Abstract

Seed vigor and viability preservation during storage is an important concern for the conservation and management of valuable seed germplasm and elite genotypes. In this work, maize seed lines, accessions and crosses with different storage characteristics have been analyzed for differences in viability and vigor losses in order to elucidate the genetic basis of storage performance. Mean Generation Analysis (MGA) indicated that viability is inherited in a nuclear and recessive fashion, while vigor may be inherited in a maternal and codominant way. In F1 wide crosses a maternal influence determined good storage characteristics. The embryo polyamine titre was not correlated with good storability. There was some evidence of an increase in the DNA alkali sensitive sites during late stages of viability decline, as evaluated by electrophoresis of high molecular weight DNA. The higher proportion of abnormal seedlings observed in the cultivar with poor storage characteristics is consistent with the finding that the duration of the "labile" period is longer for this cultivar.

A transition from low rate of germinability decline to a high rate of decline of seed survival as a function of seed moisture content coincides with the moisture content at which there is a de-vitrification transition.

The sugar profiles of maize axes were determined by high performance liquid chromatography and gas chromatography. A decline in the monosaccharides galactose and glucose was detected during seed storage under sterile conditions at 30°C. A decline in raffinose might promote sucrose crystallization, an event not necessarily favorable for seed survival. The decrease in monosaccharides might be a reflection of progressive involvement in the Amadori reaction. A selective survival of recombinant F2 genotypes was detected by isozyme allelic frequency. This suggests that there are particular genetic combinations more fit for survival during storage.

The storage performance distribution among recombinant inbred lines, the F4 generation from a cross between good storing and poor storing lines, showed 13 out of 37 lines segregating for poor germinability. The vigor loss distribution was uniformly graded. These results suggest that viability might be determined by a simpler genetic mechanism than the one that determines vigor.