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PHYTOTOXICITY OF ETHYL FORMATE, CARBON DISULFIDE AND SULFURYL FLUORIDE — LABORATORY STUDIES AND SEED STORE TRIALS WITH CARBON DISULFIDE AND VAPORMATE™

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ABSTRACT

The germination and plumule vigour of wheat, barley, paddy, sorghum, maize, mungbean, soyabean, safflower and cotton seeds treated with ethyl formate (EF), carbon disulfide (CS₂) and sulfuryl fluoride (SF) were investigated. Unlike methyl bromide, at high doses EF and CS₂ had no effect on germination and plumule length, eg. 120mg L⁻¹ of EF for 72 hours exposure and 80mg L⁻¹ of CS₂. The pulses appeared more tolerant to SF eg. there was no effect on germination and plumule length of mungbean, soybean and peas at 50mg L⁻¹ of SF for 48 hours exposure. However, the germination and plumule length of wheat, barley, rice and sorghum were slightly decreased when the exposure time was > 48 hours at 30mg L⁻¹. Therefore, EF and CS₂ performed better where the maintenance of seed viability is desirable.

In January 2000, a sealed bin (60m³ capacity) containing wheat, barley, paddy, sorghum, mungbean and canola seeds, with loading rate about 25%, was fumigated with CS₂ at a dose of 35mg L⁻¹, at a seed temperature of 30-35°C for 5 days. All the tested mixed aged insects such as *Callosobruchus phaseoli*, *Tribolium castaneum*, *Rhyzopertha dominica*, *Sitophilus oryzae* and *Psocids* were killed, and the germination and plumule lengths were not affected.

In December 2002, a semi sealed seed store (260m³ capacity), 30% loaded with newly harvested seeds of barley, wheat and sorghum, was treated with Vapormate™ (EF+CO₂). In total, 40kg of Vapormate™ containing 6.85kg of EF was applied in 4

doses (within 20 hours) to achieve a relatively constant EF concentration of 19-23g/m³ for about two days. All tested mixed aged insects, namely *Callosobruchus phaseoli*, *Tribolium castaneum*, *Rhyzopertha dominica*, *Sitophilus oryzae* and *Psocids* were controlled. During the fumigation period, the concentrations of EF in the adjacent stores and 1m and 3m from the front door of the fumigated store were 5-25ppm lower than the Threshold Limit Value (TLV) of 100ppm. Vapormate™ had no effect on the germination of the stored seeds.