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Studies on biology and pest incidence of newly emerging tingid bug, *Urentius hystricellus*, Richter (Tingidae: Hemiptera) on off seasonal pigeonpea crop

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Abstract: Biology and morphometrics on lace bug *Urentius hystricellus* (R.) (Tingidae: Hemiptera) in off season pigeonpea under controlled condition (26 ± 1 °C temperature, 14:10 L:D photoperiod and 60 ± 10% RH) revealed that five nymphal instars took 13.6 ± 1.96 days to enter into adult stage (5.7 ± 0.97 days) with pre-oviposition and incubation period of 2.9 ± 0.74 and 6.3 ± 1.49 days respectively. Final metamorphosis stage of tinged bugs is very characteristic densely reticulated body surface and hemelytra. The total life cycle of lacewing bug observed 28.5±9.67 (4 to 5 weeks) days. Morphometric studies revealed that, mean length and width of eggs were measured about 0.45±0.014 mm and 0.16±0.014 mm respectively. However, among five nymphal instars, first nymphal instar of mean length and width was measured about 0.52±0.033 mm and 0.19±0.016mm respectively. Mean length and width of adult was measured about 0.35±0.075 mm and 0.86±0.016 respectively. The incidence of tinged bug pest population recorded in off season pigeonpea plants from 5th May to 5th July revealed that, there was maximum population recorded in the hotter months during May and June on an average of 29 to 44 nymphs and adults per 3 leaves at bottom, middle and top. This was positively correlated with Maximum temperature (r= +0.442). However, in July month drastic reduction of population was observed on an average of 18 nymphs and adults from bottom, middle and top leaves (3 leaves). This shows that, pest population was negatively correlated with minimum temperature (r= -0.288) and in later months the population was almost declined.

Key words: *Urentius hystricellus*, Biology, Incidence, Off seasonal pigeonpea

Introduction

On pigeonpea crop more than 250 species of insect pests were recorded including both chewing and sucking pest complex, although only a few of these cause significant and economic damage to crop. Among sucking pest complex, egg plant lace bug, *Urentius hystricellus*, Richter (Tingidae: Hemiptera) incidence started recently on pegionpea which was earlier known to occur on the eggplant, *Solanum melongena* Linnaeus, widely in different parts of India (1914; Pillai, 1921; Jepson, 1924; Patel and Kulkarni, 1955) with a degree of varietal preference in India. Recently, Chaudhury *et al*. (2001) recorded its presence on tomato crop in Tarai region of West Bengal. Besides India, it has also been reported from Ghana (Frempong and Buahin 1977) and Thailand (Tigvattn 1990). However, several plants including members of Solanaceae (mainly *Solanum* spp.), Malvaceae (*Gossypium* sp. & *Abutilon* sp.) and Fabaceae were shown to be infested by this pest in some countries (Pollard, 1955; Rasool *et al*., 1986; Tigvattn, 1990; Dhawan *et al*., 2005). Nymphs and the adults of the lace bug suck the sap from lower surface of leaves causing yellowish patches on either side of the leaves midrib (Elamin, 1998). In such places, adult lace bugs lay their eggs. Upon hatching, nymphs always feed in groups and were never found singly as sometimes seen in adults. Therefore, nymphal damage appears firstly as small white batches, increases gradually in sizes as the nymphs develop. In severe infestation the whole leaf turns to whitish skeletonized translucent sheet, dries up and drops and hence, the whole plant may be ruined. The nymphs are the most destructive stage of the lace bugs and they mostly do not move from one leaf to another, unless the first one has been completely exhausted. Affected leaves are covered with exuviae and excreta as well (Dhawan *et al*., 2005). As the ecological point of view pest population fluctuates in environment due to some factors of abiotic or independent were play a most crucial role in completion of life cycle or survival or outbreak of pest.

Therefore, an attempt was put forward in this study to fill some research gaps on lace bugs in general with special emphasis on the above mentioned species, as summarized in the following objective *viz*., Biology and distribution of adult and nymphal stages of the lace bugs on cultivated and self sown pigeonpea plants during off season in Kalaburgi district, Karnataka.

Material and Methods

The detailed studies on biology and distribution of tingid bugs on off seasonal self sown pigeonpea plants were carried out at Agricultural Research Station, during 2014-15. The adult bugs were collected from self sown infested off seasonal pigeonpea field and reared in laboratory conditions of 26 ±1°C temperature with a photoperiod of 14:10 L:D and 60 ± 10% relative humidity.

The host plant was sown in small plastic pots and three-leaves stage plants were used for studying the biology of tinged bug. The field collected five pairs of adult bugs were released in to pot containing host plant mentioned above. Such seedlings were enclosed cloth net inside the chamber. Starting five days from removal of ovipositing insects from the cages, seedlings were subjected to

daily inspection for eggs hatchability under the binocular microscope from the date of infestation (Sutaria *et al.,* 2010). From the adult emergence to the day of the first oviposition on seedlings was considered as a pre-oviposition period and from the day of insects removal from the leaf to egg hatching considered as incubation period. Newly hatched nymphs from each replication were placed individually in petri-dishes lined with moist filter paper and a fresh plant leaf (renewed daily) for feeding. These dishes were kept in the laboratory and observed twice a day (morning and evening) during which moulted insects were recorded based on size, colour and exivua of nymphs. The data and observations were statistically analysed and presented in results. Morphometric parameters of egg, nymphal stages and adult were recorded with the help of a standardized ocular micrometer fitted to a stereo binocular microscope. Observation made on Incidence of tinged bug population in off season host plants started from first week of May to first week of July. The number of adult and nymph population of *U. hystricellus* counted from randomly selected 5 pigeonpea host plants. In each plant observation were taken from selected three leaves of bottom, middle and top portion.

Results and Discussion

Biology: The biology of tingid bug was extensively studied on pigeonpea host plant under laboratory condition. The detailed study on biology of tinged bug on pigeonpea revealed that, the mated females started laying eggs on undersides of the leaves by deeply thrust their oviposition into the plant tissues along with a dark brownish adhesive coated material that soon hardens and forms a protective coating. The eggs are usually inserted in new leaves along the mid vein or near to it. Laboratory studies revealed that, pre-oviposition period and incubation period were 2.9 ± 0.74 and 6.3 ± 1.49 days respectively (Table 1). Upon hatching, nymphs generally feed in groups on lower leaf surfaces. Metamorphosis is gradual and five nymphal instars were recorded. Nymphs are usually spiny, somewhat dark brown or blackish in colour and oval in outline. It was observed that the last nymphal instar found characterized by having wings covering almost half of their body length. However, such nymphs represent a typical camouflaging insect, due to hairs they bear (Plate 1), usually they found exactly mimicking those hairs of host plant. The average duration of five nymphal instars were completed in 13.6±1.96 days of which first instars duration was 2.2±0.92 days, second instar was recorded 2.2±0.92 days,

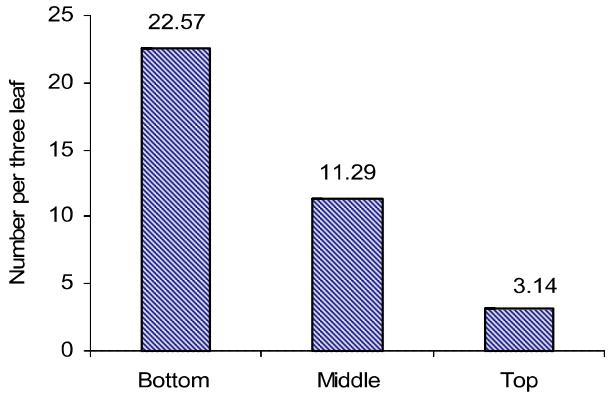

Fig. 1: Distribution of Tingid bugs on pigeonpea

Plate 1: Camouflaging due to hairs on nymph

Plate 2: Symptoms of damage on plant

Plate 3: Nymph

Plate 4: Adult bug

third instars was completed in 2.5±0.71, fourth and fifth instar stages were completed in 3.1±0.99 and 3.6±0.97 days respectively (Table 1). Whereas, final metamorphosis stage of tinged bugs are very characteristic and easily recognized, by their densely reticulated body surface (upper side) and hemelytra, hence, the name lace bugs (Plate 4). Most adults of the lace bugs are oval in shape, more or less grayish, brownish or whitish and somewhat rectangular in outline. On the other hand, first instar lace bugs have three segmented antennae and other stages has four segments, tarsi one or two segmented and ocelli are lacking with four segmented beak/stylet. The adult duration completed in 5.7±0.97 days. However the total life cycle completed in 28.5±9.67 (4 to 5 weeks) days.

Table-1: Biology of tingid bug, *Urentius hystricellus* on pigeonpea under laboratory condition

Stage	Range	Mean ± SD
Pre-oviposition (Days)	2-4	2.9 ± 0.74
Incubation (Days)	4-9	6.3 ± 1.49
Nymphal stages (Days)		
1st stage	1-4	2.2 ± 0.92
2nd stage	1-4	2.2 ± 0.92
3rd stage	2-4	2.5 ± 0.71
4th stage	2-5	3.1 ± 0.99
5th stage	2-5	3.6 ± 0.97
Total (Nymphal days)	10-16	13.6 ± 1.96
Adult stage (Days)	5-7	5.7 ± 0.97
Total life cycle	29 - 38	28.5 ± 9.67

Table-2: Morphometric parameters of tinged bug, *Urentius hystricellus* on pigeonpea

Stages	Length (mm)	*Mean±SD	Width (mm)	*Mean±SD
Egg	0.44 to 0.48	0.45±0.014	0.15 to 0.19	0.16±0.014
First instar	0.48 to 0.59	0.52±0.033	0.17 to 0.22	0.19±0.016
Final instar	1.78 to 2.20	1.94±0.123	0.94 to 0.98	0.96±0.017
Adult	2.28 to 2.46	2.35±0.075	0.84 to 0.88	0.86±0.016

Antennae 3 segmented in first instar and 4 segmented in remaining instar

Table-3: Natural distribution of tinged bug *Urentius hystricellus* during off season on pigeonpea

Sl. No.	Date of observation	Bottom (per 3 leaf)	Middle (per 3 leaf)	Top (per 3 leaf)
1	05-05-15	15	9	4
2	15-05-15	17	13	3
3	25-05-15	26	15	5
4	05-06-15	30	14	2
5	15-06-15	28	13	3
6	25-06-15	24	8	2
7	05-07-15	18	7	3

Morphometric studies: Morphometric parameters of tingd bug were revealed that, mean length and width of eggs were measured about 0.45±0.014 mm and 0.16±0.014 mm respectively. However, among five nymphal instars, first nymphal instar of mean length and width was measured about 0.52±0.033 mm and 0.19±0.016mm respectively. The remaining instars were difficult to carry out measurements. Mean length and width of adult was measured about 0.35±0.075 mm and 0.86±0.016 respectively.

Pest incidence: The detailed studies on incidence of pest population of tinged bugs on off season pigeonpea plants were revealed that, the pest population was recorded in the months of 5th May to 5th July (3 months). Of these, the population was slightly increasing from 5th May to 5th June, whereas afterwards pest population was suddenly decreased in all the parameters of bottom, middle and top leaves. On 5th May, the mean number of 15 nymphs and adults was recorded in bottom leaves. However, in middle and top leaves were recorded 9 and 4 nymphs and adults respectively. On 15th May, more or less same trend of pest population was followed. However, 25th May, population was suddenly increased 26 nymphs and adults per 3 leaves in bottom (Table 3). Similarly in middle and top leaves recoded 15 and 5 nymphs and adults per 3 leaves. On 5th June the population was increased in bottom leaves of 30 numbers per 3 leaves but in middle and top leaves there was slight decreasing population was recorded 14 and 2 numbers per 3 leaves. However afterwards from 15th June to 5th July there was sudden reduction of pest population in all three parameters of bottom, middle and top leaves.

Correlation studies: Pest population of tinged bugs were positively correlated with maximum temperature (r= +0.442) and negatively correlated with minimum temperature (r= -0.228). However negatively correlated with both morning RH (r= -0.290) and evening RH (r= -0.443) shown in table 4. It clearly says, as temperature increases the population was also increases exponentially and there was no impact on minimum temperature, morning and evening RH.

The present studies on biology of tingid bug was revealed that, pre-oviposition period and incubation period were recorded 2.9 ± 0.74 and 6.3 ± 1.49 days respectively (Table 1). Upon hatching, nymphs generally feed in groups on lower leaf surfaces. Metamorphosis is gradual and five nymphal instars were recorded and these nymphal instars took 13.6 ± 1.96 days to enter into adult stage (5.7 ± 0.97 days). Our current research findings were partially

Table-4: Correlation studies on mean pest population of tinged bug in relation to weather factors

Factors	Analysis	Maximum Temperature	Minimum Temperature	RH (Morning)	RH (Evening)	Rainfall	Pest Population
Maximum Temperature	1	-	-	-	-	-	-
Minimum Temperature	0.854**	1	-	-	-	-	-
RH (Morning)	-0.797**	-0.928**	1	-	-	-	-
RH (Morning)	-0.959**	-0.929**	0.902**	1	-	-	-
Rainfall	-0.196	-0.253	0.278	0.288	1	-	-
Pest Population	0.196	0.442	-0.288	-0.290	-0.443	1	-

confirmation with findings of Abdalla and Khidir, (2012); Hill (1983) and Shetlar (1991). The adult duration completed in 5.7±0.97 days. However the total life cycle completed in 28.5±9.67 (4 to 5 weeks) days. These research findings were in line with Dhawan *et al*., (2005); Satti and Khidir (2012).

Morphometric studies revealed that, mean length and width of eggs were measured about 0.45±0.014 mm and 0.16±0.014 mm respectively. However, among five nymphal instars, first nymphal instar of mean length and width was measured about 0.52±0.033 mm and 0.19±0.016mm respectively. Mean length and width of adult was measured about 0.35±0.075 mm and 0.86±0.016 respectively. Our research findings were confirmation with research findings of Singh and Mann (1995) who studied in India on other species of tinged bug on brinjal and reported that, the average sizes of adults were 2.339 ± 0.079 and 2.400 ± 0.082 mm in length and 0.854 ± 0.050 and 0.875 ± 0.044 mm in width, for males and females, respectively. Pest population of tinged bugs were positively correlated with maximum temperature (r= +0.442). The relative humidity did not show significant influence on tinged bug population variation. However, Satti (2003) studies on tinged bug at Khartoum state of Sudan revealed that maximum relative humidity was positive and significant correlation with tinged bug population. This might be due to the change in location of our study and during May and June month temperature was the main abiotic factor which influenced the occurance of this pest on pigeonpea.

By understanding the biology of the pest in the crop as well as in off season crops will yield valuable information for strategizing the management options of that particular pest. Pest incidence was recorded maximum in the months of May and June (Hotter months) on self sown pigeonpea in Kalaburgi district which serve as a source of pest to spread on main crop sown in July month. Therefore, removal of perennial or self sown and off season pigeonpea crops around field is best option to manage the population buildup on regular crop.

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References

Abdalla, A.S. and Khidir, E.E.: Comparative bio-ecological studies among two species of *Urentius* lace bugs (Hemiptera: Tingidae) in Sudan, *J. Saudi Society Agril Sci*., **11**, 149155 (2012).

Ahmad, S.S. and Tan, L.P.: The lace bug *Cochlochila bullita* (Stål) (Heteroptera: Tingidae), a potential pest of *Orthosiphon stamineus* Bentham (Lamiales: Lamiaceae) in Malaysia. A J. of World Insect Systematics, p. 1-5 (2010).

Chaudhury, N., Deb D.C. and Senapati, S.K.: Assessment of loss in yield caused by pest complex of tomato under tarai region of West Bengal. *Research on Crops*, **2**: 71-79 (2001).

Dhawan, S.C. Gautam, G.D. and Govil, J.N.: Occurrence of *Urentius hystricellus* (Richt.) on pigeonpea in the net-house. *Int. Chickpea and Pigeonpea Newsletter,* **12**: p. 47 (2005).

Elamin, E.M.: Ecological studies on eggplant tingid bug. Annual Report 1997/ 98, Agricultural Research Corporation, Wad Medani, Sudan. p. 32 (1998).

Fletcher, T.B.: Some South Indian insects and other animals of importance. Madras, India: *Superintendent Government Press*. p. 565 (1914).

Frempong, E. and Buahin, G.K.A.: Studies on the insect pests of eggplant, *Solanum melongena* L. in Ghana. *Bulletin de-1 Institut Fondamental d'Afrique Norie-Serie A*., **39**: 627-641 (1977).

Hill, D.S.: *Agricultural insect pests of the tropics and their control*. 2nd edn. Cambridge University Press, London (1983).

Jepson, M.: Pests of Brinjal. Pages 132-147 in *Report of Director, Agriculture*, Ceylon (1924).

Patel, K.C. and Kulkarni, H.L.: Bionomics of *Urentius echinus*. *J. Bombay Natural History Society,* **53**: 86-96 (1955).

Pillai, R.N.: Short notes on insect pests of Travancore. *Travancore Dept. Agril,* Trivendrum, p. 53 (1921).

Pollard, D.G.: The insect pests of vegetables in the Sudan. Bulletin No. 16. Agricultural Publication Committee, Ministry of Agriculture. Khartoum, Sudan. p. 76 (1955).

Rasool, G., Ahmed, N. and Malik, N.A: The bringal lace bug (Urentius sentis Distant) as a pest of cotton and its chemical control. *J. Agric. Res. Lahore*, **24**: 321-323 (1986).

Satti, A.A.: Ecological studies on lace bugs (Hemiptera: Tingidae) on their major host plants in Khartoum state. Thesis submitted for the award of Ph.D. in Agriculture to University of Khartoum. p. 26 (2003).

Satti, A.A., Bashir, N.H.H., El Khidir, E and Nasr, O.E.: Detection and seasonality monitoring of predators associated with insect pests complex of *Cucumis melo* L. (Muskmelon), at Shambat area. *Univ. Khartoum J. Agric. Sci*., **6**: 49–60 (1998).

Shetlar, D.J.: Lace bugs. HYG-2150-91, Ohio State Univ., *Ext. Fact Sheet* (1991).

Singh, L., and Mann, H.S.: Seasonal activity and population buildup of tingid bug, *Urentius hystricellus* Richter (Hemiptera: Tingidae) in the Punjab. *Indian J. Ecology*, **13**: p. 301-306 (1986).

Sutaria, V.K., Motka, M.N., Jethva, D.M., Ramoliya, D.R and Rathod, R.T.: Biology of soybean jassid, Empoasca kerri (Pruthi). *Agricultural Research Communication Centre*, **30**: 273-275 (2010).

Tigvattn and Anont, S.: Studies on the bionics and local distribution of some lace bugs in Thailand. III. *Urentius echinus*, Distant (Hemiptera: Tingidae). *Keen Kaset Khon Kaen Agriculture Journal,* **18**: 251-260 (1990).