

Analysis of F₃ Data of the Ob₁^dY₁^d Linkage Group.

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Last year, we reported that testcross populations showed that the linked genes Ob₁Y₁ which were transferred from G. darwinii CB3099 into G. hirsutum, are 3.57 ± 1.33 map units apart in an A genome chromosome. It was pointed out that we were assuming that the darwinii yellow petal allele was at the Y₁ locus of G. hirsutum. To prove this, we had hoped to isolate a homozygous Ob₁^dY₁^d line in 1985 to cross to homozygous Y₁ of G. hirsutum (T586).

In an attempt to obtain the homozygous line, Ob₁^dY₁^d F₂ progeny of the F₁ C14-3-83 2n-1 H18 Ob^dY^d/oby were selected. Since a monosomic was selfed, the F₂ progeny consists of 2n and 2n-1 individuals. Both 2n and 2n-1 F₂ plants that were Ob₁^dY₁^d were self-pollinated to obtain F₃ populations to identify the homozygous Ob₁^dY₁^d F₂ plants. The F₃ seed of four 2n and three 2n-1 F₂ plants were hand-planted in the field. Since the linkage between Ob^d and Y^d is very tight (3.57 mu), it was assumed that surely one of the seven selected F₂ would be homozygous for Ob^d and Y^d; however, all seven were double heterozygotes in coupling phase linkage because they segregated into parental and recombinant types of progeny. These data are given in Table 2.

It can be seen in the data and their analyses in Table 2 that the F₃ data (which are equivalent to F₂ data) establishes, as did the testcross data, that the two genes are closely linked, even though the F₃ progeny of 2n and 2n-1 F₂ plants gave rather widely different recombination values, $2.4 \pm 1.2\%$ vs. $11.2 \pm 3.1\%$, respectively, by the Product Method.

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A contingency test shows that the two populations are significantly different. At the 95% confidence limits, the two recombinations values came close but they do not overlap. The combined recombination value is $6.1 \pm 1.5\%$, which is not significantly different from the test-cross value of $3.57 \pm 1.33\%$.

Again, selected $Ob^{dY^d} F_3$ plants were self-pollinated in hopes of selecting a homozygous Ob^{dY^d} line to cross to T586 to verify that Y^d is really at the Y_1 locus.

Table 2. Segregation of the Ah genome markers open bud and Yellow petal in the F_3 generation of selected $F_2 \underline{Ob}_1^d \underline{Y}_1^d / ob_1 y_1$ plants.

Parent	Ob-		obob		Total	Chi-Square		
	Y-	yy	Y-	yy		Y vs y	Ob vs ob	Linkage
2n F_3	116	1	4	42	163	0.166	0.902	156.40
2n-1 F_3	88	6	6	20	120	0.711	0.711	49.84
Grand Total	204	7	10	62	283	0.058	0.029	198.48

% recombination in 2n: $2.4 \pm 1.2\%$

% recombination in 2n-1: $11.2 \pm 3.1\%$

% recombination in combined: $6.1 \pm 1.5\%$