

Biology (morphology & life Cycle) and feeding behavior (Larvae & Adult) of *Zygogramma bicolorata*

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Introduction:

In India, more than 50 insect species have been reported on *Parthenium*, but none of the indigenous insects was found host-specific yet. Based on well documented success by Mexican beetle, *Zygogramma bicolorata* Pallister (Coleoptera: Chrysomelidae), in other countries where they were introduced, beetle were imported from Mexico to India. After in-depth laboratory and field studies, it was found host specific, which can eat only *Parthenium*, hence, its' use was permitted by Government of India. Therefore, Mexican beetles can be multiplied and released anywhere in India for *Parthenium* suppression. Here's a detailed overview of its biology and feeding behavior:

Biology of *Zygogramma bicolorata*

1. Classification:

Kingdom :	Animalia
Phylum :	Arthropoda
Class :	Insecta
Order :	Coleoptera
Family :	Chrysomelidae
Genus :	<i>Zygogramma</i>
Species :	<i>Zygogramma bicolorata</i>

2. Morphology:

Eggs: Small, oval, and pale yellow in color. Each female can lay around 300-500 eggs during her lifespan.

Larvae: Grub-like, soft-bodied, and yellowish in color. They undergo three larval instars.

Pupae: The pupation occurs in the soil, with larvae burrowing into the ground after completing feeding.

Adults: The adult beetles are around 6-7 mm long, with distinctive stripes (usually yellow and black) on their elytra (wing covers). They have a rounded body typical of leaf beetles.



Eggs

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Larvae



Pupa



Adult

3. Life Cycle:

Egg Stage: The female beetle lays eggs in clusters on the underside of leaves of the host plant. Depending on environmental conditions, eggs hatch in about 4-5 days.

Larval Stage: After hatching, the larvae begin feeding on the leaves. The larval stage lasts for about 15-22 days, depending on

temperature and food availability. During this time, larvae go through three instar stages.

Pupal Stage: Once fully grown, larvae drop into the soil, where they form pupae. The pupal stage lasts for about 7-10 days.

Adult Stage: Adult beetles emerge from the soil and immediately begin feeding and mating. The adults can live for 4-6 weeks under optimal conditions.

The entire life cycle of the beetle from egg to adult takes around 30-35 days, with several generations produced annually, particularly in regions with warm climates.

Feeding Behavior of *Zygogramma bicolorata*

1. Host Specificity:

Zygogramma bicolorata has a strong preference for *Parthenium hysterophorus*, a notorious invasive weed in tropical and subtropical regions.

The beetle is highly specialized and shows minimal feeding on non-target plants, making it ideal for biological control programs.

2. Larval Feeding:

Feeding Site: The larvae primarily feed on the leaves of the host plant. After hatching, they immediately begin feeding on the soft tissues of the leaves.

Feeding Damage: Larvae skeletonize the leaves by consuming the soft mesophyll tissue, leaving behind only the veins. This type

of feeding causes significant damage to the plant, inhibiting its ability to photosynthesize effectively.

Growth Impact: The larvae grow quickly and cause extensive defoliation. After feeding, the larvae leave the plant and burrow into the soil to pupate.

3. Adult Feeding:

Feeding Site: Adult beetles feed on both the leaves and flowers of *Parthenium hysterophorus*. They chew irregular holes in the leaves, typically focusing on the younger, tender foliage.

Feeding Damage: The adults can cause similar leaf skeletonization as the larvae, though the damage is more uniform. They also feed on the buds and flowers, preventing seed production, which is crucial for controlling the spread of the weed.

Reproduction and Feeding: Adults need to feed extensively before mating and laying eggs, ensuring that both the adult beetles and their larvae inflict substantial damage on the host plant.

4. Impact on *Parthenium hysterophorus*:

The combination of larval and adult feeding can cause severe defoliation of *Parthenium hysterophorus*. This reduces the plant's ability to produce seeds and regrow, significantly lowering its population over time.

Continuous generations of the beetle ensure prolonged pressure on the weed

population, making *Zygogramma bicolorata* an effective biological control agent.

5. Feeding in Relation to Environmental Factors:

Temperature: The beetle's development and feeding activity are temperature-dependent. Higher temperatures accelerate its life cycle, allowing more generations per year. In cooler temperatures, the beetles are less active, and feeding rates slow down.

Food Availability: In the absence of *Parthenium hysterophorus*, beetles may exhibit reduced feeding and reproduction. However, they rarely feed on other plant species, maintaining their host specificity.

Significance in Biological Control:

Zygogramma bicolorata has been introduced in several countries, including India and Australia, as part of integrated pest management programs targeting *Parthenium hysterophorus*.

By defoliating the weed and limiting its seed production, the beetle plays a crucial role in reducing the spread and density of *Parthenium* in infested areas.

The beetle's life cycle and feeding habits align perfectly with the reproductive cycle of the weed, making it a valuable tool for long-term weed management.

Conclusion:

The biology and feeding behavior of *Zygogramma bicolorata* make it a highly effective biological control agent against *Parthenium hysterophorus*. Its lifecycle is closely tied to the availability of the host plant, and its feeding causes substantial damage to the weed, helping reduce its prevalence in affected areas.

