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Two additional 49-entry experiments were examined in which performance index values rather than actual yields had been used for the initial regression analysis. The performance index used is a measure of grain yields on sound plants only, eliminating from consideration all broken and root lodged plants or those with dropped ears. Similar results were obtained:

Experiments	*Regr. coeff.*	*F values*
62-7-161	1.236650	9.14
62-7-261	1.740948	5.97

From the data it appears that in each case a positive relation existed between yield or performance index and the number of days from planting to flowering for hybrids with equivalent moisture at harvest and that there was a gain in yield of over 56 pounds (1 bushel) of dry grain per acre for each increase of 1 day in the interval from planting to flowering.

The data are taken to indicate that the expectation of higher yields in early hybrids which flower later in the season and then lose moisture rapidly after physiological maturity of the grain is supported and that hybrids of this type are preferable from a yield standpoint to hybrids which flower early in the season and then dry slowly.

INHERITANCE OF ABNORMAL PALISADE MUTANT IN AMERICAN UPLAND COTTON, *Gossypium hirsutum* L.[1]

R. J. Kohel[2]

IN 1959, a plant with numerous light-colored areas on most of the leaves (Figure 1) was noted in a population of 20 F_3 plants from the cross Texas 133 (*G. hirsutum* race *morrilli*) × DPL (a highly inbred line derived from *G. hirsutum* race *latifolium* 'Deltapine 14'). On close observation these areas appeared as small depressions in the leaf surface without any appearance of external damage. Freehand sections of leaves indicated that the palisade tissue in these areas was absent or disintegrated. The phenotype of this mutant plant was referred to as "abnormal palisade" (AP).

Flowers on the mutant plant were self-fertilized. In 1960, ten plants were grown and all expressed the AP phenotype. Cotyledons, as well as leaves, exhibited the AP phenotype (Figure 2). Flowers from AP and DPL plants were cross-fertilized to begin a study of the inheritance of this mutant. F_1 seeds were planted in the greenhouse during the winter and flowers on F_1 plants were self-fertilized and backcrosses to the AP stock ($BC_1{}^1$) were made. F_1 plants had normal cotyledons and leaves; therefore, if the AP phenotype was under genetic control it must have resulted from a recessive genotype.

Seeds from greenhouse pollinations were planted in 1961 field plots to provide the following populations: $F_0{}^1$, $F_0{}^2$, F_1, F_2, and $BC_1{}^1$. Observed segregation (Table 1) approximated that expected from segregation of alleles at two independent loci with the mutant phenotype resulting from the homozygous recessive genotype. Chi-square tests (Table 1) indicated that the observed segregation did not deviate significantly from the proposed segregation of 15 normal:1 AP.

[1] Contribution from the Crops Research Division, ARS, USDA, and the Soil and Crop Sciences Department, Texas A. and M. University. Received July 1, 1963.

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Figure 1. Abnormal palisade leaf.

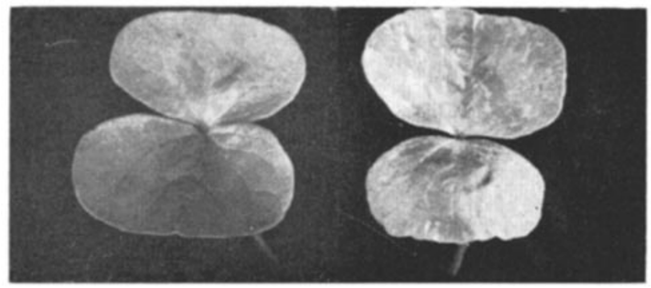


Figure 2. Normal (left) and abnormal-palisade (right) cotyledons.

In 1962, F_2, $BC_1{}^1$, F_3 and $SBC_1{}^1$ (from self-fertilized $BC_1{}^1$ plants) populations were grown to test further the proposed genetic model. Chi-square tests for deviation from the model were not statistically significant (Table 1); however, seedlings heterozygous for red plant body were found in the F_2 population. The red seedlings resulted from improper pollination or errors in harvesting. These were excluded from the classification, but they left a shadow of doubt as to the possibility of green-plant contaminants. To remove any doubt about the genetic control of the mutant phenotype, remnant seed from 1960–61 greenhouse F_1 plants and seed from 1962 F_1 plants were grown in the 1962–63 greenhouse. The resulting segregation was in agreement with the proposed genetic model (Table 1).

The 1962–63 greenhouse classification was based on seedling scoring. Mutant expression on cotyledons of the 1960 parent stock proved to be characteristic of the AP phenotype. In the 1961 and 1962 classification of segregating populations, mutant expression on the cotyledons always corresponded to mutant expression on mature leaves, and no plants were found with a mature leaf expression that did not have a corresponding expression on the cotyledons. This classification was made possible by planting seeds singly in six-ounce paper cups in the greenhouse and classifying the seedlings and then transplanting them to field plots.

A mutant controlled by homozygous recessive alleles at a single locus called mosaic leaf (ml ml) has been reported in cotton.[3] Mosaic-leaf phenotype differs from AP in that

[3] Lewis, C. F. Genetic studies of a mosaic leaf mutant. J. Hered. 49:267–271. 1958.

Table 1. Abnormal palisade segregation and chi-square tests in Upland cotton.

Year grown	Designation	Segregating Normal	Segregating AP	P
1960	F_0[1] (AP)	0	10	
1961	F_0[1]	0	12	
1962	F_0[1]	0	29	
1963	F_0[1]	0	40	
1961	F_1(DPL × AP)	14	0	
1962	F_1(AP × DPL)	15	0	
1961	F_2(AP × DPL)	65	5	.8- .7
1962	F_2(DPL × AP)	140	7	.5- .3
1962-63	F_2(AP × DPL) 1	33	5	.1-.05
	F_2(AP × DPL) 2	47	3	.95- .9
	F_2(AP × DPL) 3	48	3	.95- .9
	F_2(AP × DPL) 4	46	4	.7- .5
	F_2(AP × DPL) 5	45	4	.7- .5
	F_2(AP × DPL) 6	46	4	.7- .5
	F_2(AP × DPL) 7	46	4	.7- .5
	F_2(AP × DPL) 8	48	1	.3- .2
	F_2(AP × DPL) 9	46	4	.7- .5
	F_2(AP × DPL) 10	44	3	.98-.95
	F_2(AP × DPL) 11	48	2	.7- .5
	F_2(AP × DPL) 12	46	4	.7- .5
	F_2(DPL × AP)	158	10	.9- .8
	Pooled F_2	906	63	.8- .7*
	Heterogeneity			.95- .9
1961	BC_1[1] [AP(AP × DPL)]	46	7	.2- .1
1962	BC_1[1] [AP(AP × DPL)]	219	74	.95- .9
	Pooled BC_1[1]	265	81	.5- .3†
	Heterogeneity			.2- .1
1962	F_3[AP × DPL] (Mutant F_2)	0	98	
	F_3[AP × DPL] (Mutant F_2)	0	94	
	F_3[AP × DPL] (Mutant F_2)	0	76	
	F_3[AP × DPL] (Normal F_2)	100	0	
	F_3[AP × DPL] (Normal F_2)	100	0	
	SBC_1[1] [AP(AP × DPL)] (Mutant BC_1[1])	0	96	
	SBC_1[1] [AP(AP × DPL)] (Mutant BC_1[1])	0	57	
	SBC_1[1] [AP(AP × DPL)] (Mutant BC_1[1])	0	86	
	SBC_1[1] [AP(AP × DPL)] (Normal BC_1[1])	45	4	.7- .5†
	SBC_1[1] [AP(AP × DPL)] (Normal BC_1[1])	79	5	.95- .9†

* Tested for deviation from a 15:1 ratio. † Tested for deviation from a 3:1 ratio.

it covers the leaf surface more extensively and results in a marked reduction in plant vigor. It has variable expression at the cotyledonary stage and cannot be scored reliably at this early stage of growth. The phenotypic observations and differing number of loci involved did not suggest that these mutants were allelic, but they were tested to obtain conclusive evidence. The F_1 (ml ml × AP) was normal. An F_2 population of 74 plants was grown; and 57 were normal, 11 had mosaic cotyledons and developed into mosaic-leaf plants, 4 had normal cotyledons and developed into mosaic-leaf plants, and 2 had AP cotyledons and developed into AP plants. Plants homozygous for ml ml could not be scored for AP because when moisaic leaf was expressed on the cotyledons it masked the AP phenotype. These data were tested for independence of the three loci by pooling the observed classes into normal, mosaic-leaf, and AP and non-mosaic-leaf classes. A chi-square value of .66 for 2 d.f. (P = .8–.7) indicated no significant difference from independent segregation.

Linkage studies have not been conducted to determine chromosome location of the two loci governing the AP phenotype. The allotetraploid nature of *G. hirsutum* suggests that it is possible that the AP loci are homeologues. However, the data presented furnish no direct evidence to substantiate separate subgenome locations. Segregation ratios show that DPL is dimeric and it was assumed that the original *morrilli* stock was homozygous recessive. The AP phenotype was easy to detect during scoring but it was inconspicuous and could easily have been undetected by the casual observer. In addition, the *morrilli* stock was photoperiodic and did not flower under the long-day field conditions at College Station and only small populations were grown in the greenhouse during the short-day winter season.

The data presented support the proposed two loci genetic model and did not detect allelism with mosaic leaf. The abnormal palisades phenotype is assigned the following gene symbols and corresponding genotype $lp_1\ lp_1\ lp_2\ lp_2$.

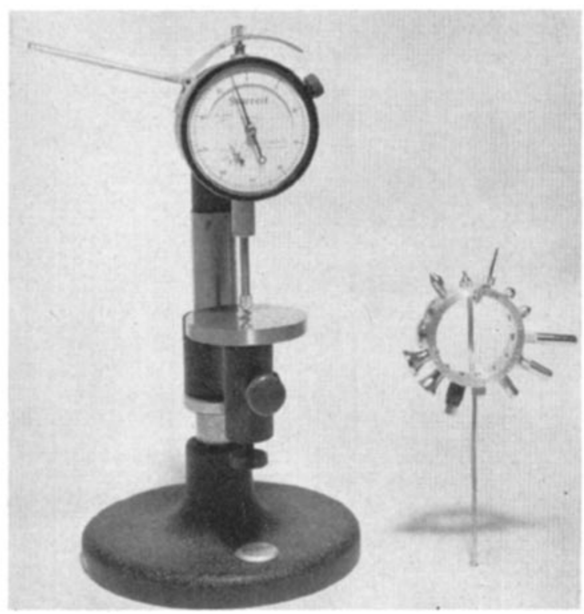
RAPID AND UNIFORM MEASUREMENT OF SEEDS AND OTHER PLANT MATERIALS[1]

B. R. Gregg[2]

ACCURATE measurements of the dimensions of seeds and other plant materials can be taken rapidly and uniformly with the Starrett No. 652 dial bench gage.

To measure a specimen, the hand lever on the left of the dial is pressed down to raise the spindle carrying the contact point. After the specimen is in position on the table, the hand lever is released to place the contact point against the specimen. The pressure of the contact holds the specimen in position, while the dimension is read directly from the dial.

Readings are uniformly accurate, since each measurement is made under the same predetermined spring contact pressure. There is no variation due to the operator's "feel". Dial reading of the actual measurement also eliminates variations due to viewing angle. Measurements are rapid, since only movement of the hand lever is necessary to release or grip a specimen.



The dial pictured is graduated in 0.001 inch, with a range up to 1.0 inch. The dial can be adjusted relative to zero, and then locked in position with a bezel clamp. The table is adjustable vertically on the ground post, so that differences in material over 1.0 inch can be measured. A sliding ring which can be locked into position on the post allows the table to be moved to either side without affecting the accuracy of readings.

A wide range of different contact point shapes are available for measuring materials of different shapes. A set of 12 different points is mounted on the ring pictured beside the gage.

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