

Evaluation of Iranian diatomaceous earth in combination with nanosilica from sugarcane bagasse ash applied on three different storage surfaces against two insect pests of stored products

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International Journal of Tropical Insect Science 41: 1747–1752. (2021)

Abstract

Mamaghan, local diatomaceous earth (DE) from Iran, was evaluated for controlling two storage beetles, *Tribolium confusum* Du Val. and *Rhyzopertha dominica* (F.). The effect of DE was enhanced by adding 15 and 20% nanosilica synthesized from bagasse ash sugarcane byproduct. Sugarcane bagasse is potentially used as natural silica resources, and nanosilica was synthesized by the sol-gel technique. Nanosilica, untreated Mamaghan DE, and Mamaghan DE treated with 15% and 20% nanosilica were used in the experiments. The formulations were applied on three surfaces, including concrete, galvanized steel, and mosaic tiles. Mortality of adult insects was recorded after five days of exposure interval. Results revealed that in galvanized steel, and mosaic surfaces adding 20% nanosilica to the Mamaghan DE caused the highest insecticidal activity of both insect species. In contrast, for the concrete surfaces, Mamaghan-15% nanosilica had the same insecticidal activity as Mamaghan-20%. The overall mortality of insects was 56.7, 66.6, and 48.9% for *T. confusum* on concrete, galvanized steel, and mosaic surfaces, respectively. While for *R. dominica*, the mortality percentage was 83.3, 95.5, and 77.8% on three tested surfaces, respectively, indicating that *R. dominica* was more sensitive to the DE than *T. confusum*. Our findings illustrated that nanosilica from sugarcane bagasse enhanced the insecticidal potential of Mamaghan DE against *T. confusum* and *R. dominica* compared with untreated Mamaghan DE.