2. Heterotic genes in the long arm of chromosome 3.

In 1938 Dobzhansky and Rhoades suggested the use of paracentric inversions as a method of locating genes affecting agronomic characters such as yield. The advantage of inversions in this connection is that all of the loci included within the inverted sector are inherited as a block except for rare double crossovers. A strain homozygous for inversion 3a (see Rhoades and Dempsey 1953) and carrying the recessive a_1 allele in the inverted segment was crossed to a number of elite inbred lines with the A_1 allele. The F_1 plants, all heterozygous for A:a and the inversion, were backcrossed by the recessive a_1 inversion stock. On the F_1 backcrossed ears there was a ratio of 1 colored: 1 colorless kernels. The colored kernels are heterozygous for the inversion and the colorless kernels homozygous for the inversion. The two classes of kernels were planted replicated yield test and the grain yield detemined. The data from the backcross experiments are given below as are available F_2 data. The kernels from selfed ears of F_1 plants were planted at random in the field without classifying for aleurone color. The F_2 plants were detasseled and intervening rows of an a_1 tester used as the pollen source. Ears with only colored kernels are homozygous for the chromosome 3 segment from the inbred line, those with half colored and half colorless kernels are heterozygous for the inverted segment, and those with only colorless kernels are homozygous for the inversion. Although these data are from a single year's testing, is apparent that certain of the inbred lines carry genes in the long arm of chromosome 3 which give a heterotic effect when tested against the same segment in the inversion strain. It is also apparent that other strains such heterotic loci.

In 3a yield test--F_2 data

	No. ears	Av. Wt. per ear in gms.	No. ears	Av. Wt. per ear in gms.	No. ears	Av. Wt. per ear in gms.	AA vs Aa	AA vs aa	Aa vs aa
I 205	33	98.15	102	148.01	39	153.08	5.6**	4*9**	.6
K 187-2	27	100.96	82	127.35	27	126.18	3.3**	2.6**	.1
C 103	55	135.18	100	142.75	37	126.27	1.0	1.0	2.1*
R 59	44	133.77	98	150.90	40	124.22	2.1*	1.2	4.2**
WF 9	40	121.53	81	130.35	43	125.65	1.0	.5	.6
M 14	53	124.91	99	131.47	39	103.46	.8	2.3*	3.4**
R 4	43	101.95	114	122.90	38	124.42	2.2*	2.1*	.2
Oh 45	46	132.83	81	117.15	38	113.05	1.4	1.7	.5

* significant at 5% level
** significant at 1% level

In 3a Yield test--Backcross data

	No. reps.	Av. Wt. per rep. in lbs. Aa	aa	"t" value
I 205	4	3.98	3.23	1.3

K 187-2	10	3.82	3.07	2.9**
C 103	16	5.33	5.01	1.3
WF 9	6	3.90	4.23	1.8
M 14	10	4.44	3.93	2.8**
R 4	10	3.96	3.69	1.8
Oh 45	10	4.37	4.08	1.8
Oh 41	10	4.35	4.40	.3
5120 B	6	3.72	3.75	.2
W 26	6	3.68	4.00	1.4
O 7	10	3.63	3.72	.4
R 2	10	4.06	4.05	11
38-11	10	4.30	4.32	.1
K 4	10	4.50	4.15	1.6

* significant at 5% level
** significant at 1% level

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