

# Contact Toxicity of Spinosad to Adult Stored-Product Beetles and a Parasitoid



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# Spinosad

- Metabolite of the actinomycete bacterium *Saccharopolyspora spinosa*
- MOA is reported to be through the nicotinic and GABA-gated ion channels (however, they are unique binding sites)
- Is marketed for insect control in production agriculture, horticulture, gardens and around homes
- Has shown no cross resistance



Source: Spinosad Technical Bulletin

# Spinosad

- Essentially non-hazardous to terrestrial birds, mammals, and some aquatic species
- Acute oral LD<sub>50</sub> levels
  - Rat >3738 mg/kg
  - Bobwhite Quail >2000 mg/kg
  - Rainbow Trout 30 mg/l
  - Earthworm >970 mg/kg
- Reported to have minimum disruption of beneficial insects and non-target organisms



# Spinosad

- DAS has applied for an experimental use permit (EUP) for testing on stored grain
  - Barley
  - Corn
  - Oats
  - Rice
  - Sorghum
  - Wheat
- Proposed EUP covers the following states:
  - Arkansas, Georgia, Indiana, Kansas, Minnesota, Montana, and Oklahoma

# Use in Stored Wheat

- Previous papers\* showed excellent control of LGB (1 mg/kg) and RW (3+ mg/kg)
- RFB and STGB not very susceptible
- Our hypothesis is that the method of exposure and feeding habits contribute to differences in susceptibility
- Biological control/aeration could potentially be used in concert with Spinosad

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\*Subramanyam, Bh., J. Nelson, L. Fang. In press. Evaluation of spinosad on stored product insects. *J. Stored Prod. Res.*

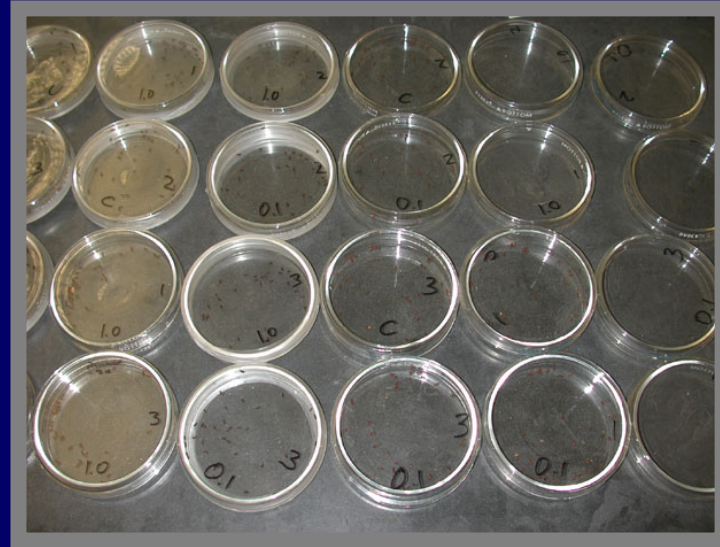
Fang, L., Bh. Subramanyam, and F. Arthur. (in review) Effectiveness of spinosad on four classes of wheat against five stored product insects. *J. Econ. Entomol.*

# Test Insects

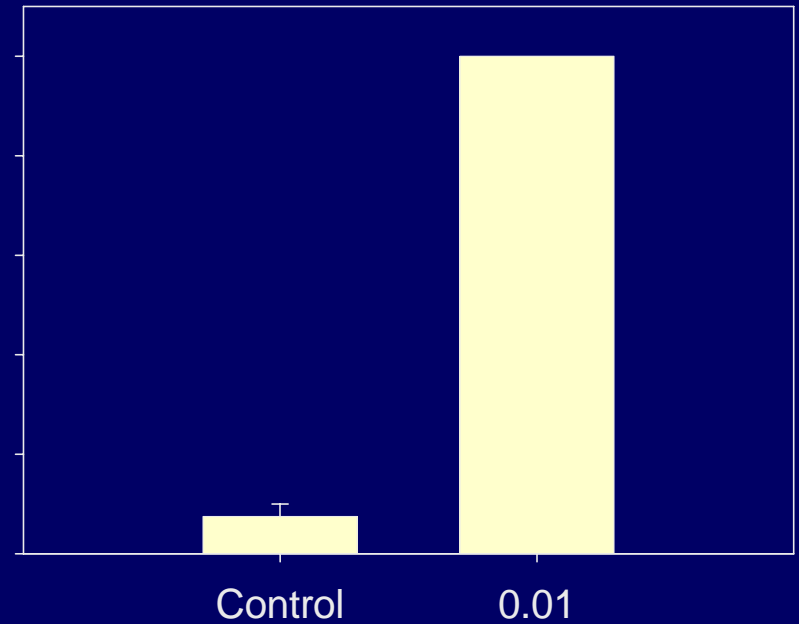
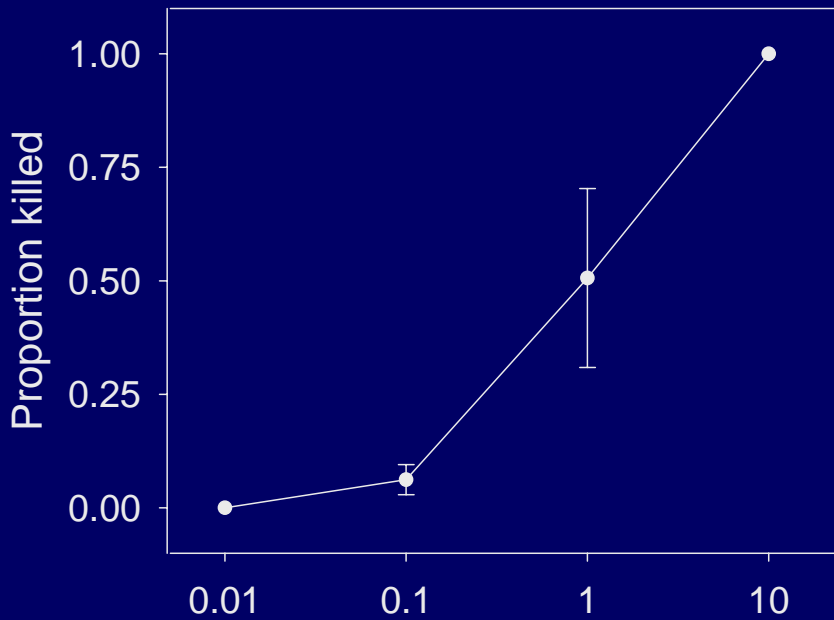


# Contact Toxicity of Spinosad

- Suspended insecticide in acetone
- Applied acetone to inside surfaces of Petri dishes
- Allowed 1 hour for acetone to dissipate
- Placed 40 adult insects (<7- d old) in each dish
- Held at 30°C, 50% RH
- 3-6 replications per treatment level



# Dose-Response Assays, 24 h

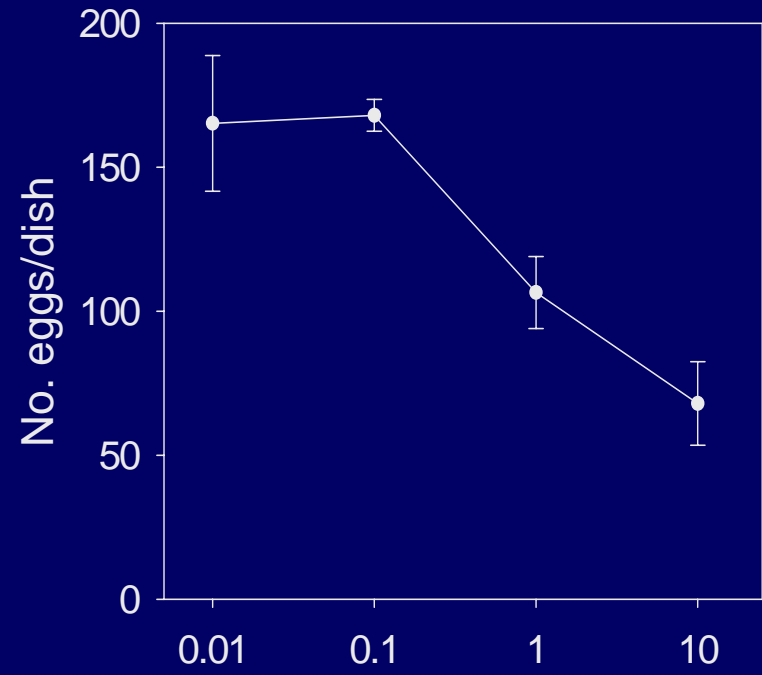
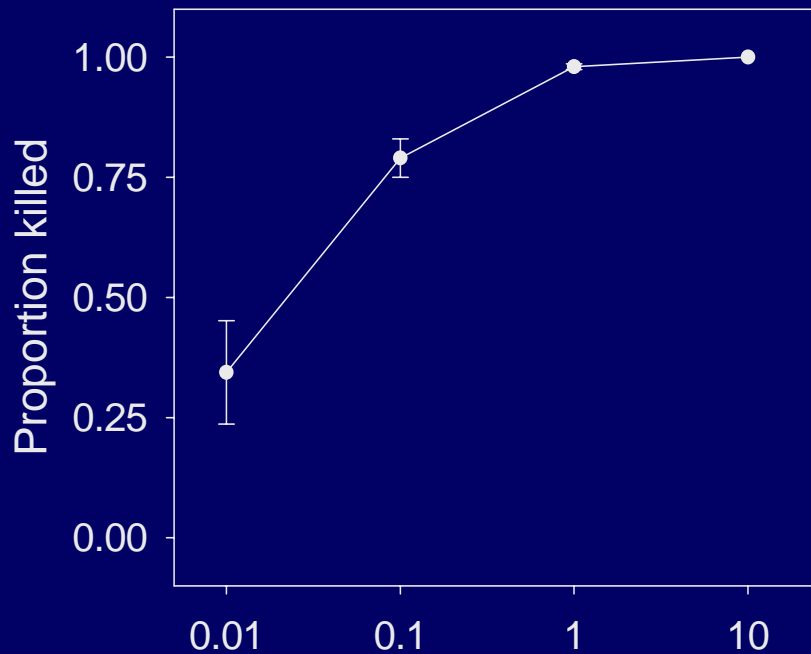


Spinosad concentration (log<sub>10</sub> scale)

< 5% mortality in control



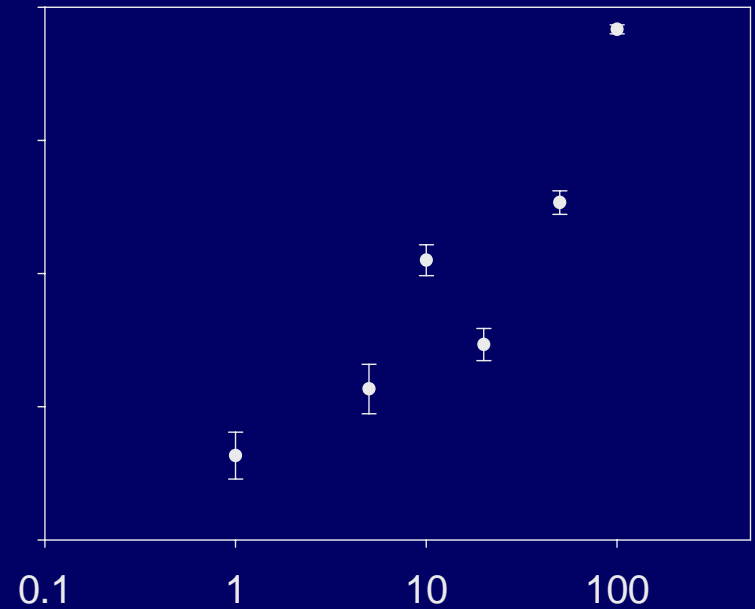
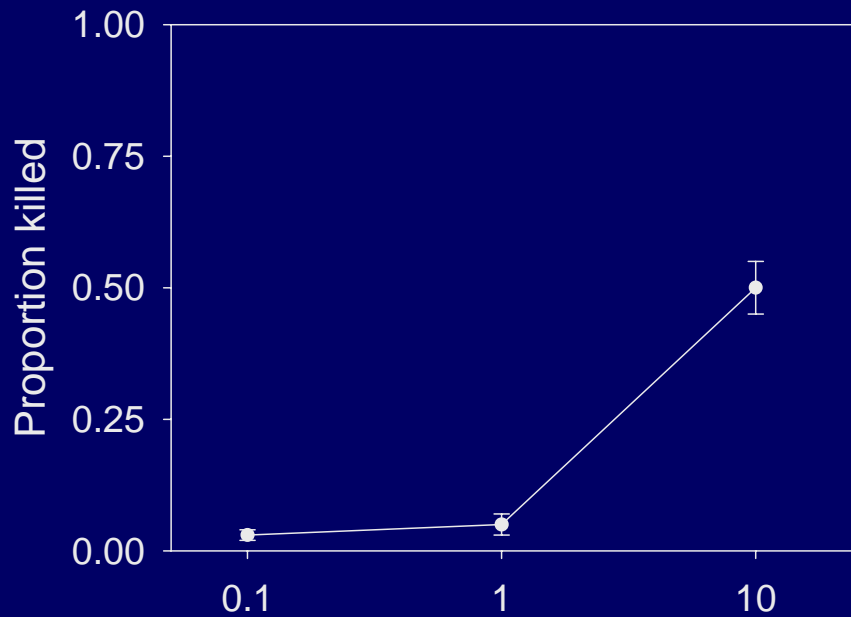
# Dose-Response Assays, 24 h



Spinosad concentration ( $\log_{10}$  scale)

< 5% mortality in control

# 24 Hour Bioassays



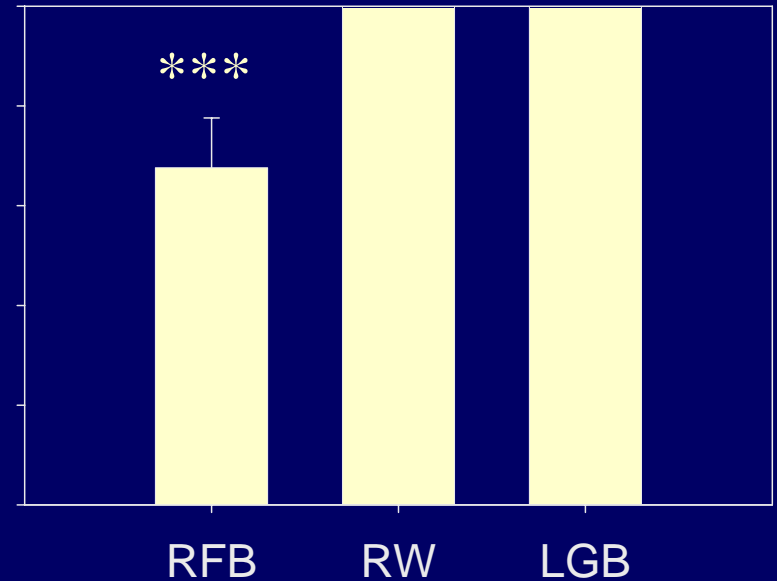
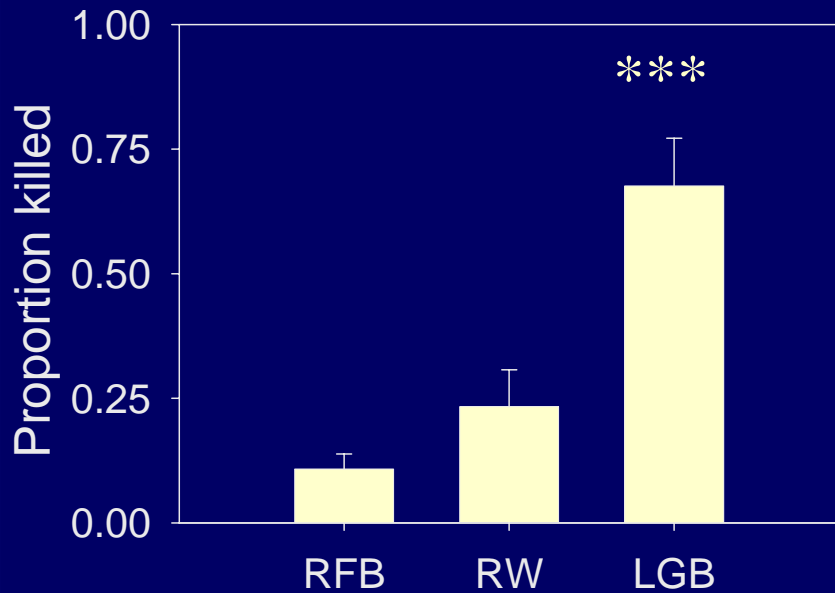
Spinosad concentration (log<sub>10</sub> scale)

< 5% mortality in control

# 48 Hour Comparison

Rate = 0.1 mg/dish  
= 0.0016 mg/cm<sup>2</sup>

Rate = 1.0 mg/dish  
= 0.0160 mg/cm<sup>2</sup>



Insect Species

< 5% mortality in control

\*\*\* = significant at  $\alpha = 0.05$

# Conclusions

- Spinosad has contact activity to adult insects and *T. elegans*
- Ingestion is not required
- LGB is the most susceptible followed by RW and RFB
- *T. elegans* was highly susceptible

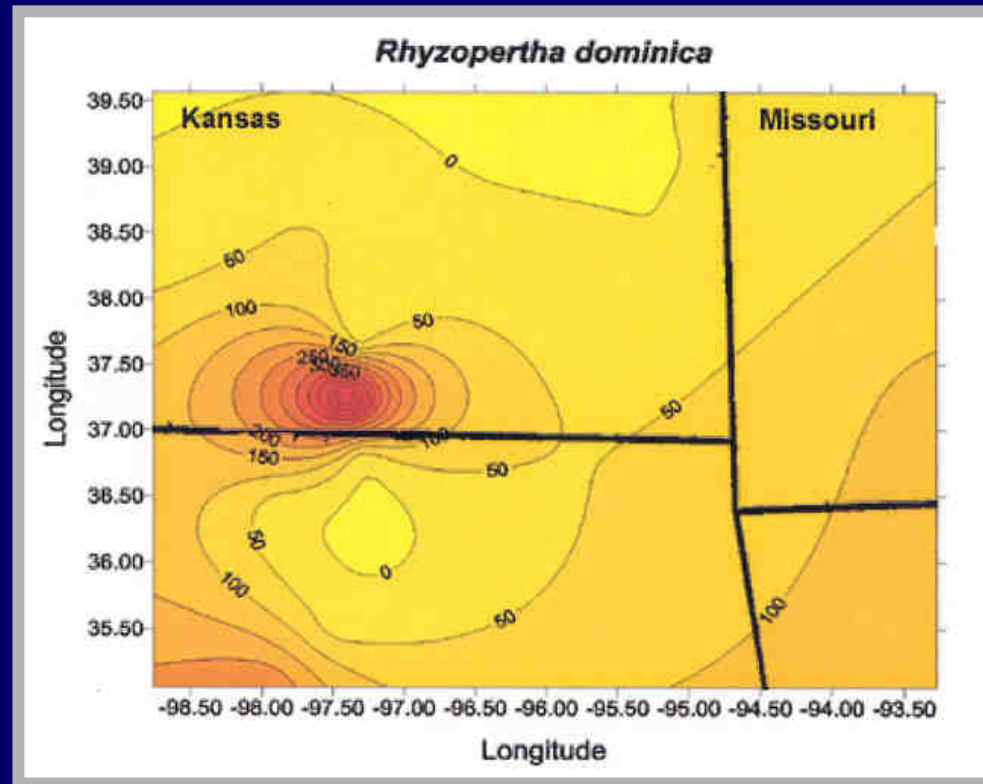


# Additional Spinosad Research

- Determining susceptibility to different parasitoids
- Effects of grain condition on insect susceptibility
- Comparison of LD<sub>50</sub> and LD<sub>90</sub> values among species
- Spinosad plus aeration as a strategy for farm-stored wheat

# Other RAMP Projects

- Sampling static and moving mill stock in flour mills for insect infestation
- Correlate insect counts with trap counts
- Develop a viable sampling plan for use in this environment



Data: Newell Good (1937; J Kansas Entomol. Soc.)