

among different protein fractions and in particular with the quantity of proteins others than zein, those having a greater biological value than zein.

The author investigated 26 different selections. He found a correlation ($r = 0.800$) between the quantity of lysine in the entire kernel and the difference of nitrogen content : Pro-Meter less Kjeldahl.

The test of "double-analyzing of nitrogen" is simple, cheap, rapid (40-50 determinations a day) and sufficiently accurate to screen corn inbred lines for approximate lysine content.

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1. Aleurone color variegation involving the R locus.

A heritable system producing aleurone color variegation was reported in M.G.C.N.L. 43:176-178, 1969. The variegation consists of irregular colorless aleurone areas on a colored aleurone background. Further study of this system has shown the aleurone variegation to be determined by interaction of an element, designated \underline{Ac}^R , with alleles at the R locus.

The \underline{Ac}^R element is inherited independently of the R locus, and it exhibits the following properties:

- (1) \underline{Ac}^R is effective in producing variegation only when present in 2 or 3 doses in the triploid endosperm.
- (2) \underline{Ac}^R is pollen transmitted at markedly reduced frequency. About 1/3 of the male gametes from $\underline{Ac}^R/-$ plants transmit the element.
- (3) Ovule transmission of \underline{Ac}^R is slightly reduced.
- (4) Presence of \underline{Ac}^R in a plant appears associated with some reduction in seed sets. There appears to be no reduction in pollen fertility in $\underline{Ac}^R/-$ plants.

The \underline{Ac}^R element thus exhibits an unusual pattern of inheritance and spectrum of effects. The element exhibits no specificity for

Table 1
Relation of grade of variegation and number of R^E alleles

Paired matings	Number of R^E alleles	Frequency distribution of kernels by grade of variegation*							Total no. colorless squares	Diff.
		0 Not. var.	0 Var.	1-5	6-10	11-15	16-20	21-25		
1	2	16	5	9	10	7	2	1	244	231
	3	37	7	6	-	-	-	-	13	
2	2	23	7	14	3	1	2	-	204	188
	3	38	4	8	-	-	-	-	16	
3	2	26	2	9	9	4	-	-	143	87
	3	33	3	11	2	1	-	-	56	
4	2	25	1	16	6	2	-	-	127	63
	3	36	3	6	2	3	-	-	64	

*Number of colorless aleurone squares in a 5 x 5 reticule grid.

particular R alleles, since aleurone variegation was produced in interaction with all R alleles tested, including R^r, R^G, R^{sc} mutants from stippled, R^{nj} and a number of hypomorphic R^G mutants. The element produces aleurone variegation but not mutation of R alleles, since no instance of germinal mutation of R alleles has been observed in Ac^R carrying plants.

Involvement of the R locus in this aleurone variegation system was initially suggested because the phenotype appears due to loss of capacity to produce pigment, and the R locus was the only one of the complementary dominant genes involved in aleurone pigmentation that was segregating in the genetic stocks under study. This argument for association with R alleles is negated by the observation of aleurone variegation in endosperms homozygous for an R^G allele, e.g., in selfed matings on R^G R^G, Ac^R/- plants. Following these observations, aleurone variegation could involve any one, all or none of the genes involved in producing aleurone variegation.

Evidence for an integral involvement of R alleles in the variegation system was sought by examining the relationship between grade of variegation (i.e. the relative frequency of colored and colorless aleurone areas) and number of R^G alleles in the triploid endosperm. Two experiments were conducted. In the first, plants of constitution R^G R^G, Ac^R/- producing two ears were double pollinated. One ear was selfed, and the other was pollinated with r^r/r^r pollen, thus providing on the 2 ears of one plant the contrast of R^G R^G R^G and R^G R^G r^r endosperms. The resulting paired ears were scored by recording the number of colorless squares in a 5 x 5 reticule grid superimposed on the abgerminal surface of each of 50 kernels from each ear. The data so obtained are given in Table 1.

These data clearly show a relationship between frequency of variegated kernels, and grade of variegation, with number of R^G alleles in the triploid endosperm.

In the second experiment colored kernels from selfed matings on R^G/r^r, Ac^R/- plants were classified for grade of variegation and subsequently germinated for determination of seedling color. If the R locus is not associated with grade of variegation, a 2 red: 1 green seedling ratio would be expected in each phenotypic class. The data in Table 2,

Table 2
 Classification of seedling color of seedlings
 from $\underline{R}^G/\underline{r}^r$ $\underline{Ac}^R/-$ selfed matings

Kernel phenotype	Red seedlings $\underline{R}^G/\underline{r}^r$	Green seedlings $\underline{R}^G/\underline{R}^G$	Total seedlings
Variegated-Minute	38	41	79
-Medium	86	34	120
-Extensive	74	21	95
Not variegated	370	182	552
Total	568	278	846

show that this expectation was not realized, and there was a compensated deviation from the expected ratio. In the minute variegated class of kernels there was an excess of green seedlings ($\underline{R}^G \underline{R}^G \underline{R}^G$ endosperms), and in the extensive variegated class there was a deficiency of green seedlings, but the overall ratio of red to green seedlings within the variegated class of kernels is close to the 2 red : 1 green ratio expected.

Both these results are consistent with an interpretation that colored to colorless variegation is produced if \underline{R} action in pigment production is lost in the aleurone, and that there is a reduced probability of loss of \underline{R} action in $\underline{R}^G \underline{R}^G \underline{R}^G$ endosperms compared with $\underline{R}^G \underline{R}^G \underline{r}^r$ & $\underline{r}^r \underline{r}^r \underline{R}^G$ endosperm kernels.

These results implicate the \underline{R} locus in production of the aleurone variegation, and they suggest that aleurone variegation is due to an interaction between the \underline{Ac}^R element and a component situated at or near the \underline{R} allele involved. All \underline{R} alleles appear to have the latter component, and it may be a basic \underline{R} gene element responsible for regulation of gene action at the \underline{R} locus.

K. S. McWhirter