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1. **Linkage of the S factor of the "Kys" type of male sterility.**

The $\underline{S}$ factor of the "Kys" type of male sterility (Schwartz 1951, Bauman 1956) has been tested against a number of genetic testers to determine its linkage relationship. The crosses made were as follows:

$$\underline{Msms}\ \underline{ss}\ \underline{AA} \quad x \quad \underline{MsMs}\ \underline{SS}\ \underline{aa}$$
(male sterile)   (tester)

$$F_1 \qquad \underline{Ms}\text{--}\ \underline{Ss}\ \underline{Aa}$$
(partial pollen plant)

The F_1 with partial pollen was used in reciprocal backcrosses to the tester. Depending on the direction of the cross, the following genotypes may be expected in the B.C. progeny:

F_1 used as male	F_1 used as female
Ms-- SS Aa	Ms-- SS Aa
Ms-- SS aa	Ms-- SS aa
	Ms-- Ss Aa (partial pollen)
	Ms-- Ss aa (" ")

When the F_1 is used as the male parent, the gametes with $\underline{s}$ are non-functional; in the case of linkage of gene $\underline{A}$ with $\underline{s}$, the transmission of $\underline{A}$ will be reduced, the reduction depending on the proximity of $\underline{A}$ to $\underline{s}$. In the reciprocal cross the linkage of $\underline{s}$ and $\underline{A}$ may be ascertained by the non-random distribution of plants with partial and normal pollen in the $\underline{Aa}$ and $\underline{aa}$ progeny classes.

The tests with all but chromosome 2 linkage groups were negative. In the case of $\underline{lg_1}$ and $\underline{gl_2}$ (chromosome 2) the following phenotypes were obtained when the F_1 was used as the male parent: $\underline{Lg_1}$: 133, $\underline{lg_1}$: 205; $\underline{Gl_2}$: 113, $\underline{gl_2}$: 225. All plants tested had normal pollen. Using the F_1 as the female parent, 1 : 1 ratios of $\underline{Lg_1}$:$\underline{lg_1}$, $\underline{Gl_2}$:$\underline{gl_2}$, and $\underline{Fl_1}$:$\underline{fl_1}$ were obtained. On the basis of 893 plants from two crosses involving $\underline{lg_1}$ and $\underline{gl_2}$, and 289 plants from a cross involving $\underline{lg_1}$, $\underline{gl_2}$ and $\underline{fl_1}$, the following map distances were calculated: $\underline{lg_1}$-$\underline{gl_2}$: 13.84, $\underline{lg_1}$-$\underline{fl_1}$: 50.87, $\underline{lg_1}$-$\underline{s}$: 61.25, $\underline{gl_2}$-$\underline{fl_1}$: 37.02, $\underline{gl_2}$-$\underline{s}$: 47.40, and $\underline{fl_1}$-$\underline{s}$: 10.38.

The map values for $\underline{lg_1}$, $\underline{gl_2}$, and $\underline{fl_1}$ have been established at 11, 30, and 68 respectively (Rhoades 1950). The position of $\underline{s}$ may therefore be mapped in the vicinity of 78 on chromosome 2.

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1. Crossover data for chromosome 3.

Three point backcross data were obtained from plants homozygous for
In 3a. Since Rg is not included in the inverted segment the linear
order in the inverted chromosome should be Rg A Lg instead of the usual
Rg Lg A order.

$$\frac{\text{In 3a Rg A Lg}}{\text{In 3a rg a lg}} \qquad X \qquad \text{rg lg a pollen}$$

(0)	(0)	(1)	(1)	(2)	(2)	(1-2)	(1-2)	Total
Rg	rg	Rg	rg	Rg	rg	Rg	rg	
A	a	a	A	A	a	a	A	
Lg	lg	lg	Lg	lg	Lg	Lg	lg	
317	279	123	126	191	195	52	52	1335

Recombination: Rg-A = 26.4%
A-Lg = 36.7%

Sibling plants of the above tested individuals were heterozygous
for the Gl_6 locus rather than Rg. Using these plants as pollen parents
the following backcross data were obtained:

$$\text{gl lg a} \qquad X \qquad \frac{\text{In 3a gl A Lg}}{\text{In 3a Gl a lg}}$$

(0)	(0)	(1)	(1)	(2)	(2)	(1-2)	(1-2)	Total
gl	Gl	gl	Gl	gl	Gl	gl	Gl	
A	a	a	A	A	a	a	A	
Lg	lg	lg	Lg	lg	Lg	Lg	lg	
275	254	71	64	174	158	27	40	1063

Recombination: Gl-A = 19.0%
A-Lg = 37.5%

Since the Rg-A recombination percentage was 26.4 and that for Gl-A
was only 19 percent, the linear order in a structurally normal chromo-
some, starting from the centromere, appears to be Rg-Gl-Lg-A.

The probable correctness of this order is suggested by the follow-
ing backcross data from structurally normal chromosomes 3:

$$\frac{\text{Rg gl lg a}}{\text{rg Gl Lg A}} \qquad X \qquad \text{rg gl lg a}$$