2. Chromosome aberrations from polymitotic.

In 1958, progeny were grown from 21 polymitotic plants crossed as ♀ with inbred A188. The number of progeny varied from 1 to 51, but 13 had 10 or more. For the seven cultures that had one or more semisterile or low sterile plants, the numbers were: 1 in a total of 9, 1 in 12, 2 in 33, 2 in 44, 3 in 28, 4 in 51, and 5 in 29; a total of 18 partially sterile plants. Eleven of the partially sterile (P.S.) plants were crossed on inbred A188. All but two segregated for P.S. in the next generation. Fertile plants from selfs of P.S. plants were testcrossed on normal to establish lines homozygous for the change. Studies were resumed after several years. Only seven of the lines that continued to segregate for P.S. plants were continued. Two lines that had plants with about 25% sterility were tested extensively without obtaining the homozygotes. Three homozygous lines were established. Two that traced back to the same original po plant had interchanges. One is T4-7, the other a T7-9. The third line is probably an inversion, since crosses with the chromosome identification set of interchanges give only a ring of 4. The results indicate that in polymitotic plants interchanges and other chromosome changes that can be recognized by partial sterility in progeny from crosses with normal do occur, probably at meiosis. They also suggest that different P.S. plants from the same po plants may be separate events.

The results reported here are only from tests in which partial sterility was transmitted through the pollen in generations subsequent to the first one.

If the experiment is repeated, tests for ♂ and ♀ transmission should be made to answer the question: do pollen abortion (pa) type changes also occur in polymitotic plants? As pointed out in M.N.L. 45: 133 (1971), certain of these might have a practical value in the use of male-sterility in the production of hybrid corn.

Chas. R. Burnham

3. Chromosomal interchanges from colchicine treatment.

In 1968, Neubauer and Thomas (Crop Sci. 6:209-210) reported that, when solutions were made with different commercial lots of colchicine,

the pH value varied. In order to obtain repeatable results, it was important to adjust the pH level. In alfalfa, pH4 gave the highest frequency of chromosome doubling in root tip cells of treated seeds.

In 1963, one of us (Neubauer) injected a colchicine solution at pH6 into the developing ears and tassels of corn plants growing in the field. Progeny were grown from two treated plants, 90 plants from one and 107 from the other. He found partially sterile plants in both. Three of the 8 plants in the first group examined cytologically had a ring of 4 not associated with the nucleolus. Four of the 5 plants in the second group had a ring of 4, two of them associated with the nucleolus (∴T6+?), two of them not. Homozygous lines were established from 6 different semi-sterile plants in the first group and 9 different ones in the second group. Since a change that occurred in a sector might produce several seeds with the same interchange, one line (now identified as a T2-6) was crossed with 6 of the others in the second group. One of the crosses had a ring of 4 and sometimes 1OII, showing that the two lines involve the same two chromosomes, but have different breakpoints. The crosses with the other 5 all had 2 rings of 4, indicating that they had a different interchange. Intercrosses between the five show that three of them have an identical aberration, later identified as T4-7; the other two have interchanges involving either 4 or 7 plus some other chromosome. Hence, there are at least 4 different interchanges among this group of 9 homozygous lines.

One of the lines from the other group of 6 has been identified as a T1-5 interchange. No intercrosses have been made with the others in that group.

Until pachytene analyses are completed, we cannot rule out contamination as the source of the T1-5 and T2-6 interchanges since we were growing the entire series of these Coop stocks for our chromosome pairing studies. Since we were not growing any T4-7 interchanges, we conclude that at least this one and the other one that is T4 or 7 + ? were produced following colchicine treatment.

Interchanges from colchicine treatment may be of interest, since Garber and Dhillon (Genetics 47:461-467, 1961) have shown in Collinsia

that, with respect to chromosome segregation and fertility, they differ from those produced by x-ray treatment.

Charles R. Burnham
Joseph Neubauer*

*Arrco Chemical Company
P.O. Box 328
Fort Madison, Iowa 52627

4. Effects of colchicine, using multiple interchange heterozygotes.

In M.N.L. 42:120 (1968), Ghobrial reported that, when seedlings heterozygous for two rings of 10, e.g., T1-5-6-7-8 x T3-2-4-9-10, were treated with colchicine, a few of the plants produced sectors that extruded their anthers and shed pollen. The anthers had normal-appearing pollen that was much larger than normal. We concluded that tetraploidy had restored fertility. In M.N.L. 44:146-147 (1970), we reported that three plants were obtained from selfing, but the one that matured had a well-filled ear and kernels that varied somewhat in size. Plants from both classes of seed were diploid.

The crosses of those plants with the standard normal mentioned in that report have been grown. All F_1 plants were fertile, and hence the plants tested carried no interchanges. Barring an error, the 2n fertile plant from selfs using pollen from the fertile sector must have come from a ♂ and a ♀ gamete that carried only the normal chromosomes from the heterozygote with two rings, each ring having 5 normal and 5 interchanged chromosomes. If they arose by a haploidization process followed by chromosome doubling, only a combination which had all normal chromosomes, all the interchanged chromosomes plus the other 5 normal ones from either parent that contributed the ring of 10, or all the interchanged chromosomes from both parents would be able to produce viable diploid tissue. Certain aneuploids might also be viable. This still would not account for the abnormally large size of the pollen. Except for that point, the results appear to be similar to those reported by Franzke and Ross (1952, Jour. Hered. 43:107-115) in which true-breeding new types arose in C_2 progeny from colchicine-treated seed. Our experiment with corn should be repeated. The multiple interchange stocks are available from the Coop. If haploidization followed by chromosome doubling does occur,