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1. Genetic analysis of the absence of aleurone color in South American maize.

One method of analyzing the structure of populations of indigenous races of maize consists in the analysis of characters with simple inheritance. This report is concerned with the genetics of absence of anthocyanin in the aleurone in South American Highland and Lowland races of maize, as part of a project testing a large number of indigenous races for the genetic basis of colorless aleurone, started by Brieger several years ago (M.N.L. 28:74, 1954). Plants of indigenous races with strong modifier complexes for colorless aleurone were crossed with plants of Negrito, a race from Northern Colombia, which is completely homozygous for all the genes for aleurone color and which has a strong modifier complex for coloration. By selfing the F_1 plants, segregating F_2 ears were obtained. These ears give normal Mendelian ratios owing to the apparent randomization of the two types of modifier complexes. A statistical analysis was elaborated for the observed segregations in 1,764 F, ears from Highland races and 704 F, ears from Lowland races. The results are given in Table 1 on the following page.

From the lowland data, we may conclude that the colorless races were homozygous for at least one recessive inhibitor gene; a second recessive inhibitor was present in all races with a frequency of approximately f = 60%, and the presence of the third recessive inhibitor varied from race to race. Future analysis with genetic testers should elucidate more clearly the situation, especially with regard to the exact nature of the loci involved but it is interesting to note that there seems to be a certain stability in the gene frequencies of two of the loci involved.

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1. The Navajo phenotype at the R locus - an example of phase change or a cell differentiation?

In a recent interesting paper P.A. Peterson (Genetics 54:249, 1966) described two unusual phenotypic patterns of mutability, designated "flow" and "crown", at the \underline{A}_1 locus. These were interpreted as due to phase variation of two different regulatory elements. It was implied also, that the Navajo allele (\underline{R}^n j) at the \underline{R} locus could be a further example of phase variation in maize.

An alternative, though not readily distinguishable, concept of the Navajo phenotype is that it is a manifestation of a cell differentiation

Table 1 Frequency of Mendelian ratio in F_2 ears from the crosses between colorless races x Negrito 173

requency of	races x Negrico				
	3:1	9:7	27:37	1:3	3:13
HIGHLAND					
CAPIA	13 13 	15 19 9	15 9	15 4	 16
DENT BRANCO	16 13 	49 57 54 50 23	26 61 31 25 16	18 9 5	 6
FLINT BRANCO	11 27 11 	6 134 89 174 6	 53 38 77 15	16 7	
FLINT AMARELO	15	108	31	3 	
PISINCHO	12 33 41	45 111 13	2 61 2	13 2	5
LOWLAND					
CAINCANG	50 3	71 39	 24		
LENHA		6	13	10	مدر و <u>ن</u> جد هد
	30	68	95 Lo		
GUARANI YELLOW Soft Corn		29 3	49 15	10	
CALCHAQU I		74 10	58 14	 6	
PIPOCA PAULISTA		53	95		، هم
CRISTAL		+	+		

phenomenon. That is, the aleurone cells which become pigmented in $R^{nj}/-/$ kernels are differentiated with respect to the non-pigmented cells. This does not necessarily imply that the cell types be morphologically distinguishable. The concept implies that there is a master differentiation process, to which the Rnj alleles respond, probably under the direction of a specific genetic element (operator like?) located at or near the Rlocus, by expressing the synthesis of anthocyanin. The phase change concept reaches the same phenotype by implying that the "differentiation" observed results from the specific activation to expression of the \underline{R}

Both concepts, "phase change" and "cell differentiation," imply that R-Navajo alleles be R in basic R locus constitution. Evidence for this has been obtained with one particular Rnj allele. The Rnj allele studied is designated \mathbb{R}^n j(scl 34)-14, and was obtained by mutation of a self-colored (RE) allele by the sequence of mutation events (M.G.C.N.L. 35:142, 1961);

The by the sequence of mutadata
$$\underline{R}^{\text{st}}$$

Self-colored mutant #134

Self-colored mutant

The R^{nj} mutant thus isolated has been observed to mutate to R^{g} (self-The κ - mutant thus isolated has been observed to mutate to κ (self-colored). Seven proven Rg (self-colored) mutants have been obtained from Rnj/r genotypes (rate ca.30 x 10-4), and one proven Rg (self-colored) mutant has been obtained from Rnj/Rnj genotypes (rate ca. 1 x 10-4). Additional nutative mutant kernels are currently being progeny tested. Additional putative mutant kernels are currently being progeny tested, and a suggestive association of mutation of Rnj to Rg in Rnj/rr genotypes, with crossing over in the G - R region is being tested further.

The phenotype of the mutant R^{nj} allele studied is quite similar to that The phenotype of the mutant R allele studied is quite similar to that of some R^n j alleles of natural occurrence. Its origin by the mutation sequence outlined above may mean, however, that it is constituted differently from other naturally occurring R^n j alleles. The study of R^n j alleles, with emphasis on an attempted recombination analysis of the structure of the R region, is being extended to include alleles Rnj (Illinois), Rnj (Cudu), Rnj (Anderson), Rnj (New Mexico) and R. A. Brink's Rnj:st(stippled-Navajo). I would appreciate receiving seed of any Rnj allele of different anicin to the contract allele of different origin to those listed. K. S. McWhirter

A paramutagenic Navajo allele at the R locus.

A mutant allele with the Navajo phenotype was obtained by mutation of a self-colored (RE) allele, by the sequence of mutations (M.G.C.N.L. 35:142, 1961):

961):

$$\underline{R}^{\text{st}} \longrightarrow \underline{R}^{\text{g}} \longrightarrow \underline{R}^{\text{nJ}}$$

Self-colored mutant #134

Navajo mutant