

c. Nondisjunction of  $B^3$  at the 2nd microspore division.

In this particular cross (cf. Table 1), the percentage of nondisjunction of  $B^3$  in " $3^B B^3$ " pollen was 93%. If all colorless, shrunken kernels ( $cl\ sh$ ), which were obviously hypoploid endosperm with hyperploid embryo, had germinated, the percentage would be higher. It would seem that hypoploid gametes tended to fertilize eggs more frequently, the apparent percentage being 59%. But if we take account of all  $cl\ sh$  kernels, including ones which could not be analyzed because they failed to germinate, the percentage would approach 50%. This indicates random fertilization by both types of gametes, " $3^B$ " and " $3^B B^3 B^3$ ".

As discussed in section A, nondisjunction of  $B^3$  in " $3 B^3$ " type pollen is not a common event. This can be checked genetically by planting colorless and colored kernels from  $3^a 3^a \times 3^a 3^a B^3 A$  cross separately and scoring for the occurrence of colored and colorless plants respectively.

(2) Nondisjunction of  $B^3$  on the female side.

a. Nondisjunction of  $B^3$  at meiosis.

When  $3^a \underline{Sh} 3^B B^3 A \underline{Sh} B^3 A \underline{Sh}$  plants were crossed by  $3^a \underline{sh} 3^a \underline{sh}$  tester plants and the ears were analyzed, about 17.6% of kernels were  $cl\ \underline{Sh}$ . According to a rough calculation the expected frequency of  $cl\ \underline{Sh}$  occurrence due to crossing-over within the T-A segment is about 14% at maximum. The excessive  $cl\ \underline{Sh}$  kernels could be accounted for by meiotic nondisjunction of  $B^3$  followed by formation of a " $3$ " type megaspore. There is no way to tell the difference between nondisjunction of  $B^3$  at AI and at AII except by cytological study. The actual ratio of expected megaspore types can be obtained by planting all kernels from the original cross and by classifying plants according to kernel phenotype, plant color, pollen abortion and degree of glume clumping.

b. Nondisjunction of  $B^3$  at embryo sac formation.

If nondisjunction of  $B^3$  takes place some time at embryo sac formation, the genotypes of polar nuclei and egg might be different. They can be determined by planting  $cl\ \underline{Sh}$  and  $Cl\ \underline{Sh}$  kernels separately and scoring for the occurrence of colored and colorless plants respectively.

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6. The effect of a-x deficiencies on crossing over in  $T\ \beta\ a\ sh / N\ a-x$  plants.

Of the 109 alpha-bearing strands reported by Laughnan (Mutation and Plant Breeding Symposium, 1961) among offspring of T-marked hemizygotes ( $T\ \beta\ a\ \underline{Sh} / N\ a-x$ ), none carried the marker (N) proximal to the a-x deficiency. As was reported, their complete absence is somewhat surprising since they might be expected, at least occasionally, as a result of a coincidental exchange in the T- $\beta$  segment.

Two obvious hypotheses to explain the rarity of this coincidental exchange are that the event giving rise to the nonrecombinant alpha has an interfering effect, or that the deficiency or its effect may extend well to the left of the A locus. The deficiencies a-x<sub>1</sub> and a-x<sub>3</sub> are of X-ray origin and are known to include the A locus and also to extend to the right beyond the Sh locus.

Data collected in this laboratory this past summer seem to bear on the hypotheses regarding the lack of N a Sh recombinants. Hemizygotes of the constitution T β α sh / N a-x were crossed by a homozygous colorless (a Sh / a Sh) pollen parent. From the F<sub>1</sub> ears, colored (β α sh / a Sh) and colorless (a Sh / N a-x) individuals were planted and determinations made on each individual plant for the presence or absence of aborted pollen. The presence of aborted pollen is typically associated with plants that are heterozygous for the translocation (T). In addition, individual suspect plants were either self-pollinated or crossed by a known pollen parent tester and at maturity the ears checked for the normal or aborted condition.

Preliminary results indicate the frequency of exchange in the T-β region is greatly reduced when the homologue is deficient. The normal frequency of recombination between T and β in T β α sh / N a Sh heterozygotes approximates 7.0 percent, whereas in the T β α sh / N a-x hemizygotes this frequency is reduced to 1.0 percent or less.

It appears from these data that the effect of the a-x deficiencies is a marked inhibition of exchange in the T-β segment of the hemizygote. Moreover, since the above experiment does not involve the isolation of the nonrecombinant alpha strand, the hypothesis of an interference due to this event seems unlikely as an explanation for the absence of N a Sh recombinants.

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