

## RED FLOUR BEETLE MANAGEMENT IN RICE MILLS

Frank H. Arthur, Tanja McKay, James F. Campbell, and Laura Starkus

Insect pests can be found within various components of rice mills, and composition and diversity will change depending on location. One of the predominant pests in the milling component of mills is the red flour beetle, *Tribolium castaneum* Herbst. Several recent studies have evaluated efficacy of aerosols on adult insects, but in many instances resident populations may be located in areas that are not accessible to the aerosol. Contact insecticides are being evaluated as targeted treatments for areas likely to contain insect infestations. Also, this species can persist on a wide variety of food products, including rice fractions generated during the milling process. Therefore, development of the beetle on these fractions needs to be examined for their possible impact on control programs. A series of studies were conducted to examine some of these questions.

In the first study, a test was conducted using the pyrethrin cyfluthrin (Tempo), a residual contact insecticide. It can be applied at two label rates, hereby termed low and high. Concrete treatment arenas were either sealed or unsealed, treated with the high and low rates of cyfluthrin, and held for 0 to 8 weeks either with or without flour on the treated surface. Bioassays were conducted at post-treatment intervals by exposing adult red flour beetles on the concrete arenas. The sealant provided some benefit by reducing the amount of emulsion that penetrated into the concrete. Knockdown of red flour beetle adults occurred faster on the sealed versus the unsealed concrete when no flour was present. When flour was present, it helped absorb the insecticide from the concrete, leading to more rapid degradation and less mortality over time, especially on the sealed surface. Further tests are being conducted to assess residual degradation of cyfluthrin in several rice mills that are serving as field sites.

In the second study, red flour beetle population development was examined on brown rice stored at 22, 27, and 32°C. The beetles readily colonized the rice so that extensive population development had occurred after just 2-4 months. Results show the red flour beetle, which does not develop well on whole grains or rough rice, can readily feed and infest brown rice. In a final test, red flour beetle development from neonate to adult was examined initially on nine different rice fractions. They failed to develop on ground rice hulls, paddy dust, and rough rice, and five fractions were chosen for further study. These were milled whole kernels, milled whole kernels, brown rice, rice flour, and rice bran. Tests were conducted at 22, 27, and 32°C. Time required to develop to the pupal and adult stage varied with temperature, and development was greatly slowed down at 22°C compared to 27 and 32°C. Further tests will be conducted regarding red flour beetle development on rice fractions.