Beetle Immigration into Foundation Seed Warehouses

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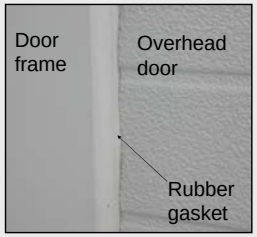
Abstract

Understanding and eliminating routes of insect immigration into grain storage and processing facilities will provide new opportunities for targeted pest management. Stored-product Coleoptera were captured on unbaited rodent glue boards positioned on the floor, along the sides, and above overhead doors in Foundation Seed Warehouses located in Kansas and Nebraska. Traps were examined and replaced weekly from May through October 2004. To examine the effects of exclusion in paired tests, exterior rubber door gaskets were installed on one side of a door in Kansas and both doors in Nebraska. Species captured included the lesser grain borer, foreign grain beetle, rusty grain beetle, hairy fungus beetle, rice weevil and red flour beetle. When rubber gaskets were installed at the Kansas location, insect captures were concentrated at or near ground level suggesting that pest management efforts, such as residual spray applications, should be focused in these areas.

Materials and Methods

Seed Warehouse

Interior sticky traps



Exterior door gasket

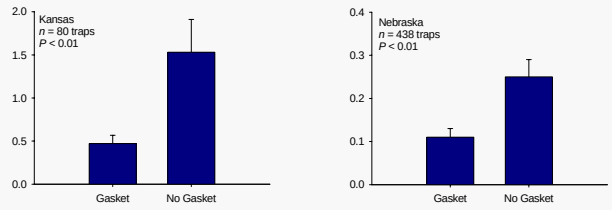
- Studies were conducted at Foundation Seed Warehouses containing wheat in Kansas and Nebraska. Three overhead doors were monitored in Kansas and two doors in Nebraska.
- Unbaited sticky cards (rodent glue boards) were affixed on the ground, from ground level to 200 cm high on the sides of overhead doors at 20 cm intervals, and above the doors.
- Rubber garage door gaskets were installed on one side of both doors in Nebraska and one door in Kansas. The remaining two doors in Kansas already had gaskets installed.
- Sticky cards were observed weekly to determine the species and quantity of insects immigrating into the facilities.
- Data analyses (SAS PROC MIXED) included linear contrasts comparing the mean number of insect captures with and without door gaskets, trend analyses to show the location of captures, and timing of captures.
- Although not discussed here, additional data collected included lesser grain borer captures in pheromone baited traps inside and outside the facilities, and weather data.

Results and Discussion

Table 1. Total number of insects captured on unbaited sticky traps positioned around overhead doors during the 2004 field season by state.

Species	Kansas	Nebraska
Lesser grain borer	39	4
Foreign grain beetle	158	5
Rusty grain beetle	110	117
Warehouse beetle	137	33
Hairy fungus beetle	14	13
Rice weevil	26	0
Red flour beetle	20	4

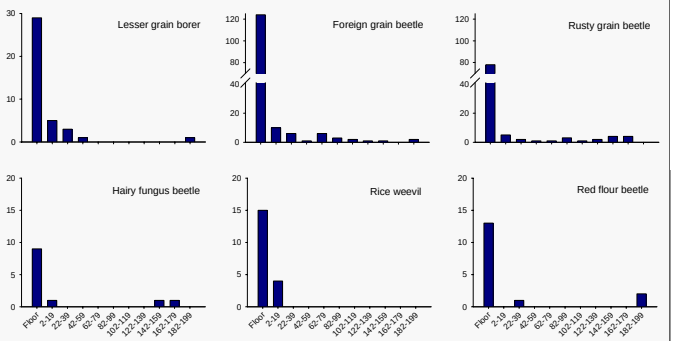
Fig. 1. Mean ± SEM number of beetles/trap/wk captured on unbaited sticky traps adjacent to overhead doors with or without a rubber gasket installed.



Summary

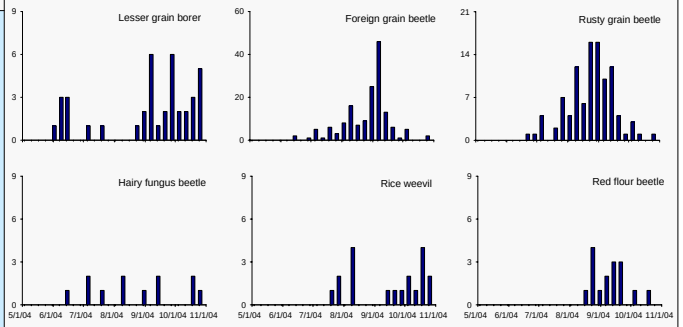
- A wide variety of stored-product insects were captured entering into seed wheat warehouses.
- Rubber gaskets located along the sides of the overhead doors significantly reduced the number of insects entering the warehouses.
- Insects primarily entered the Kansas facility at ground level around doors with existing gaskets; however, insects (specifically rusty grain beetles) were captured at all trap locations in Nebraska. We hypothesize that the much lower insect numbers, poor building condition, and small gaps between the gaskets and wooden doors contributed to this discrepancy.
- Foundation Seed Warehouses are similar in construction and design to food production and storage facilities. Results shown here are broadly applicable to many pest management situations and demonstrate how to identify important routes of pest entry.
- Better exclusion may prevent insect colonization and reduce or eliminate the need for fumigation with methyl bromide, an ozone depleting substance.

Fig. 2. Total number of insects captured in Kansas on unbaited sticky traps by trap height (cm) when rubber door gaskets were installed.



- Regardless of insect species, the vast majority of the captures occurred in traps placed on the ground.
- Captures of insects at locations above ground level were < 5 for the entire year per trap location.
- Pest management techniques such as exclusion and residual insecticide applications should be targeted to the ground level to prevent immigration of these species.

Fig. 3. Total number of insects captured on unbaited sticky traps by date during the 2004 field season



- Insect captures occurred at low levels from June through August, peaked in September, then declined during November.
- Pest management tactics designed to reduce immigration should be targeted to peak times of insect activity (August through October).
- Insects were captured on the side of the sticky cards closest to the doors suggesting that captures were a result of immigration.