

Title Spinosad: an effective replacement for organophosphate grain protectants.
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Abstract

Spinosad is a bacterial fermentation product that has low mammalian toxicity. It exhibits both stomach and contact activities against insects. Spinosad is commercially registered on 250 crops in more than 24 countries. It is not registered for use on stored grains. Laboratory and field tests on wheat and maize have shown that this product is effective against the lesser grain borer (*Rhyzopertha dominica*), rice weevil (*Sitophilus oryzae*), flat grain beetle (*Cryptolestes pusillus*), rusty grain beetle (*Cryptolestes ferrugineus*), confused flour beetle (*Tribolium confusum*) and larvae of the Indian meal moth (*Plodia interpunctella*) at 1 mg/kg. On stored grain, adults of the red flour beetle (*T. castaneum*) and saw-toothed grain beetle (*Oryzaephilus surinamensis*) are less susceptible to spinosad than other species. In farm bins, spinosad on wheat at 0.1-6 mg/kg was stable for one year. This was confirmed by residue data and bioassays against the lesser grain borer and red flour beetle. The trend in species susceptibility was consistent among grain types (maize and wheat), but varied among wheat classes. On concrete, steel, floor tile and waxed floor tile surfaces, spinosad provided >98% mortality of adults of eight stored product beetles exposed for 24 h to deposits of 0.05 and 0.1 mg/cm². Activity against a variety of stored product insects, persistence in farm-stored grain, and low mammalian toxicity make spinosad a viable alternative to currently registered organophosphate grain protectants, such as malathion, chlorpyrifos-methyl and pirimiphos-methyl.