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Phenotypic dosage effects of the *ae* and *wx* loci on mature kernel phenotype

C. W. Moore and R. G. Creech (MGCNL 43:140) reported that *Ae ae ae wx wx wx* kernels were tarnished waxy in appearance and smaller than either *Ae Ae ae wx wx wx* or *Ae Ae Ae wx wx wx* kernels but distinguishable from partially shrunken *ae ae ae wx wx wx* kernels. In studies of the interaction of these two loci, we have now observed all 16 endosperm genotypes of the dosage series. The W64A inbred (*Ae Ae Wx Wx*) and the *ae*, *wx*, and *ae wx* backcross conversions (backcrossed 9, 9 and 4 times respectively) were self-pollinated and crossed in all possible combinations. Phenotypes of the mature kernels are given in Table 1 using the terminology of Garwood and Creech (Crop Sci. 12:119, 1972).

Table 1. Effect of increasing doses of *ae* and *wx* upon mature kernel phenotype.

Doses of <u><i>wx</i></u>	Doses of <u><i>ae</i></u>			
	0	1	2	3
0	Full <sup>a</sup> Translucent	Full <sup>a</sup> Translucent	Full <sup>a</sup> Translucent	Semi-collapsed Tarnished <sup>c</sup>
1	Full <sup>a</sup> Translucent	Full <sup>a</sup> Translucent	Full <sup>a</sup> Translucent	Semi-collapsed Tarnished <sup>c</sup>
2	Full <sup>a</sup> Translucent	Full <sup>a</sup> Translucent	Semi-collapsed Tarnished	Collapsed Tarnished
3	Full <sup>b</sup> Opaque	Full <sup>b</sup> Opaque	Semi-collapsed Tarnished	Shrunken Translucent to glassy

<sup>a</sup>Normal appearing.

<sup>b</sup>Waxy appearing.

<sup>c</sup>Typical *ae* in appearance

Eight genotypes were normal in appearance as expected. *Ae Ae Ae wx wx wx* and *Ae Ae ae wx wx wx* had the typical waxy phenotype. The double mutant kernels were shrunken. We have observed that the phenotypes of these genotypes converted to W64A are often more extreme than observed in other backgrounds. In addition, phenotypes may be more extreme than typically encountered by other researchers due to cooler growing conditions encountered in Pennsylvania compared to other corn growing areas.

Dosage effects were apparent in the *Ae ae ae wx wx wx*, *Ae ae ae Wx wx wx*, and *ae ae ae Wx wx wx* genotypes. Appearance of *Ae ae ae wx wx wx* agrees with the observations of Moore and Creech. The *Ae ae ae Wx wx wx* genotype was clearly distinguishable from normal appearing genotypes and approached the *ae ae ae Wx Wx Wx* phenotype. The *ae ae ae Wx wx wx* genotype was clearly distinguishable from *ae ae ae Wx Wx wx* and *ae ae ae wx wx wx*. Similar dosage effects were observed in physicochemical examination of the starches of these 16 genotypes.

Dosage effects can be seen in material homozygous for either *ae* or *wx*; however, such effects are not apparent in material homozygous for *Ae* or *Wx*. Our observations coupled with other published studies of dosage effects involving other

endosperm mutants suggest that the majority of maize endosperm mutants considered to be dominant will exhibit dosage effects if observed when appropriately selected endosperm mutants are present as homozygous recessives.

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#### Sweet corn breeding questionnaire summary

Information has been compiled concerning (1) maintenance of publicly released su inbreds, (2) maintenance of publicly released du, sh2, and su2 inbreds in sweet corn backgrounds, (3) open pollinated sweet corn (su) variety maintenance, and (4) mutant genes being incorporated by backcrossing into sweet corn inbreds and varieties. Copies of the summary are available upon request. Information from individuals not previously contacted would be appreciated.

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PIONEER HI-BRED INTERNATIONAL, INC.  
Mankato, Minnesota

#### Progress report on lethal leaf spot (lls)

Dr. A. J. Ullstrup and I reported (Phytopathology 57:1282, 1968) a recessive lethal leaf spot whose lesions resemble H. carbonum race 1. The target-shaped lesions (concentric rings) begin on older leaves at the 5 or 6 leaf stage then spread and enlarge to kill the plant just before or shortly after pollen shed. Our efforts at Mankato on the trait since that report are as follows:

1. We have made allelism tests with hm. Because of the similar phenotype, we made tests with the recessive gene for susceptibility to H. carbonum race 1 in the presence of the disease. F<sub>1</sub> plants were normal and the two genes segregated with normal in F<sub>2</sub>, indicating they are non-allelic.

2. We have successfully selected for longer living plants. After ten years of selection, all lls plants shed pollen well; some even produce a few silks, but none have set seed. Our goal is to be able to maintain the stock by selfing.

3. We have tested two new sources of lls and found them to be allelic to the original. The first new source was also from Mankato (we do not think it was a contaminant) out of a background involving a cross of Oh43 by a Pioneer synthetic. The other new source (from Dr. D. N. Duvick of our organization) was in two or more stocks that had Confite Puneno (from Bolivia) in common. The Confite Puneno source dies before shedding, the original dies at about time of shed, and the Oh43 source usually sheds before dying. These differences in time of death are presumed to be due to modifiers that may also condition non-lls stocks.

4. We are trying to map lls. Dr. C. R. Burnham graciously provided 22 translocation stocks. Progenies of T1-3(5883) and T1-3(5982) deviated from expected backcross ratios ( $p=.05-.02$ ), indicating that lls is probably located on the short arm of chromosome one. Dr. R. J. Lambert provided marker stocks for chromosome one. Backcross ratios with bm2 (at the far end of the long arm) did not deviate significantly ( $p=0.30$ ) from 1:1:1:1. Two attempts to set up a three point test with br and sr have failed; we have not yet produced the double mutant (lls, sr) let alone the triple mutant. Perhaps lls is very close to sr or perhaps they are incompatible. We will keep trying.

5. We have observed other mutants from the Confite Puneno lls source, including: Pale green or yellowish seedlings that become normal colored when 2 or 3 feet tall, governed by a single recessive gene; double tassels due to a branched stem (usually above the ear), inheritance unknown; and a lethal leaf spot stripe occurring on three or four leaves (one stripe per leaf), usually including the ear leaf (the stripes are 1/8 to 1/2" wide, have straight edges, and contain lethal