

made it possible to present a relationship of the 12 types.

(4) In order to ascertain the agro-climatic response of the given races, measurements of the 29 characters were made on 57 samples grown under different climatic conditions at Iwate in North Japan, Hiratsuka in Middle Japan and Ehime in South Japan. With regard to the average temperature during the growing season, the 3 locations can be arranged in a sequence with approximately equal intervals of temperature difference: Hiratsuka>Ehime>Iwate. Similarly, for the average precipitation they are: Ehime>Hiratsuka>Iwate. Of the 29 characters measured, 26 were affected at the three stations. The other three characters, namely leaf width, no. of kernel-rows and kernel thickness, may be considered stable attributes of the native race with a high heritability under certain environmental conditions.

Thirteen of the 26 characters, namely tasseling time, silking time, stalk diameter, shank diameter, ear length, ear width, cob weight, no. of kernels per row, kernel width, kernel length, kernel size, kernel weight per plant and weight of 100 kernels, all relating to either the organ size or time of maturity, were closely associated with temperature. At the lower temperature, the growing period of the race was longer, probably resulting in the larger organ and heavy yield.

The variability of 6 characters, no. of tillers, plant height, stalk height, leaf length, shank length, ear height and length of tassel-branches bearing axis, all of which are connected with the length of organ, was certainly associated with precipitation. In a given place, a decrease of rain-fall is accompanied by an increase of sunshine. Under such conditions, these organs tend to elongate. But there was no tendency for an increase in the grain yield under the same conditions.

The remaining 5 characters, no. of prop-rooting nodes, no. of leaves, length of tassel and tassel-branches and no. of husks, all connected with the number of nodes, were certainly affected at the 3 stations, but apparently without regard to temperature or precipitation. At present, it cannot be said whether the variability of these characters is due to the joint effect of two factors, temperature and precipitation, or to some other unknown factors.

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1. Further studies on breakage-fusion-bridge cycles in maize endosperm.

Previously reported investigations (Schwartz and Murray, Cytologia 1957) on anaphase configurations in young endosperm tissue indicated

that (1) single bridges are found in only a small proportion of those cells which form variegation patterns of endosperm markers known to be involved in chromatid B-F-B cycles, and (2) chromosomal B-F-B cycles as recognized by the occurrence of double crossed bridges are found in endosperm material where only the chromatid cycle is expected. The former was explained by the postulate that fusion of sister broken ends is most often weak so that the bridges break at the very early separation of the chromosomes and are thus not found in middle or late anaphase where the chromosomes are well enough separated to be scored. The latter is thought to result from non-disjunction of a chromatid bridge without breakage converting a chromatid cycle into a chromosome cycle. These studies were made with endosperms resulting from pollination with irradiated pollen and in Ac-Ds material.

Recently these experiments were repeated using pollen carrying broken chromosomes resulting from crossing over in a reverse duplication of the short arm of chromosome 9 (McClintock, Genetics 1941). A batch of pollen from a single plant (material kindly supplied by Dr. McClintock), heterozygous for the duplication which carried C and Wx on the duplicated segments and a deficient chromosome 9, was used to pollinate six c wx tester plants. Three ears were allowed to develop to maturity while the other three ears were picked and fixed 7 days after pollination. Gametes carrying the deficient chromosome 9 do not function through the male so that all fertilizations are accomplished by either gametes carrying the entire duplication or a broken chromosome resulting from breakage of the AII dicentric formed from one half the crossovers in the duplicated region. The latter gametes have a competitive advantage in fertilization over those with the large duplication.

From the proportion of variegated kernels on the mature ears it was determined that approximately one half of the endosperms received a broken chromosome 9. Since the same batch of pollen was used in all six crosses, one half of the young fixed endosperms should have had a broken chromosome 9 undergoing the chromatid B-F-B cycle. None of the endosperms should have received a dicentric chromosome. Two hundred endosperms were examined cytologically. None were found with single bridges in all or even as high as 15% of the anaphase configurations. However, occasional clusters of cells with double bridges were observed, confirming the earlier observations.

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1. Further studies on a mutable system involving chromosome 6.

This mutable system was first described in the 1957 Maize News Letter. The pale green character described in the 1957 News Letter