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Diversity, seasonal abundance, distribution and damage of Jassids to crops from Western Maharashtra

Chandani S. Kamble[1] & T. V. Sathe[2]
[1,2] *Dept. of Zoology, Shivaji University, Kolhapur - 416 004, India*

*Email: profdrtvsathe@rediffmail.com; chandni.kamble77@gmail.com

ABSTRACT

A total of 40 species of Jassids have been reported from Western Maharashtra especially from Kolhapur, Sangli and Satara districts. Most of the species reported were prevalent in the region in monsoon season. However, some of the species of genera *Nilaparvata, Sogatella* and *Deltocephalus* were found throughout the year. *Deltocephalus* genus was mostly associated with grassland ecosystems. The species of *Empoasca* were found most destructive to the cotton and castor crops in Maharashtra. Castor plants persist most of time of the year. Therefore, *Empoasca* complex was also more persistent on castor ecosystems. Mango Jassids were found throughout the year on the crop but, during hot months, May-June and cold months, October-January only adults were found sitting in the cracks and crevices of tree trunk. First population peak on mango ecosystem of jassid was from July-August which damaged new sprouting leaves and second was in February, synchronizing blossoming of the crop during which severe damage was caused to the crop. Almost all mango trees were made sterile by sucking cell sap of inflorescence. Most of the flowering bodies dropped down and sticky substances were associated with the crop. More Jassid diversity was associated with paddy crops due to mono and continues culture of the crop from Kolhapur region. Many species of Jassids attracted towards the light hence, they have been controlled by light sources (Traps) for avoiding pesticidal use. Jassids have been controlled by spraying the crop with Malathion 0.03% or Azadirachtin 0.03%. The occurrence, distribution, host plants and nature of damage of jassids have been given in the paper.

Keywords: Jassids, diversity, abundance, distribution, damage, control.

INTRODUCTION

Jassids (Hemiptera: Cicadellidae) are wedge shaped insects which walk diagonally and suck the cell sap with the help of piercing and sucking type of mouth parts and affect the growth and yield of crops. In past, several workers (Baker, 1924; Datta,1922; Distant,1908,1918; Pruthi,1930,1936; Hussain and Pruthi,1923; Rao,1980; Singh,1989; Das and Vraktamath,1998; Sathe and Margaj, 2001; Sathe and Kamble, 2015; Sathe & Kamble, 2014; Kamble & Sathe, 2015a, b) worked on seasonal abundance, distribution and nature of damage of jassids from India. In the present work, attempts have been made on seasonal abundance, distribution and nature of damage and control of jassids. The present work will provide base line data for designing integrated pest management of jassids.

MATERIAL AND METHODS

Seasonal abundance of jassids was studied by collecting jassids from various ecosystems of Kolhapur, Sangli and Satara districts of Maharashtra. The collected samples were examined and identified by consulting appropriate literature (Distant, 1908, 1918; Datta, 1912; Pruthi, 1930 and 1936). Abundance, distribution and nature of damage of jassids were studied in various crop fields of Western Maharashtra by spot observation. Observations were also made on biocontrol agents of jassids like mantids, ladybird beetles and lacewings by spot observations. The trial plots have been treated with pesticides like 0.03% Malathion or Azadirachtin for control of jassids.

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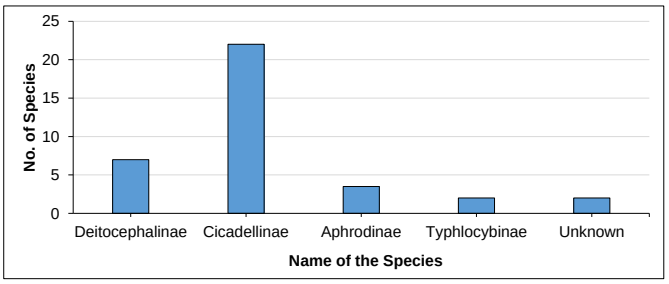
RESULTS

Results are recorded in table-1 and fig. 1-6. A total of 40 species of Jassids have been reported from Western Maharashtra especially from Kolhapur, Sangli and Satara districts. Most of the species were prevalent in the region in monsoon season. However, some of the species of genera *Nilaparvata, Sogatella* and *Deltocephalus* were found throughout the year. *Deltocephalus* genus was mostly associated with grassland ecosystems. The species of *Empoasca* were found most destructive to the cotton and castor crops in Maharashtra. Castor plants persist most of time of the year. Therefore, *Empoasca* complex was also more persistent on castor ecosystems. Mango Jassids were found throughout the year on the crop but, during hot months, May-June and cold months, October-January only adults were found sitting in the cracks and crevices of tree trunk. The Jassids population peaks on mango ecosystem were from July-August which damaged new sprouting leaves. Second peak was observed in February synchronizing blossoming of the crop during which severe damage was caused to the crop. Most of the mango trees were made sterile by feeding on cell sap of inflorescence.

Figure-1. Abundance of Jassids from Western Maharashtra



Most of the flowering bodies dropped down and sticky substances were associated with the crop. Jassid diversity was relatively more associated with paddy crops. Probably due to mono and continues culture of the crop from Kolhapur region. Many species of Jassids attracted towards the light. Hence, they have been

Figure-2. Nephotettix virescens

Figure-3. Cofana unimaculata

Figure-4. Osbernellus limosus

Figure-5. Maiestas dorsalis

Figure-6. Amrasca biguttula biguttula

Table-1. The occurrence, distribution, host plants and nature of damage Jassids

Sr. No.	Scientific name	Family	Host plants	Nature of damage	Occurrence	Locality
1.	Brown plant hopper *Nilaparavata lugsena* (Stal.)	Delphacidae	Paddy *Oryza sativa* L.	Suck the cell sap, cause yellowing and drying of leaves, dropping of flowering and fruiting bodies. Cause sooty mould, affect photosynthesis, growth and yield of the crop.	Throughout year, abundant Oct-Feb.	K, S, St.
2.	White black plant hopper *Sogatella furcifera* (Horv.)	Delphacidae	Paddy *O. sativa*	Suck the cell sap, cause yellowing and drying of leaves, dropping of flowering and fruiting bodies. Cause sooty mould, affect photosynthesis, growth and yield of the crop.	Throughout year,	K, S, St.
3.	Green leaf hopper *Nephotettix nigropictus* (Stal.)	Cicadellinae	Paddy *O. sativa*	Suck the cell sap, cause yellowing and drying of leaves, dropping of flowering and fruiting bodies. Cause sooty mould, affect photosynthesis, growth and yield of the crop.	July- Aug.	K, S, St.
4.	*Nephotettix virescens* (Distant)	Cicadellinae	Paddy *O. sativa*	Suck the cell sap, cause yellowing and drying of leaves, dropping of flowering and fruiting bodies. Cause sooty mould, affect photosynthesis, growth and yield of the crop.	July- Aug.	K, S, St.
5.	*Nephotettix pavus* I & K	Cicadellinae	Paddy *O. sativa*	Suck the cell sap, cause yellowing and drying of leaves, dropping of flowering and fruiting bodies. Cause sooty mould, affect photosynthesis, growth and yield of the crop.	July- Aug.	K, S, St.
6.	White leaf hopper *Cofana spectra* (Distant)	Cicadellinae	Paddy *O. sativa*	Suck the cell sap, cause yellowing and drying of leaves, dropping of flowering and fruiting bodies. Cause sooty mould, affect photosynthesis, growth and yield of the crop.	July-March	K, S, St.
7	*Cofana albida* Walker	Cicadellinae	*O. sativa*	Suck cell sap from leaves and flowering bodies	June- March	K, S, St.
8	*Cofana maai* Young	Cicadellinae	*O. sativa*	Suck cell sap from leaves and flowering bodies	June- March	K, S, St.
9	*Cofana jedarfa* Young	Cicadellinae	*O. sativa*	Suck cell sap from leaves and flowering bodies	June- March	K, S, St.
10	*Cofana oryzae* sp. nov.	Cicadellinae	*O. sativa*	Suck cell sap from leaves and flowering bodies	June- March	K, S, St.
11	*Scaphoidus indica* sp. nov.	Deltocephalinae	*O. sativa*	Suck cell sap from leaves and flowering bodies	July- March	K, S, St.
12	*Ishidaella albomarginata* Signoret	Deltocephalinae	*O. sativa*	Suck cell sap from leaves and flowering bodies	Oct.- Feb.	K, S, St.
13	*Anoscopus albifrons* Linn.	Aphrodinae	*O. sativa*	Suck cell sap from leaves and flowering bodies	Oct.- Feb.	K.
14	*Anoscopus sp.* 1	Aphrodinae	Grass	Suck cell sap from leaves and flowering bodies	July- March	K, S.

15	*Xestocephalus brunnens*	Aphrodinae	Grass	Suck cell sap from leaves and flowering bodies	Nov.- Feb.	K.
16	Zigzag leaf hopper *Recilia dorsalis* (Mots.)	Cicadellinae	Paddy *O. sativa*	Suck cell sap from leaves and flowering bodies	July-Oct.	K, S, St.
17	Blue leaf hopper *Typhlocyba maculifrons* (Mots.)	Cicadellinae	Paddy *O. sativa,* Maize *Zea mays* L., Jowar *Sorghum vulgare* L. Sugarcane *Saccharum* sp.,	Suck cell sap from leaves and flowering bodies	July-Oct.	K, S, St.
18	*Amrasca* spp.	Cicadellinae	Wheat *Triticum* sp.	Suck cell sap from leaves and flowering bodies	Aug-Dec.	K, S, St.
19.	*Laodephax striatella* (Fall.)	Delphacidae	Wheat *Triticum* sp.	Suck cell sap from leaves and flowering bodies	Aug-Dec.	K, S, St.
20	Grapevine leaf hopper *Erythroneura* sp.	Cicadellinae	Grape vine *Vitis vinifera* L.	Cause brownish spots to leaves and fruits.	Spring	K, S, St.
21	*Idioscopus clypealis* (Lethi.)	Cicadellinae	Mango *Mangifera indica* L.	Sucking cell sap of tender leaves and blossoming and fruiting bodies drop down, cause sooty mould, affect photosynthesis, growth and yield.	Feb-April	K, S, St.
22	*Idioscopus atkinsoni* (Lethi.)	Cicadellinae	Mango *M. indica*	Sucking cell sap of tender leaves and blossoming and fruiting bodies drop down, cause sooty mould, affect photosynthesis, growth and yield.	July-Aug.	K, S, St.
23	Potato Jassid *Hishimonus phycitus* (Distant)	Cicadellinae	Potato *Solanum tuberosum* L.	Suck cell sap, cause sooty mould, affect growth yield.	July-Nov.	K, S, St.
24	Cotton Jassid *Empoasca devastan* (Distant)	Cicadellinae	Cotton *Gossypium arboretum* L. Ladies finger *Abelmoschus esculentus* L.	Suck cell sap, cause yellowing and curly leaves. Sooty mould, affect growth yield.	July-Nov.	K, S, St.
25	*Empoasca notata* (Mel.)	Cicadellinae	Cotton *Gossypium hirsutum* L.	Suck cell sap, cause yellowing and curly leaves. Sooty mould, affect growth yield.	July-Jan.	K, S, St.
26	*Empoasca flavescens* (Distant)	Cicadellinae	Castor *Ricinus communis* L. Tea *Camellia sinensis* L. Mulbery *Morus alba* L.	Suck cell sap, cause yellow and curly leaves, cause sooty mould. Cause sooty mould, affect growth yield. Cause sooty mould, affect growth yield, cause hopper burnt.	July-Jan.	K, S, St.

27	*Empoasca kerri* (Pruthi)	Cicadellinae	Castor *Ricinus communis* L.	Suck cell sap, cause yellow and curly leaves, sooty mould, affect growth and yield.	July-Jan.	K, S, St.
28	*Empoasca parathea* (Pruthi)	Cicadellinae	Castor *Ricinus communis* L.	Suck cell sap, cause yellow and curly leaves, sooty mould, affect growth and yield.	July-Jan.	K, S, St.
29	*Deltocephalus vulgaris*	Deltocephalinae	Jowar *Sorghum vulgare* L.	Suck cell sap, cause yellow and curly leaves, sooty mould, affect growth and yield.	Aug-Sept.	K, S, St.
30	*Deltocephalus trisuli*	Deltocephalinae	Grass	Suck cell sap, affect growth	Aug-Sept.	K, S, St.
31	*Deltocephalus truncatus*	Deltocephalinae	Grass	Suck cell sap, affect growth	Aug-Sept.	K, S, St.
32	*Deltocephalus brevis*	Deltocephalinae	Grass	Suck cell sap, affect growth	July-Sept.	K, S, St.
33.	*Amrasca biguttula biguttula* (Ishida)	Cicadellinae	Cotton *G. arboretum* Okra *A. esculentus* Brinjal *Solanum melongena* L. Sunflower *Helianthus annus* L. Cowpea *Vigna sinensis* Pigeon pea *Cajanus cajan* L. China rose *Rosa chinensis* Jacq. Durva grass *Cyanodon dacylon* L.	Suck cell sap, affect growth Suck cell sap, affect growth Suck cell sap, affect growth Suck cell sap, affect growth Suck cell sap, affect growth Suck cell sap, affect growth Suck cell sap, affect growth Suck cell sap, affect growth	Throughout year	K, S, St. K, S, St.
34	*Varta longula* Virakatmath	Deltocephalinae	Sugarcane,	Suck cell sap, affect growth	July- Sept	K, S, St.
35	*Obornellus limosus* Delong	Cicadellinae	Grasses	Suck cell sap, affect growth	July- Sept	K, S, St.
36	*Gyponana cacuminal*	Typhlocybinae	Cashew nut	Suck cell sap, affect growth	July- Sept	K, St.
37	*Exitianus plebeius* Kirkaldy	Cicadellinae	Grasses	Suck cell sap, affect growth	July- Sept	K, S.
38	Unknown-1	Cicadellinae		Suck cell sap, affect growth	July- Sept	K.
39	Unknown-2	Typhlocybinae		Suck cell sap, affect growth	July- Sept	K.
40	Unknown-3	Typhlocybinae		Suck cell sap, affect growth	July- Sept	K, S.

controlled with the help of light sources (Traps) for avoiding pesticidal use on various crop ecosystems.

The occurrence, distribution, host plants and nature of damage of jassids have been given in table-1. The family Deltocephalinae was dominant over others.

Jassids can be controlled by spraying the crop with 0.03% Malathion/ Azadirachtin. Mantids, ladybird beetle, lacewings were found feeding on jassids and were good biocontrol agents.

DISCUSSION

Nakamuro *et al.* (1967) estimated the population density of the green rice leafhopper *Nephotettix cincticeps* Uhler in spring field by the capture-recapture method. *N. cineticeps* is an important pest of rice in Japan which injures the crop not only in direct way but also in carrying the rice dwarf virus. In the Kanto district, this species hibernated in the nymphal stage on gramineous weeds grown in resting paddy field and the adults emerges from late in March to mid-April. It completed three generations throughout a year. The capture-recapture method has been used for sampling many insect pests including Orthoptera, Diptera, Lepidoptera, Coleoptera and others. This method used for sampling Hemipterans insect *N. cincticeps* was quite suitable. This method is based on two assumptions that is, the marked and remarked animals mingle completely with the unmarked ones and the sampling efficiency is performed equally on the marked and unmarked animals. The number of *N. cincticeps* in hibernated generation was rather small and the rate of recapture was also low.

Population studies and tests on the relationship between density and damage were conducted by Egwurube, *et al.* (1982) in 1999-2001 to determine the status of *Empoasca dolichi* Paoli on groundnut *Arachis hupogaea* L. in Nigeria. Their analysis showed that *Empoasca* numbers varied significantly from one year to another and within each year the number of leafhoppers observed at the different growth stages of the plant were significantly different (P=0.01). The density of the pest did not reach the EIL throughout the groundnut growing seasons. Thus, they concluded that this insect was not an economic pest on groundnut.

Mahmood *et al*. (2002) studied the population dynamics of *Amrasca biguttula biguttula* on brinjal and the effects of biotic factors on its dynamics in Pakistan. The pest started its activity soon after transplanting. The serious activity was noticed from 21st may to 6th August. The highest leafhopper number per leaf was found as 12.96 ± 0.93 on 9.7-96. Mean maximum and minimum found as negatively and non-significantly correlated with population damage. Relative humidity and rainfall was found as negatively and non-significantly correlated with population damage. The sunshine was positively but non-significant correlated factor.

Hafizal and Idris (2014) studied the temporal population abundance of leafhoppers on rice crop from Malaysia. Their results showed that the mean temperature and relative humidity were varied slightly during the rice growth period but not significantly affecting the population abundance of leafhoppers. Change in temperature has not affected the population of jassids. They concluded that Cicadellids had the highest and the lowest abundance during maturity stages and reproductive stages, respectively.

The incidence and abundance of sucking insect pests on groundnut was studied by Kandakoor *et al*. (2012). The leafhoppers were among the major pest of groundnut and were more abundant on the crop from August and September. They showed negative correlation ship with rainfall and minimum temperature. According to Faleuro and Rai (1985) the leafhopper damage to okra during early and late stages of its growth had very little influence on fruit yield.

Very recently, Kamble *et al*. (2014) studied vertical destructive pattern of *A. biguttula biguttula* to sunflower wherein they noted that the lower leaves had lowest number of nymphs and upper highest. The peak of incidence was noted in the month of August on monsoon crop.

According to Sharma and Tara (2014) peak incidence of mango jassid *Idioscopus clypealis* (Leth.) was seen during the full bloom stage of the crop (Reddy, 1968; Shivastava & Butani, 1972; Patel *et al*., 1973; Sharma &Sharma, 2009; Sharma *et al*., 2010). Biology of *Idioscopus nitidus* Walk, a mango jassid was studied by Nordin & Ibrashim (1995) from Malaysia. This is serious treat to mango industry in Malaysia due to its damage to crop by sucking cell sap and falling down flowering and fruiting bodies.

Indian green jassid *A. biguttula biguttula* is serious pest of many agricultural crops in India and Australia (Kamble *et al*., 2014; Sathe *et al*., 2014). It attacks crops such as soybean, sunflower, cotton, tomato, maize, pigeon pea, mung bean and several others which is also prominent pest of several agricultural and other crop plants from Kolhapur.

Since, jassids suck the cell sap and cause sooty moulds over crop plants, affect photosynthesis, growth and yield of the crops and transmit various viral diseases to crops, the present work will add great relevance by providing base line data for adopting their IPM strategies.

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Conflict of Interests

Authors declare that there is no conflict of interests regarding the publication of this paper.

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