

Efficacy of Methoprene Against Neonates of Lesser Grain Borer (Coleoptera: Bostrichidae) on Rough Rice

Yaowaluk Chanbang¹, Frank Arthur², and Gerald Wilde¹

¹Department of Entomology, Kansas State University

²USDA-ARS Grain Marketing and Production Research Center, 1515 College Ave, Manhattan, KS, 66502
yaowaluk@ksu.edu, arthur@gmprc.ksu.edu, gwilde@oznet.ksu.edu



■ *Rhyzopertha dominica* (F.)

Acknowledgements
 This work was funded under the Postgraduate Education and Research Development Project, Postharvest Technology Institute, Chiang Mai University, Thailand and USDA-CSREES- RAMP grant No. 00-511-01-9674.

Abstract

Eggs of the lesser grain borer, *Rhyzopertha dominica* (F.), are laid on the exterior of grain kernels. The eggs hatch and the neonate larva bores inside the kernel and completes development to the adult stage. Methoprene is an insect growth regulator (IGR) labeled for direct application to stored grains, but there are no data for eggs exposed on rough rice treated with methoprene. In this test, 1 ppm of methoprene was sprayed on long grain rough rice (var. Cocodrie), then individual kernels were cracked and paired with an egg. About 80-90 % of untreated eggs hatched and eventually emerged as adults, while only 10-20% of eggs exposed on the treated rough rice developed to the larval stage. Eggs either failed to hatch on the treated rice or the larvae died before they could penetrate the rice hull. In addition, adults that did emerge exhibited various morphological deformities commonly associated with exposure to IGRs.

Introduction

- Lesser grain borer, *Rhyzopertha dominica* (F.) (Coleoptera: Bostrichidae) is one of the most important insect pests in rough rice
- Females lay eggs outside kernels and the larvae bore and feed inside the kernel
- Methoprene is an insect growth regulator (IGR) which is applied on rice as a protectant

Objective

- To assess the toxicity of methoprene on eggs and neonate larvae of *R. dominica* on rough rice

Materials and Methods

I. Hatchability of *R. dominica* eggs exposed to methoprene on filter paper

- One ppm of methoprene was sprayed on filter paper (9 cm dia)
- Ten two-day-old eggs were placed on each treated paper and compared to untreated control. The experiment was replicated 3 times
- Neonate larvae were counted on day 7

II. Dose-response of *R. dominica* eggs to methoprene

- A series of methoprene concentrations were sprayed on dark filter papers at 0.1, 1.0, 10.0, 100.0 ml/3.8 L/94 m²
- The treated paper was cut into a circle (6.5 mm dia) and placed in each individual 96-well-flated plate
- An egg was placed over the paper along with crumbed rice as neonate food source
- Neonate larvae were counted on day 7

III. Efficacy of methoprene on treated rice

- 500 gm of long grain rice ('Cocodrie' var.) were sprayed with 1 ppm of methoprene
- A single kernel of treated rice was cracked and put in an individual well of a 96- well plate
- A two-day-old egg of *R. dominica* was put individually in each well with the cracked kernel
- Development of *R. dominica* eggs on treated rice was compared to untreated rice at 35 (larvae developed inside kernels) days and 56 days (adults)
- Larvae inside kernels were assessed using X-ray photography



■ An individual kernel of rough rice with *R. dominica* egg in each well



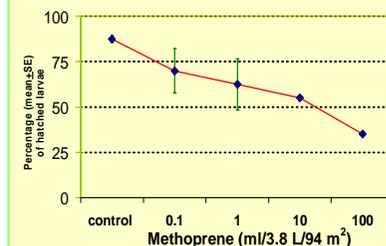
■ Eggs of *R. dominica*

Results

I. Percentage (mean±SE) of neonate larvae of lesser grain borer eggs exposed to 1 ppm methoprene on filter paper

	Control (n=30)	Methoprene (n=30)
	80±4.6%	26.7±11.5%

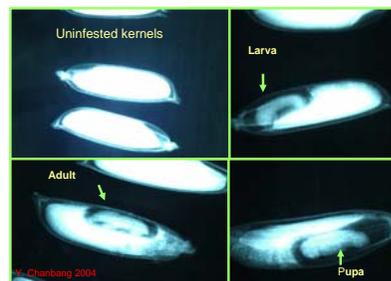
II. Dose response of the *R. dominica* to methoprene



III. Efficacy of 1 ppm methoprene treated on rice to development of *R. dominica*

	Control (n=60)	Methoprene (n=60)
Larvae inside rice kernels	41.7±5.9% [*] (alive)	10.7±4.7% (dead)
Adults emerged	48.3±3.5%	0.0±0.0%

^{*} Mean ± SE



■ *R. dominica* developed inside kernels assessed by x-ray photograph

Conclusions

- Methoprene affects egg and larval stages of *R. dominica* on rough rice. The methoprene-treated rice decreased the number of larvae hatching from eggs
- Most of the larvae that bore into kernels treated with methoprene will die before reaching the adult stage, while larvae inside the untreated kernels are able to develop to adult

Significance

- Methoprene can control egg and larval stages of *R. dominica*
- Population of *R. dominica* on rough rice would be suppressed by methoprene