EFFECT OF AMMONIUM-NITRATE ON THE DEFOLIATION OF IMMATURE COTTON LEAVES

This note is concerned with leaf defoliation of immature cotton resulting from side-dressing treatments with ammonium nitrate. The results mentioned herein may be indicative of the need for more basic research regarding aspects of nitrogen metabolism on the chemical defoliation of mature cotton leaves.

The defoliation of the immature leaves occurred in an experiment designed to study the effects of differential fertilizer treatments on the chemical defoliation of mature cotton. This investigation consisted of a 3° factorial fertilizer test in quintuplicate. The cotton variety, Delapine TPSA, was used and plantings were made in five gallon crocks. Initial applications of fertilizers at equivalent rates in pounds per acre were: elemental nitrogen (N), 0, 50 and 100 from 33.5% ammonium nitrate and phosphoric acid (P₂O₅), 0, 100 and 200 from 45% superphosphate. The fertilizers were spot-placed two inches below and two inches to the side of the cotton seed. The cotton originally treated with N received an additional supply of 50 or 100 pounds of spot-placed N as a side-dressing treatment at the time of squaring. The cotton was given approximately equal amounts of water directly after the side-dressing treatment.

Eight hours after the side-dressing treatment with N, wilting and interveinal yellowing occurred on plants in three replicates which had received a total application of 100 and 200 pounds of N without the addition of P₂O₅ (figure 1). Microscopic examinations of fresh tissue from injured portions of the leaves indicated that the palisade layer of cells had collapsed but the mesophyll tissue appeared to be intact. Two days subsequent to the side-dressing treatment, defoliation of the older leaves occurred after the formation of an abscission layer. The affected plants later recovered and produced rapid vegetative regrowth.

Leaves were selected from the injured cotton plants and from plants which received comparable fertilizer treatments but did not show visible evidence of injury. Immediate qualitative tests indicated that the damaged leaves were exceedingly high in ammonia and high in nitrates. Uninjured leaves gave a slight reaction for nitrates but ammonia was not detectable. No evidence of polypeptide hydrolysis was found indicating that the ammonia accumulated from either rapid reduction of nitrates or direct absorption by the cotton plant. Total nitrogen, quantitatively determined, was higher in the damaged leaves but no positive tests for glutamine and asparagine were obtained. The toxic effect of the excess ammonia might have been such that it inhibited the formation of these two compounds. There was evidence of carbohydrate hydrolysis since carbohydrates, particularly reducing sugars, were significantly higher in the uninjured leaves.

In summary, indications are that excess ammonia in the immature cotton leaves derived from an ammonium nitrate side-dressing treatment caused defoliation. The question still remains unanswered concerning whether defoliation was directly the result of the toxic effect of ammonia or a by-product created by the presence of excess ammonia.—H. W. GAUSMAN, Associate Agronomist, and W. R. COWLEY, Superintendent, Lower Rio Grande Valley Experiment Station, Weslaco, Tex.

PREPUNCHING OF I.B.M. CARDS WITH PLOT CODE NUMBERS

In the use of I.B.M. punch-card equipment for analyzing and summarizing data, the most expensive operation is key punching the cards. For crop variety yield trials conducted as lattice designs, about one-third to one-half of the time spent on key punching the cards is devoted to coding the individual plots. A 12 x 12 triple lattice requires a minimum of 15 columns per card for recording plot codes, and in most yield experiments only 15 to 20 columns per card are used for recording data. It is possible to eliminate the manual key punching of plot codes on the cards by prepunching them on a gang punch machine from a set of master cards. This machine duplicates the master cards at the rate of 100 per minute. A limitation of the prepunching scheme is that a research worker must use fixed randomized arrangements year after year.

At the Michigan Experiment Station three randomizations of sets X, Y, and Z (9 replications) for each triple and rectangular lattice design from size 6 x 6 to 13 x 13 have been punched onto master cards. The coding is illustrated in figure 1. Columns 3, 4, and 5 (entry number), 7, 8 and 9 (plot number), 10 through 15 (block numbers), and column 16 (set number) are punched on master cards according to the randomized order. Columns 1 and 2 are left blank on the master cards so that the experiment can be assigned an experiment number. Likewise column 6 is left blank so that replications can be assigned at random. Column 16 is necessary for distinguishing between the three randomizations of X, Y, and Z in any size lattice.

A completely coded set of cards from one experiment can be obtained in one operation on the gang punch

![Fig. 1.—Interveinal yellowing of defoliated cotton leaves as a result of a side-dressing treatment with ammonium nitrate.](image_url)