THE POTENTIAL OF INSECT GROWTH REGULATOR (IGR) APPLICATIONS FOR MANAGING MOTH POPULATIONS IN PACKAGED COMMODITIES

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The efficacy of using juvenoid agonists (JH_{Ag}) for controlling the Indianmeal moth, the most important insect pest associated with feed, food and seed storage in the U.S., has been extensively investigated. In our current studies, we have found fenoxycarb and pyriproxyphen are the most effective JH_{Ag} affecting the development of stored product moths. The JH_{Ag} can be used to manipulate the developmental and reproductive processes of the pest insect. Our studies provide strong evidence that indicates effective insect control strategies can be developed that use JH_{Ag} to protect stored commodities from moths with little risk to the consumer and the environment.

Freshly laid eggs treated once with the JH_{Ag}, fenoxycarb, undergo abnormal embryonic development that causes the death of the insect. At higher agonist doses (ppm) the embryo dies before hatching; at lower doses (ppb) mortality occurs during the larval and pupal molts. Embryonic mortality results from failed midgut closure, which is caused by impaired yolk cell movement. Mortality during larval molting results from a failure to successfully shed the old cuticle; this failure is caused by the retention of sticky chitobiose between the old and new cuticle, produced by the incomplete digestion of chitin from the old cuticle.

Additional experiments are focused on determining the mechanism(s) whereby a short exposure of a freshly laid egg to JH_{Ag} prevents the normal completion of embryonic development in the Indianmeal moth. The mechanism appears to involve the activation of a cell signalling pathway that in part relys upon the protein, Rho. Rho stimulates the gene, *fos*, which is a regulator of cell growth. These studies on the mechanism(s) of JH_{Ag} action are continuing.

These observations indicated that a single treatment of Indainmeal moth eggs with a JH_{Ag}, early in embryogenesis, can cause lethal developmental effects throughout the life of the insect. We subsequently found that this treatment could be effectively "delivered" to the egg by treating the gravid female with JH_{Ag}, either topically or by contact. This technology has been tested for protecting high-value, boxed commodities from insect infestation during storage at simulated warehouse conditions. Small scale tests indicate that JH_{Ag} provide significant protection when the protocol calls for treating the warehouse walls with agonist and the commodity is stored in an agonist-treated paper overwrap. Tests in progress are further testing the efficacy of this application for protecting stored commodities.