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Methods of Applying Fertilizer for Efficient Use

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Certain principles need to be considered when fertilizer is applied to crops. They are:

☆ Sufficient moisture and oxygen should be in the root zone to enable the plant to make the most effective use of added fertilizers, as well as residual nutrients in the soil. Without adequate moisture no plant can fully develop. Even though it has plenty of water, if nutrients are lacking in the soil the plant still does not develop fully. Plant nutrients in the soil and adequate water and air are required to produce maximum crops at minimum cost.

☆ The plant should be adapted to climatic conditions of the area.

☆ Soluble materials are in most soils and move to some extent. The movement that takes place depends upon the nature of the soluble material and the character of the soil. Soluble materials tend to rise to the surface during dry periods and wash downwards in rainy periods or with heavy applications of irrigation water. If the amount of irrigation water applied, or rainfall, is excessive some of the soluble material, is washed down from the root zone into the subsurface strata and thence on to the drainage ways of the area. This leaching may be desirable in case of some salts, but is undesirable insofar as plant nutrients are concerned. Usually, following heavy rainfall or excessively heavy applications of irrigation water, additional nitrogen fertilizer may be advisable to offset losses due to leaching.

☆ Nutrient elements are of little benefit to the plant when in dry soil. Such conditions may exist in the surface during prolonged dry periods. Therefore, the sidedressing of plants in dry periods may result in no increased yields. The nitrogen applied during this time would, of course, become available to weeds and other plants growing after the crop has matured and with adequate rainfall. For this reason, benefits may not always be realized from sidedressing crops on the Blacklands and in some of the soils further west.

☆ Excessive concentration of soluble materials in contact with either the seed or young root hairs may cause serious injurious effects and result in a poor stand. This is particularly true of fertilizers containing both nitrogen and potash. Phosphate does not seem to affect the germination when placed in contact with the seed in moderate quantities. Some crops are supersensitive to soluble materials while others are highly tolerant. Those crops best adapted to the particular area are more tolerant of the excessive salt content in the soil than those that are not well adapted. It is recommended that fertilizer not be placed in contact with the seed.

☆ Fertilizers applied on the soil surface are apt to be lost in the surface run-off by sudden, heavy rains.

☆ Leaching is greater from sandy soils than from the heavier textured soils such as clays.

☆ Fixation of phosphate and potash by some soils reduces their efficiency. Fixation refers to any change whereby the soluble plant nutrients become less available to the crops by combination with the soil. Acid soils high in iron tend to fix phosphates more readily than those of low iron content. These iron phosphates are less soluble and less available to most plants than those fixed by soils of high lime content.

☆ Since phosphate moves slowly from the point of placement, it should be placed so as to be readily accessible to plant roots.

☆ One of the best methods of fertilizing crops is through rotations. The crop rotation can be planned to conserve nitrogen, potash and other nutrients that would be lost by erosion or leaching during the non-crop season. Green manure crops also supply organic matter and improve soil structure and water relationship. Deep-rooted legumes, which open the subsoil, will carry some of the plant nutrients deep into the soil, thus increasing the root-feeding area of succeeding crops.

☆ Band placement of fertilizers near the seed is desirable for three reasons: (a) restricted contact of fertilizer with the soil lessens fixation of phosphate and potash; (b) necessary plant food is placed within easy reach of the plant roots and injurious concentrations minimized if the placement is closely controlled; and (c) fertilizer placed in a band along the row does not furnish plant food to the weeds growing between the rows.

☆ Applications banded too far from the seed or root result in a retarded growth until the roots reach the supply of fertilizer.

☆ Broadcast applications of fertilizer and thorough incorporation with the soil spreads the fertilizer throughout the root zone. This method is favorable to the fixation of both phosphorus and potash; likewise, it stimulates weed growth. Band applications minimize this fixation. However, such methods of application are advisable on broadcast crops.

☆ Topdressing or sidedressing with nitrogen and sometimes potash is useful by reducing the concentration of soluble salts when heavy applications are made. Thus root damage is minimized during the early stages of growth. It furnishes plants the needed nutrients at the time plants are growing most rapidly.

Field Crops

Alfalfa

For Establishment: Drill the fertilizer into the soil at a depth of three or four inches with a grain drill attachment at the time of seeding the alfalfa. The fertilizer should be applied halfway between the drill rows. The most effective fertilizer application is made at the time of seeding.

For Maintenance: When alfalfa stands are maintained for several years phosphate and potash should be applied in the early fall, late winter or early spring as a topdressing, or by drilling, to replace that lost by cropping. If applied as a topdressing, a renovator should be run over the land until the fertilizer is incorporated in the root zone.

Annual and Biennial Legumes

All of the fertilizer needed for the production of annual and biennial legumes should be drilled into the soil three to four inches deep at the time of seeding.

Corn

Fertilizer should be applied in a band two to three inches to one side and two to three inches below the seed at the time of planting.

Sidedress corn 35 to 42 days after planting. The nitrogen or nitrogen and potash fertilizer should be applied near the middle of the row about two inches deep. The application of nitrogen in the middle of the row at that time minimizes root injury. If anhydrous ammonia is used, it likewise may be applied in the middle of the row. Since the roots have not fully developed, the small amount of root pruning at that time probably would not be injurious.

Cotton

Cotton fertilizer should be applied in the band approximately two to three inches to one side and two to three inches below the level of the seed at the time of planting.

If side-placement equipment is not available, the next best method is to apply the fertilizer in the middles then bed and plant on it. Broadcast applications fertilize weeds as well as the crop, and at the same time, do not exert full effect on the crop.

Nitrogen as a sidedressing tends to delay the maturing of cotton. Where growing seasons are short or where pink bollworm "plow up" interferes with the late crop, normally a sidedressing of cotton would not be advisable. Where growing seasons are long and the pink bollworm "plow up" does not interfere, sidedressing cotton with nitrogen fertilizer by applying the sidedressing in the middle of the row about two inches deep often is profitable. This is particularly true in the alkali soils of the Pecos, El Paso and Rio Grande irrigated areas. Cotton should not be sidedressed later than 100 days before the probable end of the growing season or time of plowing up.

Pastures

Fertilizers should be drilled in with a grain drill or broadcast and plowed in. This is especially important with respect to fertilizers furnishing phosphate or potash. Nitrogen fertilizers then may be applied as needed as a topdressing.

For Maintenance: The fertilizer may be applied with the grain drill in either the fall or spring. Pastures for winter grazing should be fertilized in late summer or early fall. Summer pastures should be fertilized in the early spring, or late winter. Broadcast application of fertilizers to establish pastures has given good results in some areas. Nitrogen may be topdressed as needed. Annual applications of fertilizers are more profitable than heavy applications that are expected to last several years.

Sudan and Johnsongrass

Fertilizer should be applied to Sudan at or before planting. Johnsongrass should be fertilized in the spring, after which the land should be plowed and leveled. Each time either grass is grazed down or cut, nitrogen fertilizer should be applied broadcast.

Peanuts

Peanuts are fertilized best by making sufficient applications to the preceding cash crop or cover crop to insure sufficient residual fertility to produce the amount of peanuts need-

ed. If sufficient quantities have not been applied to the preceding crop, fertilizer can be applied as a band placing it two to three inches to the side and two inches below the seed. The fertilizer should not come in contact with the seed. In some areas, peanuts respond favorably to a top-dressing with gypsum over the peg zone.

Small Grain

Mixed fertilizer for small grains should be drilled at the same time seed are planted. The fertilizer should be placed about an inch lower than the seed. Topdressing should be applied to small grains before the plants begin to joint. This means before the 15th of March in the High Plains; in the South Plains around the middle of February; and in North Texas and the Rolling Plains around the 15th of February. In the central part of the State, it would occur about the first of February. Where small grains are to be used for grazing in the Gulf Coast and other areas in the Southern part of the State a topdressing with 30 pounds of nitrogen in December and 30 pounds of nitrogen in February increases grazing tremendously. This amount of nitrogen, however, may cause the plants to lodge in case the grain is planted for harvest.

Rice

Fertilizer may be applied to rice at the time of planting. If fields are weedy, fertilizer should be applied on dry soil 30 to 40 days after planting and then watered.

Horticultural Crops

Vegetable Crops

Since large quantities of fertilizers are used in growing vegetables, and vegetables usually are much more rapid in maturing, the placement of fertilizers for vegetables is much more important than the placement of fertilizers for the slower-maturing field crops.

Beans and Peas: Fertilizer should be applied in bands two to three inches to the side and one to two inches below the level of the seed. If peas are broadcast, fertilizer should be broadcast and plowed in before seeding. If peas are drilled, fertilizer should be drilled in between seed rows.

Cabbage and Similar Crops: Fertilizer containing part of the nitrogen and all of the phosphorus and potash should be applied in bands two to three inches to one side and approximately three inches below the plants at the time of setting out. The use of starter solutions in the bed when setting out pays. Where the seed are planted directly in the field and thinned, the fertilizer should be applied in bands two to three inches to the side and two inches below the seed. Additional nitrogen fertilizer should be applied as a sidedressing when the heads begin to form.

Cucumbers, Cantaloupes and Other Melons: These crops respond to heavy applications of fertilizer. The fertilizer may be divided into three parts: one-third applied at the time of planting; when the young plants are up and are beginning to grow a third of the fertilizer may be applied about a foot to one side and about four inches below the surface; when the vines begin to run the last third portion of the fertilizer should be applied about two to three feet from the row and about four inches deep. Another plan for fertilizing would be to apply part of the nitrogen and all the minerals at the time of seeding. At the time the vines begin to run the remainder of the nitrogen can be used as a sidedressing about two feet from the row.

Mustard Greens and Other Greens: Fertilizer should be placed in bands two to three inches to the side and two to three inches below the seed level. After the plants are up and beginning to grow they should be sidedressed with nitrogen. Normally, this is about ten days after the plants are up.

Onions: Onions require large amounts of phosphate and potash. Part of the nitrogen and all of the phosphate and potash should be applied to the onions at the time of setting out or planting about two inches to the side and two to three inches below the plants. In about 40 days, additional nitrogen should be applied as a sidedressing.

Irish Potatoes: Fertilizer should be applied at planting time two inches to the side and slightly below the seed pieces. If large amounts of fertilizers are to be used the fertilizer should be applied in two bands. About 40 days after the potatoes are planted nitrogen should be applied as a sidedressing in the middle of the rows.

Sweet Potatoes: All of the fertilizer should be applied at the time of planting, about three inches to the side and three inches below the slip. When setting slips, use a starter solution to improve stand and speed early growth of plants.

Turnips and Beets: Fertilizer should be applied beneath the seed about two to three inches. After the turnips are growing well, or about 10 to 15 days after they are up, additional nitrogen may be applied as a sidedressing.

Spinach: The same recommendations for mustard greens apply to spinach.

Sweet Corn: Since it is essential that sweet corn be made as rapidly as possible, fertilizer should be applied one and one-half to two inches to the side and two to three inches below the seed. Corn should be sidedressed about 35 days after planting.

Tomatoes: When fertilizing tomatoes, all of the minerals and part of the nitrogen should be applied at the time of setting out. When the plants begin to bloom additional nitrogen should be added as a sidedressing. Another method is to divide the fertilizer into three portions, one-half to be applied at the time of setting out, two to three inches to the side and two to three inches below the plant. When the plants begin to bloom, one-fourth of the fertilizer should be applied about 12 inches from the plants and about four inches deep. When the tomatoes begin to form, one-fourth of the fertilizer should be applied about two feet from the row and about four inches below the surface.

Fruits and Nuts

Strawberries: Apply part of the annual application of fertilizer in fall. The remainder of the mixed fertilizer may be applied in 6 to 8 weeks. Sidedress with nitrogen fertilizer when plants begin to bloom.

Grapes and Blackberries: Apply fertilizer in the early spring 12 inches from plants. Four to six weeks later, sidedress with nitrogen fertilizer.

Citrus: Fertilizer should be applied in drill rows at the edge of the limbs. In May part of the nitrogen may be sidedressed and another application of nitrogen should be made in August or early September. Nitrogen may be applied as a sidedressing in the irrigation water.

Peaches, Plums, Apples and Pears: They should be fertilized at the be-

ginning of growth. The fertilizer should be spread around the edge of branches and disced into soil. Side. dress with nitrogen fertilizer in May or early June.

Pecans: It takes two or three years for pecans to fully utilize the mineral fertilizers that are applied. Fertilizer should be applied annually under the spread of the branches and slightly beyond and worked well into the soil. These plants respond to a topdressing in the early spring.

Shrubs, Shade Trees and Home Fruit: It is often impractical to plow or work fertilizer into soil on home shrubs and trees. In such cases, punch several holes around the plants at the end of the branches and fill with fertilizer. These holes should be 3/4" in diameter, 8" deep, and spaced from 3 to 4 feet apart.

Use of Starter Solutions: The use of dilute solutions of fertilizer at the time of setting out cabbage, tomatoes and other plants greatly increases the stand and speeds up the growth of the plants. These starter solutions may be made from complete fertilizers in some areas and from only nitrogen and phosphorus in others, depending upon the nature of the soil. For a good starter solution, dissolve two pounds of the fertilizer, such as 5-10-5, in five gallons of water; then dilute one gallon of this concentrated fertilizer to 10 gallons of water and use for watering plants.

Another solution would be to use one pound of a 10-20-0 in 10 gallons of water; dilute 1 gallon of the clear solution to 10 gallons of water for watering the plants at the time of setting out.

Direct Application to Plants Above Ground: All plants can absorb a limited amount of nutrients through their leaves. Where trace minerals are needed, one of the best ways to apply them is to spray dilute solutions on the leaves. For example, one pound of iron sulfate or copperas dissolved in 50 gallons of water sprayed on the leaves of chlorotic plants usually results in immediate response to this material. Other trace minerals behave in the same manner. However, to get a lasting result it is necessary to alter the soil in such a way as to keep these materials from becoming deficient in a short time.

Likewise, dilute solutions of nitrogen, phosphorus and potash can be absorbed through the leaves of the plants. This is a stimulating type of fertilization, and does not furnish the amount of nutrients necessary to produce the crop. It cannot be considered as a true feeding operation. Until more information is available leaf feedings for plant stimulation are not recommended as an overall practice for soil improvement and plant production.

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