ising, and could be used as seed parents of single crosses.

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1. Linkage and aberrant segregation of a new Teopod locus.

A dominant mutant, apparently identical in phenotype with Tp_1 on chromosome 7, was found by Dr. J. R. Laughnan. The new Teopod locus is located on chromosome 10, proximal to the golden locus and about 13 units from R:

Cross: $\dfrac{Tp\ G\ R}{tp\ g\ r} \times \dfrac{tp\ g\ r}{tp\ g\ r}$

Parentals		Singles G-R		Singles Tp-G		Doubles	
Tp G R	N g r	Tp G r	N g R	Tp g r	N G R	Tp g R	N G r
122	96	14	18	2	1	0	0

Additional data on Teopod-golden distance is given below:

	Tp G	N g	Tp g	N G	Total	Percent Recomb.
Backcross data	314	305	3	8	630	1.75
F_2 data	736	228	7	10	981	1.25

One strain carrying the new Teopod shows aberrant ratios of Teopod and non-Teopod plants. Heterozygotes, through three generations of testing, have produced only Tp progeny on selfing, while crosses of the same plants, used as egg or pollen parents, with non-Teopod, give 1 Tp : 1 tp ratios in the progenies. Subsequent selfing of the outcross progenies gives families showing normal 3:1 segregation.

Helen Peterson

2. Noncrossover alpha (pale) derivatives from A^b:P.

The A^b complex of Peruvian origin (beta:alpha) is highly suited to an analysis of the origin of the noncrossover alpha element since the

latter occurs about twice as frequently as the crossover alpha from this complex. From the fact that the crossover and noncrossover derivatives are indistinguishable in phenotype it could be supposed tha[t] the noncrossover alpha is the result of gene mutation of the beta ele[-] ment to a null level (β_0). This would account for the loss of purple effect and the consequent pale phenotype through an event not associ[-] ated with recombination within the complex.

To test this hypothesis we have attempted to isolate the beta el[e-] ment from the beta:alpha complex in order to study its rate of mutati[on] to the null level (colorless). Beta elements isolated by crossing ov[er] were put into marked heterozygotes with the parental beta:alpha compl[ex.] These marked heterozygotes may be represented as T $\beta\alpha$ Sh/N β sh. Sin[ce] the beta elements in this heterozygote are identical and since they o[ccur] in identical genetic background we anticipate that they will mutate t[o] the null level with equal frequency. However, a beta mutation in the $\beta\alpha$ complex yields $\beta_0\alpha$ (noncrossover pale) whereas a mutation of beta in the other strand yields β_0. Since no alpha element is present her[e] this event should yield a mutant with colorless phenotype.

In the table below data from two tested heterozygotes are given. The second one listed is without proximal marking.

Heterozygote	Total gametes	Derivatives		
		T α Sh	N α Sh	Colorle[ss]
T $\beta\alpha$ Sh/N β sh	74,000	17	5	None
N $\beta\alpha$ Sh/N β sh	76,000	$\frac{\alpha\ Sh}{34}$		$\frac{Colorle[ss]}{None}$

The absence of colorless derivatives which, on the beta mutation hy- pothesis, are expected with a frequency at least equal to that of noncrossover alpha occurrences strongly suggests that noncrossover al[pha] derivatives are not attributable to gene mutation of the adjacent bet[a] element in the beta:alpha complex.

Mr. Sarma reports elsewhere in this number on the analysis of no[n] crossover alpha cases from this complex. On the gene mutation hypoth[e-] sis discussed above these should be $\beta_0\alpha$ in constitution. His finding[s] are in agreement with those reported above in minimizing the beta mut[a-] tional event as a basis for the origin of noncrossover alpha derivati[ve.] Both lines of evidence indicate that the step in question somehow in- volves a loss of the beta element without recombination of marker loc[i.]

It has been suggested that multiple exchanges within small chrom[o-] somal segments, or "conversion", whatever that may connote, would ex[-] plain the noncrossover derivatives in this and other material. Sever[al]

lines of evidence seem clearly to rule out these phenomena as causes of the noncrossover alpha derivatives in maize. With regard to the hypothesis of multiple exchange, it is apparent that in the N $\beta\alpha$ Sh/T a sh marked heterozygote two-and three-strand double exchanges with one crossover between beta and alpha and the other immediately adjacent would indeed give rise to an apparent noncrossover N α Sh strand. However, this mechanism should, with equal frequency, yield alpha derivatives on strands carrying the parental markers of the homologue (T α sh). As indicated in the table below not a single alpha-carrying strand of this constitution was obtained from heterozygotes which produced 126 cases of N α Sh noncrossover strands. These results are equally damaging to an hypothesis of conversion based on a copy-choice mechanism since it also calls for the occurrence of the T α sh strand. The most devastating evidence

Parental constitution	Total gametes	Alpha derivatives			
		N α Sh	T α sh	T α Sh	N α sh
N $\beta\alpha$ Sh/T a sh	570,000	126	0	46	0

against these hypotheses comes from an analysis of alpha derivatives from beta:alpha hemizygotes in which the homologue is deficient (Df a-x_1) for at least the A and Sh loci. The data in the following table indicate that noncrossover alpha strands occur frequently even under circumstances where the homologous chromosome provides no opportunity for pairing at the A

Parental constitution	Total A^b gametes	Alpha derivatives	
		T α Sh	N α Sh
T $\beta\alpha$ Sh/N Dfa-x_1	69,000	41	0
N $\beta\alpha$ Sh/N Dfa-x_1	58,000	$\frac{\alpha\ Sh}{54}$	

locus. The frequency of occurrence of noncrossover alpha derivatives from the hemizygote compares favorably with that of similar cases from beta: alpha/a heterozygotes. It may be noted too that crossover alpha strands are eliminated among progeny from the hemizygote, thus confirming that the deficient segment in the Df a-x_1 chromosome does indeed include the A locus.

The foregoing data indicate that the mechanism which produces the noncrossover alpha derivative from the beta:alpha complex is intrachromosomal and does not involve the homologous chromosome except perhaps indirectly.

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