

## Seasonal cycle, hibernation and migration of tingid bug, a potential biocontrol agent of Lantana at Saharanpur

S.C. Dhiman and Y.K. Yadav<sup>1</sup>

Entomology Research Lab., Department of Zoology, M.S. College, Saharanpur (Uttar Pradesh)

<sup>1</sup>Department of Zoology, P.M.R.L. Degree College, Gangoh, Saharanpur (Uttar Pradesh)

E-mail : pk\_1280@yahoo.co.in

### ABSTRACT

*Teleonemia scrupulosa* Stal. is a potential biocontrol agent of Lantana. The weed and bug *T. scrupulosa* occurred throughout the year at Saharanpur. Bug population decreased during July – August due to rain at temperature ranging from 23.32 to 33.20°C and R.H. 71.64 to 95.82%. Population increased during September to November at temperature 10.35 to 32.62°C and R.H. 32.42 to 93.97%. *T. scrupulosa* did not hibernate or aestivate during winter months of December to mid February. Its population decreases and found in clusters on ventral side of leaves. In an aggregation, 3–20 bugs were seen. Both local and distant flights were taken. When the plants of one habitat were destroyed or dry up, the adults migrated to other places. During sunny days, bugs fed on dorsal surface of leaves, stem and on inflorescence in morning and evening hours but due to mid day heat of May and June, these migrated to ventral side of leaves.

**Key words:** Hibernation, *Lantana camara*, Migration, Seasonal cycle, *Teleonemia scrupulosa*,

*Teleonemia scrupulosa* (Heteroptera : Tingidae) is a potential biocontrol agent of *Lantana camara* Linn. (Verbenaceae). Lantana is an exotic weed which was introduced in India by English people for ornamental purposes. Since then it has spread like a wild fire in India from north to south and east to west. Due to its prolific growth and wide adaptability Lantana has over run large areas in India and has developed into a serious pest. The infested areas include cultivated and waste lands and forest areas, grazing and foster lands, road sides, canals *etc.* In most part of the country, it has displaced the local vegetation. In north western districts of Uttar Pradesh and nearby Uttarakhand low hill areas, Lantana has established enormously. Efforts have been made from time to time to check the spread and proliferation of this weed but its complete eradication over large area is difficult and costly. Various methods such as mechanical, cultural, chemical and biological have been tried to check the weed from spreading in new areas. *T. scrupulosa*, a potential bio control agent, was imported in India from Canberra (Australia) in 1941 by Forest Reserch Institute Dehradun. Since then various aspects of this potential biocontrol agent of Lantana have been worked out from time to time by Khan (1945), Roonwal (1952, 53), Livingstone (1959), Joshi (1969), Sivaramkrishanan (1979), Joy (1977), Bisht and Bhatnager (1978), Livingstone *et al.* (1980), Pawar (1984), Ramesh and Mukherjee (1992), Jain (2001), Dhiman and Bhardwaj (2008). In the present paper, an

effort has been made to describe seasonal cycle, hibernation and migration of this important biocontrol agent in Saharanpur weather representing north plain area.

### MATERIALS AND METHODS

Field studies were carried out at Saharanpur and adjacent Uttaranchal area such as Haridwar and Dehradun. The studies were carried out throughout the year at various places of Saharanpur for population build up in relation to temperature and R.H. Hibernating behaviour and migration was also recorded with extensive observations in field. Bug population was also maintained in laboratory on caged potted plants of Lantana. Various behavioural aspects including feeding were observed using hand lens. Data were recorded for two consecutive years in 2005 and 2006.

### RESULTS AND DISCUSSION

#### Seasonal cycle

*L. camara* is grown as an ornamental or hedge plant. It is covered with leaves throughout the year. Flowers of various colour bloom almost throughout the year, though less in winter. It became leafless when the insect *T. scrupulosa* attacked on it extensively. The attacking leaves turn brownish, curled, wilt up and then fell down. Young leaves appeared terminally on branches as well as on axillary regions.

*T. scrupulosa* was a good flier which took active flight during sunny days when plant was full of sap. The bug fed on tender parts (young leaves, buds, flowers and tender shoot) of plant. Population fluctuation was co-related with the increase or decrease of temperature and humidity. Bug population decreased during July-August due to rain at temperature ranging from 23.32 to 33.20°C and relative humidity 71.64 to 95.82%. The population increased during September to November at temperature range of 10.35 to 32.62°C and relative humidity range of 32.42 to 39.97 per cent. However, it was not high in the pre monsoon period, March to June. In cold weather, during December to February, they passed the winter in an almost inactive state. Nymphs generally found on ventral surface of leaf in gregarious form. Adults were seen in group of 3 to 4. Bug population decreased during winter or remained somewhat constant because eggs laid during winter take more time to hatch. Incubation period increased and nymphal period also prolonged. Longevity of adult was observed highest in field at temperature range of 05.42 to 23.01°C and relative humidity of 32.86 to 94.61 per cent.

During the month of March to June when temperature raised from 12.29 to 39.72°C and humidity decreased from 81.03 to 18.96%, the population of bug increased rapidly. Nymphal period and incubation period decreased and adult were observed actively engaged in copulation and oviposition. Finally, population attained peak.

During incessant and torrential rain, large bug population was observed dead. Some nymphs were washed away from the host plant in rain water. Thus, rain and cold weather, during winter were injurious to the population built up of *T. scrupulosa*.

### Hibernation

*T. scrupulosa* occurred throughout the year in its natural habitat. True hibernation was absent in this species of *Teleonemia*. During December to February, all stages of the bug remained in aggregated form under the lower surface of the leaves of main host plant. Adults and nymphs remained in inactive stage due to effect of low temperature. Feeding was observed on the flower and leaves. Aggregation of 3 to 20 bugs was observed which provided them warmth. However, during the warmer sunny days of winter, the bugs dispersed from gregariousness, came on dorsal side of leaf and fed. Copulation noticed generally in the mid hours of the day only.

### Migration

The bug was observed feeding only on lantana plants. The bug was noticed to take short as well as long distant flight. As and when plants from one habitat were destroyed or dried naturally, the bugs migrated to other place. In summer, they remained on the under surface during mid

day only and migrated to upper surface in morning and evening due to temperature fluctuations. In rainy months, of July to September, they migrated to the safe place such as under surface of leaf or inside rolled leaf. When the leaves were shed off due to the effect of feeding activity of the pest, the nymphs migrated towards the tip of the plant which had few tender leaves. Nymphs as well as adults were seen always moving towards tender parts of the Lantana as these parts were full of sap. Due to the migratory behaviour, *T. scrupulosa* has become widely distributed throughout India, since, it was imported in India from Canberra (Australia) at Dehradun in 1941.

Survey of district Saharanpur from 2005 to 2006 showed that the bug has well established in entire district and adjacent areas, feeding only on Lantana. Khan (1945) and Gardner (1944) reported that the bug also feed on teak and *Clerodendron* but Joshi (1969), Bisht and Bhatnagar (1978) and Ramesh and Mukherjee (1992) mentioned that *T. scrupulosa* never fed on these plants.

The bug population attained peak during March to June when temperature ranged from 12.29 to 39.72°C and humidity 81.03 to 18.96%. In July-August population decreased due to torrential rain. During September to November, the bug again increased but during winter months December to February, due to decline in temperature, population decreased. Rain and cold weather were limiting factor for the population of *T. scrupulosa* in this locality. Khan (1945) mentioned that adults fly actively in summer and become somewhat sluggish in cold weather (January to February). There was a considerable mortality during this period and only a fraction of the adult survives to oviposit at the end of winter in February to March. In case of *M. minutula*, Livingstone (1962) mentioned that the insect appeared on *Ziziphus jujuba* in the middle of March when multiplication was high. Both adults and immature stages attacked leaves and buds and caused defoliation by June which resulted decreased in population in want of food. But soon after the monsoon with the emergence of new foliage, insect also reappeared and multiplied rapidly. The population again shot upto the peak during the middle of August and decreased at the end of September. The insects altogether disappeared by the end of October. Verma and Sadatullah (1973) reported that high temperature and low humidity during February to June affect the *T. scrupulosa* population so much that it becomes nil at temperature ranging between 36 and 41°C and R.H range of 14 to 30%.

The period of abundance of *Teleonemia* in south were the period of lean population of the bug in the north. Palaniswami and Pillai (1983) stated that the *Cochlochila bullita* population varied in different durations of the year. Field population was higher during August to December,

thereafter it decreased. Singh *et al.* (1986) reported the appearance of *U. hystricellus* in the first week of May attaining peak in the middle of June. Sharma (1998) mentioned that the population build-up of *M. globulifera* started on *Ocimum sanctum* during first week of April and attained peak in October-November.

Khan (1945) reported over wintering in this bug for about 5 months. Livingstone (1962b) observed disappearance of *M. minufula* by the end of October. Singh *et al.* (1986) mentioned hibernation of *U. hystricellus* in adult stage in the plant debris under the brinjal plants from November to March. Sharma (1998) stated that true hibernation in *M. globulifera* was absent but due to low temperature during winter bug remained under semi quiescent stage due to marked effect of low temperature and congregated under the leaves of host plant.

Verma and Sadatullah (1973) mentioned that *T. scrupulosa* migrate only when plant do not have sufficient foliage to sustain the entire population. They further, reported that the bug was a poor flier and took flight of 2" to 3" at a time and their spread was very slow. In area of 14 acre the bugs could not spread to all the bushes scattered over this area in 2 year. But, during present studies it was clearly observed that the bug was a good flier and easily migrated to near by localities as well as distantly situated host plants, if the host plants of one locality were destroyed.

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