early dormant sprays of D.N.C. oil or other winter oils are known to advance the blossoming dates of apple varieties in most years and can be used to advantage with the late flowering varieties such as Yates, Dougherties and Golden Delicious. Sprays can be applied separately to any one variety.

A spray applied to all varieties in a planting is also likely to bring the blossoming period of the different varieties closer together.

POLLINATION OF VARIETIES OTHER THAN GRANNY SMITHS

Trees of varieties other than Granny Smith are usually situated not more than two rows distant from the trees of the Granny Smith variety. The Granny Smith is then usually able to serve as an excellent pollinator for these other varieties. This in turn depends on the Granny Smith trees blossoming every year.

Where large blocks of Jonathan, Yates, Delicious or Golden Delicious are planted additional Granny Smiths can be spaced in the planting according to the requirements set out below.

Alternatively, two varieties can be paired independently of Granny Smiths. For instance, Jonathans combine well with Delicious and Yates with Golden Delicious.

SUGGESTED PLANTING PLANS

Trees planted as pollinators appear to lose their effectiveness if they are planted more than two rows away from the main variety. Pollinators should not be spaced at any greater distance than this. Bearing this in mind several different planting systems are available to the grower.

Continuous Rows of Pollinators

One good system is to plant four rows of a main variety in a block with continuous rows of the selected pollinating variety on either side. Commencing with an outside row, the pollinating variety or varieties would then occupy the first, fifth and tenth rows, and so on. This system requires one fifth of the trees to be pollinators.

As a variation of this system, two rows of the pollinating variety can alternate with four rows of the main variety, giving one third of the trees as pollinators.

Scattered Trees

Where it is desired to have as few trees as possible of the pollinating variety, a planting system can be used where the trees are systematically scattered throughout the main variety.

This means more than just planting an odd tree here and there.

A recommended system is to plant every third tree in every third row to the pollinating variety. In this way only a tenth
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