

FACTORS GOVERNING SORPTION AND DESORPTION OF FUMIGANTS ON GRAIN

H. J. BANKS

*CSIRO, Division of Entomology, Stored Grain Research Laboratory, GPO
Box 1700, Canberra ACT 2601, Australia*

Grain takes up fumigant by several physical and chemical processes. This sorption influences some important aspects of fumigation. In particular, it affects the concentration produced and thus effectiveness of a dosage of fumigant, the rate at which fumigant disperses through a bulk, the rate and magnitude of the formation of fixed residues and the time taken to air fumigant from treated grain. Because of this influence, understanding the mechanism and kinetics of sorption is fundamental to the good conduct and rational improvement of fumigation.

The rate and magnitude of sorption is a function of the grain variety, its condition and history, prevailing temperature and water activity and the properties of the fumigant. Mechanistically, the rate of sorption of common fumigants can be described by an initial diffusion-controlled phase and a subsequent reaction phase. A mathematical description of this mechanism can act as a model for quantifying the influence of the various factors from laboratory-deprived sorption data.

Studies are in progress to determine the sensitivity of the diffusion constant and reaction rate for various fumigant/substrate combinations so that quantitative models of fumigant dispersion in and airing from grain bulks can be produced. Data on reaction and diffusion rates of methyl bromide and phosphine in wheat, and on the influence of moisture changes in phosphine sorption are given