Title Efficacy of surface applications with diatomaceous earth to control *Rhyzopertha dominica* (F.) (Coleoptera: Bostrichidae) in stored wheat

Author Erika A. Vardeman, Frank H. Arthur, James R. Nechols and James F. Campbell

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Abstract

Commercial formulations of diatomaceous earth (DE) products labeled for use as grain protectants usually specify on the label the depth for using them as a surface treatment, which is often 30.5 cm. An experiment was conducted at two temperatures (27 and 32 °C) and three exposure intervals (7, 10 and 14 d), at a relative humidity of 57–60% to determine if *Rhyzopertha dominica* (F.), the lesser grain borer, could penetrate a 30.5-cm layer of wheat treated with the labeled rates of three commercial formulations of DE, and, if so, to measure rates of adult survival and progeny production. When *R. dominica* adults were introduced to this surface layer of 30.5-cm wheat admixed with DE, they were able to penetrate the DE-treated layer and oviposit in the untreated wheat below. Both adult survival and progeny production were significantly lower in wheat with a surface-layer treatment of Dryacide® (1000 ppm) as compared to Insecto™ (500 ppm), Protect-It® (400 ppm) or the untreated control. Temperature and exposure interval had no effect on adult survival or progeny production. The vertical displacement patterns of adults were significantly different among DE treatments, but not for temperature or exposure intervals. More *R. dominica* traveled a greater distance in the untreated control, followed by Insecto™, Protect-It®, and then Dryacide®. Results indicate that *R. dominica* can penetrate a surface layer of DE-treated wheat and reproduce within and below it, but it is possible that pest suppression is dose dependent, or it may depend on a combination of application rate and specific DE formulation.