



Good fertilization

20 QUESTIONS AND ANSWERS ON ORCHARD FERTILIZATION



Improper fertilization

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gen (N), 12 per cent phosphoric oxide (P_2O_5) or phosphate, and 4 per cent potash (K_2O). The designation of a fertilizer by numbers always refers to these three elements in this order.

A mixed fertilizer is a mixture of two or more materials and may contain one or more of the three major fertilizer elements. An example is the familiar 16-20 or 16-20-0, which is a mixture of sulfate of ammonia and ammonium phosphate and contains 16 per cent nitrogen and 20 per cent phosphoric acid.

4. *Is there any advantage in applying fertilizers containing phosphate and potash to orchards in central Washington?*

No. Phosphate and potash have given no measurable increases in growth and yield of trees or quality and color of fruit. There may be, however, a slight response to phosphate on newly planted fruit trees in arsenic-toxic soils or in establishing a legume cover crop.

5. *Is there any harmful effect of applying a particular fertilizer element when it is not needed?*

Yes, particularly with applications of some minor elements where they are not needed. A slight excess is toxic to the plant. For example, too much boron seriously cuts down the storage life of apples even though injury may not be visible in the tree. Sulfur or lime, when not needed or when too much is applied, often cause trouble.

Excessive applications of nitrogen, phosphate, potash, or any fertilizer material can seriously injure a fruit tree.

6. *Is it possible that nutrients not now deficient, such as phosphate and potash, may become deficient in the future?*

Yes, any element may become deficient after many years of cropping. Shallow soils and those with light texture will become deficient first because they have a smaller supply of total available nutrients.

It is not likely that orchards on the deeper sandy loam and loam soils will show a response to either phosphate or

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The following 20 questions on orchard fertilization are often asked by fruit growers in central Washington. No attempt has been made to answer all questions on orchard fertilization, but to cover the main points of those most frequently asked.

1. What mineral nutrient elements are needed for fruit tree growth and which are known to be deficient in central Washington orchards?

The mineral nutrient elements needed are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, zinc, boron, iron, manganese, copper, and molybdenum. Nitrogen, zinc, boron, and, in a few cases, iron are the only known deficiencies affecting tree growth in central Washington.

2. Is it necessary to supply all nutrient elements in the form of fertilizers?

No. Fortunately the soils of central Washington are adequately supplied with available forms of all needed nutrient elements except nitrogen, zinc, and boron, and iron in a few localized areas. Nitrogen and boron are supplied as fertilizers, zinc as a spray, and iron as a tree injection. It is not necessary to add a nutrient element as a fertilizer unless the tree will benefit by such an application.

3. How does a straight nitrogen fertilizer differ from a complete or mixed fertilizer?

A **straight nitrogen fertilizer** contains only one major fertilizer element, namely, nitrogen. Common examples are ammonium nitrate, sulfate of ammonia, nitrate of soda, urea, and anhydrous ammonia.

A **complete fertilizer** is one that contains all three major fertilizer elements, namely, nitrogen, phosphorus, and potassium. An example is 4-12-4, which contains 4 per cent nitro-

mature fruit trees in central Washington require from 50 to 125 pounds of actual nitrogen per acre for satisfactory growth and yield. Generally the best time to apply nitrogen is between November and February.

10. *Is a straight nitrogen fertilizer less expensive than a mixed fertilizer?*

Yes. The approximate cost of 100 pounds of actual nitrogen (1949 prices) varies from 11 to 15 dollars if supplied as ammonium nitrate or sulfate of ammonia. When you buy a mixed fertilizer and the price of the fertilizer is charged entirely to the nitrogen it contains, since nitrogen alone is needed, the cost of 100 pounds of nitrogen bought varies from \$30 to \$100, depending upon the mixture used.

11. *Do orchards using nitrogen alone produce as high a yield of good quality fruit as those receiving complete fertilizer?*

Yes. If the same amount of nitrogen is used in both types of fertilizer, there should be no difference in the amount, color, or quality of fruit. Improved fruit color is often obtained by using less nitrogen. Growers using mixed fertilizers generally apply less nitrogen and erroneously attribute their better color to the use of mixed fertilizers rather than to the use of less nitrogen.

12. *How does the pH of my soil affect fertilizer practice?*

All fertilizers containing nitrogen affect the acidity of the soil. Some make the soil more acid, and some make it more alkaline. Since slightly acid soils are preferable for fruit trees, all alkaline soils or soils which are irrigated with hard water (which makes the soil alkaline) should be fertilized with sulfate of ammonia.

Soils already slightly acid (about pH 6) should be fertilized with materials that have the least affect on soil pH. These materials include ammonium nitrate, urea, and anhydrous ammonia. You may also fertilize slightly acid soils with alkaline-forming fertilizers (calcium nitrate or nitrate of soda) and acid-forming fertilizers (sulfate of ammonia) in alternate years.

potash for many years. Soil analyses indicate that there is enough available phosphate and potash in the top foot alone of these soils to supply the needs of fruit trees for over 100 years.

The shallow, sandy soils, however, may respond to an application of phosphate much sooner, especially if they contain an excessive accumulation of arsenical spray residues. Response to calcium (lime) occurs in those soils that have become very strongly acid through excessive fertilizer applications. Sulfur may benefit some alkaline soils. These responses to calcium and sulfur usually are indirect through their effect on the soils rather than their direct effect as nutrients.

7. Why is nitrogen so important in orchard fertilization?

Fruit trees are heavy users of nitrogen and require yearly applications for satisfactory growth and yield. Soils of central Washington do not contain an adequate natural supply of available nitrogen; therefore, it is necessary to supply it as a fertilizer.

8. What are the effects of using too little or too much nitrogen?

Nitrogen deficiency in fruit trees results in less growth and yield. Leaves on such trees are generally smaller and medium to light green in color. Heavy nitrogen fertilization generally promotes tree growth and maximum yields, but fruit color and keeping quality may be inferior. The problem confronting fruit growers is to maintain a balance between nitrogen fertilization heavy enough to approach maximum fruit production, yet light enough to permit adequate color and quality.

9. How much nitrogen fertilizer should be used and what season of the year should it be applied?

No set recommendation can be made regarding the amount of nitrogen necessary or the season of application because of variations in soil type, soil management practices, kind of fruit grown, and the age and condition of trees. Generally,

You can recognize this condition by small narrow leaves that show a striped chlorotic pattern with green veins; by rosetted or small leaves appearing on 1- or 2-year-old wood, with normal terminal growth; by small rosettes of leaves at the tip with extra small leaves or no leaves behind the tip; or by dieback following these symptoms. Soil applications of zinc are not effective. A late dormant spray of 15 to 25 pounds of zinc sulfate per 100 gallons corrects *little leaf*.

16. Do I need minor elements besides zinc, boron, and iron?

No. There are no indications of other minor element deficiencies in this area. Zinc and boron are needed in some orchards of central Washington. In a few individual cases iron injections may be needed to correct chlorosis temporarily until you can correct adverse soil conditions that cause iron chlorosis.

17. What should I do for iron chlorosis?

Pronounced leaf yellowing that occurs soon after the blossoming period is known as iron chlorosis. It is associated with too much lime in the soil, excess soil water, alkali deposits in the root zone, or the use of hard water for irrigation. Present control practices, such as inserting capsules containing iron citrate into the trunks of the trees, and applying foliage sprays containing soluble iron, have proven helpful but the effects are generally temporary and far from satisfactory.

A better and more positive method of correcting iron chlorosis is badly needed. Cultural practices that encourage surface feeding of the roots are helpful in overcoming mild to moderate chlorosis. Such practices include sod culture, minimum cultivation, sprinkler irrigation, and mulching. Avoid applying irrigation water in the spring until as late as practical, and do not overirrigate during the rest of the season.

18. Can I expect better results from liquid fertilizers than from dry fertilizers?

No. Dry fertilizers dissolve in the soil solution after being applied to the soil and become as available as similar materials applied as a liquid. It is commonly assumed that a nutrient dissolved in water moves as far into the soil as the water.

You may fertilize very acid soils with calcium nitrate or nitrate of soda or apply lime when more acid than pH 5. Continued use of nitrate of soda may prevent satisfactory penetration of irrigation water into soils. Calcium cyanamide (cyanamid) is another alkaline-forming fertilizer. Under certain conditions, not yet well understood, applications of cyanamid in orchards have resulted in detrimental effects to fruit trees and, therefore, unqualified use of this fertilizer in orchards is not recommended. The surface soils in the majority of central Washington orchards are slightly acid.

13. Does my orchard need lime or gypsum?

Neither lime nor gypsum is needed if your orchard is average or if you have followed a moderate fertilizer program. Lime is recommended only for very acid orchard soils and should be applied only to soils with a pH less than 5.

Gypsum does not affect soil structure or tilth in a normal orchard soil and is not recommended for Washington orchards.

14. What is the value of quick soil tests to determine orchard fertilizer needs?

Quick soil tests have not been very helpful to determine fertilizer needs. The reserves of phosphate and potash in soils of central Washington are so large that fruit trees do not respond to additional applications of these elements. The soil content of readily available nitrogen, which is indicated by these tests, is ordinarily a poor measure to determine the amount of nitrogen fertilizer to apply. Testing for soil acidity, however, is helpful in selecting the proper fertilizer material.

15. When is boron or zinc needed?

Your trees may need boron when the fruit shows internal cork spots or external cork; is badly misshapen; is cracked (except from rain or mildew); or drops prematurely. In young trees where there are no fruits, your trees may need boron when they show *witch's broom* caused by death of the terminal bud; when severe rapid dieback occurs; or when round, sharply defined dead areas appear on the bark of branches or the trunk. Soil applications of boron *should not exceed 1/2 pound of borax or boric acid per tree.*

Zinc is needed when the trees show *little leaf* or *rosette.*

This is not true. Most nutrients stop in the top 3 or 4 inches of soil although the water carrying them may penetrate 3 feet or more. It is sometimes advantageous to apply fertilizers in liquid form, but there is often danger of corrosion damage in sprinkler systems and possibly loss of ammonia to the air if you use anhydrous or aqua ammonia. When applied in rills during the regular course of irrigation you may lose 20 to 50 per cent as runoff.

19. *What do we mean by organic fertilizers, and are organic fertilizers needed?*

Organic fertilizers are products of plants or animals which contain nitrogen. They are sold principally as nitrogen fertilizers. A few common organic fertilizers are dried blood, fish scrap, tankage, cotton seed meal, and animal manures. Organic fertilizers are not necessary for optimum tree growth and yields; furthermore, the cost per pound of nitrogen is far greater than that of an inorganic material such as ammonium nitrate. Maintaining a good cover crop is the cheapest and most practical method of supplying organic matter to orchard soils.

20. *Even though my trees are growing and producing well, is it possible to appreciably improve the vitamin content and health-giving properties of the fruit by using certain types of fertilizers?*

No. Present information indicates that unless trees are suffering from a nutrient deficiency, fruit from trees receiving a straight nitrogen fertilizer contain about the same mineral and vitamin content as fruit from trees fertilized with a great variety of different materials containing different kinds and forms of nutrient elements.

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