

Trapping Indoors and Out—

Lessons from the Red Flour Beetle Survey

BY DR. BH. SUBRAMANYAM AND JENNIFER NELSON, GUEST CONTRIBUTORS

In nature, red flour beetles (*Tribolium castaneum* [Herbst]) are found under the bark of trees, in acorns with longitudinally split seed coats and in poultry manure. Still, very little research has been done to truly identify its natural sources.

In 1998, we had the opportunity to sample and trap red flour beetles outdoors and indoors in a residential area of Minneapolis, Minn., surrounding a grain-cleaning facility and a railroad corridor. The details of our involvement in this research were published in the January and May 1999 issues of *Pest Control* magazine. Here, though, we will share some of our insights on trapping red flour

beetles inside and outside the grain cleaning facility, outside the railroad yard, and inside and outside houses surrounding the cleaning facility and railroad yard.

Trap Placement and Methodology

We trapped red flour beetles in an area that is approximately one square mile on all sides of the grain cleaning facility. Sticky traps with red flour beetle lures were

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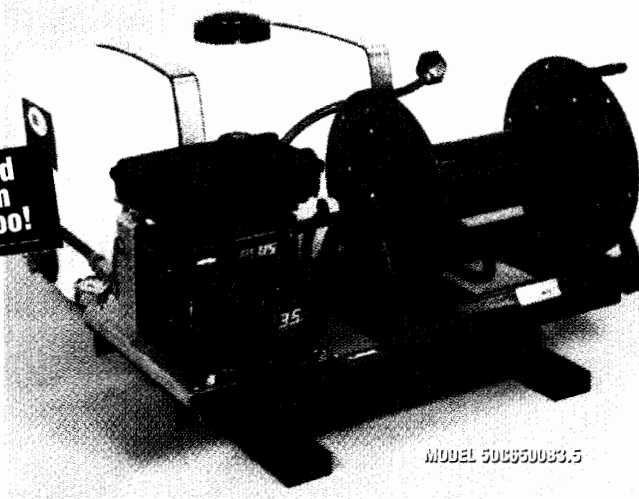
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RED FLOUR BEETLE

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placed inside and around the cleaning facility, throughout the railroad yard and outside a select number of houses. Inside houses, commercial food and pheromone baited traps were used in different rooms to trap red flour beetles. Sticky traps were examined approximately every 15 days between July and October 1998. Trap lures were changed at monthly intervals. Traps inside houses were in place for 27 to 62 days, and were examined only once. Adults captured in all traps were expressed as the number of beetles captured per trap per 30 days.

Reading Trap Results

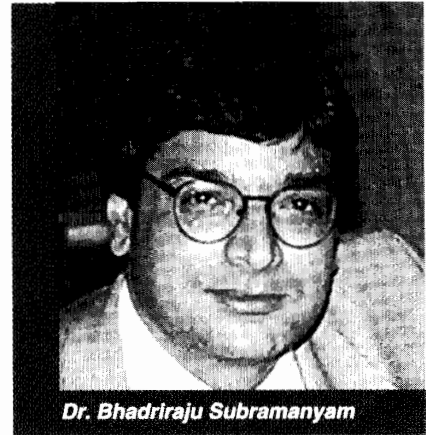
The percentage of total traps catching one or more red flour beetles and the actual number of beetles captured per trap provide information on red flour beetle presence, distribution and abundance. Out of the 35 traps inside the grain-cleaning facility, 69 percent captured one or more beetles. More beetles were captured on the bin floor (33 beetles per trap) compared to other floors, and the lowest numbers were found in the basement area (0.3 beetles per trap). Outside the grain cleaning facility, 92 percent of the 49 traps had beetles, whereas in the railroad yard only 41 percent of 46 traps had beetles. About 78 percent of the 124 traps outside the houses had beetles. This suggested that these beetles were present on the outside at all three sites, but were distributed more widely on the outside of the elevator and houses. The actual number of beetles per trap ranged from 0.4 to 34.3 outside the grain cleaning facility, 0.4 to 2.23 in the railroad yard, and 0.8 to 22.7 outside the houses. The higher catches were outside the cleaning facility, and in a house northeast of the cleaning facility.

Interestingly, houses to the south of the elevator and the railroad yard also had beetles higher than the railroad yard. If beetles were indeed flying from the cleaning facility to the neighborhoods, traps in the railroad yard should have intercepted them. However, this did not happen. These data suggest that the populations of red flour beetles found in the neighborhoods may be independent of the cleaning facility, or that the founding populations may have come from the cleaning facility prior to our trapping in the neighborhoods. In certain houses, we observed that beetles caught on traps were indeed coming from inside the houses. For example, in one of the houses farthest from the cleaning facility, we found high numbers of beetles on traps outside the house. The resident complained about beetles inside the house, but a careful search of the pantry revealed a red flour beetle infestation

in one-year-old corn grits!

The presence of red flour beetles in the neighborhoods may be due to the abundant tree cover, which provides adequate bark habitat. Furthermore, during summer months, birdseed and pet food are available for these beetles to infest and reproduce.

How can one determine if beetles are dispersing from the elevator into the neighborhoods? The first approach involves marking beetles with a fluorescent dye, releasing them from the grain



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cleaning facility and trapping them at various distances from it. The presence of grain in the cleaning facility makes this a risky approach. The second and simplest approach involves initiating outdoor trapping as early as March. If a similar survey is planned for the future, it is best to sample early in the spring so that dispersal patterns of this insect can be better understood.

Red flour beetle catches in commercial food and pheromone baited traps placed inside the houses were valuable in determining insect abundance and distribution within houses. In each of the 26 houses, we placed 10 traps in different rooms. However, some residents failed to return all 10 traps to us. Therefore, data were obtained from a total of 235 traps. Only 1 of the 235 traps was in the attic and it did not catch any beetles.

About 78 percent of the 235 traps had at least one red flour beetle. Of these, about 48 percent of the traps had anywhere from 0.1 to 10 beetles per trap, and five percent had more than 50 beetles per trap. The number of beetles captured in all 10 traps varied significantly from house to house. The average number of beetles per trap per house ranged from 0.1-63.8 beetles. Across all 26 houses, the second floor had the highest number of beetles (16.4 beetles per trap), followed by the ground floor (12.2 beetles per trap) and basement (3.5 beetles per trap).

The beetles were present in all rooms of the houses. The highest numbers were in the dining room (21 beetles per trap) and the kitchen (14.9 beetles per trap). The bedrooms, bathrooms and living rooms had 7.4 to 10 beetles per trap; the laundry room had only five beetles per trap. As a part of the indoor trapping, in two of the 26 houses, we compared the number of beetles captured in traps

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containing the food-based oil as bait with traps containing both the food-based oil and pheromone lure as baits. Our results showed 10 to 13 times more beetles were captured in traps with the oil and lure compared to traps with the oil alone. Other researchers under laboratory conditions reported similar findings. Therefore, for trapping red flour beetles indoors, it is advisable to use both the oil and the pheromone lure.

The average temperatures throughout our study were above 60 degrees Fahrenheit, except during the first week of October. These temperatures are conducive for red flour beetle activity and reproduction. It rained on 18 different occasions between July and October; most rainfall was below 0.7 inches, but on one occasion it was over an inch. Very little is understood about the influence of rainfall on beetle activity. However, rainfall was an important detriment to using traps outdoors. Traps and lures, damaged by the rain, should be changed immediately.

On 20 percent of the occasions, the wind was blowing in the northwest direction, and 18 percent of the time it was blowing in the southern direction. About 10 percent of the time, the wind was blowing in all other directions. The prevailing wind direction, however, failed to explain the observed trap catch of beetles in traps placed outdoors.

Conclusions and Suggestions

In conclusion, our survey documented that the red flour beetles were present inside and outside the grain-cleaning facility, with very few beetles being present in the railroad yard. The beetles were active outdoors in the residential areas to the north and south of the elevator. The source of these beetles, however, is unclear. Beetles were present inside houses in every room.

It is important to point out that the sticky traps we used were not designed for outdoor use. The red flour beetle traps (both sticky and food plus pheromone baited traps) were designed for use in commercial settings such as food-handling establishments, warehouses, etc. Furthermore, the activity of red flour beetles outdoors has not been previously studied. Therefore, interpreting the survey results is somewhat difficult. While some trap improvements are needed, our survey did point out that these traps could be effectively used to monitor red flour beetles outdoors. ♦

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