

2. Preferential pairing in trisomic inversion heterozygotes.

Stocks of tetraploids and trisomes which are heterozygous for many different inversions are being synthesized and tested.

Preliminary data have been collected for a series of trisomes 3 which are heterozygous for one of five different inversions and will be presented here.

TABLE 2

Gene Segregation of Five Different Trisomic 3 Inversion Heterozygotes used as the Pollen Parent

Inversion	Breakage Points	No. of Plants	No. of Gametes	% <u>A</u>	Interaction $\chi^2$ between plants
In 3a	3L.40-L.95	13	7543	22.0	11.98
In 3b	3L.25-L.75	5	2917	19.4	1.45
In 3c	3L.09-L.90+	3	2507	12.6	22.09**
In 3d	3S.72-L.42	3	5526	26.8	1.53
In 3h	3L.19-L.72	4	7532	14.4	27.28**

Additional data must be obtained before any conclusions or conjectures can be stated. It is apparent that different inversions give markedly different results.

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3. Preferential pairing in trisome 3 plants containing irradiated In 3a chromosomes.

In an attempt to produce and isolate chromosomes 3 with more than one inversion, pollen from homozygous In 3a plants was given 1000r and was placed on the silks of standard trisome 3 plants.

Forty-one of the trisome plants from this cross were backcrossed as the male to an  $a_1$  tester. The In 3a chromosome carried  $A_1$ . The results are given in the table below.

TABLE 3

The Transmission Frequencies of Irradiated In 3a Chromosomes  
in Trisomic Pollen Parents

Plant no.	No. of gametes tested	% A	Plant no.	No. of gametes tested	% A	Plant no.	No. of gametes tested	% A
						28	2215	14.4**
1	1027	25.2*	15	589	18.5*	29	1546	14.3**
2	1125	24.4	16	1279	18.1**	30	1028	14.2**
3	1370	24.2	17	2033	17.8**	31	1256	13.9**
4	1127	22.4	18	1547	17.6**	32	815	13.9**
5	708	22.0	19	1101	17.5**	33	1579	13.5**
6	1878	21.7	20	1515	17.4**	34	1735	12.6**
7	1435	21.4	21	1557	17.2**	35	1516	11.7**
8	2261	21.1	22	2052	17.2**	36	1291	11.5**
9	619	20.0	23	812	16.5**	37	1799	10.2**
10	1478	19.2**	24	619	16.5**	38	1663	10.0**
11	793	19.2	25	1653	15.9**	39	2199	8.8**
12	1375	19.0**	26	1163	15.8**	40	500	1.8**
13	1635	18.9**	27	1003	15.6**	41	1489	1.1**
14	364	18.7						

\* significant at the .05 level

\*\*significant at the .01 level

Thirty or 73% of the forty-one plants tested had a percentage of A gametes which was significantly lower than 22%, the percentage found when unirradiated In 3a chromosomes are used. In these thirty cases it is believed that the In 3a chromosome has been structurally changed. There are four possibilities: an additional inversion large enough to be cytologically detectable, a translocation involving chromosome 3, small inversions, and deletions. The nature of these structural changes will be determined this summer. It is probable that a large number of the cases involve deletions in which case the A gene must crossover onto a normal chromosome if it is to be transmitted. Because of the presence of the inversion and of the incomplete pairing in a trisome this is rendered difficult.

In any event it appears that chromosomes are more liable to structural changes than is commonly believed. Preferential pairing has never been used before to detect induced structural changes.

Pollen from normal 2n plants (i.e. with all standard chromosomes) will be irradiated this spring and used in the greenhouse on standard trisomes. Here we can expect deviations from 33.3% in the transmission of the A gene. If stable transmissible structural changes are frequently induced then this provides a method for synthesizing a modified genome for use in a synthetic allotetraploid strain.

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