QUALITY CHANGES IN GRAIN UNDER CONTROLLED A TMOSPHERE STORAGE

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ABSTRACT

A review of recent literature largely confirms the conc1usions drawn in an earlier review in 1981 concerning the effects of controlled atmospheres on stored grain. Seed longevity in storage is influenced mainly by temperature and moisture content and gases playa minor roles. At constant temperature and relative humidity (r.h.), seed viability is decreased by the presence of oxygen (O_2) in the range of 0-21 %. Seed germination, milling and baking characteristics of wheat, and the germination, milling, and cooking properties of rice are unaffected in 6 months when the grain is dry and atmospheres comprise 0.5% O_2, 9-9.5% carbon dioxide (CO_2), and 90% nitrogen (N_2). Malting barley is apparently unaffected by controlled atmospheres although some reports indicate a negative effect of high N_2 on seed germination because of pre-germination. Endosperm yellowing in paddy (rough rice) is caused by elevated temperature and relative humidity with controlled atmospheres (high CO_2) having little effect on yellowing. Controlled atmospheres do not affect the slow rise in free fatty acids in dry grain that occur in air storage, but the normal, rapid increase in moist grain is slowed. The storage of wet grain under controlled atmospheres has positive effects, slowing germination loss, maintaining grain quality longer than air storage, and inhibiting fungal growth. Atmospheres >20% CO_2 inhibit fungi in dry grain and 80% CO_2 is needed in wet grain; 20 to 60% CO_2 reduces mycotoxin production. Yeast and yeast-like fungi can survive at <0.5% O_2 and lactic bacteria can become active anaerobically at >90% RH causing fermented and tainted products. Controlled atmospheres of elevated CO_2 and depleted O_2 are beneficial to dry grain (inc1uding malting barley and seed grain) in long-term storage and wet grain in short-term storage.