THE EFFECTIVENESS OF SPINOSAD AGAINST GRANARY WEEVIL, *Sitophilus granarius* (L.) AT LABORATORY CONDITIONS

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Synthetic pesticides all over the world have traditionally been used as grain protectants (Arthur 1996). However, the number of pesticides currently registered for used is decreasing due to concerns over food and environmental safety and development of resistant pest populations. With the continuing requirement for residue-free grain, the need to assess alternative compounds is of increasing importance. Spinosad is an insecticide based on a fermentation product of the bacterium *Saccharopolyspora spinosa* Mertz & Yao, which was discovered during the 1980s (Mertz and Yao, 1990). It is effective at 1 mg (a.i.)/kg of grain against several species of stored product insects according to laboratory tests (Fang *et al*. 2002 a,b; Toews and Subramanyam 2003; Huang *et al*. 2004). Previous tests conducted with a liquid spinosad formulation have shown it to be highly effective against several stored-grain insects at 1 mg(a.i.)/kg (Fang *et al*. 2002 a,b; Toews and Subramanyam 2003), but very little work has been done with dust formulations (Nikpay 2007) .

Thus, the aim of our study was to assess the efficacy of a dust formulation (DP 0.25% a.i., Dow AgroSciences) of spinosad applied at 8 rates on wheat against granary weevil, *Sitophilus granaries* (L.).

The test insects were reared on a whole wheat at a temperature of 25°C and 55-60% RH. Exposure studies were carried out at 25°C, 55% RH, and eight dose rates (0.00 (control), 0.05, 0.10, 0.20, 0.40, 0,60, 0.80 and 1.00 mg a.i./kg of wheat) of Spinosad dust formulation. All tests were conducted using 1- to 3-week-old, unsexed adult weevil. Clean soft white wheat of known origin was used in this test. The moisture content of the wheat ranged between 11.8 and 12.1%. Before use in experiments, the wheat was stored for 5 days at −18 ◦C to kill any residual insect infestation. The wheat was than transferred to the humidity chambers at 25◦C and equilibrated to test condition for 2 weeks before commencing the experiments. The experimental unit for this study consisted of 40 g of wheat weighed into a cylindrical plastic vial with a perforated lid covered with US standard sieve wire mesh #120. The appropriate amount of spinosad was added to 320 g wheat in 1-litre jars for each application rate. The jars were tightly closed with the lids and thoroughly shaken for 5 min to ensure even distribution. They were than divided into test vials with 40 g each. Thirty 1- to 3-week old adults were placed in each vial containing wheat treated with each rate. After adult introduction, vials were closed with lids and then placed in temperature controlled humidity chambers. There were eight replicates at each rate. After 7-day exposure period, dead and live insects were counted and removed. Live adults then placed another test vial containing untreated wheat for another 7-day exposure for recording any delayed mortality. After a second 7-day exposure for delayed effects, dead and

live insects were counted and removed. Both test vials (first 7-day exposure and second 7-day-exposure) was then returned to temperature controlled humidity chambers for 8 weeks until F_1 adults emerged. The numbers of live and dead F_1 adults were then counted. Data both mortality and F_1 adults were then combined; mortality records were converted to percent.

The present laboratory tests showed that complete mortality was achieved at 0.80 and 1.00 mg spinosad (a.i) / kg of wheat (Figure 1). Despite the fact that mortality increased with increasing rate, mortality was very low level (less then 5%) at 0.00, 0.05 and 0.10 mg spinosad (a.i) / kg of wheat. The number of progeny produced by granary weevil, *S. granaries* varied among the spinosad rates (Figure 2). F_1 progeny decreased with increasing rate.

The results of the present study indicate that spinosad dust can be used against granary weevil at 1 mg (a.i.)/kg dosage rate, which is also effective against may important grain pests (Fang *et al*. 2002 a,b; Toews and Subramanyam 2003; Huang *et al*. 2004; Nikpay 2007).

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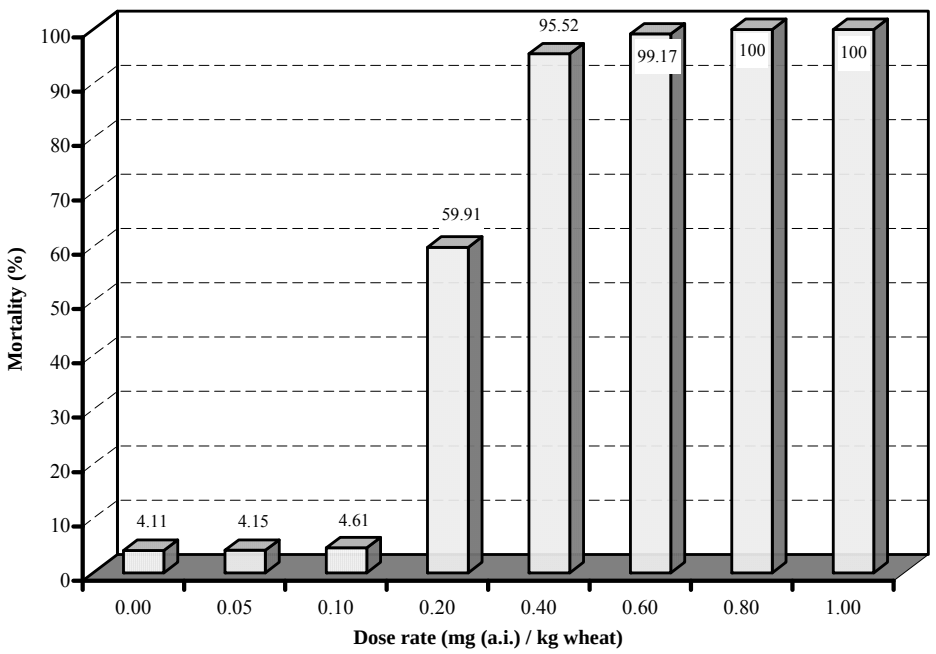

Fig. 1- Impact of eight rates of Spinosad on the mortality of *Sitophilus granarius* at 25°C

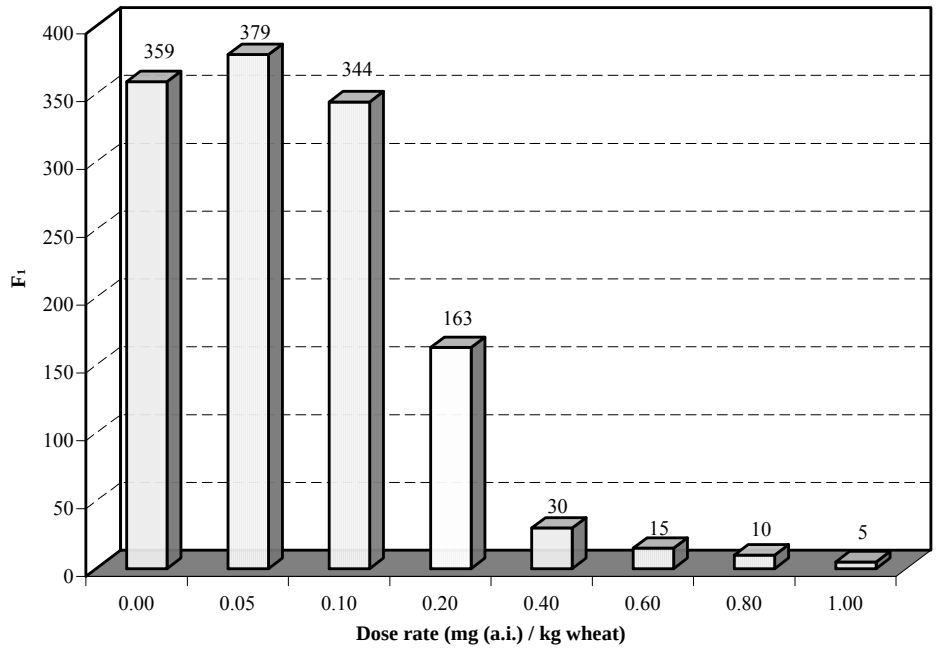

Fig. 2- Impact of eight rates of Spinosad on F_1 progeny production of *Sitophilus granarius* at 25°C