Influence of Postemergence Herbicides on the Fiber Quality of Selected Cotton Varieties

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POSTEMERGENCE HERBICIDES are of particular interest for weed control in subhumid areas where rainfall may be insufficient for action of many preemergence herbicides. It has repeatedly been found that cotton yield was not influenced by postemergence herbicides, assuming the plants were treated at a safe stage, but fiber quality was not analyzed. However, many workers have reported yield reduction and crop injury from misapplication of herbicides (1, 2, 3, 5, 6, 8). Johnson (3) showed N-(3,4-dichlorophenyl)-methylacrylanilide (dicryl) to delay maturity in cotton, which could influence fiber quality. Everson and Arle (3) found that preemergence applications of 3-(p-chlorophenyl)-1,1-dimethylurea (monuron) in excess of 2 pounds per acre reduced boll weight, fiber length, and fiber coarseness. Scifres et al. (7) found that 1,1'-dimethyl-4,4'-dipyridinium cation (paraquat) did have some influence on cotton fiber quality, particularly fiber coarseness. On the other hand, Foy and Miller (4) reported that 2,2-dichloropropionic acid (dalapon) treatments did not influence fiber quality. However, no report was found on the influence of the most widely used postemergence cotton herbicides on fiber quality.

Research was conducted in the field to determine the influence of five postemergence herbicides on cotton fiber length, strength, fineness, and seed germination. Five genetically different upland cotton varieties were used in the analysis because genotype may have some influence on herbicide phytotoxicity.

MATERIALS AND METHODS

Five upland cotton varieties ('Parrott,' 'Acala,' 'Paymaster 101A,' and 'Lankart 57') were seeded in a split plot design with four replicates in a loam soil near Stillwater, Okla., in 1964 and 1965. When the plants were at least 20 cm tall, the herbicides were applied at the normally recommended rate and at double that rate. The herbicides and rates used were: 3-(3,4-dichlorophenyl)-1,1-dimethyl urea (diuron), 0.44 and 0.89 kg/ha; disodium methanearsonate (DSMA), 2.8 and 5.6 kg/ha; 2,4-bis(isopropylamino)-6-methylmercapto-s-triazine (prometryne), 0.85 and 1.7 kg/ha; 2-(m-trifluoromethylphenyl)-1,1-dimethyl urea (C-2059), 2.2 kg/ha; and 3,4-dichlorobenzyl-N-methylcarbamate (UC 22463), 4.4 kg/ha. Diuron and DSMA were used at two rates both years, the other two herbicides were used at only one rate in 1965 only. A nonionic surface active agent (surfactant — in this case, surfactant WK) was used in combination with all herbicides on a volume basis.

The herbicides were applied as directed sprays so that only the bottom 4 cm of the cotton stem is the normal application procedure for postemergence herbicides. The plants were treated twice, when 25 and 50 cm tall in 1964 and when 20 and 40 cm tall in 1965, and were applied in 372 liters of water per hectare.

Composite fiber samples were collected from 20 plants selected at random from each plot. The fiber was ginned on a saw gin and fiber quality determinations made, each sample being subsampled and analyzed twice. Fiber coarseness was determined on a micronaire and is expressed as micronaire readings in fibers/cm. Fiber strength was determined on a stelometer and was expressed as the 1/2 gauge reading in g/cm. 386.89 equals g/m². Fiber length was determined on a fibergraph and is given as the 2.5 span length in centimeters. Twenty-five seeds in each of four replications were germinated in a Da-Lite Jr. germinator.

RESULTS AND DISCUSSION

Variation in fiber coarseness was found between the varieties in 1965 but not in 1964 (Table 1). In general, the Acala variety was finer than the other varieties. Some possible influence of the herbicide on coarseness was noted in 1964 in that all treated plots were finer than the untreated check of the Paymaster variety. However, this did not hold...