Some Factors Influencing the Response of Cotton to Fertilizers

(T. C. Tucker)

The value of fertilizers in maintaining and increasing the yields of crops has been demonstrated throughout the country. This contribution in the production of food and fiber has added not only to the standard of living of the farmer but also to the social and economic condition of communities and to the country. In a modern farming operation an intelligent use of fertilizers plays an important part in crop production. An intelligent fertilizer program must be based on an understanding of the factors determining the need and effect of fertilizers.

For convenience, the term "yield possibility" will be used to describe the maximum yield possible under a given situation with adequate nutrients available. The yield possibility sets a limit above which additional yield increases can not be obtained solely by adding fertilizers. The factors that determine yield possibility are: (1) physical condition of the soil, (2) season, (3) water or soil moisture supply during the growth of the crop, (4) the plant yield potential, (5) the rate and pattern of planting, (6) the effect of toxic substances and (7) the influence of disease and insects. Any one or more of these factors may set an absolute limit to yield or the effect of one may be conditioned by the effect of another. Such is the case when one variety of a crop behaves differently with respect to another from one season to the next. The yield possibility is not a constant. It can change by variations of any one or more of the factors mentioned. It is often difficult to explain in quantitative terms the exact effect of many of these factors. Many agree that a certain season was unfavorable for cotton in most of Arizona. This may not have been true, however, for cotton at a particular location. Unfortunately, this is the one factor over which man has the least control. The limit placed on yield in any year by the seasonal effect may have restricted the utilization of fertilizers applied.

The amount of "available" nutrients in the soil is of considerable importance in planning a fertilizer program. The soil nutrient level and the yield possibility are probably the two most important factors determining crop response to added fertilizers. The "available" soil nutrient supply and the amount of added fertilizer can determine the actual yield of a crop but not the yield possibility. It follows that a marked response to added fertilizers can be obtained when the "available" soil nutrient level is low and the yield possibility high. At the other extreme - a high "available" soil nutrient level and low yield possibility - little or no response to added fertilizers can be expected.

The actual yield of a crop without any added plant nutrients is a good indicator of the "available" soil nutrient supply. The difference between this yield and the yield with all nutrients adequate (i.e., the yield possibility) represents what can be accomplished by adding fertilizers. It should be realized that as the yield possibility is approached smaller and smaller increments of yield will result from each increment of additional plant nutrients. The economics of the situation will determine the extent to which it may be feasible to approach the yield possibility.

In order to use fertilizers efficiently it is important to know not only which nutrient or nutrients are deficient but also the amounts necessary to

eliminate that deficiency. To approach this problem it is necessary to add nutrients singly and in combination at different rates. This approach can not be used on all fields of all farms for all crops because of financial and physical limitations. Information from a limited number of experiments should be helpful in planning a fertilizer program for other fields and farms within a given area. All information about this new situation should be considered carefully and the final recommendation conditioned by the best estimate of the "available" soil nutrient supply and expected yield possibility.

COTTON PRODUCTION - Weed Control

Control of Annual Weeds in Cotton with Preplant-Layby Combinations of Herbicides

(K. C. Hamilton)

During the past year, tests were conducted at Marana, Phoenix, and Yuma to determine herbicide combinations that would control annual weeds for an entire growing season. Herbicide combinations in one or two applications in one season have several advantages over the use of a single herbicide. The proper herbicide combination results in better control of infestations of several annual weeds. Herbicide combinations minimize the build up of weed species resistant to a single herbicide. Herbicide combinations allow the use of lower rates than when only one herbicide is applied. The lower rates result in lower costs, greater safety to cotton, and less herbicide residues in the soil to affect the following crop.

Preplant applications of herbicides followed by layby applications were evaluated at the Cotton Research Center, Phoenix, on the soil averaging 33% sand, 43% silt, 24% clay, and 1.7% organic matter. Weeds present included browntop panicum, watergrass, red sprangletop, Wrights groundcherry, and carelessweed. Preplant applications of trifluralin (Treflan), DCPA (Dacthal), and prometryne (Caparol) were made in March before furrowing for the preplanting irrigation. In April Deltapine Smooth Leaf cotton was planted in moist soil.

The test area was cultivated until mid-July. The hand-weeded checks were also weeded three times. Layby applications of diuron (Karmex), monuron (Telvar), and prometryne were directed to the soil covering the entire middles and base of cotton plants. Dates and rates of treatments, percent weed control, and cotton yields of selected treatments from two tests are summarized in the table.

All preplant applications of trifluralin stunted cotton for 2 to 3 months. Applications of prometryne caused temporary chlorosis of cotton foliage. Combinations of preplant and layby herbicide applications gave better weed control than either preplant or layby herbicide applications alone.

Yields of cotton receiving preplant and layby applications of herbicides equalled yields of hand-weeded cotton, except for cotton treated with prometryne at layby. Preplant applications of trifluralin or DCPA combined with layby applications of diuron or monuron gave season-long control of annual weeds and increased cotton yields compared to the cultivated checks.