CONTROLLED ATMOSPHERE STORAGE RESEARCH AND TECHNOLOGY IN CANADA

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Limited work was done in the past on modified atmospheres for control of stored-grain pests in Canada because of the effectiveness of phosphine, methyl bromide and the liquid fumigants, and the relatively high cost of carbon dioxide at $1000 US/tonne in Canada compared with $160 US/tonne near large production facilities in the United States.

Work by E. J. Bond and colleagues in London, Ontario focused on the effects of oxygen levels on fumigant toxicity to insects, on carbon dioxide synergism with fumigants at low temperatures, and the development of resistance to carbon dioxide in the *Sitophilus granarius* (L.). Fears of fumigant hazards to applicators and consumers, and slowly increasing resistance to phosphine have led to our current research in Winnipeg on modified atmospheres for pest control in stored grain. Numerous laboratory and small bin studies have defined the effects of elevated carbon dioxide (10 to 50%) and depleted oxygen (>10%) on stored-grain ecosystems (seed, microflora, insects, and mites) at warm and cool temperatures. Laboratory equipment has been constructed to observe the response of several insect species. A 3-D computer model to describe CO_2 diffusion in grain is being developed and verified. The aim of current research is to develop and integrate 3D models for CO_2 diffusion, temperature change, and moisture movement in bulk grain to predict the amount of CO_2 and length of time needed for pest control.