

***Pediobius foveolatus* Parasitic Wasp**  
**Biological Control of Mexican Bean Beetle**

Mexican bean beetle can be a devastating pest of beans. The larvae skeletonize the foliage, and can completely defoliate the plants which reduces yields. However, a small eulophid wasp has great potential for controlling Mexican bean beetle in small gardens, even in urban settings. The small beneficial wasp, *Pediobius foveolatus*, will seek out and destroy Mexican bean beetle larvae. Imported from India, this non-overwintering wasp can suppress MBB to non-damaging levels. Introduced from India, is a gregarious larval parasite that can completely eliminate the beetle in small gardens. This wasp also parasitizes another minor pest in urban gardens, the squash beetle.



Mexican bean beetle (MBB) is a major insect pest of beans in the Mid-Atlantic region. MBB adults and larvae eat the undersides of bean leaves causing lacing of the foliage. High levels of defoliation can significantly reduce bean yields. *Pediobius foveolatus* is a wasp *Pediobius* has been raised since the late 1970's to control MBB on commercial soybean acreage in New England.

The *Pediobius* wasps are shipped when in a dormant state inside the parasitized host (the Mexican bean beetle larvae upon which they are cultured in our lab). The customer receives six mummies per carton each containing 20-25 wasps (total 120-150 wasps expected to emerge per carton). This will cover approximately 500 square feet of bean space. We ship by first-class mail. During the 4-5 days in the mail, the wasps mature and, as soon as the cartons are received, they are ready to be set out in the infested beans. To insure proper timing for release, customers should be advised to order the wasps as soon as the first adult Mexican bean beetles are noticed on the bean plants. We do not ship outside of the continental United States as the wasps could not withstand the longer shipment periods. I have enclosed the informational brochure that we currently send with our orders.

The wasps will not overwinter in freezing temperatures, thus we keep a maintenance culture going in our lab throughout the winter. We fill orders generally from May through August for retail companies.

The environmental and health benefits of using biological controls over pesticides are obvious. In addition, the economic advantage with the *Pediobius* wasps is that once a culture has been established in a bean plot, it will continue to multiply throughout the season. If consecutive plantings are made in close proximity to each other, the wasps from the earlier planting will move into the new planting and maintain the protection without the purchase of many additional cartons.

Biological Control of the Mexican Bean Beetle  
Courtesy United States Department of Agriculture

**Important Handling Instructions**

- Do not allow your carton of *Pediobius* wasps to freeze or overheat (85° F).
- Remove the carton from the shipping box.
- Remove the lid from the carton just before placing the carton in your garden.

- Hang the opened carton by its side on or near a bean plant that has Mexican Bean Beetle larvae. Do not remove the contents. Allow the *Pediobius* wasps to leave on their own. We recommend placing the carton of *Pediobius* wasps in your garden in the cool early morning or late evening hours. Do not allow rain or irrigation water to saturate the inside of the carton. After seven days, the carton can be discarded.
- Do not use pesticides on your beans for at least two weeks following the release of the *Pediobius* wasp. If it is necessary to control a pest other than the Mexican Bean Beetle, use only those pesticides labeled for beans and at the lowest rate recommended. Important, apply when the Mexican Bean Beetle is in the dark mummy stage only. (see #4). We recommend that no pesticides be used if at all possible.

## Biological Control of the Mexican Bean Beetle

Mexican bean beetle (MBB) is a major insect pest of beans in the Mid-Atlantic region. MBB adults and larvae eat the undersides of bean leaves causing lacing of the foliage. High levels of defoliation can significantly reduce bean yields. *Pediobius foveolatus* is a small beneficial wasp that will seek out and destroy Mexican bean beetle larvae. Imported from India, this non-overwintering wasp can suppress MBB to non-damaging levels. The Plant Protection Section has raised this effective biological control agent since the late 1970's to control MBB on commercial soybean acreage in Maryland.

May through October (frost)

Adult Mexican Bean Beetles (MXBB) appear from hidden winter hibernation sites in the spring. They may complete two to three generations before fall frost. Late season adults seek out winter protection in various sheltered field sites.

June through September

Yellow clusters of thirty to fifty eggs are deposited on the bottom side of most kinds of bean plant leaves from early summer until about September.

June through September

Eggs hatch in five to fourteen days. Young MXBB larvae feed and develop on the bean plant leaves.

June through August

MXBB larvae are becoming well developed, their numbers have not yet reached peak density. This is the optimum time and stage for the *Pedio* (pee-d-o) wasp to sting (lay eggs) and parasitize the MXBB larvae. An inoculative release of *Pedio* wasps directly among larvae of the MXBB will result in colonization. The parasitized MXBB larvae will appear dark (brown/black) in seven to ten days after being stung by the female *Pedio* wasp. New *Pedio* wasps will emerge from the mummified MXBB larvae twelve to sixteen days from the sting date. The new *Pedio* wasps will seek out additional MXBB larvae and the cycle repeated. A tenfold increase in *Pedio* wasps approximately every two weeks can be expected. To obtain the maximum benefit, it is important to make the *Pedio* wasp releases as soon as the first MXBB larvae are detected in early summer.

July through September

MXBB pupa may be seen on bean plants. A new adult MXBB will emerge from this stage. Some of the MXBB larvae will not be parasitized by the Pedio wasp. More MXBB larvae will escape the Pedio wasp's eggs in the early part of the season than will later as the number of Pedio wasps increases.

## **The Mexican Bean Beetle**

### **Appearance and Life history:**

The Mexican bean beetle (MBB) overwinters as adults. Adults look like and are closely related to lady-bugs. They are copper colored with 16 black spots. Overwintered adults can be found on young beans as soon as they emerge in the spring. Yellow eggs are laid in groups on leaves and hatch in 5-14 days. Bright yellow, soft-bodied, spiny larvae develop in two to three weeks. When larval development is complete, the larva attaches itself to a leaf and "pupates" or enters a resting state. After seven to ten days, a new adult emerges. There are usually two generations of MBB in the Mid-Atlantic region.

### **Damage:**

MBB adults and larvae feed on bean leaves causing a "lacing" effect. Adults chew all the way through the leaves, while larvae scrape the upper surface, leaving a layer of leaf tissue where they have fed. Lima beans are preferred, but MBB will feed on many different beans including snap beans, soybeans, and shelling beans.

### **Pediobius foveolatus**

#### **Background:**

*Pediobius foveolatus* is a larval parasitoid of MBB. Originally from India, this small wasp cannot survive freezing temperatures and must be maintained in laboratory colonies through the winter months. Programs which control MBB on soybeans using releases of *P. foveolatus* have been successful in the Mid-Atlantic area. Release strategies in small, successive, fresh-market bean plantings are considerably different and are the focus of this brochure.

#### **Appearance and Life History:**

*P. foveolatus* is a small black wasp. Female wasps lay eggs inside MBB larvae (a.) Wasp larvae eat the inside of the MBB larva causing death (b c) Adult wasps make an emergence hole in the "mummy", or parasitized MBB larva and fly away to start another generation (d).

#### **Parasite Care:**

Parasites may be shipped as pupae in the mummies or as adults. Adult wasps that cannot be released immediately should be kept cool and shaded. A cooler with an ice pack is an excellent choice. Do not let the parasite container come in direct contact with the ice pack. Refer to package enclosure for specific care instructions.

## **PROTECT PARASITES FROM EXTREMES OF HEAT AND COLD.**

### **Parasite Release**

**TIMING IS CRITICAL!** Order parasites as soon as MBB larvae begin to hatch.

Parasitized larvae do not stop eating immediately. To minimize damage to the bean crop, larvae should be parasitized when they are young.

Take the parasite container to the infested area of beans, open it and place it under the bean leaves. Time of day is not critical, but do not release during or before heavy rainfall. If the

parasites have not yet emerged from the mummies, put the container above the ground in the bean canopy, to protect the mummies from predators.

After about a week, the yellow Mexican bean beetle larvae that have been parasitized will begin to turn brown and can be seen attached to the bean leaves. New adult parasites will emerge from these mummies" in 10 to 14 days, ready to parasitize more Mexican bean beetle larvae, protecting subsequent bean plantings.

#### COMMONLY-ASKED QUESTIONS:

Q: Can this wasp harm humans?

A: Absolutely not! This small parasite can only harm larvae of the Mexican bean beetle. The adult wasps feed harmlessly on plant nectar.

Q: Will the wasp become a pest itself?

A: No. The wasp will only "sting" Mexican bean beetle larvae. It does not parasitize any beneficial insects. In addition, the wasp is tropical and is not known to survive North American winters.

Q: How will I know the wasp is working?

A: The presence of brown, parasitized mummies indicates that the wasps are working. Yellow MXBB larvae can also be broken open to check for white, maggot-like wasp larvae

In a study done in urban gardens in Washington, D.C., this wasp parasitized 97 to 100% of the Mexican bean beetle larvae in each garden by late summer. In one year no living Mexican bean beetle larvae could be found 14 weeks after parasite releases were made, and the bean plants were thriving. If inoculative releases of the wasps are made at the right time they can eliminate most Mexican bean beetle damage. In Washington, D.C. this is late June, but in some parts of the Midwest it may be later. The wasps should be released when the first generation Mexican bean beetle larvae are about half grown.

This summer *Pediobius* wasps were released in the students' community gardens at the University of Wisconsin-Madison. The extent of parasitism throughout this growing season is being studied, and the impact of this release on beetle populations and bean damage will be assessed next year. Unfortunately, this wasp does not overwinter in the Midwest, so it must be released each year for biological control. *Pediobius* is available commercially.

Last summer the wasp parasite *Pediobius* was released in the student gardens at the University of Wisconsin - Madison for control of Mexican bean beetle. The beetle had been a devastating pest on bean plants in these gardens for years some people even gave up growing beans entirely. Early this summer local gardeners reported they had yet to find any leaf damage or any beetle larvae or adults. They didn't want to be too optimistic, but were hoping that the wasp releases the year before completely eliminated this isolated population of Mexican bean beetle. A team of researchers searched the gardens in early August and were unable to find any beetles either.

#### Source:

Barrows, E. M. and M. E. Hooker. 1981. Parasitization of the Mexican bean beetle by *Pediobius foveolatus* in urban vegetable gardens. *Environ. Entomology* 10: 782-786.