

4. Preferential Segregation Due to a Paracentric Inversion

A paracentric inversion, when paired with its normal homologue, will have cross-overs in the inversion region. These cross-overs give a bridge and an acentric fragment at 1st anaphase. The bridge retards the movement of the depleted chromatids and allows the chromatids without cross-overs to reach the poles of the spindle first. If the deleted chromatids retain their proximal position during the interphase, the 2nd meiotic division of the megaspore will exclude deleted chromatids from the basal cell of the tetrad. All eggs develop from these cells and each will have a normal chromosome complement except these cases in which there has been a four strand double cross-over in the inversion region. Thus a paracentric inversion causes a preferential segregation at megasporogenesis.

In 1952 a progeny homozygous for recessive *r*, for an inversion in the long arm of chromosome 7 and for knobs on the inverted piece was crossed to a progeny without this inversion but homozygous for *ab. 10* and the closely linked dominant *R*.

All F_1 seeds of the above cross were colored and a progeny from these seeds was grown this season and crossed reciprocally with a normal *R*-tester stock. The 26 ears on the F_1 plants showed a slight indication of sterile eggs due, unquestionably, to the small amount of four strand double crossovers in the inversion region. The 4954 seeds were classified and gave 71.9% colored seeds, that is approximately 71.9% of the eggs received the *ab. 10*. This percent is very close to that of previous tests on the preferential segregation of *ab. 10*, and there is no suggestion that the presence of the inverted chromosome has affected the transmission of *ab. 10*.

The 28 ears from the *R*-tester progeny were well filled, indicating that all eggs were viable. These ears gave 6542 seeds, 42.1% of which were colored. This departure from the expected 50% suggests that the sterility caused by the presence of a deleted chromatid is approximately 20% and is linked or associated with the dominant *R*. If the deleted chromatid went with the normal form of chromosome 10 during microsporogenesis, as it presumably does during megasporogenesis, there should have been an excess of colored seeds. The most obvious explanation of the excess of white seeds in these 28 ears is to assume that the 1st meiotic division was similar to the 1st megaspore division and that between the 1st and 2nd divisions the paired chromatids were reoriented so that the faster-moving chromatids, e.g., the *ab. 10* with its secondary centromere and the deleted 7, were in a position to move to the same pole.

The foregoing preliminary test will be extended the coming season. Colored seeds from the above cross will provide material heterozygous for the inversion and for *ab. 10*, and material heterozygous for *ab. 10*, but normal for chromosome 7. The former group will duplicate this season's test while the latter will provide the essential control test.

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