

Title Kinetics of diatomaceous earth (Fossil-Shield(R)) uptake by *Callosobruchus maculatus* (F.)
(Coleoptera: Bruchidae).

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Citation Advances in stored product protection. Proceedings of the 8th International Working Conference on
Stored Product Protection, York, UK, 22-26 July 2002 (2003); 200-207

Abstract

Fossil-Shield is an industrial diatomaceous earth (DE) which is recommended for grain and surface applications. *C. maculatus*, the cowpea weevil, picks up the DE particles as it moves through the dust-treated grains. Mn⁺² ion was used as a tracer element to detect the amount of DE accumulation on the bodies of male and female insects over 4 days at dosages of 500, 1000 and 2000 mg/kg. The amount of Mn⁺² in the accumulated DE was analysed by inductively coupled plasma spectrometry (ICP). Before the Mn⁺² was used as a tracer, the natural Mn⁺² content of the insects' bodies was evaluated. The kinetics of DE uptake were analysed using three different types of kinetics models. The kinetics of Fossil-Shield uptake by a cowpea weevil can be determined more precisely by using the two compartment model than by using the one- or three-compartment models. Therefore, it can be concluded that DE uptake occurs as a two-site reaction. First, pick-up and loss happens quite rapidly. Second, picked-up DE particles are incorporated into the cuticle lipid layer. It is also significant that Fossil-Shield is effectively adherent to mung bean kernels to about 90% (wt/wt).