

First Record of Capsid bug, *Megacoelum stramineum* (Walker, 1873) on walnut (*Juglans regia*) from Central Kashmir, India

Shaziya Gull, Tariq Ahmad*, Razia Rasheed and Ajaz Rasool

Entomology Research Laboratory, Postgraduate Department of Zoology, University of Kashmir, Srinagar-190006, J & K, India

***Corresponding author: drtariqento@kashmiruniversity.ac.in**

Abstract

Walnut in Jammu and Kashmir is infested by various insect pests causing prominent damage to different parts of walnut trees predominantly fruits. The type of damage caused by Capsid bug, *Megacoelum stramineum* on walnuts is reported for the first time from Central Kashmir. Both adults and nymphs were found to feed on the lower surface of leaves, emerging buds and fruits. Emergence was reported in month of April with peak population in the month of July and plunge in population was observed in the month of October in the year 2014-2015. Feeding pattern was gregarious on abaxial surface of leaf leading to small and round sunken spots on them. Results further depicted that average mean abundance was maximum at district Budgam (59.00 ± 31.42) followed by district Srinagar (42.29 ± 26.32). Thus, present work is the attempt to add further knowledge to prevailing literature for mounting integrated pest management.

Keywords: Capsid bug, *Juglans regia*, seasonal abundance, damage, new record and *Megacoelum stramineum*

Introduction

Miridae belongs to the order Heteroptera having 1400 genera with more than 1000 species (Schuh, 1995). It is the large and diverse group of insect family commonly called a capsid bugs or mired bugs. They are notorious agricultural pests that pierce plant tissues feeding on the sap (Knight, 1941). They show the presence of coneus and 1 or 2 cells on the base of membrane which makes them discernible from all the close families (Dolling, 1991; Wheeler, 2001). Capsid bugs can spoil appearance of plants by giving the foliage a dilapidated and slanted appearance which leads to abort of flower buds. They feed on various hosts and some of the species are phytophagous and others are predacious (Alford, 1984; Mc Gavin, 1992). Capsid bug like *Lygus pabulinus* is a serious pest of currants, gooseberries, strawberries, potatoes, dahlias and also on apples, pears, plums, cherries and peaches (Petherbridge and Theorpe, 1928). Feeding on plant sap leads to damage of host species (Kenneth, 1920). *Megacoelum stramineum*, commonly known as capsid bug feeds on shoots and under surface of leaves of host plants. It has wide host range and walnut (*J. regia*) is one of the host plants causing damage by sucking sap of leaves, soft buds and fruits. Walnut is one of the important industries and commercial hub for Jammu and Kashmir. Jammu and Kashmir is the major walnut producing state of about 2.66 lakh metric tonnes under 89,000 hectares of land. About 2.47 tons/ha is produced overall and due to its high productivity J&K is announced as Agri- Export Zone for walnut (Verma and Awasthi, 2012). Thus, walnut industry of Kashmir is main contributor from India and is certified as organic. The constituents present in walnut have unique property and health benefits having high nutritional value containing folates, pyridoxine, vitamin (A,C,E,K), minerals (Sza-Toa *et al.*, 2000) and also saturated & unsaturated fatty acids (Muradoglu *et al.*, 2010). Having said this, walnut harbours diversity of pests which cause deterioration in its quality and productivity and irrespective of its enormous economic value, huge losses

occur every year. Therefore the aim of the study was to define taxonomy of pest with its damaging pattern and seasonal variation as no attention is paid to this pest from our region and is first reported from Central Kashmir.

Materials and Methods

Different walnut orchards were selected and field surveys were done to record the occurrence of pests in three districts of Central Kashmir *viz.*, Srinagar, Ganderbal & Budgam. From each district, three sites were selected S1, S2 & S3 from district Srinagar; G1, G2 & G3 from district Ganderbal; B1, B2 & B3 from district Budgam to check the pest infestation from June 2014 to November 2015 with nature of damage (**Figure 1**). During the study period, data regarding average monthly temperature and rainfall was procured from Weather Department, Srinagar Jammu and Kashmir (**Figure 2**). Assessment of each walnut orchard was done and data was taken fortnightly. To evaluate the type of damage caused by capsid bug, different trees were randomly selected and tagging was done on leaves. Seasonal variation in accordance with this pest was also carried out in which divergence of insect population size in four different seasons has been shown graphically through bar graphs with standard deviation. The insects along with immature and mature stages were collected by the net sweeping method. Sampling was based on sweeping with insect collecting net which was repeated after a gap of 10 minutes with 10 sweeps per tree from randomly selected five trees from each selected site in Central Kashmir (Kumar & Naidu, 2010). The collected specimens were preserved in 75% alcohol in vials for later identification in the laboratory. The collected specimens were identified by running available keys in standard taxonomic literature and were further confirmed by Zoological Survey of India with their report No.01/2016: lot No.60/2015. Data was put to analysis by using SPSS Statistical software (Version 20). Photography was carried out by using Canon EOS600 D with 300 mm wide angle lenses.

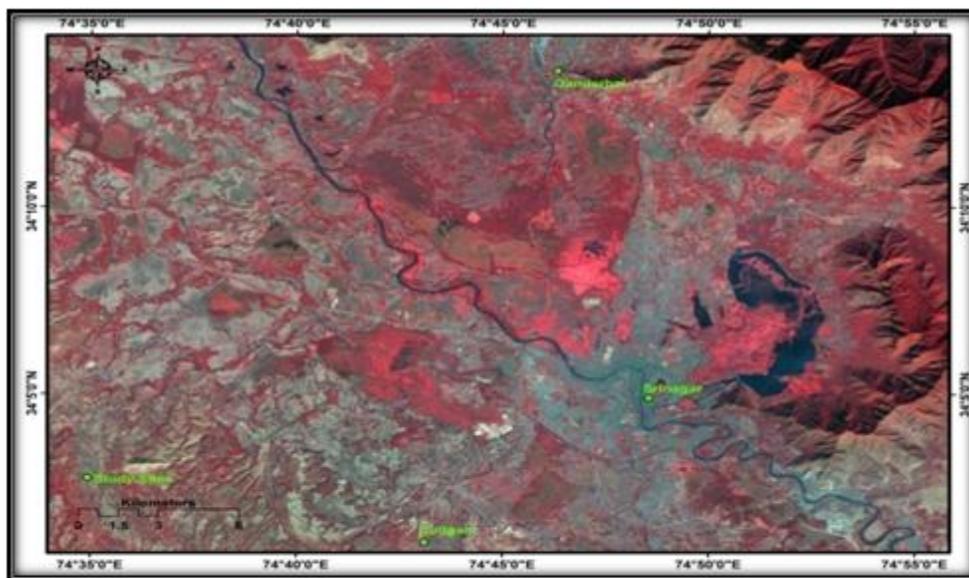


Figure 1: Satellite image of study sites of three districts in Central Kashmir, India (Land Sat8, OLI)

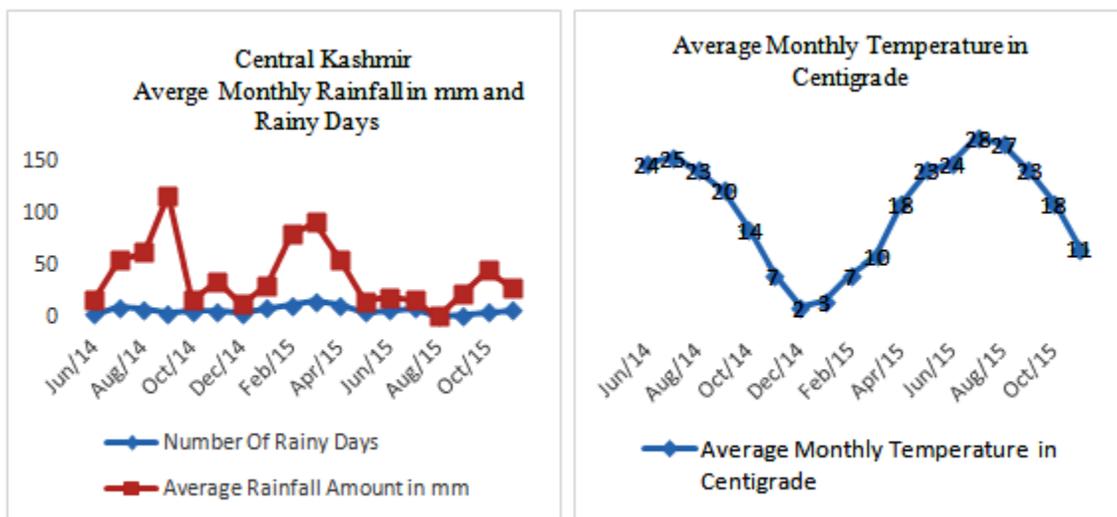


Figure 2: Average rainfall in mm, rainy day and temperature from Jun. 2014- Oct. 2015

Results and Discussion

Most of the walnut orchards studied in Central Kashmir except district Ganderbal were affected by the presence of Capsid bug, *Megacoelum stramineum*. The seasonal abundance of the pest is presented in the Table 1. The results of the experiment based on survey of different walnut orchards on seasonal abundance, monthly population, nature of damage on walnut trees and species diagnosis are discussed as under:

Table 1: Seasonal abundance of capsidbug, *M. stramineum* on walnut in Central Kashmir during the year 2014-2015

Site Area	Sites	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Srinagar	S1	-	-	-	-	+	++	+++	++	+	-	-	-
	S2	-	-	-	+	+	++	+++	+	+	+	-	-
	S3	-	-	-	+	+	++	+++	++	+	+	-	-
Ganderbal	G1	-	-	-	-	-	-	-	-	-	-	-	-
	G2	-	-	-	-	-	-	-	-	-	-	-	-
	G3	-	-	-	-	-	-	-	-	-	-	-	-
Budgam	B1	-	-	-	+	+	++	+++	+	+	+	-	-
	B2	-	-	-	-	-	++	++	++	+	+	-	-
	B3	-	-	-	-	-	-	-	-	-	-	-	-

+++ : Maximum population (50-70%); ++: Moderate population (20-49%); +: Lowest population (10-19%); -: indicates no population

Diagnosis to species

Body pale yellowish brown in colour with body length of about 7-8 mm; corium with a slight greenish tinge; eyes and apex of scutellum black; membrane pale transparent; apical area of posterior femora brownish- yellow; a number of oblique striae on each side of vertex in front of eyes, interior margin of clavus, apical margin of corium and on membrane, reddish head with a distinctive central sulcation; antennae with first and second segments

brownish-yellow remaining dark brown; head, pronotum and scutellum finely pilose; tibiae with long hair (**Figure 3**).

Nature of damage

Megacoelum stramineum, commonly called as capsid bug and is a new report as no data sets are existing to check its feeding potential on walnuts although as per available literature, it has a wide host range. Adults usually forage on shoots, under surface of leaves and flower buds of many plants. The perceptible symptoms include small and round sunken spots on leaves while infestation appears from spring to early autumn with greatest abundance in summer (**Figure 4A & B**). The present results were strengthened by works of Ballard (1917) and Udikeri *et al.* (2014) who studied its damaging potential on crops. Ballard (1917) observed its infestation on grains laying about 150-200 eggs resembling to a conspic white collar from which nymphs and adults develop and feed voraciously. Udikeri *et al.* (2010) contended that mirid bugs are one of the serious pests of Bt cotton and suggested chemical control measures approximating 69% reduction in pest control however, the pest has potential to suck the sap from base of square and tiny balls leading to heavy shedding of the fruit and reduction in yield. The symptoms of infestation and impact of mirid bugs observed in India do not deviate from the pestiferous cotton mirids described elsewhere (Udikeri, 2008).



Figure 3: Showing body dimensions of *Megacoelum stramineum* using digital Vernier calipers



Figure 4 A & B: *M. stramineum* feeding on the sap of walnut leaves (Lower surface)

Seasonal variation

The monthly variations in population of *M. stramineum* during the study period are presented in **Figure 5**. The average population abundance of *M. stramineum* in district Srinagar was 42.29 ± 26.32 with maximum of 101 individuals at site S3 in July 2014 and minimum of 12 individuals at the same site in October 2014. In Budgam, average population density was 59.00 ± 31.42 with peak population of 111 individuals at B1 in July 2014 and least of 9 individuals at site B1 in October 2015, however it was entirely absent in all the three sites of Ganderbal. On comparing overall mean abundance of two districts, it can be concluded that district Budgam had maximum population followed by district Srinagar. The overall population of *M. stramineum* in different seasons increased in spring while reaching to its peak in summer followed by a continuous decline in rest of the seasons. On comparing the seasonal abundance data, the average value at district Budgam was 82.00 ± 18.16 showing maximum value in

summer in contrast to minimum average value of 20.00 ± 7.38 at district Srinagar in autumn. No individual was observed during winter from any of the selected sites during one and half year study. All the species showed high activity in spring attaining peak in summer with no activity in winter. Similar findings were drawn by Joseph (1953) and Ishihara (1950) who indicated the infestation levels caused by bugs. Food plays an important role for the developmental stages, which was in agreement with the results of Bhat (2007) who concluded that the change in food quality especially during the developmental stages adversely affects the population of bugs. Similar infestation pattern was observed by Todd (1981) on soya bean which was highly infested by stink bugs in America. Temperature played an important role for the development of bugs mostly low temperature decreased their abundance. The results were in consonance with the findings of Bhat (2007). Similar results were also found by Sridhar *et al.* (2012) while studying population dynamics of zoophytophagous mirid bugs on the tomato in different villages of Bangalore. Temperature as a key abiotic factor exhibited positive correlation with the development of bugs. High bug infestation was recorded in the months of June and July. The results were further ascertained by the findings of Karner *et al.* (2000) who also observed heavy bug infestation in months of late June and July on cotton.

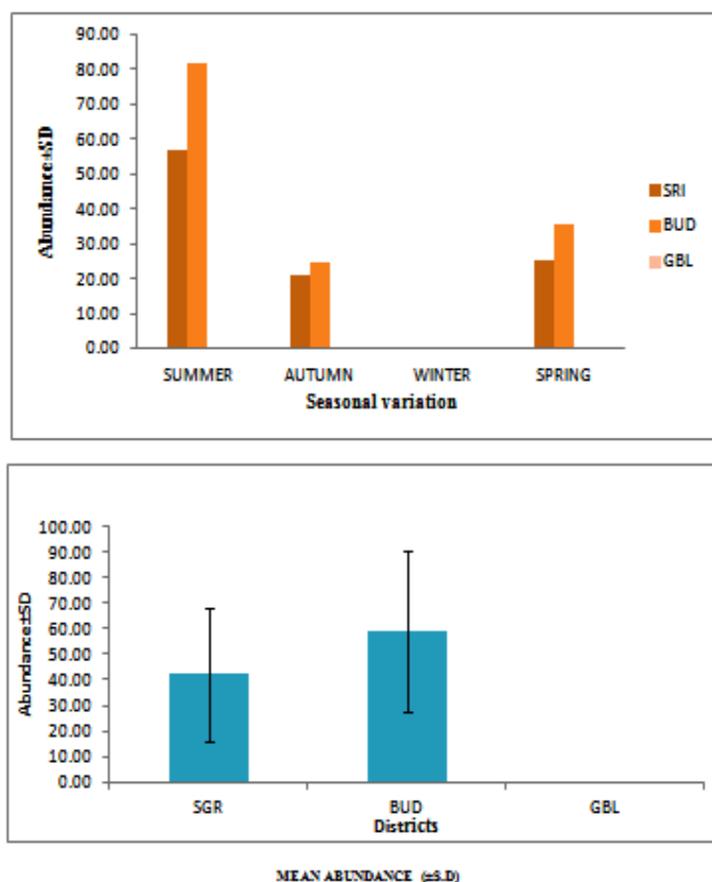


Figure 5: Seasonal variation & Mean abundance (\pm S.D) of population of *Megacaelum stramineum* in three districts of Central Kashmir

Conclusion

Observations reveal that each site had different abundance of pests in different sites of Central Kashmir. Summer exhibited highest population followed by spring and plummet in abundance in fall and no population was seen during winter. The data further depicted that maximum population was seen in the month of July as temperature had positive correlation with growth of pests. The damage caused by *M. stamineum* to walnut trees can lead moderate to severe damage which in turn can reduce the total yield annually. Thus before controlling any walnuts pest in the field it is imperative to study its seasonal abundance, lifecycle, nature of damage caused to host so that walnut production is enhanced as enormous loss occurs every year by the way of pests which has resulted in decrease in export business. Also large import of California walnuts in Kashmiri markets is also taking gleam of local nuts because of bigger size, light colour and low market price. Thus, it is indispensable to monitor *M. stamineum* and develop appropriate management practices so as to control its further dissemination.

Acknowledgements

Authors gratefully acknowledge to Dr. M. E. Hassan, Scientist-D and I/C *Hemiptera* Section, Zoological Survey of India (ZSI), Kolkata, for taxonomic identification of insect pest and Head, Department of Zoology, University of Kashmir, for providing necessary laboratory facilities.

Competing interests

Authors have declared that no competing interests exist.

References

- Alford, D.V. 1984. *A colour atlas of fruit pests, (their recognition, biology and control)*. Bblantyre Printing & Binding Co. Ltd, Glasgow, Scotland.320 pp.
- Ballard, E. 1917. *Notes on the life-history of Megacoelum Stramineum, Walk.* Agricultural Department Year book, Madras. 83-87pp.
- Bhat, M. S. 2007. *Taxonomic Survey and Bio-ecological studies of stink bugs (Heteroptera :Pentatomidae) of Kashmir*, Ph.D. Thesis, University of Kashmir.
- Dolling, W.R.1991. *The Hemiptera*. Natural History Museum. 274 pp
- Ishihara, T. 1950. The developmental stages of some bugs injurious to the kidney beans (Hemiptera). *Trans.Skikoku.ent.soc.*1: 17-31.
- Joseph,T. 1953. On the biology, bionomics, seasonal incidence and control of *Piezodorus rubrofasciatus* Fabr, A pest of Linseed and Lucerne at Delhi, *Indian.Journal of Entomology*. 15: 33-37.
- Karner, M., Hutson, A. L. and Goodson, J. 2000. *Bollgard®-Impact and Value to Oklahoma's cotton industry 1996-99*. In Proceedings of the Beltwide Cotton Conference Volume 2 (Dugger, C. P. andRitcher, D. A. eds). Memphis, TN: National Cotton Council of America: 1289-1293.
- Kenneth.M., Smith, A.R.R.C.S.1920. Investigation of the nature and cause of the damage to plant tissue resulting from feeding of capsid bugs. *Annals of Applied Biology*. 7(1):40-65
- Knight, H.H.1941. *The plant bugs, or Miridae, of Illinois*. Bull. Illinois Natural History Survey. Vol. 22, Art. 1. 234 p.
- Kumar, D. and Naidu, B. 2010.A contribution towards the insect fauna of Vadodara,Gujrat (India): The Order Hemiptera. *Hallteres*. 1 (2): 58-63.
- McGavin, G.C.1992. *Insects of the Northern Hemisphere*. Richard Lewington. Dragon's World Ltd Published.192 pp.
- Mc Gavin, G. C. 1993. *Bugs of the world*, London, Blandford, an imprint of Cassell plc., 1993. 192 pp.
- Muradoglu, F., Oguz, H. T., Yildiz, K. and Yilmaz , H. 2010. Some chemical composition of walnut (*Juglans regia* L.) selection from Eastern Turkey. *African Journal of Agricultural Research*. 5 (17): 2379-2385.
- Petherbridge, F.R. and Thorpe, W.H. 1928.The common capsid bug (*Lygus pabulinus*). *Annals of Applied Biology*.15 (3).

- Schuh, R.T. and Slater, J.A. 1995. *True Bugs of the world (Hemiptera: Heteroptera) Classification and Natural History*. Cornell Unive. Press. Ithaca, NY and London. 336 pp
- Sridhar, V., Jayashankar, M. and Vinesh, L.S. 2012. Population dynamics of Zoophytophagous mired bug, *Nesidiocoris tenuis* (Reuter) (Heteroptera: Miridae) and its prey, *Bemisia tabaci* Genn. (Homoptera: Aleyrodidae) on tomato (*Solanum lycopersicum* Mill). *Pest Management in Horticulture Ecosystem*. **18** (1): 35-38.
- Sze-Toa, K. W. C., Sathe, S. K. 2000. Walnut (*Juglans regia* L): proximate composition, protein solubility, protein amino acid composition and protein in vitro digestibility. *J. Sci. Food Agric.*, **80**: 1393-1401.
- Todd, J. W. 1981. *Effect of stink bug damage on soyabean quality*, Proceedings of a conference for Scientists of Asia, III inois University, 46-51.
- Udikeri, S. S. 2008. *Mirid Menence: An emerging potential sucking pest in cotton*. The ICAE recorder Vol-XXVI No. 4.
- Udikeri, S. S., Kranthi, K. R., Patil, S. B., Modagi, S. A. and Vandal, N. B. 2010. Bionomics of mirid bugs *Creotia biseratense* (Distant) and oviposition pattern in Bt cotton, **Karnataka J. Agri. Sci.** **23**: 153-156.
- Udikeri, S., Kranthi, S., Kranthi, K. R., Vandal, N., Hallad, Patil, S. B. and Khadi, B. M. 2014. *Species diversity, pestiferous nature, Bionomics and Management of mirid bugs and flower bud maggots: the new key pests of Bt cottons*, World Cotton Research Conferences-5, Mumbai: 203-209
- Verma, M.K. and Awasthi, O.P. 2012. *Prospects of new varieties under High density for temperatefruitsandnutproduction*. <https://www.researchgate.net/publication/282356742>.
Walnuts.apeda.gov.in/apedawebsite/SubHead-products.
- Wheeler, A.G. 2001. *Biology of the Plant Bugs (Hemiptera: Miridae)*. Pests, predators, opportunists. Cornell Univ. Press, Ithaca and London. 507 pp.