

LIMITATIONS FOR INFESTATION CONTROL IN COOLED BULK  
GRAIN AND A STRATEGY TO OVERCOME INHERENT SEALING AND  
GAS DISTRIBUTION PROBLEMS USING PHOSPHINE GAS

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The tolerance of 5 important grain pests to phosphine at 10°C and below was assessed in the laboratory. Older stages of *Sitophilus granarius* were highly tolerant of the combination of cold and exposure to phosphine and survived exposures of over 3 weeks duration at phosphine concentrations above 0.7 mg/l at 5 - 7.5°C. As a result fumigation with phosphine at temperatures below 10°C can only be recommended if *S. granarius* is absent. The other species tested were all killed by a 12-day exposure to 0.1 mg/l phosphine.

A sensor-controlled automated dosing system originally developed for use with methyl bromide mill fumigations has been modified for use in phosphine fumigations of bulk grain. A new sensor based on an electrochemical cell has been incorporated into the system to monitor phosphine concentrations within the ranges encountered in commercial fumigations. The dosing system has been tested in the laboratory and in one recent field trial on a 470 tonne bulk of grain. The system offers the potential of maintaining adequate gas concentrations of phosphine throughout the long exposure times required for phosphine treatments at low temperatures, by countering gas losses caused by adverse weather conditions and inherent sealing problems.