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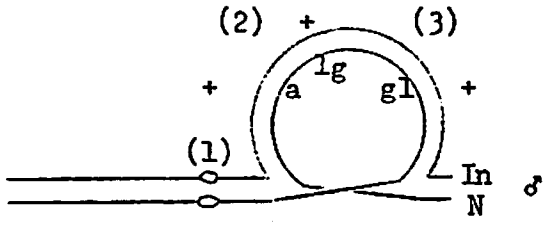
1. Cytogenetic studies with Inversion 3c.

Inversion 3c, found by Rosalind Morris, is a paracentric inversion in the long arm of chromosome 3. A precise determination of the breakpoints cannot be made until pachynema of homozygous plants is studied but the proximal breakpoint is very close to the centromere and the distal break near the end of the long arm--i.e., almost all of the long arm is inverted. When plants heterozygous for the inversion with the normal alleles $\underline{Gl_6}$ $\underline{Lg_2}$ $\underline{A}$ in the inverted homologue and the recessive alleles in the structurally normal chromosome were used as the pollen parent in testcrosses the following data were obtained:

Families 25083-94

gl lg a ♀ X



(0)	Gl Lg A In	631	(2-3)	Gl lg A In	37
(0)	gl lg a N	643	(2-3)	gl Lg a N	24
(1-2)	Gl Lg a In	3	(2-4)	gl lg A In	0
(1-2)	gl lg A N	6	(2-4)	Gl Lg a N	5
(1-3)	Gl lg a In	7	(3-4)	gl Lg A In	2
(1-3)	gl Lg A N	2	(3-4)	Gl lg a N	6
(1-4)	gl lg a In	4			
(1-4)	Gl Lg A N	4			

In addition to the above classes the following individuals were found in the backcross progeny:

Gl Lg A high pollen sterility	5
Gl lg A " " "	1
gl lg a In with two sizes of starch filled grains	2
gl lg a high pollen sterility	4
gl lg a N with two sizes of starch filled grains	2

At the time of pollen classification in the field the nature of the exceptional plants was uncertain and it was not until later in the season that it was realized that they contained deficient-duplicate chromatids arising from a bridge-breakage-fusion cycle following crossing over within the inversion loop to form a dicentric chromatid. The occasional transmission of these Df-Dp chromosomes through the pollen suggests that the distal breakpoint in In 3c is nearer the end

than the distal break in the In 3a since no functioning of Df-Dp chromosomes coming from crossing over in In 3a heterozygotes was found through the pollen.

It is quite likely that some plants scored as carrying the In actually possessed a Df-Dp chromosome with the normal order. The abortion of some of the Df-Dp pollen simulates the sterility arising from inversion crossing over. Further, some plants scored as carrying the In chromosome undoubtedly had a Df-Dp chromosome with the inverted order.

The reciprocal cross gave the following results: Families 25095-112

(0)	Gl Lg A In	877	(2-3)	Gl lg A In	24
(0)	gl lg a N	621	(2-3)	gl Lg a N	37
(1-2)	Gl Lg a In	8	(2-4)	gl lg A In	16
(1-2)	gl lg A N	30	(2-4)	Gl Lg a N	1
(1-3)	Gl lg a In	3	(3-4)	gl Lg A In	3
(1-3)	gl Lg A N	5	(3-4)	Gl lg a N	1
(1-4)	gl lg a In	10			
(1-4)	Gl Lg A N	4			

Gl Lg A high pollen sterility	10
Gl lg A " " "	1
gl lg a In with two sizes of starch filled grains	1*
gl lg a N with two sizes of starch filled grains	2**
gl lg a high pollen sterility	7
gl lg A " " "	2
gl lg A N with two sizes of starch filled grains	2**

* one chromosome is In Df-Dp and the other normal.
** one chromosome is N Df-Dp and the other normal.

The more frequent transmission of Df-Dp chromosomes through the megaspores is clearly evidenced by the unequal complementary cross-over classes in the (1-2) doubles, the (1-4) doubles and the (2-4) doubles. For example, the ratio of 30 gl lg A N to 8 Gl Lg a In, presumed to arise from (1-2) doubles, is actually due in part to the recovery of gl lg A Df-Dp chromosomes with a N order and producing no or little pollen abortion. These would be classified as gl lg A N. Chromosomes of this constitution could arise following single exchanges in region (2). Breaks in the dicentric chromatid near one centromere would yield a functioning gl lg A N Df-Dp strand while a break near the other centromere would produce a gl lg A In Df-Dp chromatid. The two kinds should occur in equal numbers; hence an excess of the gl lg A In class over the complementary Gl Lg a N class should be found. The observed ratio was 16:1.

Plants homozygous (Families 25127, 130 and 132) for In 3c and heterozygous for the gl_6 lg_2 a_1 loci were testcrossed as the egg parent to give the following data:

(0)	a	Lg	Gl	962	(2)	a	Lg	gl	323
(0)	A	lg	gl	1005	(2)	A	lg	Gl	330
(1)	a	lg	gl	619	(1-2)	a	lg	Gl	104
(1)	A	Lg	Gl	633	(1-2)	A	Lg	gl	124

Σ = 4100 A-Lg = 36.1% Lg-Gl = 23.9%

It is clear that all three loci lie within the inverted segment. This is expected from what is known of the cytological position of these genes. The A_1 locus lies distal to point .75 (In 3b) and proximal to point .95 (In 3a). The gl_6 locus is proximal to point .25 (In 3b) and distal to .05 (In 3c). (As we stated earlier, the proximal break in In 3c has not been exactly determined but it is very near the centromere.) The crossover values from homozygous In 3c plants permit a study of the effect of the centromere on crossing over in adjacent regions. The Drosophila data indicate that distal regions brought near to a centromere have a greatly reduced frequency of crossing over. In the present study the Lg-A region normally out in the distal portion of the long arm of 3 is placed close to the centromere and the proximal Gl-Lg region is far removed from the centromere. However, the crossover values in homozygous In 3c plants for the Gl-Lg and Lg-A regions do not differ significantly from those in plants with structurally normal chromosomes 3. The data in maize, therefore, do not agree with those from Drosophila and emphasize the danger of generalizing about centric effects on crossing over from experiments with one organism.

M. M. Rhoades

2. Recombination values between the centromere and three loci in the short arm of chromosome 2.

In the 1956 News Letter data were presented which indicated that the unreduced eggs produced by homozygous el plants arose by the failure of the second meiotic division. It was further argued that for a locus very near the centromere the percentage of diploid eggs homozygous for the recessive allele would be 50 and that the frequency of homozygosis could be used to measure the recombination value between a given locus and its centromere. The percent of recombination was determined in this way for the wx and sh loci in chromosome 9 and for the lg_2 and A_1 loci in chromosome 3. However, it seemed desirable to test the method by studying the homozygosis percentages for three loci, all of which were located in the same chromosome arm. Accordingly, plants homozygous for el and heterozygous for the ws_3, lg_1, and gl_2 markers, all known to reside in the short arm of chromosome 2, were used as the female parent