Orchard Fertilization
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# ORCHARD FERTILIZATION

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# Orchard Fertilization

By T. A. MERRILL

The problem of fertilization in order to obtain satisfactory tree growth and production presents itself to the fruit grower at the beginning of each growing season. In order to analyze his own problem and obtain the best results, the orchardist should learn to recognize certain symptoms of nutrient deficiencies.

Some of the factors to be considered in that connection are:

(1) **The length of terminal growth made the previous season;**
(2) **The color and size of the leaves;**
(3) **The yield, size and color of fruits, in the case of bearing trees, and**
(4) **The abundance of cover crop or weed growth.**

Moisture conditions being favorable, short terminal growth, yellowish leaves and sparse cover crop or weed growth are indications that nutrient elements are unavailable or deficient. Unfortunately, some trees of a single variety of the same age in a single orchard may not require the same fertilizer application that others may need because of soil differences. Such soil differences cause sufficient differences in tree growth for the orchardist to recognize them easily and modify the treatment given. Whenever weak trees are observed that do not respond to the application of nitrogenous fertilizers, the belief arises that they are set on poorly drained or very drouthy soil unsuited for orcharding.

Two factors are to be considered with this problem: Proper or sufficient growth to maintain fruitfulness in the bearing tree and proper coloration of the fruit. Often the problem arises as to just what steps may be taken to increase fruit color when growth is 12 to 18 inches. Too much nitrogen usually results in over-growth and poor color of fruit. When such occurs it would be advisable to omit nitrogen from the orchard altogether until a further need is indicated by the tree. Over-growth often results in alternate bearing as well as leaving the tree immature and unable to withstand low winter temperatures.

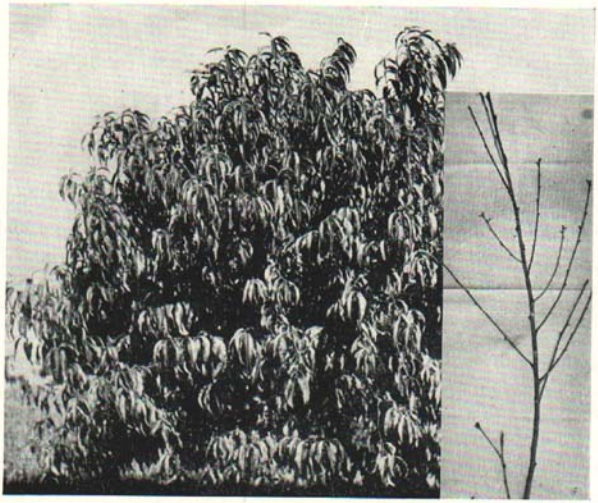

**Fig. 1. Four-year-old Halehaven peach. Note abundant foliage and satisfactory terminal growth, which in this case was approximately 28 inches.**

## FERTILIZING YOUNG TREES

Young non-bearing trees, whether apples, peaches. pears or plums, should make a greater amount of annual terminal growth than older or bearing trees. Figures 1 and 2 show a peach tree and an apple tree that are representative of young trees that have made sufficient growth. Young trees that make such growth early in the season, by July 1 are becoming well established which in most cases influences the longevity and productive period of the tree. The amount of growth made is influenced by the depth and texture of the soil, water supply, the supply of available nutrients, and cultural practices. A reasonable amount of new growth should be made each year, though just how much is needed varies with the variety. It may vary from 6 or 8 inches in the case of an apple to 30 or more inches in the case of the peach, though these are extremes and more frequently something intermediate is desirable. More nearly average amounts would be 12 to 15 inches for the apple and 18 to 24 inches for the peach.

**Tree Growth**—Young non-bearing trees that fail to make the desired amount of growth when soil moisture conditions are favorable will usually respond to applications of a nitrogenous fertilizer. On the other hand, the rather common practice of forcing young trees to grow more than a reasonable amount should be avoided. A tree making a normal amount of growth will bear earlier than trees making twice that amount of growth and will be less susceptible to winter injury. From this standpoint it would be better to have a tree

**Fig. 2. Four-year-old Red Delicious that has made a desired amount of growth. Insert shows terminal growth of 18 inches.**

grow too little rather than too much. Under normal growing conditions the tree should have completed its season's growth early in July. This will give the new wood ample time to ripen and harden off for the winter. However, if the same amount of growth is not made until late in the season this ripening and hardening of the wood does not have a chance to take place.

**Cultural Practices**—In the young orchard it is good practice to cultivate frequently, at least a strip along the tree rows, until the cover crop is sown during the first part of July. If with this tillage treatment the needed amount of growth is being made each year, it is questionable if there is any need of applying fertilizer. If such growth is not being made then not more than one-fourth pound of sulfate of ammonia (or its nitrogen equivalent) for each year of the tree's age may be applied. A vigorous cover crop of soybeans, sudan grass, or similar long-season plant, if sown early enough to become well

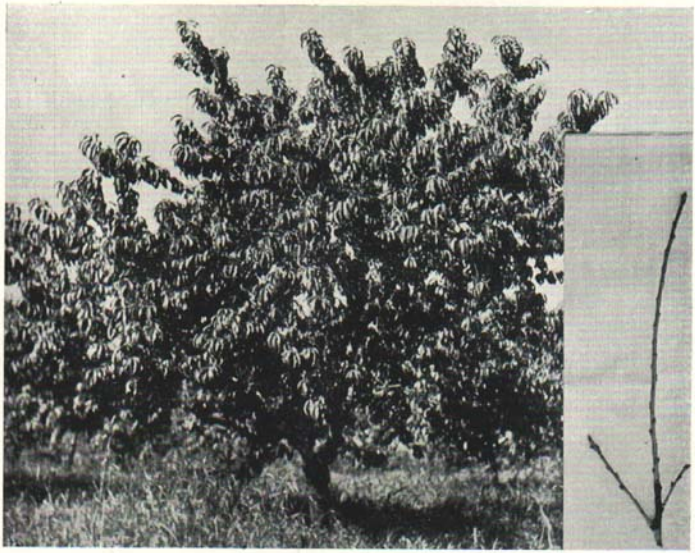

**Fig. 3. Twelve-year-old Elberta still in sound condition and making plenty of terminal growth to keep it in a productive state. Insert shows terminal growth for 1939.**

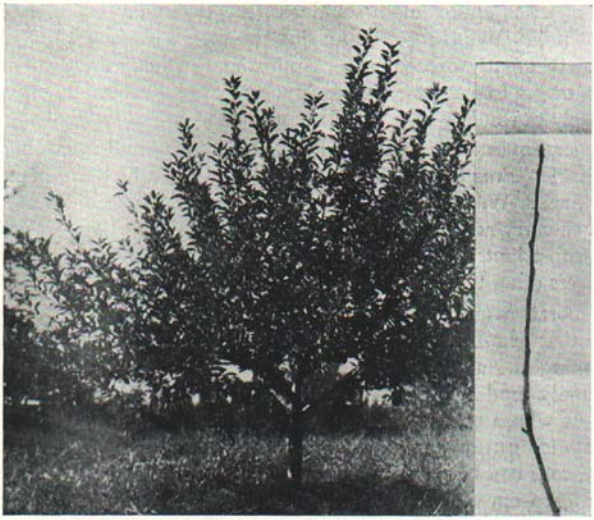

**Fig. 4. Golden Delicious 14 years old that produced a heavy crop in 1939 and made a sufficient terminal growth of 12 inches as shown by the insert.**

established before the summer drouth, for instance, in late June or perhaps in early July, will usually check the growth of young trees. A vigorous cover crop will also reduce wind and water erosion and, when worked into the soil, will help maintain the soil organic matter content.

## FERTILIZING BEARING TREES

**Terminal Growth**—Practices affecting the amount of growth in young trees will also influence the growth of bearing trees, though usually the effect will not be so pronounced. The length of annual terminal growth made by the bearing tree will vary with the variety and the conditions under which the tree is growing. In general, however, an average shoot length of from 6 to 12 inches is desirable in the apple, and from 12 to 20 inches in the peach. Figures 3 and 4 illustrate bearing trees that have made sufficient growth to keep them in a healthy, productive condition. If the annual growth falls much

short of those approximate standards, the trees may be expected to be less productive than those making the specified amount of growth. If growth greatly exceeds those approximate standards, then lighter yields, owing to over-vegetativeness, or poor color especially on apples are likely to result.

Several questions arise regarding the fertilizer applications in order to obtain optimum growth. What fertilizers should be applied and how much? Will nitrate of soda, sulfate of ammonia or some other nitrogen-carrying fertilizer give the best results? Usually soils in Michigan adapted to orcharding are not benefited by applications of fertilizers other than nitrogen.

Laboratory and field trials and likewise orchard experience demonstrate that of all the nutrient elements nitrogen is most important in promoting the growth of trees and likewise the grasses and plants commonly used as orchard cover crops. Nitrogen is usually the only element whose scarcity in the soil limits the growth and productivity of Michigan orchards. The tendency for available nitrogen to be low in soils can be partially accounted for by the fact that it is likely to be lost from the soil because of leaching. Phosphorus and potash seldom are lost in this manner and are usually present in large enough quantities for the trees' use.

Under field tests it has been found that nitrogen is the key to the fertilization of fruit trees on Michigan soils adapted to fruit growing. Nitrate of soda and sulfate of ammonia are the two materials that have given the most satisfactory results when considered from the standpoint of available nitrogen and cost.

Complete fertilizers and lime may have their place in many orchards but the trees are indirectly, if at all, benefited by their use. Legume cover crops are more likely to respond to applications of such materials than non-legumes. Response may also occur when they are applied to permanent grass sods, although many sod orchards have been observed in which the grass did not respond noticeably to applications of phosphorus, potash or lime. Figure 5, however, illustrates a soybean cover crop that responded favorably to an application of 250 pounds of 2-12-6 fertilizer. When sod or cover crop growth is increased more organic matter is returned to the soil, which in turn will increase bacterial activity in the soil. This increased bacterial activity releases more of the necessary mineral elements from the soil particles and these elements are then available to the tree. By maintaining a high organic matter content in the soil, its ability to

supply moisture to the trees is increased, erosion is decreased, and the texture of the soil as a whole is improved.

If good orchard soil management is maintained by other accepted practices such as preserving the organic matter content, conservation of moisture, and maintaining an adequate supply of available nitrogen, it seems inadvisable to recommend the use of phosphorus and potash or lime except in those cases where it is impossible to get an adequate cover in the orchard without them. If, however, a permanent cover is being maintained and growth is not adequate the lime requirement should be satisfied first and then an application of phosphorus and potash should be made if needed.

Growers are cautioned against over-liming. If more lime is added than is required by the trees, growth and productivity may be reduced because an excessive amount of lime in orchard soils is known to be harmful to fruit tree performance, because it tends to make other nutrient elements unavailable. Specific examples of this have been

**Fig. 5. Effect of a complete fertilizer on cover crop growth. In figure at right 250 pounds of 2-12-6 was applied per acre while figure at left received no fertilizer.**

observed in several Michigan peach orchards where lime had previously been added to grow alfalfa. Since alfalfa has a high lime requirement and the peach has a low requirement for this element, growers have experienced difficulty in producing peaches which were set on land previously limed for alfalfa production.

**Applying the Fertilizer**—Apparently fertilizers can be applied to best advantage about 10 days to 2 weeks previous to blooming. In the clean tilled orchard they should be broadcast around the trees, and extending a little beyond the outer spread of the branches and kept about 2 feet from the trunks. In the sod orchard the fertilizer should be applied in a narrow band—6 inches to 8 inches in width around the drip of the branches. The amounts necessary to apply will vary with the age and size of the tree. Sulfate of ammonia may be applied at the rate of not more than one-fourth pound for each year of the tree's age; the maximum amount recommended in any case being not more than 8 to 10 pounds for a full-sized bearing apple tree. Full-sized peach or cherry trees should not receive more than about half these amounts. When nitrate of soda is used in the place of sulfate of ammonia the quantity by weight should be increased by about one-fourth. Other things being equal, the quantity of either material should be greater in an orchard in sod than in one which is cultivated. The growth of the tree and the color of fruit in either case should serve as a guide.