1. <u>Plants homozygous dominant vs. heterozyaous for 'white seedling' on a heterogenous-background</u>.

It is desirable to study single locus heterosis on a homozygous background. The difficulties to obtain homozygosity on all but the locus under consideration are numerous. It was felt that the comparison of the two genotypic classes WW vs. Ww may well be accomplished on an uncontrolled and heterozygous background. Under the assumption af random assortment of genes, any combination can occur equally frequent in WW or Ww plants. Consequently, if a large enough number of WW and Ww plants were grown and measured, possible heterotic effects on the white locus might become measurable.

In the course of an inbreeding study (Maize Genetics Cooperation News Letter 27) a number of selfed ears, obtained from the open pollinated variety Reid Yellow Dent, were segregating for white seedlings. Tests for allelism established two alleles. One occurred with a frequency of .01310 and the other of .00062. Five ears segregating in a 3:1 fashion for the former allele were planted ear-to-row. Since all homozygous recessives are lethal, a field population consisting of two heterozygous to one homozygous dominant plants, was expected. To identify plants as to their genotype, each individual was selfed immediately after the appearance of the first silks. This procedure resulted in selfed seed of at least a section of the ear. The following day ear bags were removed to secure a full seed set of the remaining portion of the ear by open pollination. Ears were harvested and weight of shelled grain, as well as number of seeds, was determined on an individual plant basis. Fifty seeds, taken from the basal portion of each ear, were grown in sand in the greenhouse to determine the genotype of each plant, with respect to the white locus.

The field population of the five progenies, together with the χ_2 values of these ratios, are summarized in Table 1. It may be noted that only one progeny segregated in a typical lethal ratio (2:1) as expected. In the other four cases, deviations in both directions occurred. The method of pollination and sampling may be responsible for occasional misclassifications of Ww plants. An excess of WW plants in two progenies can not be explained so easily. Upon pooling the five progenies, the deviation from expectation is not significant; however, the heterogeneity χ_2 value suggests that we were dealing with different populations. Hence the analyses were carried out on an ear-to-row progeny basis. Table 2 contains the results. In none of the two attributes, in any of the five populations, was there any significant difference between the WW vs. Ww genotypes.

If the assumptions made in the beginning were correct, then we were not able to demonstrate a heterotic effect on this white-locus. It is realized, however, that the high degree of heterozygosity may well conceal any existing slight departures in favor of the heterozygous allele combination. Larger population numbers could overcome certain limitations, while others such as close repulsion or linkage of 'White' with major yield genes would not be altered materially by increasing the number of plants. It is felt that the above approach was of the nature of a preliminary experiment.

Table 1. Segregating ratios and χ_2 values of five segregating progenies.

Source	WW	Ww	χ^2	P
	Number of plants			
1	6	32	5.26	<.02
3	6	31	4.88	<.02
166-2	50	49	13.14	<.01
171-2	29	60	.002	<.95
183-2	33	34	7.64 (30.92)	<.01
	124	206	2.67	<.50

	χ^2	DF	P
Pooled deviation	2.67	1	<.50
Heterogeneity	28.25	4	<.01

Table 2. Number of kernels and seed weight in grams, means, standard deviations and t-values of 5 ear-to-row progenies.

Parental Source	Genotype	Number of kernels: Mean	Number of kernels: Standard Deviation	Number of kernels: t	Number of kernels: t_{05}	Number of kernels: P	Seed weight in grams: Mean	Seed weight in grams: Standard Deviation	Seed weight in grams: t	Seed weight in grams: t_{05}	Seed weight in grams: P
1	WW	300.1	40.95	.72	2.52	.05	78.5	11.09	.41	2.50	.05
	Ww	269.1	13.28				73.6	4.29			
3	WW	337.8	45.27	2.37	2.48	.05	118.6	16.80	.90	2.53	.05
	Ww	455.1	19.68				134.2	4.91			
166-5	WW	367.6	21.73	2.005	2.006	.05	105.8	6.72	.80	2.02	.05
	Ww	421.7	15.99				112.7	5.34			
171-2	WW	305.7	8.14	1.17	2.02	.05	104.5	2.97	1.63	2.03	.05
	Ww	291.6	8.83				98.4	2.26			
183-2	WW	345.2	22.20	.58	2.03	.05	63.2	3.38	.50	2.04	.05
	Ww	362.7	20.43				65.6	3.38			

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