

Title Efficacy of different natural and synthetic silicas against two stored grain pests: *Sitophilus granarius* (L.) and *Sitophilus oryzae* (L.)

Author T. Mucha-Pelzer, I. Mewis and CH. Ulrichs

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Abstract

The development of non-chemical pesticides, e.g., physically active substances such as diatomaceous earth (DE) is promising. The purpose of the present study was to compare the efficacy of different silica products against two stored insect pests, the granary weevil, *Sitophilus granarius* (L.), and the rice weevil, *Sitophilus oryzae* (L.), under different environmental conditions. Different AL-06-formulations (developed at Humboldt University) were compared with commercial DE products Fossil Shield[®] (FS100, FS90.0s and FS80p) and three synthetic amorphous silica formulations (SAK). The experiments were conducted in Petri dishes with and without food under different climate conditions. Mortality and mass of the beetles were recorded over time. The mortality rate was determined after 1, 2, 4, 7, 14, and 28 d. The highest *S. granarius* mortality, with 92% after 48h, was achieved with a commercially available SAK. This study indicates that SAK can effectively control *S. granarius*. The hydrophilic DE FS100 and another SAK failed to control the beetles effectively. Beetle mortality rate increased with dosages of all materials. Feeding material increased survival time significantly, most likely because beetles were able to metabolize water from the food. Four of the DE products decreased the beetle population within 14 d to less than 50% and within 28 d to 15%, respectively. The poor performance of some formulations was due to the loss of insecticidal efficacy as a consequence of water saturation of these hydrophilic substances when held in higher humidity. The application products consisting of smaller particles resulted in generally higher mortality rates than the use of DEs with larger particles. Further studies are planned to identify water saturation effects.