

7. Spontaneous aberrations in male gametes.

Spontaneous aberrations were found in chromosome 10 by means of selecting colorless seeds from the cross of $r^g r^g \times R^r R^r$. The colorless seeds consisted of two types, (1) colorless seeds with plant color, designated r^r and (2) colorless seeds lacking plant color, designated r^g . The latter class was saved for cytological analysis since the r^r seeds commonly represented a mutation of R^r to r^r . Three stocks were used, one possessing the heterozygous abnormal knob 10 (K/k), one carrying the homozygous knob 10 (K/K), and one lacking the knob (k/k).

In 108,466 gametes tested from plants of the $R^r K/R^r k$ constitution, 106 colorless seeds were observed. The 106 colorless seeds produced 79 r^r seedlings, two variegated plants, and 18 r^g seedlings. Six seeds did not germinate and one colorless seed was not tested. The r^r seedlings were discarded; thus the number of r^r plants was not a true indication of the spontaneous mutation frequency since confirmatory tests were not made. Mutants secured from male gametes are always suspected of being contaminants and need to be tested for the presence of specific contamination markers.

The variegated and r^g plants were saved for cytology. Among the 18 r^g plants, the following cytological alterations were found: 13 terminal deficiencies; one deficiency translocation; and one plant with a normal knobbed-10 chromosome. Three of the r^g plants were not sampled cytologically but one plant showed 50% aborted pollen at maturity. No pollen samples were obtained from the other two r^g plants. The two variegated plants both possessed normal knobbed 10 chromosomes. The three plants with the normal knob have not been tested for contamination.

In this same experiment, one male culture was used which was homozygous for knob 10 in some plants and heterozygous for knob 10 in others. Among 33,896 gametes tested from this culture, 34 colorless seeds were found of which 25 were r^r and five were r^g . Four seeds did not germinate. Three of the r^g plants were analyzed cytologically. The examination showed one terminal deficiency, one interstitial deficiency, and one normal knobbed-10 chromosome.

In plants of the $R^r k/R^r k$ (knobless 10) constitution, 87 colorless seeds were found in 42,635 gametes tested. The 87 colorless seeds included 69 r^r plants and 13 r^g plants one of which died in the seedling stage and one died before maturity. Five colorless seeds did not germinate. The 11 r^g seedlings included six terminal deficiencies, one with the entire chromosome 10 missing, and four with normal knobbed-10 chromosome. These four plants exhibited normal pollen but were not tested to exclude contamination.

The alterations which were observed in the heterozygous and homozygous knobbed-10 stock could be attributed to (1) failure of terminalization of a chiasma since a large subterminal knob was present; (2) breakage as the result of precocious movement of the knob to the poles at anaphase (Rhoades, 1952); or (3) presence of a small inversion in the region distal to the R locus in the knobbed-10 chromosome.

The deficiencies that have occurred spontaneously in the homozygous knobless 10 chromosome could be due to the failure of terminalization of a chiasma, The other processes mentioned in connection with the heterozygous knob 10 would not account for deficiencies occurring in a knobless stock.

(Rhoades, M. M. 1952 Preferential Segregation in Maize. Heterosis, Iowa State College Press 66-80.)