Title Estimation of safe storage periods for malting barley using a model of heat production based on respiration experiments.

Authors Jacobsen, E. E. and Fleurat-Lessard, F.

Citation Advances in stored product protection. Proceedings of the 8th International Working Conference on Stored Product Protection, York, UK, 22-26 July 2002 (2003); 456-463

Abstract

The respiration of grain is closely associated to heat production that mainly resulted from the combination of unfavourable storage conditions (temperature and moisture content (m.c.)). In addition, temperature and moisture content are the prime factors affecting the germinative capacity of malting barley. The possibility of describing the respiration of malting barley by way of a mathematical model based on these two measurable factors was investigated. The effects of temperature (range 10-39 deg C) and moisture content (range: 15-25% wet basis) (converted to water activity, Aw) on the respiration of barley was investigated experimentally. A mathematical model based on the two controlled variables was developed from the experimental data for the estimation of oxygen (O_2) consumption and carbon dioxide (CO_2) production. A general equation for O_2 consumption (O_2 cons) or CO_2 production (CO_2 prod) was: ln(respiration temperature)=a+b(Aw). This model showed highly significant correlation coefficients of 0.982 and 0.974 for O_2 cons and CO_2 prod, respectively. Oxygen consumption was converted into heat production using theoretical conversion factors. This second formula enabled the calculation of the rise of grain temperature to the limit of 35 deg C, which corresponded to the threshold for the deterioration of seed viability. It was then used to create another model, usable graphically or by computer, and enabling the assessment of the "safe storage life" of malting barley as dependent on moisture content and temperature.