Role of Physical Character of the Ovipositional Substrate for Preferential Egg Laying and Viability in *Zygogramma bicolorata*

*Brajesh Mishra and P.H. Pathak*

1Plant Quarantine Station, Gandhidham, Gujarat, 370 201
2D.D.U. Gorakhpur University, Gorakhpur, Uttar Pradesh, India, 273 009

**Abstract:** Experiments were carried out to see the role of physical character of ovipositional substrate for rearing of *Zygogramma bicolorata* in the laboratory. Maximum egg output was obtained on cloth followed by upper covered leaf, lower covered leaf, on adhesive and non-adhesive portion of cellophane tape, on glass and bits of card board. The total mean number of viable eggs laid on cloths per female was significantly higher than that recorded from, upper covered leaf, lower covered leaf, on adhesive and non-adhesive portion of cellophane tape, glass and bits of card board.

**Key words:** Phytophagous beetle • Oviposition • *Parthenium hysterophorus*

**INTRODUCTION**

*Parthenium hysterophorus* Linnaeus (Asteraceae) of Neotropical origin commonly known as congress grass is an exotic weed in India. It is a native of subtropics of Southern parts of North America, Central America, West Indies and central parts of South America. It has also been reported from South Africa, Bangladesh, Madagascar, Kenya, Mozambique, Ethiopia, Mauritius, Rodriguez, the Seychelles, Israel, India, China, Vietnam, Taiwan, many South Pacific Islands and Australia [1]. It is commonly known as American feverfew, whitehead, white top and carrot or congress grass [2]. It was first observed from Pune in 1955 [3] and has since then it spread virtually in other part of the country covering approximately 5 million hectare of land [4] and at present it has occupied almost all part of India [5]. Biological control efforts were initiated in India with the introduction of *Zygogramma bicolorata* Pallister in 1983 [6]. Post-entry quarantine tests were conducted at Bangalore. These tests included host-specificity tests with economic plants. Based on the tests, it was found safe to economic plants [6]. For maintaining the laboratory culture physical character of best suitable ovipositional substrate on egg output and egg viability plays an important role in maintaining any Biocontrol agent that can finally be recommended for mass rearing of this beetle.

**MATERIALS AND METHODS**

The experiment was set in a 2 liter plastic jar. A bouquet of *Parthenium* plant having two leaves was prepared. On one leaf the upper surface was covered with cellophane tape. To avoid detachment of cellophane tape due to moisture released from the leaf during transpiration, the cellophane tape was fastened by stapling it with the leaf. The adhesive surface of the tape was projected out from the margin of leaf lamina to provide additional substrate for egg deposition. Similarly, the lower surface of the other leaf was covered with cellophane tape as done in the case of upper surface. The jar was covered with muslin cloth fastened with rubber band. In this way seven physical surfaces viz: glazed glass, muslin cloth, card board bits, non-adhesive portion of cellophane tape, adhesive surface of cellophane tape, upper and lower surfaces of *Parthenium* leaf were made available for the female beetle to lay eggs. In this experimental set-up a pair of five day old male and female beetle was released to know the preference of the physical substrate for egg laying and their subsequent viability after 48 hours (08.00 am to 08.00am). The experiments were replicated five times. Data were subjected for one way Annova statistical analysis [7].

**Corresponding Author:** P.H. Pathak, D.D.U. Gorakhpur University, Gorakhpur, Uttar Pradesh, India, 273 009.
RESULTS AND DISCUSSION

The result clearly indicates that there is a significant variation in the total egg output in females of *Zygogramma bicolorata*. Maximum mean egg output was obtained on muslin cloth (52.00) > followed by upper covered leaf (25.00), > lower covered leaf (12.20), > non-adhesive portion (7.60), > on adhesive portion of cellophane tape (6.20), > glass (0.60) and bits of card board (0.40) on all the seven substrate provided for egg deposition. The total mean number of viable eggs laid on muslin cloth by females (42.80) was significantly higher than > upper covered leaf (20.00), > lower covered leaf (9.80), > on adhesive portion of cellophane tape (3.00) > non-adhesive portion (4.60) > glass (0.40) and > bits of card board (0.2). The higher egg output and viability by the beetle on muslin cloth followed by upper covered leaf covered by cellophane tape was due to the roughness of muslin cloth and lower leaf portion of leaf. The data are presented in (Table 1), (Fig.1, 2). Roughness of the substrate was also reported by Gupta, *et al.*, [8] while working with *Andrallus spinidens* F., *Cantheoconidea furcellata* Wolf in the laboratory in which gravid females after a pre-oviposition period of 1–3 days, moved up and down over the object on which the eggs were to be deposited, bent the abdomen and rubbed the object with its tip before egg-deposition. The egg hatched in 5.7 to 8.0 days, with a mean incubation period of 6.46 ± 0.51 days on glass surface, cotton or muslin cloth. He also recorded oviposition by reduvid bug *Sycanus pyrrhomelas* Walker in captivity condition, they laid most of the eggs on the underside of a muslin cloth tied upon the mouth of a glass jar, with occasional laying of eggs on glass surface. Ovipositional preference of *Diaprepes abbreviatus* L. (Coleoptera: Curculionidae) on immature citrus leaves, mature citrus leaves and doubled strips of various

Table 1: Estimates of preferential egg laying and egg viability in *Zygogramma bicolorata* due to physical character of the ovipositional substrate

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Ovipositional substrate</th>
<th>Mean Egg output</th>
<th>Mean Egg viability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cloth</td>
<td>52.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>42.8&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Upper leaf covered with cellophane tape</td>
<td>25.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>20.0&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>Lower leaf covered with cellophane tape</td>
<td>12.2&lt;sup&gt;c&lt;/sup&gt;</td>
<td>10.0&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>4</td>
<td>Non-adhesive portion of Cellophane tape used to cover leaf</td>
<td>7.6&lt;sup&gt;c&lt;/sup&gt;</td>
<td>4.6&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>5</td>
<td>Adhesive portion of Cellophane tape used to cover leaf</td>
<td>6.2&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3.0&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>6</td>
<td>Glass</td>
<td>0.6&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.6&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>7</td>
<td>Bits of card board</td>
<td>0.4&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.4&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>14.85</td>
<td>11.62</td>
</tr>
<tr>
<td>LSD at</td>
<td>1%</td>
<td>13.83</td>
<td>11.51</td>
</tr>
<tr>
<td></td>
<td>5%</td>
<td>10.30</td>
<td>8.55</td>
</tr>
</tbody>
</table>

Mean followed by different letters differs significantly with control at 5% or 1% by Least Significant Difference (LSD) test.

Egg Laying

![Fig. 1: Influence of physical character of the ovipositional substrate on preferential egg laying in *Zygogramma bicolorata*](image)

OVIPOSITIONAL SUBSTRATE

Fig. 1: Influence of physical character of the ovipositional substrate on preferential egg laying in *Zygogramma bicolorata*
Fig. 2: Influence of physical character of the ovipositional substrate on egg viability in Zygogramma bicolorata

Fig. 2: Egg viability graph showing the mean number of viable eggs against different substrates.

substances as potential oviposition sites was observed by [9]. He recorded that both the laboratory and in caged outdoor experiments more egg masses were deposited between freezer paper strips than between mature leaves. No egg masses were deposited between immature leaves. Substrates were preferred in the following order: freezer paper > waxed paper > transparency film. [10] observed preferred oviposition substrate for rearing of Helicoverpa armigera (Hübner) under laboratory conditions using pigeonpea leaves, muslin cloth, tissue paper and cotton wool as oviposition substrates as free-choice and no-choice tests in descending order, to be cotton wool, pigeonpea leaves, tissue paper and muslin cloth. The preference index of cotton wool was 65% higher than the least preferred substrate, muslin cloth. Misra [11] also worked out the preferred ovipositional substrate of Epiricania melanoleuca on glazed glass, dry sugarcane leaf and green in situ sugarcane leaf. The higher egg output by females was observed in situ sugarcane leaf.

REFERENCES