

## Advanced Grain Storage Methods for Quality Preservation and Insect Control Based on Aerated or Hermetic Storage and IPM.

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Journal of Agricultural Engineering. (2012), 49, 1, p. 13-20.

### Abstract

The grain industry is facing serious problems of insect and mite contamination due to restrictions placed on the use of chemical pesticides because of adverse effects of pesticide residues in grain and environment, resulting in strict limitations on pesticide registration by regulatory agencies. Consumer demand for chemical-free and insect contamination-free products is a general tendency, with which the grain industry finds it difficult to conform. In addition, in many countries, insects in particular have been developing resistance to contact insecticides and to the conventionally used phosphine gas. In temperate and cold climates, the most common non-chemical alternative to pesticides for cereal grain stored in bulk is the use of aeration systems during the winter that can effectively reduce grain temperature. In summer, refrigeration provides an excellent solution for quality maintenance of grain. In warm climates, for cereal grain stored in bags or in bulk, a new gaseous application technology that has successfully replaced fumigants is the manipulation of modified atmospheres (MAs) using biogenerated MAs, for insect control and for quality preservation of dry cereal grains and high moisture corn. Freshly harvested high moisture corn was successfully stored under hermetic conditions, thereby maintaining its quality prior to subsequent drying or processing into feeds or ethanol. These niche applications of MAs have resulted in very promising treatments with market acceptability. A new approach to the use of pheromones is the monitoring of insects based on remote sensing electronic transmitters that are progressively integrated into control programs. An IPM program that might integrate insect monitoring, aeration in winter, chilling with refrigerated air in summer in grain silos, biogenerated MAs, for insect control and for quality preservation of grain, and assisted MAs during storage of grain and at the final stages of the processed grain before packaging is proposed.