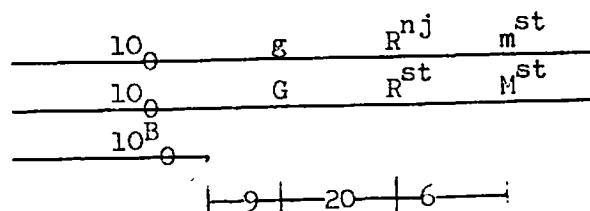A note might be added regarding the physical location of the genes
g and R in the long arm of chromosome 10, with the reservation that the
variable position of the center of a translocation cross makes these
placements very tentative. As can be seen from the table, a transloca-
tion breakpoint in the long arm of chromosome 10 occurring between
10L 0.60 and 10L 0.80 may be either proximal or distal to g, but is
always proximal to R. Breakpoints proximal to 10L 0.60 are always
proximal to g. Thus, g would be placed in the sub-terminal one-fifth
and R in the terminal one-fifth of the long arm of chromosome 10. This
placement of R agrees with Stadler's.

An examination of the genetic map of the long arm of chromosome
10 reveals that g lies in the proximal one-fifth of the arm and R
approximately midway between the centromere and the distal end. To
reconcile the genetic map with the physical map one can postulate a very
high frequency of recombination in the distal two-fifths of the long arm
of chromosome 10 relative to that in the remainder of the arm. The
possibility of localized high recombination in the terminal segment of
10L agrees well with previous findings in maize and differs markedly from
findings in Drosophila, where the frequency of recombination increases
towards the center of the chromosome arm.

Hugo Dooner


3. Use of a partial trisomic in a half-tetrad analysis.

A cytogenetic system was sought for the recovery of reciprocal
products of crossovers in the R region of chromosome 10. Such a system,
ideally, would be disomic, of such a nature to permit recovery following
a single exchange, and be efficient in terms of its yield of reciprocal
products. As a preliminary to study of R intralocus crossovers, an
investigation involving the g-R and R-$M^{st}$ segments was performed utilizing
the following heterozygote:

$$\frac{10_0 \qquad g \qquad R^{nj} \qquad m^{st}}{10_0 \qquad G \qquad R^{st} \qquad M^{st}}$$
$$\overline{10^B_0} \qquad,$$

$$\vdash 9 \dashv 20 \vdash 6 \dashv$$

Individuals of $10/10/10^B$ constitution were synthesized initially by intercrossing primary trisomic-10 plants as female with ones heterozygous for translocation B-10a as male. Besides primary-10 trisomics and the usual $B^{10}$ hyperploids, there occurred in progeny of this cross plants having a combination of primary trisomic-10 features complementary to those of $B^{10}$ hyperploids. Such plants proved to have received two chromosomes 10 from the trisomic-10 parent, and the deficient $10^B$ chromosome from the male--hence the designation $10/10/10^B$. From successive crosses to $\underline{G}\ \underline{R}^{st}\ \underline{M}^{st}$, a $G\ \underline{R}^{st}\ \underline{M}^{st}/\underline{G}\ \underline{R}^{st}\ \underline{M}^{st}/10^B$ stock was derived which, when mated with $\underline{g}\ \underline{R}^{nj}\ \underline{m}^{st}$, gave plants of the heterozygous constitution illustrated above.

Table 1

Chromosome 10 and golden-$\underline{R}$ classification among offspring produced in
$\underline{g}\ \underline{R}^{nj}\ \underline{m}^{st}/\underline{G}\ \underline{R}^{st}\underline{M}^{st}/10^B\ ♀\ x\ \underline{g}\ \underline{r}^{g}\ \underline{m}^{st}\ ♂$ matings

| G-R constitution | Chromosome 10 class[1] | | |
|---|---|---|---|
| | 10  10 | 10 10 $10^B$ | 10 10 10 |
| $\underline{G}\ \underline{R}^{st}$ | 455 | 175 | 18 |
| $\underline{g}\ \underline{R}^{nj}$ | 393 | 136 | 24 |
| $\underline{g}\ \underline{R}^{st}$ | 95 | 17 | 5 |
| $\underline{G}\ \underline{R}^{nj}$ | 75 | 42 | 3 |
| % of total | 71.8 | 26.1 | 2.1[2] |
| % of recombination | 16.7 | 15.9 | 16 |

[1]Excludes 16 morphologically abnormal or diseased plants that could not be classified according to one of the chromosome 10 phenotypic categories.

[2]Includes four cases not analyzed for marker composition.

Table 1 summarizes the classification for chromosome 10 makeup and g-R recombination of 1417 offspring obtained from 13 matings of the marked $\underline{R}^{nj}/\underline{R}^{st}/10^B$ heterozygote with $\underline{g}\ \underline{r}^{g}\ \underline{m}^{st}$ as male. $10^B$ was

transmitted as an extra chromosome to 26% of the progeny, whereas only two percent received an extra chromosome 10. Consideration of $g$-$R$ recombination over the three chromosome 10 classes indicates independence between recombination and transmission of an extra chromosome, either $10^B$ or 10. Furthermore, the recombination values do not differ markedly from an average level of about 20 observed for normal diploids (inbred W22 background).

A sample of 381 $R^{st}$ $m^{st}$ crossovers from additional progeny of the same cross was used to examine chiasma interference. Only two of the 381 were golden, whereas some 63 simultaneous exchanges in the $g$-$R$ and $R$-$M^{st}$ regions would have been expected were there no interference. The resulting coincidence value of 0.03 compares with ones ranging from 0.05 to 0.14 obtained similarly in various tests involving normal 10/10 parents.

Table 2

Classification according to chromosome 10 marker relations of 10/10 spores obtained from $g$ $R^{nj}$ $m^{st}$/$G$ $R^{st}$ $M^{st}$/$10^B$ ♀ x $g$ $r^g$ $m^{st}$ ♂ matings

| Class | Number |
|---|---|
| One of each parental chromosome | 13 |
| Both chromosomes of one parental type | 4 |
| Reciprocal crossovers ⟨ G-R region | 3 |
| R-M$^{st}$ region | 1 |
| One parental, one crossover ⟨ G-R region | 2 |
| R-M$^{st}$ region | 2 |
| Identical crossovers | 0 |
| | 25 |

Eight of the twenty-five 10/10 spores analyzed for marker composition (Table 2) carried one (four cases) or both (four cases) chromosomes 10 recombinant in the $G$-$R$-$M^{st}$ region. In the latter event the two chromosomes were reciprocally marked and never identically so, an observation consistent with expectation based on high chiasma interference. The

four instances of one recombinant and one parental chromosome also were of one sort: markers proximal to the exchange were heterozygous whereas those distal were homozygous. Double or higher order exchanges in the chromosome arm are not necessary to account for these eight cases, provided that sister centromeres undergo normal, equational separation at the second division. Similarly, those cases (also four) where both chromosomes were of one parental type could have originated following a single exchange between the most proximal marker, golden, and the centromere.

In principle, the $10/10/10^B$ system therefore appears to provide for the recovery and ready identification of both products of crossovers in the chromosome 10 segment represented by $B^{10}$. Efficiency of the system suffers, however, from the relatively low frequency of 10/10 spores formed.

<div style="text-align: right;">J. L. Kermicle</div>