Fruiting Height Response: A Consideration in Varietal Improvement of Pima Cotton, *Gossypium barbadense* L.¹

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The Pima cotton industry involves a relatively small acreage in the southwestern United States. However, the crop is grown over a wide range of environments at altitudes from approximately 100 to 4,000 feet. During the fruiting season for the crop, the lower altitudes, ranging up to 1,500 feet, are characterized by high day and night temperatures. At the higher altitudes, 2,500 feet and above, day temperatures are high and night temperatures moderate. The minimum night temperatures in the 1,500- to 2,500-foot zone fluctuate between high and moderate from year to year. Observations to date indicate that minimum night temperatures near 80° F. are not conducive to efficient fruiting and should be considered as high.

Historically, only one commercial variety of Pima cotton has been grown at any given time, except during the periods of transition from one variety to another. To date, only seven varieties of Pima have been grown commercially in the Southwest. The first was the 'Yuma' variety, followed by 'Old Pima,' 'SxP,' 'Amsak,' 'Pima 32,' 'Pima S-1,' and 'Pima S-2' (2). Yuma, Old Pima, SxP, Amsak, and Pima 32 were developed directly or indirectly from a few cottons introduced from Egypt. Thus, they involved a fairly narrow germplasm base and were very similar in many respects. Pima S-1 was developed much differently. The parents of Pima S-1 included 'Sea Island,' Pima, and 'Tanguis' from *Gossypium barbadense* L., and a Stoneville variety from *G. hirsutum* L. These parents were crossed, the resulting F₁'s were crossed, and selections in later generations were subsequently recrossed over a 20- to 25-year period. Pima S-2 was selected from the experimental Pima strain, 3–79, with Pima S-1.

One of the striking differences between the previous commercial Pima varieties and the first fruit. The first fruit sets lower on Pima S-2 than on Pima S-1; the set of Pima S-2 is more pronounced what lower than at the higher altitudes. This results in a genotype × location interaction, with Pima S-2 more adapted at the lower than at the higher altitudes.

One objective of the Pima varietal improvement program is to develop varieties with genotypic environmental interactions that result in the maximum production of fiber of acceptable quality. Our work is primarily concerned with these three considerations: the effect of predictable environmental variations on fruiting height, the relationship of fruiting height to yield, and the genetic systems which favors a homeostatic effect.

**LITERATURE REVIEW**

Allard and Bradshaw (1) express opinions and cite literature pertinent to our work. A summary of their comments follows.

Plant breeders working with many crops general that interactions between genotypes and environment have an important bearing on the breeding of improved varieties. However, opinions vary as to how these interactions may be utilized. Some breeders prefer to concentrate on genotypes that tend to mask certain interactions of genotype × environment. Still others prefer to separate the components of final characters such as yield, and to work with the individual components in relation to environmental effects. Some prefer to determine the genetic systems most likely to give high and stable performance.