

3. T4-6 (C.H. Li).

This interchange was used in earlier studies (Burnham, Genetics 35:446-481, 1950) of chromosome segregation. Pachytene observations showed the break in 6 was at or near the distal tip of the organizer. Photographs of pachyte configurations from the heterozygote were kindly analyzed by McClintock. She concluded it is a 1-6 interchange. Intercrosses with T4-6 interchange stocks form a Θ 6, confirming the fact that it is not a T4-6 interchange.

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4. "Double interchange" marker method, progress report.

The procedures which might be used to establish stocks in which the 4 arms of two chromosomes are marked with an interchange were described in last year's newsletter (Maize News Letter 41:137-138). F_1 's and backcrosses of Type 1a intercrossoes (breakpoints in opposite arms¹ in both chromosomes) that had relatively long differential segments were grown again the past summer. The F_1 's had higher sterility than that found in either parental heterozygote, about 65% as compared with the usual 50 per cent for a single interchange. High sterile plants were found among the backcross progeny from certain T1-5, T2-6, and T 4-6 intercrossoes. These plants should carry the crossover that combines the two interchanges. Test crosses to the parents were made to test this possibility, and selfs were made for increase. Stocks for establishing a double interchange series with nine stocks that will mark the ten chromosomes with 9 as the common chromosome were received from the Coop and the intercrossoes were made.

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5. Notes on T1-5 interchanges.

The following interchanges listed as T1-5 (Longley, A.E., ARS 34-16, 1961) are T1-2 interchanges: 6178, 8347, 018-5, 024-5 and 8388. Number 4331 now has only a 7-10 interchange.

The one listed as 2-6 (4394) is a 4-6 interchange, and the one listed as 2-6 (6671) is a 5-6 interchange. The above identifications are based on examinations at diakinesis of crosses with the chromosome identification set.

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6. Correlation of diakinesis observations with chiasma positions and frequencies.

Crosses between stocks of interchanges that involve the same two chromosomes are being studied with regard to pairing, crossing-over, and disjunction. In one group of crosses the breakpoints of the parents are in opposite arms of both chromosomes. This has been designated the type 1a intercross.

If all homologous parts are synapsed at pachytene in the F_1 , the resulting configuration is a 2-cross complex, with one "cross" in each arm of both chromosomes. Each differential segment is shared by the two "crosses" and is comprised of the non-interchanged segments of the long and short arms of the same chromosome. The other two arms of each "cross," in alternate positions, have the two interchange chromosomes.

Diakinesis configurations should differ depending on the number of segments with chiasmata. If a chiasma occurs in each of the differential segments the associations of four chromosomes at diakinesis may appear as criss-crossed bivalents, normal-looking rings- or chains-of-four, or "pairs," depending on the number and location of chiasmata in the interchanged segments. The "pairs" would be homologous only in the differential (centromere) segments. A chiasma in only one of the differential segments may result in a "figure-eight" configuration at diakinesis. No chiasmata in either differential segment may lead to "pairs" which are associated homologously only at the ends. Occasionally, univalents may appear as a result of no chiasmata in either end or differential segments.

All of the expected diakinesis configurations have been observed in the type Ia series of T1-5 intercrossovers. When "pairs" are formed they are usually the type in which homologous ends are paired.

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7. "All-arms" interchange tester set.

The interchanges listed in Table 1 have been backcrossed to A188, an inbred line with white endosperm, strong stalks, very dark green leaves, and a strong tendency for 2 ears per stalk. After 2 to 3 generations of backcrossing at Minnesota, Dr. M. T. Jenkins added 4 or 5 backcrosses. Following this, additional lines from the Cal Tech collection were added, and the backcrossing continued at Minnesota. If the breakpoints are correct, the series marks every chromosome arm at least twice. Not all breakpoints are at what might be surmised as the ideal position, about .6 in each arm. After at least 8 backcrosses, stocks homozygous for the interchange are established. The chromosomes involved in the interchange are then re-checked by cytological examination of crosses with the chromosome identification set, which includes T1-2a, T2-4d, T3-7c, T5-7c, T8-9a, and T8-10b.

The additional interchanges listed in the second part of the table are being retained until the backcrossing and final checking of all lines are completed.

Seed of these stocks is available for distribution.

Chas. R. Burnham
(Assisted by many over the years)