

Evaluation of ProvisionGard (PG) Rice Packaging against the Indian Meal Moth

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1. Objectives

In this present study, the rice packaging with ProvisionGard (PG) adhesive additive was evaluated against the Indian meal moth, *Plodia interpunctella* (Hübner), a common stored-product insect pest that infests packaged products in warehouses and retail environments.

2. Materials and Methods

Rice was packaged in 0.45 kg (1 lb) and 9.1 kg (20 lb) film bags. Control bags without ProvisionGard had multi-colored packaging on the outside, and the PG treated bags with ProvisionGard had only black and white markings. Three bags of control and three bags treated with PG with 1 lb rice were placed in separate 3.78 L plastic containers (Fig 1). Similarly, three bags of control and three of PG treated bags with 20 lb of rice were placed in separate 53 L plastic containers. A black rubber ring of 2.5 cm diameter was placed on the top bag in the container, and 100 eggs (< 24 h old) of Indian meal moth were confined inside the ring. Hatchability of Indian meal moth eggs was 85%. About 5 g of Indian meal moth diet (Subramanyam and Cutkomp 1987) was sprinkled inside each container. All containers were kept on the shelf at room conditions (25°C and 28% r.h.) for three months before evaluation. There were three replications for 1 lb bags and two for 20 lb bags.



Fig. 1. Tests with rice packages

3. Results

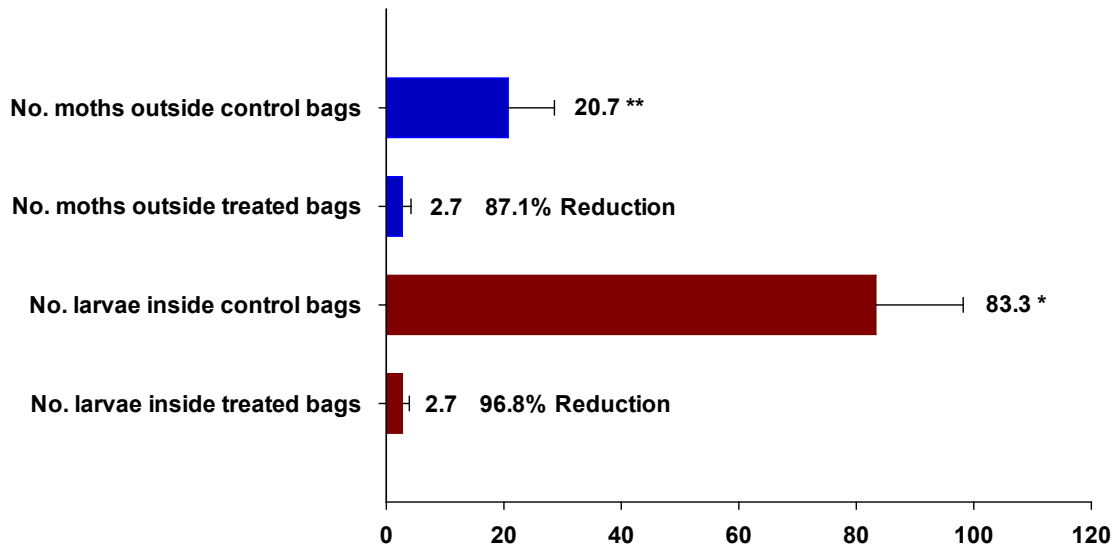


Fig. 2. Indian meal moth counts in control and PG treated 1 lb rice packages ($n = 3$).

*Significant ($P < 0.05$)

**Significant ($P < 0.10$)

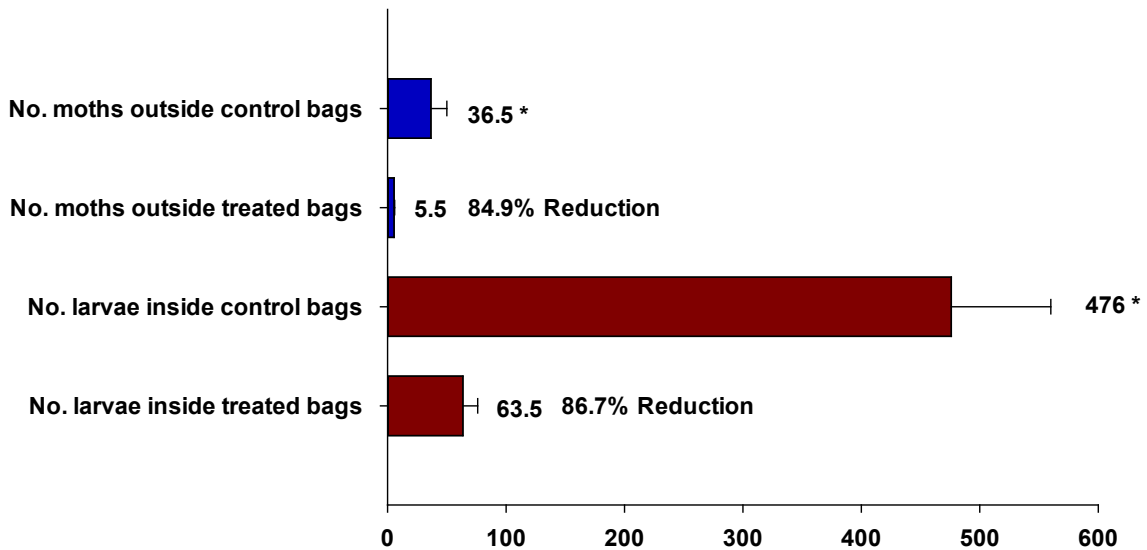


Fig. 3. Indian meal moth counts in control and PG treated 20 lb rice packages ($n = 2$).

*Significant ($P < 0.05$)

**Significant ($P < 0.10$)

1 lb packages

Indian meal moth larvae penetrated both control and treated film packaging. For the 1 lb packaging (Fig. 2), there were an average of 20.7 moths found outside the control bags from each container, and an average of 2.7 moths outside the treated bags from each container, representing a reduction of 87.1% which was significant at $P < 0.10$ ($t = 2.52$; $df = 4$; $P = 0.0654$). The total number of larvae inside control bags based on three replicates was 83.3, of which 21.6 were dead larvae and 61.7 were live. The total number of larvae inside PG treated bags based on three replicates was 2.7 consisting of 0.7 dead larvae and 2.0 live larvae. The number of larvae found inside the PG treated bags was significantly lower than the ones found inside the control bags ($t = 7.32$; $df = 4$; $P = 0.0019$), and the overall reduction rate was 96.8%.

20 lb packages

The mean number of moths outside the control bags was 36.5, and the mean number of moths outside treated bags was 5.5, and this difference was significant ($t = 4.38$; $df = 2$; $P = 0.0483$), and this represented a 89.4% reduction (Fig. 3). The average number of larvae inside the control bags was 476, and among these, there were 475 live larvae and 1 dead larva. The average number of larvae inside the treated bags was 63.5, and there were 34.5 live larvae and 29 dead larvae. In control bags, significantly more larvae were found compared to the treated bags ($t = 7.54$; $df = 2$; $P = 0.0171$).

4. Conclusions

PG treated bags protected the rice by suppressing the development of Indian meal moth larvae. Indian meal moth infestation in the PG treated bags was significantly less severe compared to infestation in the control bags. In addition, PG treated bags reduced the number of moths that developed from eggs initially placed on the bags.

Reference:

Subramanyam, Bh. and Cutkomp, L.K., 1987. Total lipid and fatty acid composition in male and female larvae of Indian meal moth and almond moth. *Great Lakes Entomol.* 20, 99-102.