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SEASON-LONG EFFECTS OF CHILLING TREATMENTS APPLIED TO GERMINATING COTTONSEED[1]

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ABSTRACT

Field growth response of cotton (*Gossypium hirsutum* L.) to chilling during germination was investigated by laboratory application of controlled dosages of cold, followed by germination in sterile soil and subsequent field culture to maturity. Chilling during germination reduced plant height, delayed fruiting, and reduced fiber quality in a direct relation to the length of exposure to cold.

Additional key words: ***Gossypium hirsutum*** **L., Environment, Low temperature.**

IMMEDIATE and short-term inhibition of cotton (*Gossypium hirsutum* L.) seedling growth as a result of chilling during early stages of germination was previously reported (1, 2). A linear inhibitory influence by increasing periods of chilling was noted in greenhouse and laboratory studies. These results emphasized the impact of low temperatures during germination upon subsequent growth. Investigation of season-long field expression of the effect of early chilling was a logical extension of the greenhouse and laboratory studies.

Many researchers have attempted to determine low temperature influence on cotton by date of planting studies with little success. Our approach to field testing of chilling influence consisted of applying controlled temperature treatments to seed in germination rolls, planting the seedlings in sterile soil in peat pots, germinating in the greenhouse to emergence, and transplanting the seedlings to the field after all possibility of low temperature was past. In this manner it was possible to apply closely controlled dosages of adverse temperatures. The seeds were of M-8 genetic selection from a Deltapine cultivar, as used in previously reported greenhouse studies (1, 2). The temperature treatments were: a control, which was germinated 24 hr at 31 C before planting in sterile soil (radicle elongation of approximately 1 cm); and, seedlings germinated 24 hr at 31 C which were subsequently chilled in the seed rolls at 10 C for 2, 4, or 6 days. Initiation of treatments was timed so that all received the same time period at 31 C prior to planting. All seedlings were planted at the same time in sterile soil in peat pots. Seedlings were transferred to the field in late May after soil temperatures were well above 15 C. The test area was irrigated immediately after the plants were set in the field. The test was planted in a randomized block design with four replications. Each treatment plot consisted of two 11-m rows with single plants set at 0.3-m intervals. The data collected included time to first bloom, plant height, yield, and fiber properties. Earliness of maturity was determined by six weekly harvests of open bolls.

The results were in complete agreement with previously reported greenhouse data. Plant height at the end of the growing season was reduced significantly in relation to the amount of chilling applied. A 6-day chilling treatment reduced height by 36 cm; 4-day chilling reduced final height by 14 cm; and the 2-day chilling reduced height by 5 cm (Fig. 1). The date of first flower was delayed in a linear relation to quantity of chilling. The 2, 4, and 6-day cold treatments delayed first flower by 3, 6, and 10 days (Fig. 2). The delay in flowering presumably influenced time of boll opening, as evidenced by the earliness data (Fig. 3).

Although a trend was evident, the delay in total crop maturity by chilling did not significantly influence total yield; however, crop value was significantly reduced because of lower fiber quality. Micronaire readings were 3.89, 3.75, 3.64, and 3.38 for fiber from the control, 2-, 4-, and 6-day chilling treatments. The lower fiber micronaire readings were presumably a consequence of fruiting delay, and maturation of fiber

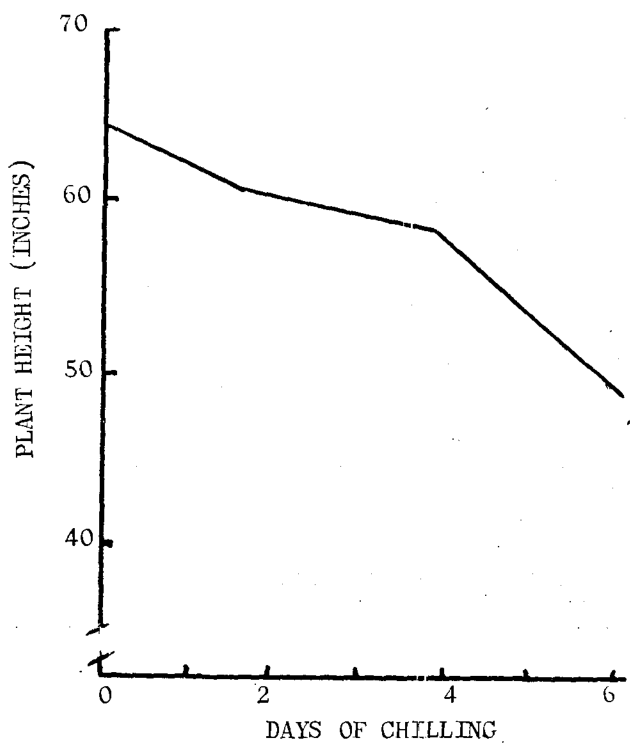

Fig. 1. Influence of chilling during germination upon height of the cotton plant at maturity.

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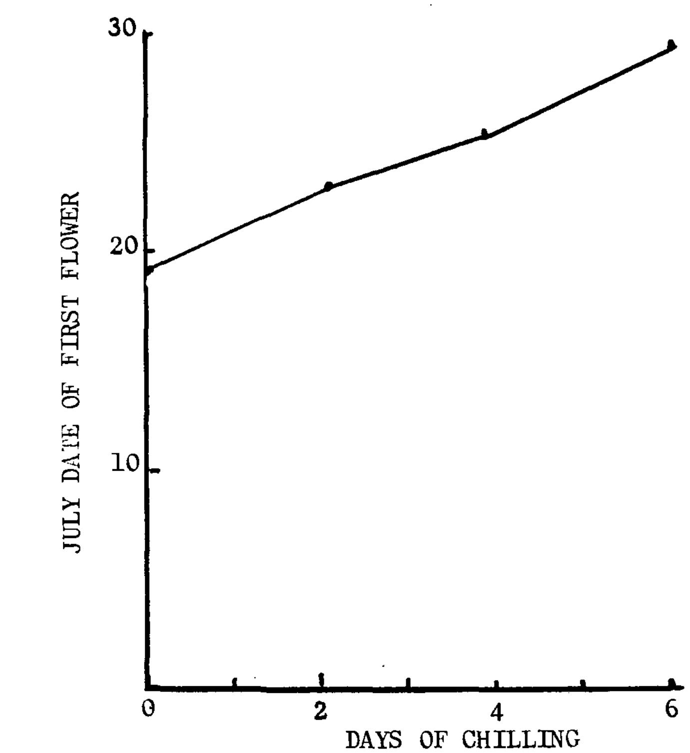

Fig. 2. Influence of chilling during cottonseed germination on the time of first open bloom.

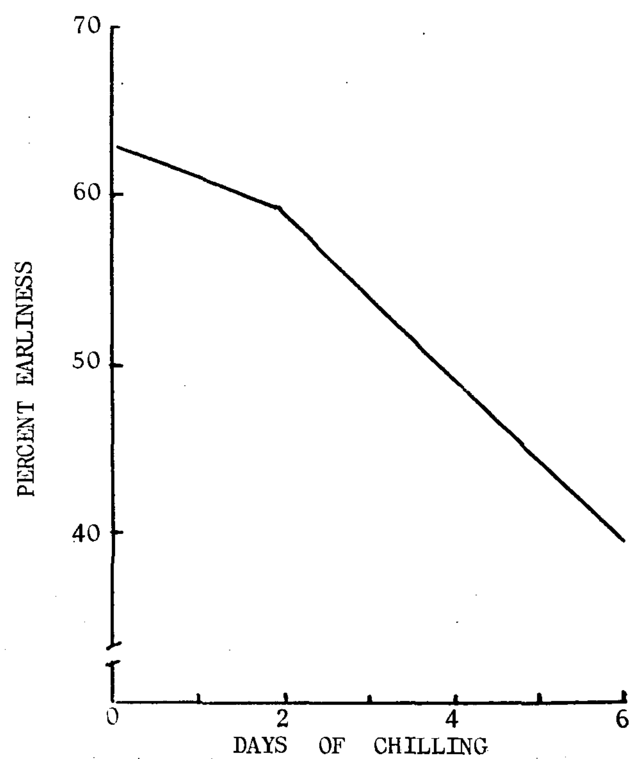

Fig. 3. Influence of chilling during germination on the percentage of total seed cotton maturing prior to October 7.

in late bolls during a period of less favorable (late fall) environment.

The present and previously reported data from greenhouse tests (2) show that incidence of sub-favorable temperatures during germination can have far-reaching effects. Incidence of chilling can alter growth and fruiting pattern throughout the season. This may be reflected only in loss of fiber quality, due to lateness of maturity; or it may greatly increase cost of production by extending the period of time that cultural practices must be provided for a late-maturing crop. Because of late maturity, open cotton may be exposed to more deterioration from late fall rains, and thereby lose market value. In the northern limits of cotton production, where cold planting seasons and a short growing season are common, reduction of yield by low temperature at planting is likely.

On the basis of this information, we therefore suggest that a part of cotton yield variability is determined by specific conditions that occur during germination. The fact that a seedling emerges and survives the rigors of the environment does not necessarily indicate that it will mature into a productive plant. This is evident from a recent report by Wanjura et al. (3) who correlated speed of emergence and productivity. In earlier reports (1 and 2) the senior author found that subsequent seedling growth can be inhibited by discrete dosages of cold, applied soon after radicle elongation. Thus, if cold slows seedling growth, emergence is delayed, and indications are that the entire plant development process is adversely affected.

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RELATIONSHIPS BETWEEN PARENTS AND SELECTIONS IN CROSSES OF DRY BEANS, *Phaseolus vulgaris* L.[1]

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ABSTRACT

A study was made of the relationships between 160 F_8 dry bean selections tested in 1966 and their parents tested in 1959, the year the decision to make the 22 crosses was made. Statistically significant interannual correlations were found for yield, maturity, growth habit, and infection of common bacterial blight, *Xanthomonas phaseoli* (E. F. Sm.), but not for seed size.

Additional index words: **Derived lines, Correlations.**

PERFORMANCE of varieties or strains is the criterion commonly used in determining which parents to use in a breeding program with self-polinated crops. The objective of this study was to determine the extent of relationship, if any, between the final product,

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