Educator Insights: A Journal of Teaching Theory and Practice
Volume 2, Issue 2, February 2026
brightmindpublishing.com
ISSN (E): 3061-6964

APPLICATION OF BRACON ENTOMOPHAGE AGAINST THE SOUTHERN WAREHOUSE MOTH DURING THE STORAGE OF AGRICULTURAL PRODUCTS

Sulaymonov Inoyatullo Novatullo o‘g‘li,
Senior Researcher, Scientific Research Institute of
Plant Quarantine and Protection

Abstract
The article describes the morphological, biological characteristics of the Bracon hebetor parasite and the effectiveness of its use in the fight against the southern storage moth (Plodia interpunctella) during the storage of agricultural products.

Introduction

According to the Decree of the President of the Republic of Uzbekistan No. PF-6262 dated July 15, 2021 "On Measures for the Fundamental Improvement of the Plant Quarantine and Protection System in the Republic" and the Resolution No. PQ-5185 "On the Establishment of the Agency for Plant Quarantine and Protection of the Republic of Uzbekistan", it is stipulated to define an integrated pest management system in plant quarantine and protection, to control and monitor its implementation, as well as to prevent the entry and spread of economically harmful organisms and to effectively combat them across the territory of the country.

The braconid entomophage has been widely used in open field conditions in Uzbekistan to control a variety of agricultural crop pests. For example, to protect one hectare of cotton fields from pests, depending on the pest density, from 1,000 to 2,000 braconid entomophages are used. In addition, the mass reproduction of braconid entomophages for use against pests of other agricultural products is carried out in almost all regions of our republic. However, up to now, braconid entomophages have not been used at all, and no studies have been conducted for the control of storage pests. In the course of our research, the effectiveness of using the Bracon hebetor parasitoid against the southern warehouse moth, one of the main pests encountered during the storage of agricultural products, was

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studied. Bracon (Bracon hebetor Say), a hymenopteran insect, belongs to the family Braconidae within the order Hymenoptera, and is a beneficial parasitic insect.

The adult braconid parasitoid's color varies from yellowish-reddish to almost black. The antennae of males have 23–26 segments and are slightly shorter than those of females. Female braconids measure 2–3 mm in length and have a wingspan of 4–5 mm. In the spring, they are brown, while in the autumn, they become dark brown. The female's antennae have 16–17 segments, are beaded, dark brown in color, and are covered with yellowish hairs. Their legs are yellowish-gray, the upper surface is dark-gray and also covered with hairs; at the end of the abdomen is an ovipositor, yellowish-brown in color, 0.9–1 mm in length. Bracon eggs are milky-white, rarely pale yellow, 0.45–0.50 mm in length and 0.20 mm wide, cylindrical, with a slightly narrowed upper part, usually slightly curved. The color of the third instar larva varies from dull whitish to shiny yellowish-green or shiny yellowish, usually directly related to the color of its host caterpillar. It is 3–4 mm long, the head is dull yellowish, the mouthparts are strongly developed, and the jaws are sickle-shaped. The larva's body consists of 13 segments, is apodous (legless), and the shoulder region is covered with indistinct white dots. This feature distinguishes third instar larvae from the first and second instars.

The pupa is free, measuring 2.5–3 mm in length and 1.6 mm in width, and is enclosed within a white cocoon about 4 mm in size. At the final stage of development, the pupa turns a reddish-brown color. In nature, fertilized female braconids overwinter under plant residues, in curled but not yet fallen leaves of trees, or under tree bark. In early spring (March–April), when the average day and night air temperature reaches 17–20°C, the bracon emerges from overwintering and lives for about 1.5 to 2 months, feeding on the nectar of leguminous and various cultivated and wild plant flowers. This is because, for the ripening of her eggs, the female must feed on either flower nectar or the hemolymph of the host insect.

When searching for its prey, the bracon finds the host caterpillar by detecting the scent of the caterpillars themselves or the odor of their excrement. For this reason, it can easily locate caterpillars inside plant fruits. Before laying its egg on the prey's body, the female bracon uses its ovipositor to sting the host's shoulder and paralyze it. As a result, the caterpillar becomes immobile and ceases feeding. It

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should be noted that, when attacking its prey, the bracon uses only the additional venom from its venom gland. In general, it has been determined that the venom of a single female bracon can paralyze up to 1 million 600 thousand host caterpillars.

The optimal temperature for braconid development is 27–32°C, and the relative humidity should be 75–80%. Under these conditions, full development of the bracon takes 8–12 days. The adult bracon can survive without food for 2–3 days during the summer, but if fed on various nutrients (such as hemolymph or carbohydrates), its lifespan can extend from 12 up to 30 days.

Infestation by the larva of the poaching parasite southern barn moth (Plodia interpunctella)

In our scientific research, the larvae of the southern barn moth were propagated in unabi (jelonjiyda) fruit. In the laboratory studies conducted in February-March-April 2023 (temperature 28-30 0 C C, 60-70%), it took 56 days for the southern barn moth to develop through the egg-larva-mushroom-adult stages in unabi (jelonjiyda) fruits, that is, to produce one generation.

Damage to unabi fruit by the larva of the southern barnacle moth (Plodia interpunctella)

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In our scientific research, the daily fecundity of bracon females was found to be on average 10–30 eggs per day at temperatures of 28–30°C, while at 32–35°C, it reached 60 eggs per day. When the temperature dropped below 16°C, they completely stopped oviposition. The bracon did not attack the larvae of the southern warehouse moth at temperatures below 16°C. Although the female bracon damages the larvae, it does not lay eggs on all of them. During oviposition, the bracon pays attention to the smoothness and sparse hairiness of the host's body surface, as well as its body size. The more favorable these characteristics, the higher the number of eggs the parasite will lay. Therefore, it was observed that the bracon more often attacks third, fourth, and fifth instar larvae. Bracon was applied at ratios of 1:10, 1:15, and 1:20, and the following results were obtained: when the bracon entomophage was used at a 1:20 ratio against 3rd–5th instar larvae of the southern warehouse moth, 80% biological efficacy was achieved; at a 1:15 ratio, 87%; at a 1:10 ratio, 90%; and at a 1:5 ratio, up to 100% biological efficacy was obtained. Therefore, for the protection of stored fruits such as jujube, apple, apricot, pistachio, and other products susceptible to southern warehouse moth infestation, using the bracon entomophage at 1:10 and 1:5 ratios provides an environmentally safe method for protecting the stored fruits.

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