

3. Segregation of pollen restoring genes in inbreds used as pollen parents and seed parents.

When the inbreds NC77, Tx127 and Ky21 used as restorers on T cytoplasm are studied separately it is found that they segregate differently in F₂ selfed progenies. All of these inbreds used alone or in single cross combinations produced all normally fertile plants in the F₁ generation grown in 1954, 1955 and 1956 in combination with WF9T, 38-11T, C106T, KysT, K4T, CI7T; not all combinations were grown in each of the three years. These F₁ fertile plants were selfed and the F₂ segregating progenies were grown in 1955 and 1956 and the results combined.

Of the three restoring inbreds used as pollen parents Tx127 segregated in a 9:7 ratio, Ky21 and NC77 segregated in 3:1 ratios. The differences between observed and calculated are not significant. Of the inbreds used as seed parents with these pollinators WF9T and 38-11T segregated in a 9:7 ratio, while C106T, KysT and K4T segregated 3:1. Again the differences between observed and calculated are not significant. However, in view of the wide differences in the two different years and in different progenies the results are only indicative of differences in the number of restoring genes involved in the crosses of the different inbreds used.

4. Segregation of fertile and sterile plants in backcrossed progenies of different inbreds.

That different numbers of genes are involved in the restoration of different sterile inbreds is also borne out by the behavior of backcrossed lines in the process of conversion to complete restoration. Many of the standard corn belt inbreds widely used in the northeastern and northcentral corn growing regions are in process of conversion by taking the S or T cytoplasmic sterile versions of these inbreds, crossing them as females by several different restoring inbreds followed by backcrossing the restored fertile plants repeatedly on the sterile inbreds. These inbreds have been backcrossed from two to six generations and then self pollinated for one or two additional generations. The segregation of fertile and sterile plants is quite different in many inbreds. A few illustrations are given here.

Al58 is completely sterile in both S and T types of cytoplasm and in five additional sources. No anthers shedding pollen appeared on any plants in 10 backcrossed generations in the S cytoplasm and 5 generations in the T cytoplasm. Both the S and T steriles are completely restored by Ky21. Anthers appear and pollen is shed in normal amount about 5 days before the first silks appear in the original, fertile inbred, and this same pattern is shown by the restored fertiles. The backcrossed S steriles in 5 generations of backcrossing and 1 generation selfed usually produced no sterile plants. Small progenies of 15 to 20 plants were grown each generation but several progenies were grown each year.