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A game changer: synthetic amorphous silica for protection from stored grain pests

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ABSTRACT

Keeping in mind high recommended dosages of diatomaceous earth (1,000 to 3,500 ppm) which can adversely affect physical and mechanical properties of grain and its wide-scale application as a stored-grain protectant, novel food grade synthetic amorphous silica (SAS) was tested for the first time in laboratory and field to assess its insecticidal properties against major stored grain pests including both phosphine susceptible and resistant strains in four major grain commodities. For comparison study, Dryacide®, Absorbacide® and Diafil 610® commercial diatomaceous earth formulation were selected. For preliminary selection of best performing SAS based MU powder, 19 powders were tested against *Lasioderma serricorne* (F.), *Tribolium castaneum* (Herbst), *Sitophilus oryzae* (L.) and *Rhyzopertha dominica* (F.) at 150 ppm. Based on their performance on all four stored grain insects, four best performing SAS powders were selected. These were than further subjected to laboratory trials with lower rates using above mentioned species, along with *T. castaneum and R. dominica resistant strains, Cryptolestes pusillus* (Schönherr), *C. ferrugineus* (Stephens) and *Oryzaephilus surinamensis* (L.). For *C. pusillus* and *C. ferrugineus,* 100% mortality can be seen from second day at 50 ppm. For *O. surinamensis* and *L. serricorne* 100% mortality was observed at 50 ppm within 7 d. For *T. castaneum, R. dominica* and *S. oryzae* 100% mortality was achieved at100-150 ppm within 7 d of treatment. Similar data were found to be for strong resistant *T. castaneum* and weak resistant *R. dominica.* For the effect of SAS on different grain commodities, the mortality of *T. castaneum*, *S. orzae* and *R. dominica*, were similar in barley when compared to wheat. In case of oats *S. orzae* and *R. dominica* were equally effective as in wheat but mortality of *T. castaneum* in oats showed reduction by 10%. Thus, we concluded that SAS based MU powder could be game changer for stored grain protection.

Keywords: Synthetic amorphous silica, Grain, Wheat, Diatomaceous earth, *Rhyzopertha dominica*, *Tribolium castaneum , Sitophilus oryzae,* Stored grain pests