Fertiliser recommendations for apple trees

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FERTILISER RECOMMENDATIONS FOR APPLE TREES

By N. H. SHORTER, Horticultural Adviser, Bunbury and J. E. L. CRIPPS, Research Officer, Plant Research Division

The increased use of irrigation and chemical thinning in apple orchards and the planting of trees in light soils have resulted in responses to regular fertiliser dressings.

In the past, summer drought and overcrowding reduced root growth and consequently nutrient uptake. Tree growth and production were also restricted so that the beneficial effects of nutrients absorbed were masked. As nutrients are only taken up by the tree if they are in solution, irrigation is essential if maximum absorption is to be obtained.

Irrigation has in turn enabled lighter soil types to be planted and as these have a low natural fertility and nutrient holding capacity, adequate quantities of fertilisers must be applied if a profitable level of production is to be reached.

The table in this article gives a general guide to fertiliser requirements. The rates should be adjusted according to soil type, previous fertiliser history and tree condition.

Major fertiliser elements

Nitrogen, phosphorus and potassium are the three major elements required by plants for healthy growth.

Nitrogen

Nitrogen is needed for shoot growth and adequate leaf size. It also improves leaf colour and the fruit colour of green varieties. Recent experiments have shown that summer applications of nitrogen may also improve fruit set the following spring.

The main forms of nitrogen fertiliser are calcium ammonium nitrate (C.A.N.), urea, ammonium nitrate, and sulphate of ammonia.

C.A.N. is a highly soluble fertiliser containing 20 to 25 per cent. nitrogen. It consists of ammonium nitrate mixed with powdered limestone. The amount of lime is just sufficient to neutralise the soil acidifying effects of the ammonium nitrate. It is an excellent orchard fertiliser but tends to be expensive.

UREA is a more concentrated form of nitrogen fertiliser, containing 46 per cent. nitrogen. At the moment it is the cheapest form of nitrogen available.

The use of urea will tend to make the soil more acid although its acidifying effect is not nearly so great as that of sulphate of ammonia. Occasional soil testing should be carried out to enable corrective measures to be undertaken if required.

If urea is applied to the soil surface during summer, losses of gaseous ammonia may occur if it is not watered in.

AMMONIUM NITRATE is a highly soluble fertiliser which contains 34 per cent. nitrogen. On a cost per unit of nitrogen basis, ammonium nitrate is second to urea on current prices.

SULPHATE OF AMMONIA contains 21 per cent. nitrogen and mixes well with other fertilisers but is relatively expensive. It also tends to acidify the soil.

Phosphorus

Phosphorus is essential for shoot and leaf growth and trials have shown that...
most of the phosphorus applied to the tree finds its way to the shoot tips. Trees deficient in phosphorus are liable to show terminal "dieback" of leader shoots.

Unfortunately phosphorus is readily "fixed" by most West Australian soils and made unavailable to the tree so that repeated heavy dressings are usually necessary to build up a soil bank and ensure a tree response. Once a soil "bank" has been built up moderate annual dressings are sufficient.

Phosphorus is available as superphosphate, containing 23 per cent. P₂O₅ (10 per cent. P.) and as ammonium phosphate, containing 24 per cent, P₂O₅.

Potassium

Potassium is essential for healthy tree growth and satisfactory leaf and fruit colour.

Some West Australian orchard soils appear to be inherently low in potassium and may require special corrective measures.

Potassium is available as muriate of potash (60 per cent. K₂O) and sulphate of potash (48 per cent. K₂O). Muriate is the cheaper.

Fertiliser mixtures

A list of registered fertilisers is published each year by the Department of Agriculture, giving details of ingredients and costs. The latest edition (1968-69) is available as Bulletin 3624.

Trace elements

Deficiencies of trace elements such as copper, zinc, magnesium and manganese commonly occur in West Australian orchards. Deficient trees low in trace elements do not always respond to applications of nitrogen, phosphorus and potassium.

Symptoms of the main trace element deficiencies are described in Department of Agriculture Bulletins 2654 and 3107 and corrective measures are listed in the Department's Orchard Spray Guide.

Responses to fertiliser

Increased fruit yields have been recorded in recent trials with irrigated and spray-thinned trees where heavy applications of a balanced fertiliser have been made over a period of years. Increased new shoot growth was also observed in some trials.

Nitrogen and potash applications have increased the "greenness" of the Granny Smith variety both at harvest and after cold storage. No increase in the percentage of apples showing bitter pit either before or after storage was recorded.

Heavy applications of nitrogen will delay the development of red pigmentation of red varieties.

Trials with newly planted trees and young non-bearing trees have demonstrated an interaction between nitrogen and phosphorus. If both are applied to irrigated trees, rapid shoot growth is made but in the absence of one or the other, growth is restricted.

In general these results support the use of all three elements with some reduction in nitrogen application to bearing red varieties.

Leaf analysis

The chemical analysis of apple leaves has proved a useful guide to fertiliser requirements. Such analyses can be arranged through a district Horticultural Officer. Growers with an area of unthrifty trees who wish to take advantage of this method should contact the local field officer, who will assess the need and value of such an analysis.

Fertiliser expenditure

The cost-of-production survey conducted by the Department of Agriculture in 1965 showed that the average operating cost for an orchard (including fertilisers, spraying, fuel and electricity), was only one-tenth of the total cost of producing fruit for sale. Fertilisers then represent a very small percentage of the cost of production, so that increased expenditure on fertilisers, if followed by an increase in production, might well improve net profits. Growers can test this in their own orchards by applying to one row of trees for a period of years double the rate of fertiliser normally used on the remainder of the orchard and observe whether or not production increases.
**Recommendations**

From the fairly wide range of fertiliser rates recommended the orchardist should adopt a level of fertiliser application suited to his orchard. Sandy soils have a higher fertiliser requirement than heavy clay loams and orchards which have received little fertiliser in the past have a higher requirement than those which have been given generous dressings.

**Fertiliser recommendations for apple orchards**

<table>
<thead>
<tr>
<th>Type of Tree</th>
<th>Time of Application</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Spring</td>
<td>Summer</td>
</tr>
<tr>
<td>(a) Irrigated green varieties of bearing age</td>
<td>3-10 cwt. 5:1 super potash per acre or 3:2 super potash plus 2-4 cwt. C.A.N. per acre or 1½-3 cwt. ammonium nitrate per acre or 1-2 cwt. urea per acre</td>
<td>2-4 cwt. C.A.N. per acre or 1½-3 cwt. ammonium nitrate per acre or 1-2 cwt. urea per acre watered in</td>
</tr>
<tr>
<td>(b) Irrigated red varieties of bearing age</td>
<td>As for (a) above</td>
<td>As for (a) above but applied after harvest</td>
</tr>
<tr>
<td>(c) Non-irrigated trees of bearing age. All varieties</td>
<td>5 cwt. 9:9:9 fertiliser per acre</td>
<td>....</td>
</tr>
<tr>
<td>(d) Non-bearing trees</td>
<td>1 pound of 9:9:9 fertiliser or equivalent per tree per year of growth</td>
<td>2-4 lb. C.A.N. per tree or 1½-3 lb. ammonium nitrate per tree or 1-2 lb. urea per tree in two equal dressings</td>
</tr>
<tr>
<td>(e) Newly planted trees</td>
<td>Light monthly applications of nitrogen such as ½ lb. C.A.N. or ½ lb. urea watered in</td>
<td>Light monthly applications of nitrogen such as ½ lb. C.A.N. or ½ lb. urea watered in</td>
</tr>
<tr>
<td>(f) Cover crops first year</td>
<td>....</td>
<td>....</td>
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<tr>
<td>(g) Cover crops second and following seasons</td>
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<td>....</td>
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