**Overcoming agronomic shortcomings of "opaque-2" maize by selection for genetic modifiers**

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Maize grain is normally deficient in the essential amino acids lysine and tryptophan. The levels of these are significantly enhanced by the presence of the recessive gene opaque-2 (o2). However the introduction of this gene brings with it a number of agronomic disadvantages including reduced grain yield, soft endosperm, low grain density, susceptibility to ear rots and insect pests, slow drying rate, and increased risk of kernel damage during mechanical harvest. These disadvantages stem from the softer opaque endosperm. Opaque-2 maize would be far more readily accepted by commercial growers if its endosperm was less drastically altered, while retaining its higher levels of lysine and tryptophan. Utilization of genetic modifiers is the most favoured approach to achieving this end (Vasal 1975).

While introducing the o2 gene into a number of inbreds at Grafton, some homozygous o2/o2 segregates with modified-endosperm phenotypes were observed. Kernels of these 'modified-opaque' segregates contained varying proportions and patterns of vitreous translucent endosperm. A segregate (A) with small opaque islands embedded in vitreous endosperm, and another (B) with the upper third of each kernel consisting of vitreous endosperm, were selected for further back-crossing. Crude protein and lysine contents of kernels from these two recoveries, the recurrent parent inbreds, and the single-cross hybrids, are shown in Table 1 (Lewis pers.comm.), where they are compared with a 'modified-opaque' line bred in Illinois (Dudley et al. 1975).

**TABLE 1. Grain protein and lysine contents of normal (+/+) and modified-opaque *(o2/o2)* near-isogenic lines and their hybrid, compared with a modified-opaque line (OH43) from Illinois.**

| | Inbred A | | Inbred B | | A x B | | OH43 | |
|---|---|---|---|---|---|---|---|---|
| | *+/+* | *o2/o2* | *+/+* | *o2/o2* | *+/+* | *o2/o2* | *+/+* | *o2/o2* |
| Crude protein (%) | 10.9 | 9.2 | 9.8 | 8.9 | 11.3 | 9.5 | 9.7 | 13.0 |
| Lysine (g/100 g CP) | 2.3 | 4.1 | 2.7 | 4.2 | 2.2 | 3.2 | 2.7 | 3.8 |

The 'modified-opaque' version of inbred A in particular is very similar in kernel appearance to its normal counterpart. The 'modified-opaque' endosperm of inbred B has less vitreous starch than that of inbred A, and the hybrid between these two lines tends to fall mid-way between the parents in endosperm appearance. From these preliminary results, and overseas observations (Vasal 1975), it appears that the utilization of genetic modifiers will allow opaque-2 maize to be commercially feasible, producing grain similar to normal field maize, with the advantage of significantly higher levels of lysine and tryptophan.

Dudley, J.W., D.E. Alexander, and R.J. Lambert (1975). CIMMYT-Purdue Internat. Symp. on Protein Quality in Maize, El Batan, Mexico, 1972. (Dowden, Hutchinson & Ross: Penn U.S.A.) :120.

Vasal, S.K. (1975). CIMMYT-Purdue Internat. Symp. on Protein Quality in Maize, El Batan, Mexico, 1972. (Dowden, Hutchinson & Ross: Penn U.S.A.) :197.