

<u>Mutant Type</u>	<u>Requires</u>	
	<u>Inactivation of</u>	<u>Intermediate Components Unaffected</u>
Stable, pale, recessive brown pericarp, Sh <sub>2</sub>	$\beta M - P^b$	$\alpha$
Stable, deep, dominant brown pericarp, sh <sub>2</sub>	$M \alpha - Sh_2$	$P^b$
Stable, pale, dominant brown pericarp, sh <sub>2</sub>	$\beta M - - Sh_2$	$\alpha P^b$
Stable, pale, recessive brown pericarp, sh <sub>2</sub>	$\beta M - P^b Sh_2$	$\alpha$
Stable, colorless, dominant brown pericarp, sh <sub>2</sub>	$\beta M \alpha - sh_2$	$P^b$

None of these critical types have been found as yet, but an extensive program for their detection is underway.

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### 1. Competitive growth of pollen tubes in maize.

In this preliminary investigation the possibility was considered whether there is a relation between combining ability and pollen tube growth.

The experimental procedure was to mix equal quantities of pollen of yellow and white seeded inbreds obtained from 15-20 plants in each case and to use this mixture to pollinate different white seeded inbreds and the white seeded variety Potchefstroom Pearl. The sources of pollen were the well known American inbreds K 64, 33-16 and Hy and the South African inbred A 413, all known for their good combining ability. In addition five local yellow inbreds and a white inbred P 697 all of unknown combining ability, and the white inbreds F60 and E58 of known weak combining ability were used as pollen parents. The maternal parents were the inbreds K64, 33-16, E58 and F60 all of known combining ability and 20 other white inbreds of unknown combining ability. Pollen mixtures of the good white combiner K64 with different yellow

inbreds of unknown combining ability or with the yellow good combiner Hy were used to pollinate the white maternal parents named above. A consistent and significant excess of white seed was obtained throughout where equal numbers of yellow and white kernels were expected. Similar results were observed where Hy (yellow seeded) was used in pollen mixtures with the weak combiners F60 and E58, but in these cases there were consistent and significant excesses of yellow seed. The combination however of Hy with P697 using the same pollen sample on 7 different white inbreds in four cases yielded a distinct superiority of Hy and in three cases a slight superiority of P697 depending on the maternal parent used in the crosses.

In crosses where the yellow inbreds Hy and A413, known for their superior combining ability, were used in pollen mixtures with the variety Potchefstroom Pearl, the varietal pollen proved to be significantly superior as was reflected by the far greater number of white seeds formed. Since varietal pollen is composed of a great diversity of genetic types, there was an opportunity for gametic selection which could explain its apparent superiority.

Where the weak white combiners F60 and E58 were used in pollen mixtures with the yellow inbreds of unknown combining ability, some combinations gave a significant preponderance of white seeds and other combinations of preponderance of yellow seed with similar maternal parents. This would suggest that F60 and E58 are superior to some of these yellow inbreds and inferior to the others tested.

If unequal pollen mixtures had caused the deviations from an expected equality of the numbers of yellow and white seeds a consistency in the results would have been expected when the same sample of pollen was used in different crosses. A wide variation, however, was obtained, differing characteristically according to the maternal inbred used indicating that a deficiency in the pollen mixture could not have been the sole cause, and that other factors are involved.

The good white combiner 33-16 reacts the same as K64 when used as the maternal parent, but shows a striking exception when used as a pollen parent. Six different pollen mixtures of 33-16 and yellow inbreds of good, weak and unknown combining ability used to pollinate 18 different white inbreds yielded a consistent and significant deficiency of white seed. On these ears the ratio of yellow to white differed widely from equality, ranging from 3:1 to as much as 32:1. This could not have been due to pollen sterility since in the absence of competition with pollen from other sources 33-16 pollen produced well filled ears. Josephson and Jenkins (*J. of Agron* 40: 267-274, 1948) reported that 33-16, when used in crosses, transmitted male sterility to its progeny maternally through its cytoplasm but apparently not through its pollen. It seems likely that 33-16 cytoplasm present in its pollen tubes is responsible for the apparent deficient growth of such pollen tubes as is indicated by the deficiency of white seed in the crosses

reported above. Since seed of reciprocal crosses is available it should be possible to test the genic or cytoplasmic nature of this phenomenon.

Although the results suggest that there may be a relation between combining ability and pollen tube growth, final conclusions must await the results of actual yield tests of the crosses made. Such results should become available during the present season. If such a relation exists it should be a great help in the evaluation of inbred lines for combining ability on an extensive scale and thus help materially to speed up the Hybrid Maize Program.

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1. Effects of gibberellic acid on maize plants homozygous for the recessive gene (la).

A compound of interest to both geneticists and physiologists is gibberellic acid. Reports indicate it differs physiologically from most other auxins in that it is usually much less active in assays based on response of isolated plant parts, but stimulates growth of intact plants much more than most other auxins, as evidenced by increases in height, fresh weight, and dry weight. It has been shown to produce responses on known gene controlled auxin characteristics in maize. The present study was undertaken to determine if gibberellic acid would affect a genetically controlled auxin factor where bending of the stem from perpendicular to horizontal is concerned. The gene in question (la in maize), when in the homozygous condition causes an auxin differential between sides of the stem resulting in a horizontal growth form. The redistribution of auxins in lazy stems is reversed from normal horizontal stems, so that about 55 percent of the auxin moves in the upper half (Shafer, J., Botanical Gazette 101: 68 (1939).

Gibberellic acid was applied by three types of application and at three stages of growth. (1) a .5 percent gibberellic acid - lanolin paste was applied to the cotyledonary node and coleoptile of the embryo at the time the coleoptile broke through the pericarp during germination, (2) an aqueous solution of gibberellic acid at the concentration of .01, .1 and 1.0 ug. was injected into the stem by use of an ordinary hypodermic needle or sprayed on the leaf surface by using a small atomizer to previously untreated plants beginning at the fifth leaf stage of growth and repeating treatments at weekly intervals for a four week period, (3) a .5 percent gibberellic acid-lanolin paste was applied to previously untreated plants on the under side of the curvature as soon as bending of the internodes started. This was done by removing a