A STUDY OF THE CAUSES OF SEED DETERIORATION FOLLOWING PROCESSING IN MAIZE (*Zea mays* L.)

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To my wife, Ruth

and daughter, Ruby Ann,

this piece of work is dedicated.

ABSTRACT

This experiment was designed to study the influence of commercial maize seed processing on seed quality. In particular, it aimed to determine:

1) the particular stage or stages of processing which could be responsible for a reduction in seed germination,
2) whether seed cracking contributes to the problem of seed deterioration after storage,
3) which of the various stages of processing seed cracking occurs,
4) possible ways of reducing seed damage caused by seed processing.

The results showed that seed processing adversely affected seed quality. The damage which occurred, however, did not cause any immediate reduction in seed viability but was strongly implicated in hastening seed deterioration in storage.

The stages of seed processing which most likely contributed to a reduction in seed germination following storage were cob drying, seed drying, shelling and the final stages of dressing, grading and treating. Hybrid XL72aa was less susceptible to processing damage than Hybrids D54 and XL81 although the former had less potential to germinate as indicated by its lower initial seed germination.

Remarkable levels of stress cracking occurred due to seed drying. In this particular experiment, stress cracking had no direct damaging effect on essential seed structures even though it hastened seed deterioration in storage depending on the type of cracks. Stress cracks which were not seen by X-ray in a longitudinal position but which could often be seen visually did not affect seed viability after storage for 12 months. This kind of crack appeared as tiny shallow cracks in a transverse line in seeds on an X-ray plate. Similarly, fissures located outside the germ area as revealed by X-ray radiography had no adverse effect on seed viability after storage. However, cracks which were detected by X-ray along the side or extending into the germ area seriously reduced seed viability in storage.

X-ray radiography is a useful technique for determining the specific location or magnitude of seed cracking in maize and can be used to critically assess the likely affects of seed cracking on seed storage longevity.

Machine shelling at a seed moisture content of 22% produced more broken seeds than shelling at either 18% or 14% moisture content.

After ear drying, tempering of the ears before shelling reduced the level of stress cracking after seed drying, particularly at temperatures of 30 C and 20 C. Generally, the germination after storage was higher in seeds from tempered ears before shelling than from ears which were not tempered at this stage.

Reducing seed drying temperature from 40 C to 20 C drastically reduced the levels of stress cracking and resulted in better seed viability after storage. Seed drying starting with a initial seed moisture content of 14% at 30 C or 18% at 40 C reduced the level of stress cracking.

After seed drying, seed tempering at the same drying temperature of 40 C did not reduce stress cracking but did reduce seed viability after storage. Seed tempering at a drying temperature of 30 C reduced stress cracking and resulted in higher seed viability after seed storage compared with non-tempered seeds. Tempering had no effect when seeds were dried at 20 C.

This study has clearly shown that mechanical seed processing is a major contributory cause of reduction in seed quality. Although seed damage may not be evident before seed storage it is clearly involved in hastening seed deterioration in storage. The study concludes that particular attention to ensure artificial seed drying at a relatively lower temperature and lower initial seed moisture content and tempering, play an important part in ensuring that seed damage and deterioration are both greatly reduced.

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