

Title Diatomaceous earths enhance the insecticidal effect of bitterbarkomycin against stored-grain insects

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Abstract

The insecticidal effect of bitterbarkomycin (BBM), a plant extract from the roots of the plant *Celastrus angulatus*, was evaluated as a stored-grain protectant when used either alone or in combination with diatomaceous earth (DE). Bioassays were carried out in the laboratory, against adults of the maize weevil, *Sitophilus zeamais* (Motsch.) (Coleoptera: Curculionidae), the red flour beetle, *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae) and the rusty grain beetle, *Cryptolestes ferrugineus* (Steph.) (Coleoptera: Cucujidae). Quantities of wheat were treated with five dose rates of BBM, ranging from 0.0375 to 0.0875 ppm, or five doses of DE, ranging from 71.25 to 166.66 ppm, and five dose rates of their combination, the formulation DEBBM. Mortality was evaluated after 5, 7 and 14 d of exposure in the treated wheat, while after 50 d the capacity for progeny production was also evaluated. For *S. zeamais*, mortality on wheat treated with BBM or DEBBM was higher than that of DE alone, in all exposure intervals tested. After 14-d exposure >90% of the exposed individuals of this species were dead at doses ≥ 125 ppm of DEBBM. For *T. castaneum*, with the exception of few cases, mortality caused by DEBBM was significantly higher than that caused by DE or BBM. After 14 d of exposure, mortality was >90% on wheat treated with ≥ 100 ppm of DEBBM. *C. ferrugineus* was the most susceptible species from the three species tested, and mortality was 90% after 5 d of exposure, even at the lowest DEBBM dose. The increase of dose significantly decreased progeny production in the treated substrate, but the higher rate of this reduction was noted for DEBBM. Our results indicate that DEBBM can be used with success at low dose rates against the three species tested in stored-grain commodities.