1. Increased chromosome breakage in endosperm tissue associated with the variegated pericarp.

As reported in the 1954 Maize News Letter the frequency of waxy sectors in Wx wx wx endosperms is significantly higher in kernels carrying a P^{VV} allele (medium variegated pericarp) than in those carrying a P^{WR} allele (stable colorless pericarp). Further studies showed that at least part these Wx losses are due to the loss to the nucleus of a chromosome segment during mitosis in the endosperm tissue.

Three near-isogenic stocks were used as pollen parents, each differing in the genetic constitution for pericarp: F336 was heterozygous medium variegated (P^{VV}/P^{WW}), F337 was heterozygous light variegated (P^{VV}/P^{WW} + tr-Mp, the transposed modulator together with P^{VV} giving the light variegated phenotype), and F341, a P^{WW}/P^{WW} control. All three stocks also were homozygous A r C Wx. Pollen from them was put on the silks of the tester stock A R c wx, resulting in colored aleurone and non waxy endosperms. C (colored aleurone) losses were scored under a binocular microscope as colorless sectors on the otherwise colored kernels. These colorless sectors were then classified for waxy. Since C and Wx are linked, C being distal to Wx on the short arm of chromosome 9, colorless sectors showing also the waxy phenotype could be interpreted as due to losses of chromosome 9 segments including both the C and the Wx loci. The frequencies of these c wx sectors are summarized in Table 1. Sectors smaller than 0.25 mm. in length are not included.

Table I. Mean frequencies of colorless and waxy endosperm sectors per 100 kernels from different variegated and non-variegated pollen parents.

			No. of colorless endosperm sectors		
Family of male plant	Pericarp phenotype	Male genotype	Colorless non waxy	Colorless waxy	Total
F336	medium variegated	P^{VV}*/P^{WW}	231.4±59.1	142.7±11.6	369.4±50.0
F337	light variegated	P^{VV}/P^{WW} + tr-Mp / P^{WW}/P^{WW}	234.0±75.5	280.0±48.9	538.1±89.8
F341	colorless		70.6±45.2	48.6±23.5	119.2±59.3
			54.1%	45.9%	100%

* $P^{VV} = P^{RRMP}$

The last column in Table I shows that both the medium variegated and light variegated plants gave higher frequencies of colorless sectors (C losses) than the near-isogenic P^{WW} inbred. Approximately 46% of the sectors showed simultaneous losses for both C and Wx. The simultaneous loss of linked dominant markers indicates the loss of a chromosome segment with the breakage point proximal to the Wx locus. In the remaining 54% of the sectors C alone was lost. These may or may not result from chromosome breakage. Included in the latter group of 4147 colorless sectors (54%) were 32 sectors large enough to show mottling of waxy also, in a pattern suggesting the breakage-fusion-bridge cycle. This pattern could arise from an initial break removing the C locus only, followed by breakage-fusion bridge cycles resulting in secondary breaks during subsequent cell generations, eventually affecting the Wx locus also.

How does the P^{VV} (or P^{RRMP}) allele, normally on chromosome 1, induce breakage in the short arm of chromosome 9? The fact that P^{VV} "activates" McClintock's Dissociation in producing chromosome breakage at the locus of Ds suggests that perhaps there are relatively weak dissociation-like elements scattered along chromosome 9, and probably elsewhere in the genome also, and that increased chromosome breakage at these sites occurs under the action of P^{VV}.

The data in Table I also show that the light variegated male plants gave larger increases in the frequency of endosperm sectoring than the medium variegated plants. The difference is statistically significant. This increase of endosperm sectoring or the dosage effect of the transposed Modulator is

contrary to the known suppressing effect of transposed Modulator on pericarp variegation and on Dissociation. No explanation is apparent.

In a similar experiment, involving the Pr locus instead of the Wx locus, there was a Modulator dosage effect of the expected kind. That is, the frequency of pr-sectors in the light variegated group was reduced as compared with the medium variegated group. These data are summarized in Table II, which includes the results from two separate experiments involving different inbred strains.

Table II. The dosage effect of Modulator on the frequency of pr sectors.

Family of male plants	Pericarp Phenotype	Male genotype	No. pr sectors per 1000
F 302	medium variegated	P^{VV}/P^{WW}	225.5 ± 28.9
F 301	light variegated	P^{VV}/P^{WW} + tr-Mp	129.9 ± 39.0
F 304	colorless	P^{WW}/P^{WW}	94.7 ± 17.5
F 305	homozygous medium variegated	P^{VV}/P^{VV}	456.5 ± 75.5
Estimated	medium variegated	P^{VV}/P^{WR}	272.4
F 306*	light variegated	P^{VV}/P^{WR} + tr-Mp	164.4 ± 40.5
F 307	colorless	P^{WR}/P^{WR}	88.3 ± 29.6

* The transposed Modulator in the light variegated appeared to be closely linked with P^{VV}. The 1953 family gave 9 light variegateds only and a duplicate family in 1954 gave 7 light variegateds and no medium variegateds.

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