2. Dp-Df transmission tests for In 2c.

A stock homozygous for chocolate pericarp (Ch) and the paracentric In 2c has been established. Tests were made for possible transmission of the Dp-Df in plants heterozygous In 2c homozygous chocolate by crossing them as ♀ with ch ch. The 1442 progeny were all chocolate, none with colorless pericarp expected from functioning of Dp-Df (the Ch locus is distal to the inversion).

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3. A test to recognize Dp+Dp combinations from interchange crosses of type 2b (Gopinath & B. Genetics 1956).

Since duplications may be of use in modifying chemical composition associated with endosperm or other characters, it is desirable to have methods for identifying individuals carrying the duplication. One method is the following: 1. Cross the two interchanges that are homozygous for the Dominant allele at the locus to be duplicated. 2. The F_1 between them is crossed to a stock of either parent interchange which is homozygous for the recessive allele. 3. In the progeny any plants suspected of carrying the Dp+Dp may be tested by crossing them as ♀ to the double recessive. Plants carrying the duplication should give a ratio of about 3 dominant:1 recessive, and should have about 25% spore abortion. I am not aware that this test has been proposed, but I would be surprised if it hasn't. One feature of establishing a duplication by this method of using interchanges is that the duplicated region is not in tandem, but is in a different chromosome. One possible difficulty in getting it homozygous is that the duplication may show low transmission through the pollen.

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4. Inversions.

The inversion stocks isolated by Anderson and Longley were grown and crossed with W23. Forty-two of those listed in their Table 7 (ARS 34-16) were in the collection received from them.

5. Miscellaneous stocks available.

1. (Ra Ra) gl_1 v_5
2. Multiple recessive bm pr ys virescent with expanded glumes.

6. Progress in producing multiple interchange stocks.

Stocks homozygous for the following interchange combinations were produced: 2-1-7, 1-2-6, 1-3-7, 1-3-9, 3-2-6, 4-2-6, 4-2-8, 3-4-8, 4-6-5, 3-6-5, 6-5-7, and 8-10-9. Crosses were made with the chromosome identification set to check on the interchanges present in these and in the lines produced earlier. A stock homozygous for the 3-2-4-9 interchange combination has been established. The cross with 9-10b produced a 010. This F_1 has been backcrossed to 3-2-4-9 to add chromosome 10. A stock of 3-2-4-9-10 when crossed with 1-5-6-7-8 (already established) should produce plants with 2010. From this we expect to establish a stock homozygous for 3-2-4-9-10 plus 1-5-6-7-8. This is to be X-rayed in an attempt to unite the two rings.

Progress continues on the Inman plan which uses crosses between lines which have an increasing number of interchanges in common.

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7. Segregation for quantitative characters in crosses with multiple interchange stocks.

Tests for possible association between quantitative characters and a 06 and a 08 were repeated in 1961. The general plan was to test F_1's made up as (Inbred A x 06 Inbred B) and also as (Inbred B x 06 Inbred A). Parents, F_1's, F_2's and backcrosses to each parent were grown in a trial with 4 replications. Growth conditions were much more favorable than in 1960 (Newsletter #35 p. 87).

A preliminary examination of the data shows a difference for one of the F_1's but not for the other for height to base of tassel. This showed a significant difference in the 1960 trials.

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Assisting in the above work also were Ken Kasha, Jerome Arnold, and Gerald M. Welch. The work with multiple interchanges and related studies was supported by a Rockefeller Foundation Grant.

8. Dominance of genes controlling grain yield in corn.

Comstock and Robinson (1952) outlined an experimental approach for investigating level of dominance in the action of genes controlling quantitative traits which utilizes populations derived from crossing two homozygous lines. They pointed out that linkage equilibrium of genotypic frequencies cannot be anticipated in early generations of such a population. They further demonstrated that estimates of genetic variances would be affected by linkage disequilibrium so that the proposed measure of dominance would be biased upward until equilibrium was established. In order to investigate the effect of linkage disequilibrium upon estimates of dominance they recommended that data be obtained for the same single cross population in the F_2 generation and again in later generations when linkage equilibrium will have been approached.

This approach has been effectively employed at North Carolina (H. F. Robinson and co-workers) and at Nebraska (C. O. Gardner and J. H. Lonnquist) in studies on grain yield. Overdominance would have been inferred on the basis of F_2 generation data in these studies if the possible effect of linkage had not been considered. However, results from their advanced generation evaluations conclusively indicate that linkage disequilibrium existed and had the anticipated effect. Level of dominance estimates in the most advanced generations studied were fully compatible with the hypothesis of only partial dominance at all loci. However, these results do not preclude the possible existence of a range of dominance effects, i.e., partial dominance at many loci, but with overdominance at a sufficient number of loci to be of consequence with respect to population dynamics. The purpose of this study is to obtain more decisive information to distinguish between these two possible situations.