

3. Double mutant stocks with mealy endosperm.

Starting with h_2 and other known mutants that modify the endosperm structure, double recessive stocks have been constituted in order to study the influence of these factors on one another. Stocks now available are: $h_1 h_2$, $fl_1 h_2$ and $sh_1 h_2$. The building of stock $o_2 h_2$ is under way.

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1. Gamete deletion in male-sterile crosses.

Previous reports (Agron. Abs., 1959, p. 60, and M.N.L. 1960) have shown that a greater than expected number of fertile plants is obtained when pollen segregating for Rf and rf is used to pollinate plants carrying 33-16(J) male-sterile cytoplasm. Excesses of fertile plants have also been obtained in certain crosses involving Texas (T) male-sterile cytoplasm. It was suggested (M.N.L. 1960) that the excess of fertile plants could be caused by differential competitive effects between Rf and rf pollen grains such that genotypes carrying rf are eliminated. Several studies the past two years support this suggestion.

Pollinating plants carrying T cytoplasm with equal quantities of pollen from T331, a nonrestoring inbred, and Ky21, restoring, produced 80.3 percent fertile plants while pollinating plants carrying J cytoplasm with equal quantities of pollen from Ky27, a nonrestoring inbred, and 33-16, restoring, produced 67.8 percent fertile plants.

In another experiment, plants with T cytoplasm were pollinated with nonrestoring pollen and 1/2, 1, 2, and 4 hours later were pollinated with restoring pollen. The following numbers and percentages of fertile and sterile plants were obtained from these pollinations:

	Fertile		Sterile	
	No.	%	No.	%
Tcms x $rf\ rf$	0	0	300	100.0
" x $rf\ rf$ + $Rf\ Rf$ 1/2 hr. later	1151	96.7	39	3.3
" x " " 1 " "	347	72.3	133	27.7
" x " " 2 " "	307	58.6	217	41.4
" x " " 4 " "	89	20.1	354	79.9

Ears pollinated with nonrestoring pollen only produced full seed set. Also the delayed pollinations gave similar results from the base, middle, and tip portions of the ears. The results obtained, therefore, could not be due to delayed silking.

These experiments indicate that Rf pollen grains germinate faster than rf grains, pollen tubes from Rf pollen grains grow faster than rf tubes, or both.

Some backcrosses made with F_1 pollen in J cytoplasm have failed to segregate sterile plants. Pollen abortion in these crosses may occur following the four-spore stage. The only evidence bearing on this possibility is that these tassels have had a trace to 50 percent aborted pollen grains at time of shed.

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1. Synapsis and crossing over in plants hyperploid for *Tripsacum* chromosome material.

Unexpectedly high trivalent frequencies have been found in certain 21 chromosome stocks containing a pair of *Zea-Tripsacum* interchange chromosomes. The constitutions of these plants have been described in detail elsewhere (Maguire 1961, Exp. Cell Res. 24:21-36). The chiasma frequencies inferred from these trivalents have been such as to suggest that crossover frequency (between homologous corn segments) was increased from an expected 60% (30 crossover units) to close to 100% in the distal half of the short arm of chromosome 2 in this material. Stocks of appropriate genetic constitution for simultaneous tests of recombination frequencies in the ws_3 , lg_1 , gl_2 region and parental trivalent frequencies have been constructed, and data should be available for analysis during the 1962 season.

In addition material containing these interchange chromosomes was irradiated with the hope of recovering new chromosomal constitutions in which synapsis, chiasma frequency and recombination frequency can be studied. Two such new constitutions are currently being cytologically examined. Other new constitutions are available this season from rare crossovers between corn and *Tripsacum* segments in 20 chromosome plants followed by backcrosses to 21 chromosome plants. It is thought that a series of types of constitution will provide quantitative information on pairing relationships and on unusual chiasma frequency as a function of unusual material present.

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2. An additional common locus in corn and *Tripsacum*.

In previous studies a portion of a *Tripsacum* chromosome which had been substituted for the distal half of the short arm of corn chromosome 2 was found to carry dominant alleles for lg_1 and gl_2 . Recent tests have indicated the presence of a normal allele for ws_3 also on the *Tripsacum*-derived segment. Synapsis at pachytene appears normal between the similar *Tripsacum* and *Zea* segments in plants in which no closer pairing partners are available, but crossing over apparently occurs between them only rarely.

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