

early in the development of the endosperm. Kernels from the atypical variegated cross, however, exhibited a high frequency of very small colorless sectors (6 to 8 aleurone cells each) which was not found in the kernels from the orange medium variegated crosses.

The occurrence of the orange variegated phenotype as pericarp sectors and among the progeny of this mutant atypical very light variegated indicates that the Modulator component of \overline{povov} , \overline{Mpa} , has not changed to a new state (mutant form). The loss of \overline{Mpa} from \overline{povov} which results in the orange variegated phenotype, however, is inhibited except for rare somatic and germinal changes which allow the normal expression of this unstable allele. This atypical variegated phenotype could most easily be explained by postulating a second transposable element as a component of this new mutant \overline{P} allele that suppresses \overline{povov} until it leaves the \overline{P} locus by transposition allowing the normal expression of \overline{povov} . The difference observed in the \overline{Ds} -type chromosome breakage pattern induced by the atypical very light variegated and by \overline{povov} could then be attributed to the action of this second element. The action of this second transposable element at \overline{P} would appear similar to that of the \overline{Mp} component of \overline{PVV} as postulated by Brink and Nilan (1952). In this new mutant allele, however, the action of \overline{Mpa} as well as \overline{prf} (i. e. \overline{povov}) would be suppressed. The present tests do not provide direct evidence for such a second element. Additional tests now in progress may provide information which will clarify the nature of this atypical very light variegated allele.

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1. Fertility restoration in Southern inbreds.

The fertility restoring inbred lines K55, Ky21, T115, Mp307, T210, T216, H-40B, Mp460, A14, E184 and A447 have been used in restored sterile hybrids in Tennessee. The last three are South African lines. All lines were crossed with A14Tcms and E184Tcms and advanced to F₂. All crosses failed to segregate sterile plants indicating that the restoring factors in all lines are allelic and controlled by a single dominant gene. This fact was also demonstrated by F₂ crosses and backcrosses. It is assumed from the tests that all lines carry the two dominant complementary genes as demonstrated for Ky21 and K55 by other workers and which are lacking in WF9.

-- L. M. Josephson

2. Studies with 33-16 male-sterile cytoplasm.

F₁ hybrids of 33-16 as seed parent and CI.61, CI.43 and H21 have been completely fertile while those with K63, Mo2RF, Ky27, K64 and K6 have been only partially fertile. In backcrosses, plants segregate completely fertile, completely sterile, and into various degrees of partially fertile plants indicating that more than one genetic factor, or at least modifiers, as well as sterile cytoplasm is operating in determining sterility. Some crosses indicate only a single gene for partial fertility is operating while others indicate both a gene for complete fertility and one for partial fertility are operating. Further backcrosses to sterile plants have generally rendered the populations completely sterile. Inbred Ky27 has remained completely sterile through 13 generations of backcrossing. This source has in turn been transferred to several other inbreds and has remained stable.

Of 18 inbreds which restore Texas sterile cytoplasm, only 9 restore 33-16 sterile cytoplasm. K55, K63, R6, K6, Ky122, E184, A325, E788 and K64 which are good restorers to Texas sterile cytoplasm do not restore 33-16 sterile cytoplasm. Ky39, A310, A328, Tx325, CI.7 and Ky49 restore 33-16 sterile cytoplasm but have no effect on the Texas type.

Pollen fertility restoration was studied in six inbreds using Ky27 and K55 as sterile cytoplasm sources. The restoring abilities of 33-16, Ky21, A14, R7, Ky39 and R7 were inherited similarly in all crosses. Pooled progeny data for Ky21 and 33-16 are shown for different generations and years.

Generation	Year	Total Plants	Fertility Grades					Expected Ratio	P(.05)
			4	3	2	1	0		
F ₂	1957	60	<u>JcmsKy27xKy21</u>					15:1	.90
	1958	105	39	15	2	3	1	15:1	.37
BC(F ₁ xKy27)	1957	113	8	17	30	1	57	1:1	.87
	1958	61	26	6	0	0	29	1:1	.80
	1959	69	18	14	0	3	34	1:1	.60
BC(JcmsKy27xF ₁)	1957	109	33	26	28	2	20	3:1	.28
	1958	44	12	19	10	0	3	3:1	.02
F ₂	1958	74	<u>JcmsKy27x33-16</u>					15:1	.08
	1959	640	53	18	2	1	0	15:1	.19
BC(F ₁ xKy27)	1958	19	2	7	0	3	7	1:1	.90
	1959	542	82	166	35	43	216	1:1	.35
F ₂	1958	205	<u>JcmsK55x33-16</u>					15:1	.40
	1959-Ear 1	84	149	27	13	10	6	15:1	.46
	Ear 2	89	45	11	21	4	3	15:1	.56
	Ear 3	90	55	21	6	5	2	15:1	.28
	Ear 4	90	61	21	5	2	1	3:1	.19

The F₁ populations were all completely fertile. With the exception of progeny 4 with Jcms K55x33-16, individual ear progenies segregated similarly so only totals are shown. Grade 1 plants were considered sterile and grades 2 and 3 fertile in developing ratios. Although X² values are high, the F₂ data fit a two-gene hypothesis. Even though grade 2 would be considered sterile, there is still a poor fit for a 3:1 ratio. These segregations can be explained by postulating a major dominant gene plus a modifying gene which is necessary for complete fertility, but either one alone being capable of producing partial fertility. On this basis fully fertile and partially fertile plants should segregate in a ratio of 3:2. The segregations for Jcms Ky27xKy21 in 1958 and Jcms K55x33-16 in 1958 deviate from this ratio but all other segregations show good fits. The F₁ crosses pollinated by Ky27 give good fits to a single factor hypothesis. Apparently, if modifying genes are necessary, they do not produce fertility except in the presence of the major gene.

Reciprocal backcrosses were available for classification in the cross Jcms Ky27xKy21. The plants segregated more in line with expectation on the basis of the F₂ data; however, more plants segregated

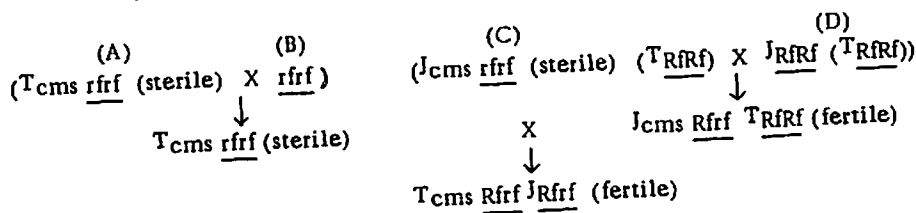
for partial fertility in 1958 than expected on the basis of two factors. Genes operating for partial fertility in F_2 would likewise be expected to operate in the backcrosses. Such is not the case. If the modifying gene is necessary for complete fertility half of the fertile plants in the backcrosses should be only partially fertile. In some populations a higher percentage of fully fertile plants was obtained, while in others more partially fertile plants were obtained.

Progeny tests should reveal whether genes for partial fertility can operate independently from the major gene. Differences in the two types of backcrosses indicate that Ky27 possibly possesses a modifying gene necessary for fertility that functions only when carried in sterile cytoplasm. The different results obtained in the two types of backcrosses suggests a gametic influence. If backcrosses are considered a more accurate determination of the genetic mechanism, then it must be assumed that an excess of fertile or partially fertile plants is expressed in the F_2 populations. This could be caused by differential competitive effects between Rf and rf pollen grains such that genotypes carrying rf genes are eliminated. This would also account for the excess number of fertile plants in the backcrosses made by pollinating the sterile inbred with fertile F_1 pollen.

-- L. M. Josephson

3. Hybrids without detasseling.

It is interesting to note that by utilizing both Texas and 33-16 type sterile cytoplasm it will be possible, without detasseling at any stage, to produce double crosses giving only fertile plants in the farmer's fields by the following method:



Texas sterile cytoplasm will be used to produce the seed parent single cross and 33-16 sterile cytoplasm to produce the male parent single cross. Inbred K55 can be utilized in the (C) position since it has been converted to 33-16 sterile cytoplasm and is a natural restorer of Texas sterile cytoplasm. Inbred K64 can be used in the (D) position since a selection which is a full restorer of Texas sterile cytoplasm has been obtained and it in turn is being converted to a restorer of 33-16 sterile cytoplasm. Other lines could similarly be converted.

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1. A presumed stippled-Navajo compound R allele.

A new R allele has been isolated giving an aleurone phenotype resembling the effects of both stippled (R^{st}) and Navajo (R^{nj}). Pigmentation is restricted mostly to the crown region of the kernel, as in Navajo, but occurs in spots rather than a solid patch, as in stippled. The limited evidence at present available suggests that (i) the new allele reflects the action of R^{st} and R^{nj} when present in the