

## II. REPORTS FROM COOPERATORS

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1. A study of reciprocal crossover differences in the presence of heterozygous translocations involving the short arm of chromosome 9.

In 1950 Burnham reported in the Corn News Letter that when  $C + + T 5-9a$  was used as the female there was 6.6% recombination between  $c sh wx +$   $sh$  and  $wx$ , whereas when it was used as the male there was 12.5% recombination. To study this phenomenon further the following translocations were selected:

Table 1.

| Group* | Identifi-<br>cation in<br>this study | Translocation<br>with Longley's<br>1950 Ident. No. | Break-Points |         | Source                       |
|--------|--------------------------------------|----------------------------------------------------|--------------|---------|------------------------------|
| A      | 2                                    | 23-19                                              | 9S .51       | 5S .28  | Anderson 6057-1              |
|        | 3                                    | 37-32                                              | 9S .46       | 5L .67  | " 4871-3                     |
|        | 4                                    | 37-84                                              | 9S .36       | 5L .28  | " 4997-6                     |
|        | 5                                    | 30-96                                              | 9S .15       | 5S .25  | " 5614-8                     |
|        | 6                                    | 31-4                                               | 9S .08       | 5L .07  | " 4817-7                     |
|        | 7                                    | 5-9a                                               | 9S .40       | 5L .85  | Burnham<br>11910-5 X 11911-6 |
|        | B                                    | 8                                                  | 38-48        | 9S .32  | 2L .36                       |
| 9      |                                      | 27-1                                               | 9S .27       | 8L .06  | " 5391-3                     |
| 10     |                                      | 3-9c                                               | 9S .20       | 3S .15  | Burnham<br>11885-2 X 11886-6 |
| C      | 14                                   | X7-39                                              | 5L .68       | 9L .44  | Anderson X7-39               |
|        | 15                                   | 24-17                                              | 5L .86       | 9L .76  | " 6200-1                     |
|        | 16                                   | 39-81                                              | 5L .51       | 9L .63  | " 4352-7                     |
|        | 1                                    | X14-111                                            | 5L .46       | 9L .74  | " 1330                       |
| D      | 12                                   | 26-50                                              | 5L .81       | 10S .38 | " 5290-4                     |
|        | 13                                   | 30-89                                              | 5L .82       | 2L .74  | " 5602-2                     |

\* Group A includes translocations with breaks at different points in the short arm of 9, and the chromosome 5 break in the long arm at different points when possible. Group B includes translocations with breaks near .30 in the short arm of 9 and involving a chromosome other than 5. Group C includes translocations with breaks in the long arm of 5 near .80 and in the long arm of 9. Group D includes translocations with breaks near .80 in the long arm of 5 and involving some chromosome other than 9.

These translocations were first crossed to the recessive stock c sh wx gl<sub>15</sub> and then exact reciprocal backcrosses were made to study recombination in the sh wx and wx gl<sub>15</sub> regions.

Table 2 is a summary of recombination tests in the sh wx region for all heterozygous translocations involving chromosome 9. The translocations are listed in order of the position of the break-point in the short arm of 9. Included in the table are the ranges and average recombination values in the male and female, the average of the differences ( $\bar{d}$ ), and their significance as measured by "Student's" paired comparison test. Note that when the break in 9S is near the centromere there is little difference between the male and the female in recombination between sh and wx. As the distance from the centromere increases, the difference becomes increasingly great but at 9S .51 there is again little difference.

In this study these observations were made:

1. Recombination in the male was always higher than in the female.
2. The magnitude of the difference between male and female had no relationship to the chromosome which was translocated with 9, or to the position of the break in that chromosome.
3. The magnitude of the difference had no relationship to the length of the interstitial segments.
4. The magnitude of the difference had no relationship to the formation of chromatids of unequal length as the result of crossing over in the interstitial segment.
5. The magnitude of the difference had no relationship to the amount of general reduction from the normal of 21% recombination between sh and wx.

The simultaneous study of recombination in the wx gl<sub>15</sub> region showed some reduction from normal for most of the translocations but no pattern of differences between reciprocal crosses such as was observed in the sh wx region. Recombination between pr and v2 on chromosome 5 was studied for the translocations involving 5L. Here also recombination was reduced in most cases and usually the difference between reciprocal crosses was not significant.

This work was done at the University of Minnesota under Dr. C. R. Burnham.

E. M. Clark

hetero-  
between  
combi-  
lons

7-1  
1-3  
7-6  
4-8  
7-7

1911-6  
56-1  
91-3

11886-6  
-39  
00-1  
52-7  
30

90-4  
02-2

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Table 2. Summary of recombination tests in the sh wx region.

| Translocation # | Break-points  | Exact re-ciprocal # | Total seeds classified |        | Range in recombination values |           | Average Recombination |        | p     |            |
|-----------------|---------------|---------------------|------------------------|--------|-------------------------------|-----------|-----------------------|--------|-------|------------|
|                 |               |                     | Male                   | Female | Male                          | Female    | Male                  | Female |       |            |
| 2               | 9S .51 5S .28 | 5                   | 1717                   | 1686   | 0.3-6.1                       | 1.8-7.1   | 3.2                   | 4.1    | 1.22  | .2-.3      |
| 3               | 9S .46 5L .67 | 6                   | 2341                   | 1918   | 10.8-26.8                     | 1.7-9.2   | 18.4                  | 6.0    | 12.21 | .001-.01** |
| 7               | 9S .40 5L .84 | 8+1 ①               | 3722                   | 1774   | 10.0-15.0                     | 0.0-3.8   | 14.0                  | 1.8    | 11.37 | <.001**    |
| 4               | 9S .36 5L .28 | 6                   | 2063                   | 1486   | 12.0-30.2                     | 6.8-15.7  | 21.2                  | 11.7   | 8.82  | .001-.01** |
| 8               | 9S .32 2L .36 | 6                   | 2234                   | 1165   | 12.3-20.7                     | 3.6-19.4  | 17.7                  | 8.5    | 8.97  | .001-.01** |
| 9               | 9S .27 8L .06 | 7                   | 2118                   | 1409   | 13.9-21.2                     | 8.3-18.3  | 16.2                  | 11.2   | 4.19  | .02-.03*   |
| 10              | 9S .20 3S .15 | 6                   | 2339                   | 2203   | 17.4-27.0                     | 14.2-22.3 | 22.1                  | 16.7   | 5.27  | .04-.05*   |
| 5               | 9S .15 5S .25 | 6                   | 1897                   | 1349   | 15.6-23.6                     | 13.0-19.1 | 18.5                  | 15.0   | 3.58  | .08-.1     |
| 6               | 9S .08 5L .07 | 6                   | 2099                   | 1271   | 13.7-26.9                     | 13.4-20.9 | 20.5                  | 17.9   | 2.40  | .2-.3      |
| 14              | 9L .44 5L .68 | 6                   | 2137                   | 1691   | 21.7-30.2                     | 20.5-28.1 | 26.4                  | 24.8   | 1.78  | .1-.2      |
| 15              | 9L .76 5L .86 | 4+1 ①               | 1735                   | 1062   | 18.2-29.6                     | 17.9-24.9 | 25.5                  | 21.4   | 4.84  | .05-.1     |
| 16              | 9L .63 5L .51 | 4                   | 1144                   | 1217   | 20.9-29.2                     | 23.9-25.2 | 24.5                  | 24.7   | 0.03  | >.9        |
| 1               | 9L .74 5L .46 | 4                   | 1218                   | 1170   | 16.3-22.1                     | 17.5-26.4 | 21.8                  | 21.6   | 1.57  | .6-.7      |

\* Significant at 5% level.

\*\* Highly significant.

① Same heterozygote used as male and female but with different recessive parents.