



## Biology of mango hopper *Idioscopus clypealis* (Leth) in Jammu region of Jammu and Kashmir, India

### KEYWORDS

*Idioscopus clypealis*, mango hoppers, biology, oviposition, life cycle, nymphal instars.

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**ABSTRACT** *The mango hopper, Idioscopus clypealis* (Leth.) is the most serious insect pest of mango in Jammu region and causes serious losses to the crop. They are seen in large numbers with the panicle emergence and hibernate during winter in adult stage. It shows incomplete metamorphosis and there is no pupal stage in its life cycle. Copulation continued for 18 to 20 minutes and oviposition take place in the tissues of flowering shoots for 4 to 5 days. Eggs are smooth, creamy, oblong in shape and laid singly. Immature stages include five nymphal instars and the total nymphal period varies from 12 to 17 days. Adult male and female are creamish grey in colour and female (4.00-4.30 mm in length) is comparatively larger than male (3.80-4.20mm). Total life span of this species under laboratory conditions ranges from 18 to 22 days.

### Introduction

The mango, *Mangifera indica* (Linn.) – is the king of fruits and is grown in as many as 63 countries all over the world. India is at the top being the highest producer of this fruit (Srivastava, 1998). In proportion to its area of cultivation, its production is very low due to insect pests attacking mango. Over 175-200 (Fletcher 1916; Vevai, 1969; Butani, 1974; Nair, 1975; and Nayar et al., 1976) different species of insect pests have been reported attacking mango trees (Veeresh, 1989). Among the mango pests, mango hoppers are the most serious and widespread throughout the country. Out of different hopper species of mango *I. clypealis* is the smallest with two spots on the scutellum, dark spots on the vertex, light brown in colour and measures 3-5mm in length (Sohi and Sohi, 1990). It is the most troublesome species and causes heavy damage to mango crop (Nene, 2001). Nymphs and adults suck sap from the tender shoots, inflorescence and leaves. The affected florets turn brown and dry up, as a result the fruit setting is adversely affected (Hussain and Pruthi, 1921; Lefroy, 1906; Singh, 1968 and Sathiyandandan et al., 1972).

Peak incidence of hoppers are seen during full bloom stage of the crop (Reddy, 1968; Srivastava and Butani, 1972; Patel et al., 1973 and 1989; Jhala et al., 1988; Tandon, 2001; Sharma and Sharma, 2009 and 2011; Rahman and Kuldeep, 2007 and Sharma et al., 2010), after which the insect migrated to cracks and crevices of the tree trunk and overwinters in adult stage (Babu et al., 2001; Hussain and Pruthi, 1924; Rahman 1939; Pruthi and Batra, 1960; Patel et al., 1975; Reddy, 1968; Patel and Telgiri, 1950; Gangolly et al., 1957; Patel et al., 1994; Tandon, 2001; Babu et al., 2002; Rahman and Kuldeep, 2007, and, Sharma and Sharma, 2009 and 2011). Though many workers (Dwevedi et al., 2003; Varshneya and Rana., 2008; Fletcher and Dangerfield, 2002; Pehzhan and Radjabi, 2002; Anithakumari et al., 2009; Sharma and Sharma., 2011; Kannan and Rao, 2006; Pushpalatha et al., 2008; Joshi and Kumar, 2012) have provided data on seasonal incidence and effect of environmental factors on the hopper population in India and in J&K but studies on the biology of mango hoppers are very few in India and specifically in J&K, its lacking. Hence, in view of its importance, the detailed studies were carried out on the biology of *I. clypealis* (Leth.) in Jammu region of J&K state.

### Materials and Methods

The studies were conducted in a mango orchard at Nagbani growing twenty years old mango trees of cultivar Dashehari. Ten pairs of adult hoppers were collected at random from the mango orchard and were kept in glass rearing jars

(15cm\*20cm) covered with fine muslin. Small cup shaped plastic boxes with perforated lids containing fresh mango spikes were kept inside the rearing jars for egg laying. The boxes were filled with water to avoid the drying of the spikes. These spikes were changed every four hours to let the nymph have enough fresh food. Investigations were carried out at room temperature (Patel et al., 1975). The leaf hoppers were allowed to lay eggs for twelve hours, after which they were removed. The development of the leaf hoppers was monitored daily. Technique of Hussain and Pruthi (1924) was adopted for restricting the movement of hoppers from spikes. One end of a thick thread was tied around the base of the twig and other end dipped in water in the box to keep it wet. The wet thread act as an effective barrier against these nymphs quitting the spikes. Larvae for morphological examinations were fixed overnight in KAAD and AAD solutions (Peterson., 1943). The preserved specimen were measured for length and width of the head, length of thorax and abdomen.

### Observations and Discussion

Field collected adult hoppers when kept in rearing jars started mating immediately when the female was provided with the male. Copulation continued for 18-20 minutes, during which male and female were joined to each other at end to end position.

**Oviposition and Egg laying:** Just after copulation, female started ovipositing in the tissues of the flowering shoots and rarely on the leaves of the mango tree, it may be the reason that this species bred only once a year that too in the flowering season in Jammu region, hence a univoltine species. Hussain and Pruthi (1924); Pruthi and Batra (1960); Gangolly et al., (1957); Tandon et al., (1983); Hiremath and Thontadarya (1991); Hiremath and Hiremath (1994); Tandon (2001); Sharma and Sharma (2009 and 2011) also reported only one breeding season of this species.

Eggs are laid singly on the flower buds and flower panicle and were deposited deep in the tissues in the slits made by the ovipositor. Only the blunt ends of the eggs were visible externally as their pointed ends were embedded deep in the tissues. Due to oviposition, the surrounding tissue becomes blackish brown in colour (Patel et al., 1975; Wen and Lee, 1978; Butani, 1979 and Babu et al., 2002.). The oviposition period varies from 4 to 5 days, thus supporting Hiremath and Thontadarya (1991). Freshly laid eggs are smooth and creamy with an average 0.85mm to 1.00mm in length and 0.25mm to 0.30mm in width, which goes with the findings of Pehzhan and Radjabi (2002) and Babu et al. (2002). The in-

incubation period varies from 5-7 days. Hiremath and Thontadarya (1991) also reported it to be 5-6 days but Hussain and Pruthi (1921); Careschem (1935) and Rahman (1939) reported it being 8-10 days, 4-6 days and 8-10 days respectively.

**Immature stages:** There are five nymphal instars with in a period of 12-17 day. Hussain and Pruthi (1924), Patel et al. (1973), Sohi and Sohi (1990), Mishra and Choudhary (1996) also reported five nymphal instars in the life history of these hoppers, but Wen and Lee (1978), Hiremath and Thontadarya (1991), Babu et al. (2002) recorded only four nymphal instars during the life cycle of these hoppers (Table 1). The nymphs are voracious feeders and suck the sap from tender shoots, inflorescence and leaves of mango crop. They also excrete a semi liquid sticky secretion called honey dew. They moult five times to become adults. Moulting take place by means of a median longitudinal splitting. Similar findings has been noticed by Hussain and Pruthi (1924), Sohi and Sohi (1990), Mishra and Choudhary (1996).

**First nymphal instar:** The newly hatched nymph is white in colour and is very delicate but gradually turns yellowish green. The head measuring 0.40-0.42 mm in width and 0.20-0.22 mm in length. Head at this time is much bigger than the body with bulged compound eyes. The thorax measures 0.31-0.35 mm in length and the segments of thorax are not marked separately from each other. Abdomen on the other hand is 0.40-0.44 mm in length and is tapering towards the posterior end. The duration of the first nymphal instar ranges from 2 to 3 days, thus confirming the findings of Hiremath and Thontadarya (1991); Rahman and Kuldeep (2007) (Tables 1&2)

**Second nymphal instar:** The nymph is yellow in colour in the beginning and changes to grayish yellow later on. The head measures 0.62-0.68 mm in width and 0.25-0.29 mm in length. The overall body length of the second instar varies from 1.56-1.65 mm with the length of the thorax varying from 0.43-0.46 mm and the abdomen from 0.88-0.90 mm respectively. The thoracic segments can be marked at this stage. Duration of the second instar varies from 2 to 3 days (Tables 1&2).

**Third nymphal instar:** The third instar nymph is also yellow in colour initially but later on turns darker in colour on the lateral sides. Two black spots become visible on the vertex and pronotum overlaps the head to some extent. Rudiments of two pairs of wings appear in the form of wing pads on meso and metanotum. The head is 0.70-0.76 mm in width and 0.31-0.34 mm in length, whereas thorax varies from 0.67-0.71 mm in length. All three thoracic segments are well differentiated. Abdomen is 1.14-1.20 mm in length and all abdominal segments are clearly marked. The overall length of the third instar nymph varies from 2.12-2.25 mm and its duration varies from 3-4 days thus goes with the findings of Hiremath and Thontadarya (1991) (Tables 1&2).

**Fourth nymphal instar:** The overall length of the fourth nymphal instar varies from 2.70-2.77 mm with the head varies from 1.20-1.25 mm in width and 0.35-0.38 mm in length, head at this stage is more broader than longer. The nymph is pale yellow in colour with clear dark red compound eyes. Wing pads are more enlarged and clearly distinct. The length of the thorax varies from 0.75-0.77 mm and abdomen varies from 1.60-1.62 mm. The duration of fourth instar nymph ranges from 3-4 days (Tables 1&2).

**Fifth nymphal instar:** Just after moulting, fifth instar is pale yellow in colour but turns to light grey later on. Distinct dark patches are present on pronotum, vertex and face. The wing pad are very large and the hopper become very active. There

is little increase in the length and width of the head with length varies from 0.40-0.44 mm and the width of the head varies from 1.46-1.51 mm but thorax and abdomen showed a noticeable increase at this stage with thorax varying from 1.00-1.07 mm in length and abdomen from 2.47-2.50 mm in length. The overall body length varies from 3.87-4.02 mm and the duration of fifth instar nymph is 2-3 days (Tables 1&2).

Thus the total nymphal period in *I. clypealis* varies from 12 to 17 days. Patel and Talgiri (1950) observed it to be 15 to 20 days whereas Hiremath and Thontadarya (1991) observed it to be 10-15 days.

**Adult:** The adult hoppers are cream in colour just after emergence but changed to grayish brown dorsally and pale yellow ventrally after an hour. The studies on male and female hoppers revealed that the length of the female varies from 4.00-4.30 mm, whereas the length of the male varies from 3.80-4.20 mm. Hence female is slightly bigger than the male adults. The ovipositor of the female is adopted for piercing plant tissue is clearly visible on the ventral side of the female. The total life span of *I. clypealis* in laboratory conditions varied from 18-22 days which coincides with the findings of Hiremath and Thontadarya (1991) but different from Pezhman and Radjabi (2002).

### Conclusion

Life history of *Idioscopus clypealis* was studied under laboratory conditions. This species oviposited once in a year in the month of February and March on the floral parts of the mango trees during the flowering season, having incubation period of 5-7 days. The total nymphal period including five instars ranged from 12-17 days and the total life cycle from egg to adult varied from 18-22 days.

**Table 1: Duration and characteristics of different nymphal stages of *Idioscopus clypealis* (Leth.) mango leafhopper**

Nymphal instar	No. of days	Characteristic features
First	2-3	Head bigger than the body with bulged red compound eyes. Black and long bristles on the abdomen.
Second	2-3	Initially yellow, changes to greyish-yellow later on with relatively large compound bulged eyes.
Third	3-4	Initially yellow, changes to darker in colour on lateral sides. Two black spots on vertex become quite visible. Rudiments of two pair of wings appear in the form of wing pads.
Fourth	3-4	Pale yellow in colour. Compound eyes, dark red in colour. Wing pads are more enlarged. Sexes can be well differentiated.
Fifth	2-3	Initially pale yellow, changes to light grey and then dark grey later on with wing pads become very large and nymph is very active.

**Table 2 : Measurement (in mm) of head, thorax and abdomen of different nymphal instars of *Idioscopus clypealis* (Leth.)**

Instar	Head		Thorax length	Abdomen length	Total
	Breadth	Length			
First	0.40-0.42	0.20-0.22	0.31-0.35	0.40-0.44	0.91-1.01
Second	0.62-0.68	0.25-0.29	0.43-0.46	0.88-0.90	1.56-1.65
Third	0.70-0.76	0.31-0.34	0.67-0.71	1.14-1.20	2.12-2.25
Fourth	1.20-1.25	0.35-0.38	0.75-0.77	1.60-1.62	2.70-2.77
Fifth	1.46-1.51	0.40-0.44	1.00-1.07	2.47-2.51	3.87-4.02

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