pollinations segregated in a ratio of three green to one pale midrib and the seedlings from the outcrosses were all completely green. These data are summarized in the table below.

	Temperature	Expression: Green	Expression: Pale midrib	Ratio	p
Selfed	Field	11	24	1:3	0.40
	21°-26°C day / 15°C night	12	21	1:3	0.10
	29°C day and night	25	7	3:1	0.70
W153R Outcross	Field	46	31	1:1	0.08
	21°-26°C day / 15°C night	19	14	1:1	0.35
	29°C day and night	48	0	---	----

It appears that at higher temperatures such as those encountered in the field, the pale midrib-2 gene acts either as a dominant or an incomplete dominant, while at lower temperatures it acts as a recessive. This difference may be controlled by the night temperature alone or by a combination of day and night temperatures. The expression of this mutant was compared to that of pale midrib-1 and was found to be considerably different. The expression of the recessive pm$_1$ is characterized by white streaks in the vicinity of the midrib. Allele tests and chromosome location studies are presently being conducted.

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2. Inheritance, environmental and preliminary linkage studies of the lutescent maize mutant.

It had previously been reported (MNL 39:146) that the expression of the lutescent character in maize resulted from a single recessive gene, probably located on chromosome 5. The location of a lutescent gene locus on the fifth chromosome has been confirmed. However, the expression of the character appears to depend on two recessive genes rather than on one. Furthermore, the expression of this trait was found to be temperature dependent.

The original lutescent material was outcrossed to two inbred lines, Oh51A and Pa423, and to one single cross, Pa32 x CMD5. F_2 and testcross populations were grown in Pennsylvania in the field and in the greenhouse in January and April, and in a growth chamber on a 16-hour photoperiod. The

temperatures maintained in the growth chamber were (a) 21°C day and 15°C night, (b) 26°C day and 15°C night and (c) 29°C day and night. Linkage studies were initiated using chromosome 5 markers $\underline{a}_2$, $\underline{bt}_1$ and $\underline{pr}$.

F_2 and testcross populations resulting from the several outcrosses did not provide consistent ratios of segregation. These data are summarized in the table below.

Outcross	Population	Phenotype		Ratio	p
		Green	Lutescent		
Oh51A	F_2 (all)	136	9	15:1	0.90
	Testcross (all)	372	138	3:1	0.30
Pa32 x CMD5	F_2 (all)	39	4	15:1	0.50
	Testcross (all)	110	42	3:1	0.40
Pa423	F_2 (field)	63	7	15:1	0.40
	F_2 (greenhouse or growth chamber)	94	31	3:1	0.95
	Testcross (greenhouse or growth chamber)	50	41	1:1	0.35
Waxy-marked translocations	F_2 (field)	259	78	3:1	0.45
Chromosome 5 markers	F_2 (greenhouse)	369	111	3:1	0.50

The segregations resulting from the Oh51A and the Pa32 x CMD5 outcrosses indicate that the lutescent expression depends on two recessive genes. These data include field, greenhouse and growth chamber populations. On the other hand, the F_2 populations resulting from the crosses with the waxy-marked translocation series, reported previously, produced a 3:1 segregation, suggesting a single gene. These were field-grown. The segregations of the progeny from the Pa423 outcross appeared to depend on the environment. When grown in the field, a 15:1 digenic F_2 segregation resulted, while in the greenhouse or growth chamber monogenic 3:1 F_2 and 1:1 testcross segregations were observed. The crosses between the chromosome 5 markers and the lutescent mutant resulted in a 3:1 segregation of normal to lutescent when grown in the greenhouse. However, when this material was grown in the field, a segregation of 2031 green to 298 lutescent plants were observed. This approximate 7:1 ratio suggests a combination of mono- and bigenic inheritance.

It is concluded from these data that two recessive genes are necessary for the expression of the lutescent character. They have been designated *lu*$_1$ and *lu*$_2$. One of these appears to be homozygous in some maize lines such as the waxy-marked translocation series. Furthermore, in certain genetic backgrounds, one of these genes (not necessarily the same one) appears to be affected by those growing conditions which differ between the field and the greenhouse or growth chamber.

Environmental studies carried out in a growth chamber indicate that temperature is a factor in the overall expression of the lutescent mutant. F_2 and testcross populations grown at 21°C day and 15°C night temperatures could not be scored visually. All plants appeared green. At 26°C day and 15°C night some plants in these populations were slightly paler than others, although it was not possible to determine clear-cut patterns of segregation. At 29°C, the lutescent expression was unmistakable and the populations could be scored with relative ease. These observations paralleled those obtained in the greenhouse. During the winter months when the temperature seldom rose above 21°C, F_2 and testcross populations could not be scored, while those populations planted in the greenhouse in the spring, when increased sunlight brought higher temperatures, could be scored. The expression of the lutescent trait under these conditions was not as intense as that observed in the field, however. To date all field work on this mutant has been carried out in Pennsylvania. It will be interesting to observe the effect of the New Mexico summer on the expression of this trait.

The small F_2 greenhouse population from the cross of lutescent with a stock carrying several chromosome 5 markers gave a definite indication of linkage between *lu*$_1$ and *a*$_2$, *bt*$_1$ and *pr*. Because the population was small, no accurate map distances could be calculated. However, based on the tables of Immer, the closest linkage appeared to be with *a*$_2$.

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3. A low temperature-chlorosis effect in Oh51A.

When seeds of inbred line Oh51A were germinated at low temperature, the leaves formed during the germination were completely devoid of chlorophyll. Seeds were planted in trays of moist vermiculite and kept in a cold box in the dark at 11±1°C for 21 days. By this time the coleoptiles were from 1 to 3 cm long and the trays were transferred to an illuminated growth chamber at about 29°C. The initial leaves which subsequently developed were completely chlorotic, while the second leaves were chlorotic at the tips. The chlorotic regions did not become green but remained very pale yellow and eventually died. Those leaves which formed later at the higher temperature were all green. Oh51A plants germinated in an illuminated growth chamber maintained at 10°C displayed the same pattern of chlorosis, so that temperature rather than light appeared to be the determining factor.

A number of other lines listed below, including both eastern and Texas inbreds, were tested for this low temperature effect.