SEED QUALITY AND STORAGE PERFORMANCE OF WHEAT (*Triticum aestivum*.) AND SOYBEAN (*Glycine max* (L) Merrill)

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ABSTRACT

Five seedlots of wheat (*Triticum* spp.)cvs. Norseman, Otane, Karamu and two unknown cultivars, and four seedlots of soybean (*Glycine max* (L) Merrill)cv. Davis, two seedlots of cv. CH187 and one unknown cultivar were assessed for prestorage quality by using different laboratory methods ie purity, thousand seed weight, seed moisture content, germination, accelerated ageing, conductivity and seed health. The results of this study showed quality differences between seedlots of both wheat and soybean. Using seed germination and vigour data, three lots of wheat with high quality, two seedlots of soybean with high quality and one seedlot with low quality were chosen and adjusted to two different seed moisture contents (10% and 14% in wheat ,and 8% and 12% in soybean). Seed samples of both species were stored in open storage (muslin bags) or sealed storage (aluminium foil packets) at 20°c 75%RH or 30°c 50%RH for 8 months. All wheat seedlots and two soybean seedlots were also stored under open storage at 30°c 95%RH. Seed quality was assessed at intervals of 1, 2, 4, 6 and 8 months.

The seed moisture content of both species in open storagechanged to reach equilibrium moisture content (EMC) with the prevailing relative humidity. At 30°c 95%RH moisture content of wheat and soybean seeds increased up to 18.5-20.5% and 22-23%, respectively while at the same temperature but lower RH (50%), SMC fell to 8.2-8.5% and 5.2-5.5%, respectively. Both low and high initial SMC of seed stored at 20°c 75%RH either increased or decreased to reach an EMC of 12.8-13.6% for wheat and 9.8-10.1% for soybean. Under sealed storage at different storage temperatures and relative humidities SMC did not change from initial levels.

At 20°c 75%SMC the type of storage container had no significant effect on germination percentage or conductivity in wheat and soybean after 8 months. At 30°c, however, the germination percentage of wheat and soybean with high initial SMC in sealed storage and in open storage high RH declined more rapidly during storage than the other treatments. Germination percentage correlated reasonably well with conductivity, with conductivity readings increasing as vigour decreased. At 30°c 95%

both open and sealed storage at high initial SMC resulted in seed showing a conductivity value increase with longer storage time, indicating seedlot deterioration.

All field fungi were eliminated from seed open stored at 30°c 95% but storage fungi developed rapidly in all seedlots after two months. The main genus involved was *Aspergillus* spp. but Penicillium spp. were also found at low levels in soybean. However, under 30°c 50%RH and 20°c 75%RH storage conduction field fungi levels in wheat and soybean were reduced during storage and seed was either disinfected or remained infected at only low levels after 8 months storage. The main field fungus present in wheat was *Fusarium* spp.. In soybean both *Fusarium* spp. and *Alternaria* spp. survived well along with low levels of *Colletotrichum* spp..

The implications of pre-storage seed quality, seed moisture levels and storage environment and their effects on seed deterioration rate and extent are discussed. The role of field and storage fungi in affecting loss of seed viability in storage and the possibility of exploiting the storage environment to obtain pathogen free seed for planting is also considered.

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INTRODUCTION

Seeds are normally stored sale for some time prior to sale or planting. It is therefore very desirable that they are of guaranteed high quality when they reach the growers. It is impossible to improve seed quality by storage as seed deterioration occurs naturally and continuously after reaching its highest potential usually attained at physiological maturity (Delouche,et al.1973). However, the rate of deterioration loss can be minimised. Obviously it is no use storing worthless seed. Testing is therefore important to determine whether a seedlot should be distributed or discarded or whether it should be sold first based on its storability relative to other seedlots. Test results can be used to predict which seedlots are most suitable for short term or long term storage and also to detect cause of poor quality. Seed testing and predict on helps the seedsman manage and control storage to reduce seed quality loss.

Wheat (*Triticum* spp.) is one of the main cereal crops in term of volume and weight in the worldwide trade of foods and feeds. Nowadays there is an increasing interest in domestic production of wheat in tropical countries such as Thailand. Wheat is grown in the dry winter season and seeds must be stored until the next winter's planting approximately 5 - 8 moths. However seeds still deteriorate continuously. Therefore, storage condition is important. If the storage condition is unsuitable, deterioration accelerates rapidly. Unfortunately, in Thailand seed storage facilities are often poor. In addition, the hot and humid tropical climatic is also a problem, since both temperature and relative humidity are often too high for seed viability maintenance.

According to Bewley and Black (1985), wheat contains approximately 10% protein, nearly 2% of fat and 70% starch. Although fat and protein content in wheat are lower than those of soybean (37% protein, 17% fat and 26% starch), it is also a species which is tolerant to adverse storage conditions.

Soybean (*Glycine max* (L.) Merrill) is one of the worlds most important legume crops, and Thailand is currently encouraging farmer production. It is normally planted after the rice harvest and hence the seed must be stored before being sown in the next planting season (approximately 9 months). Soybean's high oil content often

results in it deteriorating rapidly (Burris,1980) especially under the hot and humid tropical storage conditions. When soybean seed is stored at high temperature or high seed moisture level, germination declines more rapidly than if it is stored under cooler, drier conditions (Toole and Toole,1946; Burris,1980). The provision of such storage conditions in the tropics may be expensive and difficult to control but the ability to control seed moisture content and storage temperature, possibly by the use of sealed packaging, has the potential to provide successful seed storage with the maintenance of both high germination and vigour for an extended period. Also, accurate quality testing at frequent intervals and prediction of likely deterioration can both help to avoid the loss of inventory.

The objectives of this study were to determine:

1. the usefulness of different laboratory methods in assessing prestorage history in soybean and wheat seedlots.
2. the effects of different storage conditions on seed deterioration rate.
3. the differental rates of deterioration between soybean and wheat.