ABSORPTION AND LOSS OF MOISTURE IN COTTON BOLLS PREVIOUSLY TREATED WITH DEFOLIANTS, ADJUVANTS, AND DEFOLIANT-ADJUVANT MIXTURES

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The proper use of chemical defoliants preparatory to harvest is recognized as an advantageous practice throughout the Cotton Belt. For better efficiency, growers usually attempt to begin the harvest as soon as practical following maximum defoliation. Rain or heavy dew following defoliation, however, usually necessitates a delay in harvesting. The recently accepted commercial practice of using adjuvants with chemical defoliants to facilitate defoliation has raised a question regarding the rates of moisture absorption by cotton and the drying of cotton bolls when rain or heavy dew follows application of defoliant-adjuvant mixtures. Evidence to date indicates that adjuvants make droplet size more uniform, aid the penetration of other substances into plant cells, increase the spreading of droplets over the leaf surface, and tend to "stick" the defoliant material to the leaf. Usually most bolls are open when the defoliant solution is unavoidably deposited on the open bolls. Since intermittent rainfall often proves the most detrimental to harvest, the use of any material which might cause bolls to absorb more moisture and/or ultimately delay drying would not be desirable.

Earlier work demonstrated that relative humidity affects the moisture content of seed cotton. And more recent experiments (2) showed the relative humidity to be lower in defoliated than in undefoliated fields of cotton. However, little information is presently available relative to the drying of cotton previously treated with defoliant-adjuvant mixtures. A number of experiments, therefore, were conducted to investigate the rates of moisture absorption by cotton and the drying of cotton previously treated with defoliants, adjuvants, and defoliant-adjuvant mixtures.

Experimental Procedure

Cotton bolls collected from the varieties Plains and Deltapine 15 (Gossypium hirsutum L.) were utilized in 15 separate experiments at the University of Arkansas Agricultural Experiment Station, Fayetteville, Ark., in 1960 and 1961. Two defoliants and two adjuvant formulations, representative materials commonly used in commercial practice, were utilized in the experiments as follows: The defoliant Shed-A-Leaf "L" (sodium chlorate 18.5% with sodium metaborate) was used at the recommended rate of 4 pounds per 10 gallons of water per acre, and the defoliant DEF (s,s,s-tributyl phosphorotrithioate 70.5%) was used at the recommended rate of 1 1/2 pints per 10 gallons of water per acre. The adjuvants Colloidal X-77 (alkylarylpolyoxyethylene glycols, free fatty acids, and isopropanol) and Spreader Sticker (sodium sulfates of mixed long-chain alcohol fatty acid esters and diethylene glycol abietate) were used at a rate of 2 quarts per 100 gallons of defoliant solution in 14 of the experiments; in one experiment, adjuvants were used at rates of 2, 4, 6, and 8 quarts per 100 gallons of defoliant solution.

The chemical treatments were as follows: (a) defoliant alone, (b) adjuvant alone, (c) defoliant-adjuvant mixture, and (d) no treatment (check). The lapse time from chemical treatment to moisture treatment varied from 1 hour to 7 days. After chemical treatment, bolls (36 bolls per sample) were moistened and air-dried in the laboratory. Bolls were arranged in a randomized block design on elevated, grided hardware cloth; replications numbered 3 or 4 in each experiment. In experiments concerned with both moisture absorption and drying, bolls were moistened with a fine, water spray at 30-minute intervals for 2 1/2 hours and then allowed to air dry. In experiments concerned with drying alone, bolls were moistened with distilled water in amounts required to vary the moisture content up to a percent moisture equivalent to saturation. Bolls were weighed at 15-minute intervals throughout each of the experiments.

Results and Discussion

A statistical analysis of data from each experiment showed no significant differences among treatments; i.e., neither moisture absorption, rate of moisture loss, nor the time of ultimate drying of seed cotton was affected by previous treatments with defoliants, adjuvants, or defoliant-adjuvant mixtures. Also, the lapse in time from chemical treatment to moisture application had no significant effect on moisture absorption by cotton bolls or moisture loss from cotton bolls.

Tabular data have been omitted from this paper since statistical analyses of the data from all experiments showed no significant differences among treatments; C.V. range = 0.9 to 1.1%. A composite of data from the experiments, however, is given in Figure 1. The expectation curves A, B, and C represent a composite of eight separate experiments in which a predetermined amount of moisture was applied to chemically untreated bolls (checks) and to bolls published with the approval of the Director of the Arkansas Agricultural Experiment Station. Received Dec. 9, 1961.

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