



## Mass Production of the Parasitic Wasp *Bracon spp.*

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Braconids are a diverse family of parasitic wasps, with over 21,220 species, used in biological pest control. Female wasps lay eggs on or inside host insects, whose larvae then consume and kill the host. This helps manage pest populations in agriculture, reducing the need for chemical pesticides. Species like *Bracon brevicornis* and *Bracon hebetor* are commonly mass-reared using the low-cost "sandwich" technique, where host larvae serve as egg-laying sites. Field releases of 4,000-5,000 pupae or adults per hectare are timed based on crop and pest conditions, making Braconids effective for sustainable pest management.

**Keywords:** Braconids, pest control, parasitoid, wasps, mass production

### Introduction

Braconids are a diverse group of parasitic wasps (Hymenoptera: Braconidae). Braconidae is the largest family within the Metazoan, including over 1,100 genera and more than 21,220 described species. Braconids exhibit a remarkable diversity of behaviours and adaptations, allowing them to exploit a wide range of host species and ecological niches. Some species are highly specialized, targeting specific host insects, while others display a broader host range. The life cycle of Braconid parasitoids typically involves a host-parasitoid interaction, where the adult female wasp lays eggs inside or on the body of a host insect (ectoparasitic). Upon hatching, larvae consume the host from within, eventually killing it. This parasitic relationship often leads to the suppression of pest populations. In agricultural ecosystems, Braconid parasitoids are deployed as part of augmentative biological control strategies to manage pest infestations. Mass rearing of these parasitoids is often undertaken to produce large numbers for field release, enhancing their impact on pest populations. By harnessing the natural biological control mechanisms provided by Braconid parasitoids, farmers can reduce reliance on chemical pesticides and promote sustainable pest management practices. Their ability to suppress pest populations highlights the significance of these tiny yet formidable allies in the ongoing effort to promote sustainable agriculture and food security.

### Selection of strains

The strains of *Bracon spp.* were selected based on the host range, reproductive rate, efficiency in controlling pests, and commercial usage. The various bracon species used in pest control include *Bracon brevicornis*, *Bracon hebetor*, *Bracon didemie*, etc. The host range of *Bracon brevicornis* includes *Ephestia kuehniella*, *Ostrinia nubilalis*, *Antigastra catalaunalis*, *Adisura atkinsoni*, *Earias sp.*, *Helicoverpa armigera*, *Noorda moringae*, *Opisina arenosella*, *Pectinophora gossypiella*, *Chilo partellus*, etc., while, Another gregarious ectoparasitoid, *B. hebetor* preys on moth larvae including *Plodia interpunctella*, *Cadra calidella*, and others.

## Rearing setup

The mass production of Braconids was done with various methods but the effective production of parasitoids was done through the 'Sandwich' technique. It is an easy and cheap method of production and requires very little infrastructure like laminar airflow, 500ml glass beakers, muslin cloth, thread, *etc.* The host for multiplication may be a Wax moth or rice moth larvae. The mass production of rice moth larvae was standardized on sorghum grains.

## Rearing of parasitoid

Mass production of parasitoids was achieved using the sandwich technique. This method involves releasing approximately 20 mated female wasps into a glass jar, covering both sides with muslin sheets secured by rubber bands. A cotton swab soaked in a 50% honey water solution is affixed to the jar to serve as a food source. Implementing a high-protein diet can enhance the sex ratio, favouring the production of more female offspring. 'Proteinex' is a viable option to achieve the desired outcomes. Substituting honey with laevulose or fructose can also be advantageous in certain situations. Exposure to sunlight often stimulates mating, oogenesis, and egg fertilization.

About 10 fully developed *Corcyra* larvae are placed between two layers of facial tissue paper, positioned over the muslin sheet covering the wider end of the jar. The setup is secured with rubber bands and positioned facing a window or light source to attract female *B. brevicornis*. The females are drawn to the host larvae, penetrating through the muslin to paralyze them and lay approximately 25 eggs on each larva daily. After 24 hours, the tissue sheets containing parasitized larvae are removed and stored in plastic containers until the parasitoid grubs hatch, complete their development, and form cocoons. The egg, larval, pupal, and adult stages are completed within 28-36 hours, 4-7 days, 3-6 days, and 15-40 days respectively. A female parasitoid can deposit 150-200 eggs in its lifetime. Newly emerged adults are collected for mating and egg-laying purposes. While adults typically live for 15-40 days, egg-laying activity usually declines after the initial ten days. Two-day-old adults of *B. brevicornis* can be stored for up to 30 days at 50°C and 50-60% relative humidity (Plate 1).

## Field release

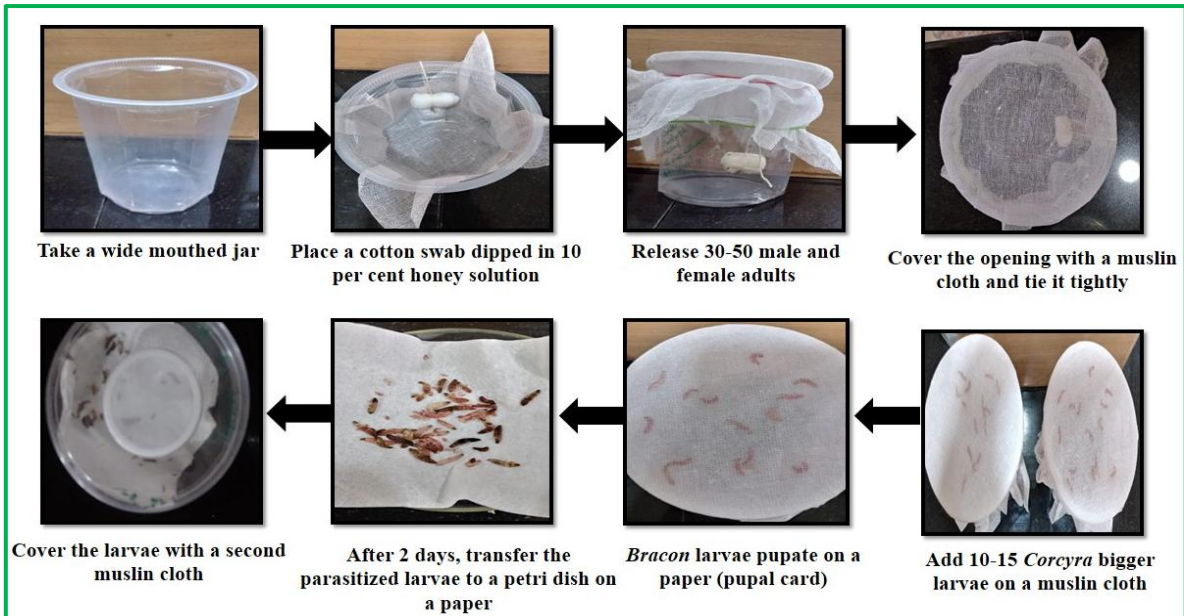
The field release of parasitoids depends on the life stage of the parasitoid and host, crop duration, and time of release. About 4,000-5,000 pupae cocoons per hectare or 2,000-5,000 adults per hectare are recommended. Weekly releases may be necessary based on pest density

### Release methods

- **Stapling Bracon Cards:** Pupal cards containing *B. brevicornis* pupae are stapled to plants
- **Releasing Adults:** Adults collected from sandwiches are released.
- **Releasing Adults in Tub method:** the mass-reared parasitoids were released through the tube method

## Conclusion

The mass production of Bracon spp. parasitic wasps offer an efficient and cost-effective solution for biological pest control in agricultural ecosystems. The "sandwich" technique provides a simple yet reliable method for rearing large numbers of parasitoids, which can be released in fields to manage pest populations sustainably. By utilizing *Bracon brevicornis*, *Bracon hebetor*, and other species, farmers can reduce dependence on chemical pesticides, promoting eco-friendly and sustainable pest management practices. This approach supports long-term agricultural productivity and minimizing environmental impact.



**Protocol for mass production of *Bracon spp.***