Linkage Analysis of Telocentric 20L Chromosome And The Virescent-1 Mutant Gene.

J. E. Endrizzi and R. Sherman, Department of Plant Sciences, University of Arizona.

In 1982 and 1983, we reported that the virescent-1 mutant was associated with Telo 20S indicating that the yl locus is located in the long arm of chromosome 20. The genetic marker line used in the crosses with T20L plants was AG170 which is homozygous recessive for virescent-1, cup leaf, glandless-1 and frego bract.

This year a segregating population involving T20L F1 plants was scored in an effort to locate the position of the yl locus in relation to the centromere. These results and those for the segregation of cup, glandless, and frego, are given in Table 4.

The gene for frego bract is located on chromosome 3, therefore its segregation in this study is of no major significance. The cup and glandless-1 loci have not been placed on a specific chromosome, and our study with T20L and T20S showed that they are not located on this chromosome. Only yl is located on chromosome 20.

Segregation of yl in the testcross of the disomic (26") F1 gave a good fit to the expected of a 1:1 ratio (Table 4). Segregation of yl in the reciprocal testcrosses of T20L F1 was not significantly different from a 1:1 ratio indicating that the locus in the short arm is at least 50 map units from the centromere. However, in both crosses there is a deficiency of the recessive class, which is significant when the two groups are combined (171:133,x2=4.75,P=.05-.02). This does not indicate a linkage of less than 50 map units from the centromere for the reason that in the T20L F1, the standard chromosome carried the yl allele and the telocentric chromosome carried the Yl allele. If the yl locus is less than 50 map units from the centromere, we would expect a deficiency of the Yl allele since there is selection against gametes carrying the telocentric chromosome.

A small population of 36 plants of the cross of T20L x AG170 was scored in the field, the results of which are given in the bottom of Table 4. This small population indicated a loose linkage of 38.9± 8.1 of yl and the centromere, but the population is too small to be reliable.

The total segregation of virescent in the three T20L F1 testcross is 187 Yl:Yl 153 ylyl which has a nonsignificant chi square value of 3.4, P=1.0-05.

It is concluded that the yl locus is in the short arm of chromosome 20 and at least 50 map units from the centromere.

In the test cross of AG170 x T20L F1, all of the 148 progeny appeared to be disomic, indicating that the telocentric chromosome was not transmitted through the pollen.

Table 4. Segregation of Marker Genes in Testcrosses of Telosomic and Disomic F_1s from Crossing T20L Plants with AG170

	Frequency of progeny in each phenotypic class							
	V_1	v_1	Cu	cu	Gl_1	gl_1	F_g	f_g
AG170 x 26" F_1	46	32	15	9	7	17*	14	9
26" F_1 x AG170$^+$	44	48	35	55*	44	48		
Subtotal	90	80	50	64	51	65		
AG170 x T20L F_1	81	67	41	28	41	28	43	26*
T20L F_1 x AG170$^+$	90	66	78	76	87	69		
Subtotal	171	133*	119	104	128	97*		

	26"		Telo 20	
	V_1	v_1	V_1	v_1
F_1T20L x AG170	13	19	3	1

% recomb = $\frac{13+1}{36}$ = 38.9 $\pm$ 8.1

\+ seedling populations in greenhouse.

* significantly different from a 1:1 ratio.