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CHEMICAL THINNING OF APPLES

By S. E. HARDISTY, B.Sc. (Agric.) and N. H. SHORTER

TWO important related problems of apple-growing in this State are biennial bearing and poor fruit size. Early thinning by chemical means, is providing a valuable and practical means of tackling these problems. With every prospect of heavy crops in most districts this year, many growers will be interested in the possibility of spray thinning.

The varieties Granny Smith, Delicious and Dunn’s Seedling are well known for their biennial bearing habits and the recent cycle of abnormally dry seasons has shown that varieties such as Cleopatra, Jonathan and Yates also react in a similar manner under drought stress. Yates in any case are always inclined to set too heavily.

The accepted “on” year and “off” year type of production, which has become so pronounced in some varieties as the trees get older, must be regarded as uneconomic, particularly when whole districts may be affected this way, so that one year the packing houses are overtaxed and the next the plant remains idle.

In the heavy “on” year, inadequate thinning and dry summer conditions can accentuate the production of under-sized and sometimes unmarketable fruit, whilst at the same time the trees must also suffer. This reduces the overall production of the trees, as the heavy crop of small fruit is often followed by a very light crop of large fruit. The problem is accentuated by the fact that the main apple production comes from non-irrigated orchards. If the trees can be induced to carry a moderate crop of good sized fruit each year, the average annual yield, as well as the general quality will be greatly improved.

Poor fruit size brings some special problems. Several pickings are required, and often picking is commenced too early in order to relieve stressed overcropped trees, or on the other hand left too late waiting for the fruit to reach sufficient size. Growers are well aware of overseas reports of apples arriving in a too forward condition, and this can result from late picking. Minimum export sizes have been increased for certain destinations and the general trend is now away from the smaller sizes which also sell at a discount on the local market. Any satisfactory means of controlling cropping will lead to better and more even fruit size at harvest, so that instead of making several pickings, in order to get adequate size, the fruit may be picked closer to the correct stage of maturity, and also nearer to the optimum size requirement.

Hand thinning, carefully carried out, will help fruit size a lot, but is not sufficient to break the biennial bearing habit.

What is wanted is a means of easing the load on the trees as soon as possible after blossoming and this is where chemical thinning is of value.

CHEMICAL THINNING

Scientific evidence has shown conclusively that thinning early, that is just after blossoming, by the use of chemical sprays helps very materially in breaking the biennial habit and at the same time in improving fruit size. Chemical thinning, however, should not be regarded as a complete substitute for hand thinning. It is merely the first step in crop control to encourage regular cropping and at the same time reduce the amount of handwork required. If extra hand thinning is not required, then some trees may have been overthinned.

By thinning early in the growing season, all the wasted effort of producing numerous
small apples which are eventually thinned off before maturity, is prevented. The trees' resources during the early active growing period are channelled towards developing marketable fruit. Also, by easing the burden at the critical stage, good fruit buds for the next year are initiated. Increased fruit size is not obtained at the expense of the crop, as little if any reduction in total yield has been noted.

Spray thinning can greatly reduce the laborious work of hand thinning in varieties such as Yates, but even for Granny Smiths, which are not normally extensively hand thinned a considerable size benefit can be expected. Better sized fruit will facilitate packing and increase output. However, the most valuable use of chemical thinning is in breaking biennial bearing.

A number of materials have been used for chemical thinning. Of those so far available in this State, naphthalene acetic acid or N.A.A. has been found to be the most suitable and the following discussion refers to this material.

Chemical thinning has been tried in this State for several years now, and some very useful results have been obtained both by Departmental officers and growers. Generally inconsistent results can be attributed to insufficient knowledge of the factors involved and especially reluctance in many cases to apply sufficient volume of spray.

The thinning of apple crops by chemical means has been accepted as routine practice in the U.S.A. and is widely used in other parts of Australia.

SUCCESS WITH CHEMICAL THINNING

Some notable responses have been achieved on growers' properties. Perhaps the most outstanding success story is that of Mr. Dilley of Upper Capel, who has used chemical thinning on Granny Smiths, Yates, Golden Delicious and Delicious for several years. Production has risen from 5,000 bushels to 8,000 bushels and the tendency to biennial bearing has been largely overcome, thus giving good crops from year to year. Part of the improvement is due to irrigation.

The yearly average for the entire Granny Smith crop has been nine bushels a tree with season fluctuations of 7½ to 10 bushels. In the 1958-59 season, results with Yates also demonstrated the advantage of spray thinning, compared with normal hand thinning and gave a better crop in 1960.

In an unirrigated orchard at Bridgetown six even Granny Smith trees were sprayed with N.A.A. at late petal fall in the spring of 1958 and compared with six unsprayed trees. Forty-nine loose boxes were harvested from the six sprayed trees in one major picking compared to sixty loose boxes in four pickings from the unsprayed trees. In the 1959-60 season, despite a protracted and late blossoming with subsequent thrips infestation, 28 loose boxes were produced from the six trees previously sprayed with N.A.A. and none from the other six trees. The year 1959 was a drought season and the advantages of being able to pick a good crop of 2½ in. and over as compared with four pickings down to 2¼ in. on the unsprayed trees are obvious. As a result the late picked fruit was in a forward condition.

In another nine acre orchard at Bridgetown, previously stressed by several dry seasons and on a light soil, all trees showing good blossoming received a blanket spray of 10 ppm N.A.A. in 1959. The varieties included Delicious, Jonathan, Cleopatra, Dunn's Seedling, Yates and Granny Smith. Good thinning resulted on all varieties with some further hand thinning being required. The crop prospects are promising for the next season if the size of the fruit buds is any criterion.

A point of interest during this season was the complete absence on this orchard of small irregular shaped fruit resulting from a late setting.

Spraying Procedure.

Although each orchardist needs to work out the best procedure for his own particular conditions, the following points will provide a good working basis.

Thoroughness of Spraying.

The thoroughness of spraying is very important and the poor results obtained by a few growers who have had difficulty with chemical thinning can be attributed to reluctance on their part to put on sufficient volume of spray.

Growers must be aware that if a tree is in its "on" year it is extremely difficult to prevent it from bearing a good to heavy crop. Where thinning sprays are used at the recommended strength, it is extremely
These good-sized and well-spaced Delicious apples are the result of chemical thinning.

unlikely that too much fruit will be taken off in the "on" year and follow up hand thinning can still be expected.

A thorough spray of the upper two-thirds of a tree is generally essential. An average sized tree—if such a tree could be said to exist—would take 1 to 1½ gallons of spray. Large Yates trees can require as much as 2½ gallons of spray. Probably the best type of spray is a broad cone of fine droplets working at normal pressures. By concentrating on the upper two-thirds of the tree, it will be found that fruit spurs on the lower third of the tree are receiving a fair wetting from drift. In any case, this portion of the fruiting area, being more shaded, does not set as heavily and can be easily hand thinned. The tops of the leaders should receive special attention, as it is well known that fruit is hard to shift on the leaders, and this fruit always constitutes a hazard for limb breakages later in the season.

Varieties, which are hard to thin, are Yates and Dougherty's and to a lesser extent Delicious, Golden Delicious and Jonathan and thorough spraying is necessary if a heavy setting is expected.

Granny Smith, in their heavy "on" year also come into this category, although where only a moderately heavy setting is anticipated or where trees are not so liable to biennial bearing, there would not be the same need for intensive thinning and a less complete spray may be advisable to prevent overthinning.

Growers have found in some cases, such as when young trees are coming into bearing or where a generally heavy crop is not expected, spraying only the tops of the leaders proves very effective in relieving the tops of the trees and minimising limb breakages.

**Type of Machine.**

Conventional spraying units at normal pressures (250-300 lb. per square inch) are preferred to concentrate or air blast machines. However, these latter machines have been used by blocking off the lower two jets of the assembly and by mixing three times (3X) the recommended
strength. In one instance, a commercial application of 45 ppm N.A.A. gave excellent thinning results on Yates. Some overseas workers maintain that twice (or 2X) normal strength should not be exceeded. The question of having to give individual trees special attention poses a distinct problem, when air blast machines are used.

Time of Application.
This again is an important factor and for consistent results the right time is at late petal fall. There is some latitude, but growers should strive to spray as near as possible to this period, treating varieties separately as they reach the optimal stage. Earlier sprays near full bloom and later sprays from the calyx stage onwards, may give inconsistent results.

Strength of N.A.A. for Chemical Thinning.
The strength of N.A.A. to be applied to varieties such as Granny Smith, Jonathans, Cleos and Dunns is 10 ppm without additives. Commercial preparations of N.A.A. for pre-harvest drop of apples, when mixed accordingly to the maker's directions are designed to give a final mixture of 10 ppm in the spray vat.

The addition of white oil or other spreaders to the mixture will increase the thinning action. Therefore, unless specifically recommended, they should be avoided. All proprietary brands of pre-harvest drop N.A.A. already contain a wetting agent and therefore effectively wet the leaves.

Some varieties set heavily and are hard to budge. With strong blossoming varieties, such as Yates and Dougherty's, 10 ppm is not sufficient and 15 ppm (1½ times normal strength) is needed. The addition of 2 to 3 pints of white oil may still be necessary for best results.

Red Delicious and Golden Delicious have been very effectively thinned with 10 ppm N.A.A. with the addition of 2 pints of white oil.

COMBINED THINNING AND INSECTICIDAL SPRAYS
Although it is possible to mix N.A.A. with certain insecticidal sprays, this practice is not generally recommended as the coverage required will usually be different for each purpose.

A NORMAL BLOSSOMING PERIOD IS HELPFUL
Irregular and protracted blossoming was a feature of the 1959-60 season following the very mild winter experienced. Where the blossoming period is definite with all flowers on a tree opening over a short interval of time, the grower is in a better position to successfully chemically thin. Oil sprays applied during the first half of August and more particularly the winter oil spray containing di-nitro-cresol (D.N.C.) will induce better blossoming, especially in those districts which regularly suffer from delayed foliation effects.

Apple trees on their "off" year come into blossom more irregularly and later than "on" year trees in the same orchard. Trees which have been chemically thinned during the "on" year, still behave in this manner and would greatly benefit from a D.N.C.-oil spray, during August in the same way.

CLEOPATRAS
Some growers may be hesitant to spray thin Cleos, having regard to the large fruit—more pit complex usually encountered with this variety. However, as the thinning effect only reduces the numbers of apples per spur and rarely eliminates all the fruit from a spur, it has been found that the incidence of pit has not been increased with the possibility of a significant decrease in this disease.

PRUNING TRENDS EXPECTED WITH THINNING
With mature apple trees, pruning practices are aimed at thinned out fruiting spurs to induce greater vigour and replenish fruiting wood. Old trees, being spray thinned have little pruning requirement as cropping is largely controlled and lateral vigour is thereby increased. This has been amply illustrated in several old orchards. Thinning out of crowded limbs might be necessary at a later stage.
AVAILABLE SOURCES OF N.A.A.
Shellestone—Shell Chemicals. Available from most local agents.
These preparations should be mixed for spray thinning at the same concentration (i.e., 10 ppm) as for pre-harvest drop prevention, except for Yates and Dougherty's which require 15 ppm or one and a half times normal concentration.

SUMMARY
(1) From experience gained over several years of trial work carried out in conjunction with growers it is considered that N.A.A. is the best material to use at present.
(2) For biennial bearing varieties commence spraying when the trees are in their “on” year.
(3) Spray when 80 to 90 per cent. of the petals have fallen, or when most of the petals will fall off when sprayed.
(4) Treat each variety and each tree separately according to its requirements, i.e., strength of blossoming and variety.
(5) For Granny Smith—
   (a) For “on” year trees expected to set a heavy crop and especially if trees are not irrigated use a thorough spray of 10 ppm.
   (b) For trees expected to set a moderately heavy crop and not irrigated or a heavier crop under favourable conditions, thoroughly spray the upper third of the trees with 10 ppm.
   (c) Where little thinning is required spray only the tops of the leaders with 10 ppm.
   The main purpose would be to reduce limb breakage. This type of spraying would apply to young trees or trees with moderate crops.
(6) For Jonathan, Golden Delicious, Delicious, Cleos and Dunns use a thorough spray of 10 ppm concentrating on the upper two-thirds of the tree. For Golden Delicious and Delicious the addition of white oil has given very good results.
(7) For Yates and Dougherty's use a thorough spray of 15 ppm concentrating on the upper two-thirds of the tree. The addition of 2 to 4 pints of white oil per 100 gallons has given good results.
(8) Complete the thinning by hand in late November or December.

IN CONCLUSION
There is with many growers a difference when approaching chemical thinning for the first time for fear that too many fruits will be removed. However, at the above recommended strengths and with thorough spraying, subsequent hand thinning can still be expected. It is well-nigh impossible to prevent good setting on an “on” year cropping apple tree. Many growers spray thinned this year; some who sprayed lightly have had moderate success, others by first indications considered that they had overthinned by thorough spraying, and now admit to picking one of their best crops. The grower should know his own trees better than anyone else and be in the best position to assess the need for chemical thinning and also the value of uniform cropping. Once he has come to the realisation that chemical thinning pays, he will find that both his trees and his returns will benefit.
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