Table 5. Mutations in outcrosses of homozygous y9 plants.

Family	Total plants	Total mutants	Total mutants %	Total different mutants	Total different mutants %	Total different mutants from outcrosses of ear parent providing the homozygous y9 %
7501-02	85	0	0	0	0	0
7503-04	85	3	3.5%	3	3.5%	8.9%
7505-06	58	10	17.2%	4	6.9%	7.1%
7507-08	89	13	14.6%	7	7.9%	2.3%
Total	317	26	8.2%	14	4.4%	6.9%

of one plant produced no mutations, while the outcrosses of the rest had three or more different mutants. There is no consistent evidence that homozygous y9 plants have a higher mutation rate than heterozygous y9 plants. If the mutator factor is loosely linked to y9, it may be that three of these homozygotes have lost the factor by crossing over in one of the two gametes and the fourth from both. In the homozygous y9 families, most plants were weak and were not usable for selfing and outcrossing; only the stronger plants were used in these tests, and these might have lost, through crossing over, one or more of the mutator factors. Homozygosity for the mutator factor might be responsible for the weakness exhibited by many homozygous y9 plants.

Donald S. Robertson

A new compound A-B translocation, TB-5S,1L(8041) — Several compound A-B translocations have been produced by crossing over between the original set of A-B translocations produced by Roman (Roman and Ullstrup, Agron. J. 43:450-454, 1951) and selected reciprocal A translocations. Rakha and Robertson (Genetics 65:223-240, 1970) describe eight such translocations. These translocations have a portion of two A chromosomes attached to the B centromere; proximally there is a piece of the A chromosome carried by the original A-B translocation and distally a segment of one of the A chromosomes which was involved in the reciprocal A translocation.

In 1973, F_1's between TB-1a (1L.2) and T1-5(8041) (1L.80,5S.10) were crossed as males to an a2 tester. Many of the ears on the a2 plants segregated for small yellow seeds, which ranged in size from very small, almost empty, pericarps to seeds about one-eighth the size of the plump purple seeds on the ear. It was assumed that these seeds were the result of fertilizations by gametes from a

pollen grain carrying a new compound A-B translocation which consisted of a proximal segment of the long arm of chromosome one (from L.2 to L.80) with the distal 90% of the short arm of chromosome 5. The small yellow seeds were assumed to have endosperms that were deficient (hypoploid) and embryos that were hyperploid for this new translocation.

In 1974 the largest yellow seeds were planted. From the 110 seeds planted, only 55 mature plants were obtained. The seeds were sown directly into the field, and a better yield would undoubtedly have been realized if the seeds had been germinated in petri dishes and later transplanted to the field. The plants that were obtained were reasonably vigorous, and most produced ears when self-pollinated. Pollen examination revealed sterility ranging from 15% to 50%; the majority of the plants had 15-25% abortive pollen grains. All the self-pollinated ears segregated for purple seeds, as is expected if the embryos of the small seeds were hyperploid for the new translocation (5/B^5 B^5, a2/A2 A2). To confirm hyperploidy these plants were also crossed to a balanced lethal stock heterozygous for vp2 and ps, which are known to be proximal to a2 in the short arm of chromosome 5. All of these outcrosses segregated for very small ps and/or vp2 seeds which were non-viviparous. Also segregating on these ears were large purple viviparous seeds. The latter are expected when the deficient sperm fertilizes the egg nucleus of a vp2 or ps embryo sac and the hyperploid sperm fertilizes the polar nuclei. The presence of purple seeds on the selfed ears, in addition to the small seeds with vp2 and ps endosperms and the large purple viviparous kernels in the outcrosses, confirmed that a new compound translocation had been produced. These tests also place the three genes a2, vp2 and ps in the distal 90% of the short arm of chromosome 5.

Five of the same plants that were crossed to the vp2/ps stock were crossed to a homozygous bz2 line; in all these crosses bronze seeds were observed to be segregating. None of the ears from the self-pollinated A-B plants segregated for bronze seeds. These results indicate that bz2 is in that segment of chromosome 1 that remains in the translocation (1L.2 to 8L.80). The bronze seeds in these crosses were not as small as those observed when this new translocation was crossed to the a2 tester or to the vp2/ps stock. The bronze seeds ranged in size from about a fourth as large to fully as large as the purple seeds on the same ears.

Small seeds are characteristic of kernels with hypoploid endosperms resulting from crosses with TB-1a. However, the seeds are not nearly as small as those

observed when the new compound translocation is used in crosses with the a2 tester and the vp2/ps stock. The occurrence of small seeds in the latter crosses would suggest that both the long arm of chromosome one and the short arm of chromosome 5 have genes that affect seed size, and the small seeds observed are the result of the cumulative effect of these seed-size genes. Since the seeds with hypoploid endosperms from the crosses with the bz2 stock are consistently larger, there is a possibility that it carries seed-size genes in this region that are more active in the hemizygous condition than allelic genes in the a2 and vp2/ps lines. Alternatively, the bz2 stock may have modifier genes elsewhere in the genome that partially suppress the action of the hemizygous seed-size genes in the hypoploid segment.

I now have seed of this translocation available for anyone that might desire some.

Donald S. Robertson

An A-B translocation with segments from three different A chromosomes — As the preceding article indicates, it is possible to produce compound A-B translocations in which segments from two A chromosomes are attached to the B centromere. The B^A element of such compound translocations undergoes nondisjunction in the division of the generative nucleus of the pollen grain. Will nondisjunction continue to be observed if additional chromosomal material is added to the B^A chromosome?

To test this, the A-B translocation TB-2L,1S(4464) and the reciprocal translocation T2-4f were used to synthesize an A-B translocation consisting of segments from chromosomes one, two and four. TB-2L,1S(4464) was generated by crossing over between TB-1b (1S.05) and TB-2(4464) (1S.53,2L.28) and carries 48% of the short arm of chromosome 1 (1S.05-1S.53) and 72% of the long arm of chromosome two. The T2-4f translocation has breakpoints at 2L.75 and 4L.12. F_1's between TB-2L,1S (4464) and T2-4f were used to pollinate a c2 tester stock. With the proper chromosome pairing, the right crossing over (in the region between 2L.28 and 2L.75) and the right chromosomal segregation ($1^B, B^{1,2,4}$, 2^1, 4^2), a balanced microspore will be produced that carries the new tripartite A-B translocation. If this new translocation undergoes nondisjunction in the division of the generative nucleus, non-purple (yellow) seeds should be observed in the crosses with the c2 tester; these seeds would be expected to have endosperms hypoploid and embryos that were hyperploid for the new translocation. A homozygous c2 contaminant seed would be confused with one carrying the translocation. I have frequently observed