

## RESPONSES OF STORED PRODUCTS INSECTS TO PHOSPHINE

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Phosphine, a major fumigant currently in use for grain protection has two drawbacks, (1) the longer exposure period necessary to obtain control and, (2) the problem of insect resistance. In recent years, there has been increasing concern over the interactions of phosphine with stored products insect pests and research has been conducted to (1) elucidate its mechanism of toxic action, (2) understand the mechanisms by which the insects detoxify and develop resistance to the fumigant, and (3) to maximize the efficacy of phosphine in the control strategy. Based on recent literature and author's findings, the various responses including mortality, narcosis, reduced uptake/active exclusion of phosphine, inhibition of respiration and reproduction and changes in development and behaviour. These responses will be discussed along with the influences of other fumigants, atmospheric gases, irradiation, and the effects of pre- and post-treatment temperature changes.

The mode of toxic action of phosphine is not unequivocal as revealed by *in vitro* and *in vivo* studies which do not always concur. The responses of phosphine treated insects seem to be different from those exposed to HCN or nitrogen (anoxia). The mortality response to phosphine dosages varies widely between species and between the life stages of same species and it showed heterogeneity at the higher response levels. The response of insects to constant and changing concentrations of phosphine needs further attention. Only carbon dioxide up to certain concentration limits improved the toxic action of phosphine. Although resistance occurs readily following repeated phosphine treatments, it is not expressed at the same level in all stages of the same species.