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ORIGINAL ARTICLE

Seasonal Abundance of Mango Leafhopper *Amritodus atkinsoni* (Leth.) (Hemiptera: Cicadellidae) in District Lakhimpur Kheri and Shahjahanpur, Uttar Pradesh, India

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ABSTRACT

Mango orchards are vulnerable to various insect pests that cause significant loss. Among them, mango hoppers are economically most important because both nymphs and adults puncture and suck the sap from tender shoots, inflorescence and leaves of mango crop, which cause non-setting of flowers and dropping of immature fruits and resulting in reduced yield. In North India, Mango leafhoppers, Amritodus atkinsoni (Leth.) has been reported to infest mango crop. Hoppers were collected by Bag trap method and sweep net method from selected mango trees in the study areas. Both nymphs and adults of A. atkinsoni were recorded in the second fortnight of February in the bags tied on inflorescences in both the study areas. Afterwards nymph population continue to grow till the first fortnight of April and the maximum mean nymph population was recorded 0.96 and 1.04 at Lakhimpur Kheri and Shahjahanpur, respectively in first fortnight of April and then it began to decline. The adult population continued to rise at both the sites and the peak mean hopper population was recorded in first fortnight of May at both the study areas, which was 4.56 and 5.88 at Lakhimpur Kheri and Shahjahanpur, respectively. Thereafter, hopper population started declining till first fortnight of July. However, it again began to rise and a second peak was observed in first fortnight of August in both the study areas. This second peak was not as high as the first one. Thereafter, hopper population again declined and the least hopper population was recorded in the first fortnight of December at both the sites, with the mean hopper population recorded being 0.72 and 0.44 at Lakhimpur Kheri and Shahjahanpur areas.

Keywords: *Mango leafhoppers, Amritodus atkinsoni, Seasonal abundance, Nymphs*

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INTRODUCTION

The mango, *Mangifera indica* (Linn.) is called as king of fruits. It is one of the ancient fruits of Indian origin. India is the largest producer of mango. Mango has adapted very well to diverse agro-climatic conditions of our country. Uttar Pradesh is the largest producer state of mango in India. Mango production is not up to the mark. Insect pests are of the most important factors responsible for low mango production. There are several insect pests that attack mango crop, among which, mango hoppers are most serious and widespread pests. The nymphs and adults of the hoppers attack mango crop in large numbers, they puncture and suck the sap from tender shoots, inflorescence and leaves of mango crop, which cause non-setting of flowers and dropping of immature fruits, causing reduction the yield (Gundappa and Shukla, 2016). Hoppers also excrete a secretion, called honey dew. In moist weather, it encourages the development of fungi like *Meliola mangiferae* (Earle), resulting in growth of sooty mould on dorsal surface of leaves, branches and fruits. This black coating interferes with the normal photosynthesis in the

plants, which ultimately results in non-setting of flowers and dropping of immature fruits. This damage is called as Honey Dew Disease (Butani, 1993). Hoppers remain active throughout the year in cracks and crevices of mango trunk, but they are recorded on twigs, when young leaves and inflorescence are available (Patel et al., 1994). In North India Mango leafhopper *Amritodus atkinsoni* (Leth.) is widespread. However, study on ecological parameters in local environmental conditions has not been reported so far, so in the present study, seasonal incidence of *A. atkinsoni* was studied in two districts of Uttar Pradesh *viz.,* Lakhimpur Kheri and Shahjahanpur.

MATHERIALS AND METHODS

The experiments were carried out at Lakhimpur Kheri (between 27.6°-28.6° N Latitude and 80.34°-81.30° E Longitudes) and Shahjahanpur (27.35° N Latitude and 79.37° E Longitudes) Districts of Uttar Pradesh from April 2021 to March 2022. The study sites were included in Terai region. At both the sites in a mango orchard five trees were first selected and no pest control was applied on them. Randomly five inflorescences from each tree were then marked, one from each four geographical directions and one from the inner quadrant of each mango tree. Bag trap method (Verghese and Rao, 1987) was adopted for recording the hopper population from January to April. In the bag trap method, each inflorescence was covered with a polythene bag (60 x 30 cm), having with a cotton swab, soaked in ethyl acetate. Both adults and nymphs were trapped inside the bags. The bags were brought to the laboratory and nymphs and adults were separated. From May to December the sweep method was used for collecting the hoppers with the help of insect collecting net, as the adult hoppers were abundant as compared to nymphal stages during those months. Sweeps were undertaken from each of the four geographical directions and on the tree trunk on each mango tree. The hoppers were collected and taken in to laboratory and were separated, then dried and preserved in glass vials. In all, 5 bag traps or 5 sweeps from each tree were made in each study area. The hoppers were collected and preserved and then were brought to the laboratory and identified. Identification was done on the basis of morphological features, viz. dark-brown to blackish in color with scutellum having arrow mark on it.

RESULTS AND DISCUSSION

The nymphs and adults of *A. atkinsoni* was recorded firstly in the second fortnight of February by the bag trap method in both the study areas. Mean adult population of *A. atkinsoni* was recorded 0.16 and 0.28 at Lakhimpur Kheri and Shahjahanpur, respectively in the second fortnight of February was; whereas, mean number of nymphs during that period was recorded 0.24 and 0.16 at both the sites, respectively. Thus, the mean total hopper population in the second fortnight of February at both the site was recorded 0.40 and 0.44, respectively. Thereafter, the nymph population continues to grow till the first fortnight of April and the maximum mean nymph population was recorded 0.96 and 1.04 at Lakhimpur Kheri and Shahjahanpur, respectively in first fortnight of April and then it began to decline. The population of adults of *A. atkinsoni* increased from March onwards at both the sites and their peak mean population were recorded in first fortnight of May at both the study areas, which was 4.56 and 5.88 at Lakhimpur Kheri and Shahjahanpur, respectively. Thereafter, hopper population started declining till first fortnight of July. However, it again began to rise and a second peak was observed in first fortnight of August in both the study areas. This second peak was not as high as the first one. Subsequently, hopper population again declined and the least hopper population was recorded in the first fortnight of December at both the sites, with the mean hopper population recorded being 0.72 and 0.44 at Lakhimpur Kheri and Shahjahanpur. No hopper was recorded from second fortnight of December to first fortnight of February (Table – 1 & 2).

Thus, observations clearly reveal that *A. atkinsoni* firstly appeared in the month of February (second fortnight) and remained active throughout the year except from second

fortnight of December to first fortnight of February with the peak population found in first fortnight of May. *Amritodus atkinsoni* showed only two generation in a year, as two peaks of its population were recorded during the study. The hoppers spent the winters in the cracks and crevices of the mango trees.

Table 1: Seasonal abundance of *Amritodus atkinsoni* in district Lakhimpur Kheri

Fortnights		Mean Population			Collection Method
		Adults	Nymphs	Total Population	
April	1-15	1.04	0.96	2.00	Bagging*
	16-30	3.04	0.84	3.88	
May	1-15	4.56	0.00	4.56	Sweeping**
	16-31	4.04	0.00	4.04	
June	1-15	2.96	0.00	2.96	Sweeping**
	16-30	2.04	0.00	2.04	
July	1-15	1.92	0.00	1.92	Sweeping**
	16-31	3.76	0.00	3.76	
Aug.	1-15	4.24	0.00	4.24	Sweeping**
	16-31	3.24	0.00	3.24	
Sep.	1-15	3.04	0.00	3.04	Sweeping**
	16-30	2.44	0.00	2.44	
Oct.	1-15	2.00	0.00	2.00	Sweeping**
	16-31	1.68	0.00	1.68	
Nov.	1-15	1.24	0.00	1.24	Sweeping**
	16-30	0.96	0.00	0.96	
Dec.	1-15	0.72	0.00	0.72	Sweeping**
	16-31	0.40	0.00	0.40	
Jan.	1-15	0.00	0.00	0.00	Bagging*
	16-31	0.00	0.00	0.00	
Feb.	1-15	0.00	0.00	0.00	Bagging*
	16-28	0.16	0.24	0.40	
Mar.	1-15	0.44	0.56	1.00	Bagging*
	16-31	0.80	0.64	1.44	

* Number of individuals per inflorescence
** Number of individuals per sweep

Several studies have reported variations in the seasonal occurrence and peak abundance of *A. atkinsoni* populations. Patel et al. (1973) and Tandon et al. (1983) observed the population peaking in April, followed by a decline by July. Similarly, Patel et al. (1990) noted a large number of adults in May, with a gradual decrease from July to October, supporting the present findings. Dwivedi et al. (2003) recorded adult hopper populations from March onwards, while Varshneya and Rana (2008) reported first appearance on mango trees as early as February, with a peak in May. These patterns were further confirmed by Sharma and Sharma (2011), Sharma and Tara (2013), and Kumar et al. (2014). Sharma and Sharma (2011) and Sharma and Tara (2013) observed the initial

occurrence in February and March, with peak populations in May and June, followed by a decline but a secondary peak during August–September. Kumar et al. (2014) reported a gradual decline in hopper population by late May at Jhansi (U.P.). Namni et al. (2017) found the species most abundant between April and May, while Patel et al. (2018) documented the highest density in April. Roy and Arivudainambi (2019) observed the peak in early May in Tamil Nadu, whereas Anant et al. (2019) recorded the maximum population in the third week of February. Similarly, Kaushik and Nirmalkar (2021) reported peak hopper abundance in the second fortnight of March in Chhattisgarh.

Table 2: Seasonal abundance of *Amritodus atkinsoni* in district Shahjahanpur

Fortnights		Mean Population			Collection Method
		Adults	Nymphs	Total Population	
April	1-15	1.76	1.04	2.80	Bagging*
	16-30	3.44	0.96	4.40	
May	1-15	5.88	0.00	5.88	Sweeping**
	16-31	5.04	0.00	5.04	
June	1-15	4.24	0.00	4.24	Sweeping**
	16-30	3.48	0.00	3.48	
July	1-15	2.88	0.00	2.88	Sweeping**
	16-31	4.24	0.00	4.24	
Aug.	1-15	4.56	0.00	4.56	Sweeping**
	16-31	3.48	0.00	3.48	
Sep.	1-15	3.16	0.00	3.16	Sweeping**
	16-30	2.56	0.00	2.56	
Oct.	1-15	2.20	0.00	2.20	Sweeping**
	16-31	1.96	0.00	1.96	
Nov.	1-15	1.08	0.00	1.08	Sweeping**
	16-30	0.84	0.00	0.84	
Dec.	1-15	0.44	0.00	0.44	Sweeping**
	16-31	0.00	0.00	0.00	
Jan.	1-15	0.00	0.00	0.00	Bagging*
	16-31	0.00	0.00	0.00	
Feb.	1-15	0.00	0.00	0.00	Bagging*
	16-28	0.28	0.16	0.44	
Mar.	1-15	0.56	0.24	0.80	Bagging*
	16-31	0.96	0.56	1.52	

* Number of individuals per inflorescence
** Number of individuals per sweep

CONCLUSION

Present study reveals that nymphs and adults of *Amritodus atkinsoni* were recorded on mango trees in the second fortnight of February, when trees bear inflorescence. It indicates that they bred on inflorescence of mango trees. The peak of hopper population was recorded in the first fortnight of May, which coincide with the pea sized fruits of mango. A second peak of hopper population was recorded in the first half of August. This

peak was not as high as the first one. This fact indicates that this species can also breed on fresh tender mango leaves. Thus, it can be concluded that *A. atkinsoni* is a bivoltine species, as two peaks of hopper population were recorded during the study period.

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