INTEGRATED INSECT PEST MANAGEMENT IN RICE MILLS

Tanja McKay*, Arkansas State University
Frank H. Arthur & James F. Campbell, USDA-ARS, Manhattan, Kansas
Brian Adam, Oklahoma State University
L. Ted Wilson & Yubin Yang, Texas A&M AgriLIFE Research
Julien Beuzelin & Thomas E. Reagan, Louisiana State University Agricultural Center

The U.S. is a major exporter of rice, and both domestic consumption and export have been increasing in recent years. Stored rice can be infested by a variety of insect pests that cause grain damage and reduce grain quality, which can decrease profitability. One insect, the red flour beetle, *Tribolium castaneum*, is the primary pest in rice mills and methyl bromide (MB) fumigations under the continuing use exemption (CUE) program are often used to control this pest. Due to the phase-out of MB, revised integrated insect pest management (IPM) plans specific to rice mills are critical in maintaining product quality and economic viability.

In this study, we are focusing on IPM for red flour beetles in rice mills. The first objective of this research is to examine the spatial distribution and movement patterns of red flour beetles in various locations within a mill. Pheromone traps are being used for monitoring, with traps placed in different locations, including near milling equipment, bran storage areas, spillage sites, and storage bins. Landscape and environmental conditions are also being recorded at each trap location to evaluate factors influencing the capture of red flour beetles. By identifying particular areas with greater insect activity, this data will be used to determine critical control points and sites of entry within the mill. Information generated can then be used to create an optimized sampling program that can be used by mill personnel for targeted control. Initial results of this objective will be presented.

The second objective is to examine how red flour beetles develop on various rice fractions that can accumulate in structures. During the first step of rice milling, the husk is removed from rough rice, and the rice is termed brown rice. When the bran is removed from brown rice, the rice is then termed milled rice, which can go through several processing steps to become polished white rice. Thus during milling two general types of waste material are produced – husks and bran – both of which could be used as resources for stored product insects. Bran and other layers of rice removed during milling can accumulate as fine powder throughout a mill. Understanding how red flour beetles develop on each milling component is critical in predicting where pest activity is likely to occur and to provide the information needed to develop a population forecasting model for rice mills.

In the third objective, residual activity of insecticides will be assessed along with the potential for accumulated milling fractions to absorb residues compromising residual efficacy.

In the fourth objective, economic analyses will be integrated into management plans, and the result will be a more comprehensive program for rice mill management that reduces reliance on MB fumigation. The use of various control options will be compared to MB fumigation in terms of economic costs and benefits.

Results from the above studies, including predictive modeling of beetle development, focused monitoring, target surface pesticide treatment and sanitation, and economic analysis, will be used to design a comprehensive control alternative to MB fumigation. The web-based Post Harvest Grain Management Program (http://beaumont.tamu.edu/Grain-Management/), which was developed through previous USDA funded projects, will be adapted for red flour beetle control in rice mills. Three new components will be developed: 1) a red flour beetle population model tailored to user-specified mill facilities, 2) an economic model comparing the cost/benefits of MB fumigation and alternative pest control measures, and 3) a management decision advisor that estimates the best combination of measures (monitoring, surface treatment, sanitation) to achieve optimal red flour beetle control. Users of the website will be able to evaluate the effect of different mill configurations, monitoring, surface treatment, and sanitation options on red flour beetle control.