

# Infrared Treatment of Rough Rice to Control Stored Product Insects

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Collaborative research with Dr. Frank Arthur of the USDA-ARS Lab in Manhattan, Kansas evaluated the use of IR energy for the destruction of insects in stored rice. This project had two main objectives. The first was to determine the minimum temperature and heating rates required for the destruction of insects using IR energy. The second was to determine the needed IR intensity and rice exposure duration to achieve these temperatures.

Tests were conducted using a prototype IR oven donated by Cadallic Drying Technologies of Independence, KS. The tests were conducted using rice kernels known to be infested with rice weevil larva ranging from small/early instar to pupae stage. Rice kernels infested with these larvae were inspected and sent to the University of Arkansas by Dr. Arthur's group at Manhattan Kansas immediately before a given IR test was conducted. Tests were conducted on medium/middle age (3 week old) larva, large/late stage (4 week old) larva, and on small/early instar (1-2 week old) and pupae (5 week old) larva.

The different IR intensity settings, as determined by the pressure of propane supplying energy to the unit, were based on previous drying curves obtained with the unit. The drying curves showed the relationship between the rice temperatures and exposure durations for rough rice at a given distance from the IR source. From these, three target gas pressures were selected; 0.03, 0.06, and 0.09 psi. At each gas pressure rough rice was exposed long enough to achieve desired rice temperatures of 50, 60, and 70°C.

Tests were conducted using 20g samples of rough rice mixed with 10 larvae infested rice kernels. These samples were exposed to the IR energy at the desired gas pressures of 0.03, 0.06, and 0.09 psi until the rice reached the 50, 60, and 70°C target rice temperature. After exposure, each sample was incubated for five weeks at 27°C and 60% RH (conditions optimal for insect growth and development). The number of insects hatching from the samples during incubation was monitored daily.

Examples of the data generated are given below. Based on the data collected to date, a rice temperature of 70°C was adequate to control all insects in rough rice, however rice temperatures of 50 and 60°C resulted in reduced insect numbers, but not total control. Additional tests are planned upon the arrival of infested kernels from the Manhattan lab.

