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Research

Research Project: [INTEGRATED MANAGEMENT OF INSECT PESTS IN STORED GRAIN AND IN PROCESSED GRAIN PRODUCTS](#)

Location: [Biological Research](#)

Title: EVALUATION OF SPINOSAD AS A GRAIN PROTECTANT ON THREE KANSAS FARMS

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Interpretive Summary: Insecticide resistance has appeared in field populations of the lesser grain borer, a devastating insect that commonly infests stored grain in Kansas and other regions of the world. Additionally, the most widely used insecticide for use on stored wheat has been phased out of production. A newly approved and environmentally friendly insecticide, spinosad, was tested on Kansas farms and in laboratory studies to examine efficacy and persistence under typical field conditions. In the field tests, no live lesser grain borers were found in any grain treated with spinosad or a combination of spinosad + chlorpyrifos-methyl. Laboratory bioassays showed that spinosad deposits killed lesser grain borer adults, suppressed progeny production, and did not degrade over time. This data was necessary for registration of spinosad in the US and to apply for international tolerances.

Technical Abstract: The persistence and insecticidal activity of a commercial bacterial insecticide, spinosad, was evaluated on three Kansas farms between July 2002 and January 2003. Spinosad was applied to newly-harvested hard red winter wheat at 1 mg (a.i.)/kg of grain at the time of storage in 68 to 81 metric ton capacity round steel bins. Insect populations recovered from natural infestations in grain samples collected monthly from bins receiving spinosad treatment were compared with populations in bins receiving no treatment

(control), bins receiving 3 mg(a.i.)/kg of chlorpyrifos-methyl, or 1 mg/kg spinosad + 3 mg/kg chlorpyrifos-methyl treatment. The actual spinosad residue on wheat was 30% less than the application rate of 1 mg/kg, but there was no significant degradation of these residues during the six month test period. None of the July samples from all four treatments had any live insect adults. No live adults of the lesser grain borer, *Rhyzopertha dominica* (F.), and very low densities (< 0.3 live adults/kg of sample) of the red flour beetle, *Tribolium castaneum* (Herbst), rusty grain beetle, *Cryptolestes ferrugineus* (Stephens), and sawtoothed grain beetle, *Oryzaephilus surinamensis* (L.), were found in wheat samples collected between August and January and treated with spinosad or spinosad + chlorpyrifos-methyl. Quantity of all four species in untreated wheat samples was 0.5 adults/kg in August 2002 and reached a peak density of 22.1 adults/kg in January 2003. In the chlorpyrifos-methyl treated wheat samples, densities of *R. dominica* adults increased from 0.4 adults/kg in September 2002 to a maximum of 10.2 adults/kg in January 2003, whereas densities of the other three species were < 1 adult/kg. Laboratory bioassays with monthly wheat samples from the field applications showed that spinosad alone or in combination with chlorpyrifos-methyl was effective in killing adults of *R. dominica* and *C. ferrugineus*, but not *T. castaneum*. However, progeny production of all three species was suppressed on spinosad-treated wheat, irrespective of the sampling month. Results show that a single application of spinosad at 1 mg/kg is effective for managing common stored grain insects, including *R. dominica*, for at least six months.

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