

## OVIPOSITING BY *ACRAEA VIOLAE* ON NON-FOOD PLANTS A MISTAKE OR AN ATTEMPT TO ACQUIRE NEW FOOD PLANT?

ALAKA R. BHAGWAT AND MADHURI K. PEJAVER

Department of Zoology  
B.N.Bandodkar College of Science, Thane 400601.

**ABSTRACT:** It is a common knowledge that the butterflies select the food plants to lay their eggs, so that as soon as the egg hatches the specific food is available to the caterpillar.

In the present study observations were made on the egg laying pattern of the butterfly *Tawny-caster, Acraea violae*, belonging to the family Acraeidae. The established food plant for this butterfly is *Passiflora*. In the presence of the *Passiflora*, the eggs were laid on *Turnera*, which is not yet reported as its food plant. Hence observations were made to study the same.

**Key words:** *Tawny-caster, Acraea violae*, butterfly, food plant, *Passiflora*, *Turnera*.

### INTRODUCTION:

Butterflies belong to the insect order Lepidoptera. They undergo complete metamorphosis with egg, larva, pupa and imago as the stages in the life history. The larval stage is mainly phytophagous wherein the larvae feed on genera/ family specific plants called as the food plants. The female butterfly, known as the best botanist in recognizing the plant species, lays eggs on food plant after first visually selecting a perfect plant/leaf and then carefully tasting the chemical composition of the leaves by drumming with her feet on them. The particular butterfly family has specific food plants belonging to particular plant families.

**Description:** Habitat India, Ceylon. Wing expanse 1.8 to 2.5"

**Description:** *Acraea violae*

Adult -- (Table 1)

**Egg** Yellow, taller than wide.

**Larva** Pale, purple brown; The body is armed with six rows of branched spines. Length of the mature caterpillar is approximately 3 cms. The larvae feed on leaves of plants belonging to families Cucurbitaceae, Passifloraceae, Malvaceae.

**Pupa** Reddish white streaked with black. The abdominal streaks spotted with red.

The recorded food plants so far for this butterfly are *Adenia hondala*, *Passiflora foetida*, *Passiflora edulis*, *Passiflora subpeltata*, (Passifloraceae), *Hibiscus cannabinus* (Malvaceae) and Cucurbitaceae plants (Wynter-Blyth, 1957; Kehimkar, 2008) *Passiflora holosericea* (personal observation) in India. All over the world the subfamily Acraeinae is known to have Asteraceae (Compositae), Commelinaceae, Moraceae, Passifloraceae, Sterculiaceae, Tiliaceae, Urticaceae, Verbenaceae and Violaceae as the major

host plant families (Owen, 1971; Vane-wright *et al.*, 1984).

*Acraea violae* is an unpalatable species. It exudes an oily, yellowish evil smelling fluid which is obnoxious to birds and insects (Wynter-Blyth, 1957).

### MATERIALS AND METHODS:

A terrace garden with potted larval food plants and nectar plants, a plastic tub of 15 inch diameter and 6 inch deep as rearing chamber, a container filled with water of dimensions 6x4x2 inches to be placed at the centre of the tub to keep the twigs of the food plant moist, two plastic containers of 4.5 inch diameter and 5 inch deep to separate the caterpillars, nylon mosquito net to hold the caterpillars within the rearing chamber and small containers, a thermometer to record the room temperature.

The study was conducted in a garden of 1000 sq. feet on the terrace on third floor of a residential building. The location was sunny getting the sun light for the whole day. The garden, specifically erected for butterflies, contained larval food plants and nectar plants for the adult butterflies. The plants of various genera/species were arranged in 6 double rows of earthen pots. The larval food plants and nectar plants of one species were planted in a group to advertise the presence and density of the particular plant. The garden also had a flat container filled with wet mud, acting as mud puddling sight.

Female of *Acraea violae* were found laying eggs on *Turnera ulmifolia* plants on 30.05.2008. The eggs were collected and brought to the rearing chambers.

A plastic tub of 15 inch diameter with a

container filled with water and covered with lid was made ready for rearing caterpillars. The twigs of *Turnera ulmifolia* with eggs were transferred to this tub, inserted in the holes of central water filled container. The tub was covered with nylon netting to stop the caterpillars from wandering away from food plant.

**Observations :** On 30.05.2008 at 11.00 am two females of *Acraea violae* species, though the reported food plants of *Acraea violae* were in the terrace, were seen laying eggs in the terrace garden on *Turnera ulmifolia* var. *elegans* a plant which is not reported as a food plant of this species earlier. At that time 4 *Passiflora* plants belonging to species *Passiflora edulis* and *passiflora holosericea* with many tender shoots on which previous egg laying was observed, and young saplings of 17 Cucurbitaceae plants belonging to *Momordica charantia*, *Lagenaria vulgaris*, *Trichosanthes anguina*, *Luffa aegyptica*, *Luffa actungula* also with tender leaves along with many *Turnera* plants which had acquired the status of weed were present all over the garden.

One female laid eggs on the *Turnera* plant which was next to the passiflora-cucurbitaceae plot. The other female chose a plant which was 12 feet away from the passiflora plot. The first female, an old weathered one, laid 36 eggs on one leaf and 11 on another leaf. The second female laid 28 eggs on a single leaf and then disappeared.

These eggs were then collected along with the twigs on which they were laid without disturbing the eggs and were kept in the rearing chambers. All the conditions of temperature and moisture were monitored and maintained.

During further observation on 2.6.2008 in the morning between 6 am and 8.15am the eggs turned black with the exception of two eggs which never changed the colour.

It was further seen that on the same day i. e. 2.6.2008 at 11am, the eggs started hatching and by 12 noon all the caterpillars emerged from the eggs that had turned black, while the 2 eggs that did not changed colour did not hatch. (Table 2)

The caterpillars were observed to be moving on the surface of *Turnera* leaf hairs and were not in direct contact with epidermis. Soon after hatching all the caterpillars ate their own egg shells however the two unhatched eggs were not touched. After consuming the shells caterpillars stopped eating for some time and did not try to eat leaf.

At 12 noon the leaf with 9 caterpillars and two unhatched eggs (Table 2, Obs. 2) was removed from the plant and transferred to a container with

two very tender passiflora leaves, which is a reported food plant of *Acraea violae*, but it was found that the caterpillars were neither eating *Turnera* leaves nor *Passiflora* leaves.

At 1.30 pm the two unhatched eggs were found half eaten.

Though the *Passiflora* leaves were available the caterpillars came back to *Turnera* leaves and preferred to eat *Turnera* leaves. Till 5.30pm these 9 caterpillars ate small portion of *Turnera* leaf and then they shifted to the *Passiflora* leaf.

The caterpillars did not eat *Passiflora* leaves. Next two days they ate inconspicuous portion of *Turnera* leaf and on 4.6.2008, 8 were found shriveled and dead. The remaining single caterpillar survived for two more days by eating remaining *Turnera* leaf and died after a slight gain in size. Though the caterpillars were on the verge of dying they did not touch the *Passiflora* leaf.

The twig of *Turnera* with 28 caterpillars (Table 2, Obs. 3) was kept as it is in the rearing chamber but all the 28 caterpillars did not eat the *Turnera* leaves. As the leaf was 7<sup>th</sup> or 8<sup>th</sup> node from the apex thinking that the caterpillars were finding it too mature or hard a tender leaf was supplied to the caterpillars to give them a chance to shift to a palatable leaf. But still the caterpillars continued wandering on and beneath the leaf margin without choosing the tender leaf. On 4.6.2008 all caterpillars were found shrivelled and dead.

36 caterpillars (Table 2, Obs. 1) were found eating *Turnera* leaf. The leaf was at 4<sup>th</sup> node from the top. They formed two groups on both sides of the mid vein of the same leaf and continued eating. The amount eaten was much less than that observed previously (June 2007, September 2007) on *Passiflora* plant. In June and September 2007, the development was observed through out till the emergence of adults without any loss at any stage but these observations were on *Passiflora* leaves, the established food plant of *Acraea violae*.

After two days without finishing the half eaten leaf and without touching the other leaves available nearby, they started wandering on the stem and other leaves. On 5.6.2008, all the 33 caterpillars died.

The remaining 3 caterpillars were transferred to another small container out of fear of losing them. On 7.6.2008 two caterpillars were found dead after a slight gain in size. The last caterpillar reached a length of 1cm and died on 13.6.2008.

The temperature was continuously in the

range of 34°C to 36°C.

In October 2008, few caterpillars were found on *Passiflora* as well as *Turnera* plants. These caterpillars had already reached the 4<sup>th</sup> instar stage and were of the same size irrespective of the plant they were eating. All the caterpillars died of unknown reason.

## RESULTS AND DISCUSSIONS :

With respect to food plants, Family Acraeidae of butterflies, are said to be effectively confined to the plant family Passifloraceae. A survey of food plants of the butterfly genus *Acraea* in Sierra Leone, Africa, done by D. F. Owen (1971), reported that 14 species of *Acraea* have different food plants belonging to altogether different eight plant families. These families are Commelinaceae, Moraceae, Passifloraceae, Sterculiaceae, Tiliaceae, Urticaceae, Verbenaceae and Violaceae (Owen, 1971). In India this family, represented by two species, is known to feed on plants from families Cucurbitaceae, Malvaceae, Urticaceae and Loganiaceae (Wynter-Blyth, 1957). This shows the genus *Acraea*'s exceptional capacity to adapt to different plant families.

The Urticaceae plants are eaten by butterflies belonging to Danaidae which are unpalatable species. Loganiaceae plants contain poisonous compounds such as strychnine (Wynter-Blyth, 1957). These compounds render unpalatability to the adult butterflies.

The Mexican Fritillary, *Euptoieta hegesia* from the Island of Jamaica has the *Turnera ulmifolia* as the preferred food plant and uses small number of passionvines, *Passiflora* spp. as alternate hosts (Schappert, 2000)

*Euptoieta hegesia*, The Mexican Fritillary, feeds on *Passiflora foetida* in North America while in Mexico and the Antilles it feeds on *Turnera ulmifolia* and in Brazil on *Ipomoea maritime*. *Euptoieta claudia*, The Variegated Fritillary, in North America has the food plants *Viola papilionaceae*, *Viola fimbriatula*, *Turnera ulmifolia*, *Passiflora foetida*, *Passiflora caerulea*, *Passiflora incarnata* (Scott, 1986).

The Gulf Fritillary was found to prefer *Piriqueta caroliniana* as food plant over the well known food plant, *Passiflora*, in a nursery in Florida. The *Piriqueta caroliniana* is a member of family Turneraceae. In the nursery the *Piriqueta caroliniana* was in dense beds and did not have any ants on it which frequent the passionvines (Cech *et al.*, 2005). The ants eat most of the butterfly eggs

possibly within seconds of being laid, reducing the survival rate drastically (Owen, 1971).

The passionvines and Turneras are found to have common chemical compounds, the Cyanogenic glucosides (Cech *et al.*, 2005).

*Papilio demodocus*, another genus of butterfly, which feeds on the Rutaceae plants, also lays eggs on Marigolds and Cosmos belonging to the family Asteraceae. The caterpillars most of the times die in the third or fourth instar, but occasionally small adults are produced. Owen (1971) attributes this probably to the presence of certain aromatic compounds in these plants.

According to Vane-Wright (1984) many large 'jumps' in butterfly food plant specificity occur when old and new food plants chronically grow in physical proximity to each other. Larvae get exposed to potential food plants for many generations and the plant gets established as new food plant by the success of the adaptive larvae. In the terrace garden where observations were made the *Passiflora* and *Turnera* were growing together for 8 years. The *Tawny coster*, *Acraea violae*, was a resident butterfly observed throughout the year for all these years. Eight years is a sufficient long time for the butterfly generations to adapt to a new foodplant.

## CONCLUSION :

The above discussion clearly shows that *Passiflora* and *Turnera* are the common plants preferred as food plants by many butterflies. They also have some chemical in common, a Cyanoglucoside, which also renders unpalatability to the butterfly. The herbaceous nature of a plant and its density play a role in butterfly's shifting to a new food plant provided the chemical composition is suitable for that species. Owen (1971), has shown *Acraea* has great capacity to acquire a new food plant family.

The observations showed continuous egg laying on *Turnera ulmifolia*. This clearly showed that it was not used for egg laying by some mistake or just because of the proximity to the *Passiflora* but it was chosen as a new food plant and the process of acquiring it as the food plant and completing the life cycle successfully is yet to be attained.

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Male	Female
Upper side	Upper side
Both wings ochreous red	Both wings paler in colour
Wing margins black	Marginal black band broad
Hind wing with a black spot at the end of cell, second spot on the costal border	Hind wing has two black spots in the cell and two on discocellular nervule
Under side	Under side
Glossy Red	Duller Coloured

Obs. no.	No. of eggs/leaf	Eggs turned black	Eggs hatched	% eggs turned black	%eggs hatched
1	36	36	36	100	100
2	11	9	9	81.8	81.8
3	28	28	28	100	100

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