

9. The non-homologous associations of centromeres and knobs of maize chromosomes at meiosis.

It is well known that the centromeres and knobs of the non-homologous chromosomes of maize are stuck together at pachynema and that this association disappears by diakinesis. In her unpublished M. S. thesis at the University of Illinois Sarah R. Peterson reported on the frequency with which centromeres of non-homologous chromosomes were associated in the prophase of the first meiotic division. She also determined the frequency with which knobs of different homologues were associated. Working with the inbred strain KYS she found a total of 86 cases of centromere adhesion and a total of 96 cases where the knobs of different bivalents were stuck together at pachynema. She concluded that the knob and centromere association were non-random. Inasmuch as the total number of cases observed was low a further study of this phenomenon seemed warranted. Only the KYS inbred was involved in this investigation but some plants were normal structurally while others were homozygous for a reciprocal translocation between chromosomes 4 and 10.

After fixing in 95% ethyl alcohol and propionic acid, the PMC were stained with aceto-carmine. Only cells with well spread chromosomes at pachynema were studied. The chromosomes involved in non-homologous association at the centromere regions and at the knobs were identified. Centromere and knob adhesions occurred in 70% and 25% of the cells studied, respectively.

It was deemed necessary to ascertain the pachytene lengths of the 10 maize chromosomes of the KYS inbred since it appeared likely that the non-random association might be a function of the relative length of the different chromosomes. The pachytene lengths given below for the normal strain are the average measurements from 6 good cells at late pachynema where there was no obvious distortion due to stretching while the measurements for the chromosomes of the homozygous translocation strain are from 4 good cells. In general the lengths and arm ratios reported here are in good agreement with those found by Longley but some differences are apparent. The greatest deviation is for chromosome 1 where ratios of long to short arms of 1.1:1 and 1.3:1 were found by us and Longley, respectively.