

TESTS FOR DEPENDENCE OR INDEPENDENCE OF  $g_1g_2g_3$  LOCI AND SIX MONOSOMES

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The glandless line 38-6-A ( $g_1g_2g_3$ ) was crossed as male to six monosomic lines. Two types of  $F_1$  plants ( $2n$  and  $2n-1$ ) are recovered when the monosomic plant is used as the female parent. For determining whether or not a marker and a monosome are associated, both types of  $F_1$  plants were backcrossed to 38-6-A, the triple recessive. Selfed seed were obtained from some of the  $F_1$  plants; these seeds were planted along with the backcross seed for the study of segregation of the marker loci in the different monosomic lines.

Scoring was carried out in the seedling stage where it is possible to distinguish  $G_2-g_3g_3$  from  $g_2g_2G_3-$  seedling by the distribution of glands in the cotyledons. According to Lee (Genetics 47:131. 1962), the following phenotypic classes, which are normally found in a normal  $F_2$ , can be used to distinguish different combinations of alleles at the  $G_2$  and  $G_3$  loci.

(1) Type A cotyledons--glands randomly distributed throughout the cotyledons =  $G_2-G_3-$ ,  $G_2G_2g_3g_3$ , and  $g_2g_2G_3G_3$  genotypes.

(2) Type B--glands distributed most abundantly along the margins and along the midvein of the cotyledons =  $G_2g_2g_3g_3$  genotype.

(3) Type C--glands along the margins only of the cotyledons =  $g_2g_2G_3g_3$  genotype.

(4) Type D--glandless cotyledons and stems =  $g_2g_2g_3g_3$  genotype.

The criteria for association of either the  $G_2$  or  $G_3$  locus with a monosome chromosome were as follows:

(a) If  $G_2$  and a monosome are associated, the backcross of the  $2n-1$   $F_1$  as male to 38-6-A  $g_1g_2g_3$  should segregate in the ratio 1C:1D. Non-association would be indicated by the segregation ratio of 1A:1B:1C:1D.

The  $F_2$  population from a monosome that is associated with  $G_2$  would be expected to segregate in the ratio of 1A:2C:1D. If there is no association, the  $F_2$  should segregate in the ratio of 11A:2B:2C:1D.

(b) If  $G_3$  and a monosome are associated the backcross of the  $2n-1$   $F_1$  as a male to 38-6-A  $g_1g_2g_3$  should segregate in the ratio of 1B:1D.

Non-association should give a 1A:1B:1C:1D segregation in the backcross.

If there is an association, the  $F_2$  population would be expected to segregate in the ratio of 1A:1B:1D. If there is no association the expected  $F_2$  ratio should be 11A:2B:2C:1D.

Scoring for linkage of the  $g_1$  locus and the monosomes was done by examining for the presence or absence of glands on the seedling stems. Seedlings with the  $g_1g_1$  genotype are devoid of glands in the stems.

Absence of stem glands in all seedlings in the backcross or the F<sub>2</sub> population is indicative that the gl<sub>1</sub> locus and the monosome are associated. If the gl<sub>1</sub> and the monosome are not associated, the ratios of 1:1 and 3:1 would be expected in the backcross and F<sub>2</sub> populations, respectively.

Tests for association of the gl<sub>1</sub> locus with five of the monosomes and a telosome for the short arm of the sixth monosome was reported by White and Endrizzi (Genetics 51:605. 1965) and found to be independent of these deficiencies. In the present study, since gl<sub>1</sub> was homozygous along with gl<sub>2</sub> and gl<sub>3</sub> in 38-6-A line, linkage of gl<sub>1</sub> and the monosomes was again checked while scoring for the segregation of the gl<sub>2</sub> and gl<sub>3</sub> markers. This additional checking required very little additional time and effort. However, this test did provide data of whether or not gl<sub>1</sub> was associated with the chromosome arm that was diplo in the telosome reported by White and Endrizzi (*op. cit.*). These authors also reported that gl<sub>2</sub> would be independent of chromosome 2 since it was observed that the Bw locus which is linked to gl<sub>1</sub>, was independent of this chromosome.

The results of the tests involving gl<sub>1</sub>gl<sub>2</sub>gl<sub>3</sub> are shown in Tables 1 and 2, and it can be seen from the data in the tables that not one of the three loci are located on the chromosomes 1, 2, 4, 6, 17, and 18.

Table 1. Distribution of Phenotypes in Testcross and F<sub>2</sub> From the Cross of Monosomic Lines X 38-6-A  $gl_1gl_2gl_3$  (Test for linkage with  $gl_2$  and  $gl_3$ ).

		A	B	C	D	TOTAL
M2 H17	38-6-A X F <sub>1</sub> D4-10-66 2N-1	12	7	10	16	45
	" X F <sub>1</sub> D4-15-66 2N	15	2	8	15	40
	F <sub>1</sub> D4-10-66 Self 2N-1	36	4	7	5	52
M3 H2	38-6-A X F <sub>1</sub> D6-4-66 2N-1	11	6	11	12	40
	F <sub>1</sub> D6-4-66 Self 2N-1	91	3	12	7	113
	38-6-A X F <sub>1</sub> D6-12-66 2N	14	1	4	11	30
	" X F <sub>1</sub> D6-13-66 2N	15	2	3	8	28
M5 H6	" X F <sub>1</sub> D8-5-66 2N-1	9	10	4	10	33
	" X F <sub>1</sub> D8-10-66 2N-1	3	4	3	4	14
	" X F <sub>1</sub> D8-3-66 2N	6	6	3	7	22
	" X F <sub>1</sub> D8-15-66 2N	4	7	9	7	27
M6 H4	" X F <sub>1</sub> D10-1-66 2N-1	16	6	12	14	48
	" X F <sub>1</sub> D10-9-66 2N-1	5	4	5	9	23
	" X F <sub>1</sub> D10-5-66 2N	13	8	14	16	51
	F <sub>1</sub> D10-5-66 Self 2N	44	19	8	7	78
M10 H18	38-6-A X F <sub>1</sub> D14-2-66 2N-1	4	4	3	6	17
	" X F <sub>1</sub> D14-4-66 2N-1	13	20	15	14	62
	F <sub>1</sub> D14-4-66 Self 2N-1	46	7	5	4	62
	38-6-A X F <sub>1</sub> D14-12-66 2N	13	13	10	12	48
M17 H1	" X F <sub>1</sub> D16-1-66 2N-1	6	5	9	5	25
	" X F <sub>1</sub> D16-8-66 2N-1	5	2	3	3	13
	" X F <sub>1</sub> D16-12-66 2N-1	4	8	8	6	26
	" X F <sub>1</sub> D16-11-66 2N	20	7	29	17	73

Table 2. Distribution of Glandless Stem ( $gl_1$ ) in Testcross and  $F_2$  From the Cross of Monosomic Lines X 38-6-A  $gl_1gl_2gl_3$

				$Gl_1gl_1$	$gl_1gl_1$	Total
M2 H17	38-6-A X $F_1$	D4-10-66	2N-1	3	42	45
	" X $F_1$	D4-15-66	2N	9	31	40
	$F_1$	D4-10-66 Self	2N-1	22	30	52
M3 H2	38-6-A X $F_1$	D6-4-66	2N-1	5	35	40
	$F_1$	D6-4-66 Self	2N-1	56	57	113
	38-6-A X $F_1$	D6-12-66	2N	3	27	30
	" X $F_1$	D6-13-66	2N	3	25	28
M5 H6	" X $F_1$	D8-5-66	2N-1	3	30	33
	" X $F_1$	D8-10-66	2N-1	1	13	14
	" X $F_1$	D8-13-66	2N	5	17	22
	" X $F_1$	D8-15-66	2N	2	25	27
M6 H4	" X $F_1$	D10-1-66	2N-1	7	41	48
	" X $F_1$	D10-9-66	2N-1	4	19	23
	" X $F_1$	D10-5-66	2N	2	49	51
	$F_1$	D10-5-66 Self	2N	43	35	78
M10 H18	38-6-A X $F_1$	D14-2-66	2N-1	2	15	17
	" X $F_1$	D14-4-66	2N-1	5	57	62
	$F_1$	D14-4-66 Self	2N-1	35	27	62
	38-6-A X $F_1$	D14-12-66	2N	8	40	48
M17 H1	" X $F_1$	D16-1-66	2N-1	2	23	25
	" X $F_1$	D16-8-66	2N-1	1	12	13
	" X $F_1$	D16-12-66	2N-1	1	25	26
	" X $F_1$	D16-11-66	2N	8	65	73