Indian Journal of Entomology 85(3): 740-742 (2023) DoI. No.: 10.55446/IJE.2021.390

DIVERSITY OF LEAFHOPPERS ON FRUIT CROPS AND WEEDS IN NORTH KASHMIR

Sheikh Aafreen Rehman[1]*, Ishtiyaq Ahad[1], Ritesh Kumar[2], Danishta Aziz[1] and Nahida Anjum[1]

[1]Division of Entomology, Faculty of Agriculture,
SKUAST Kashmir, Wadura Sopore, Jammu and Kashmir, India
[2]Department of Entomology, GBPUA&T, Pantnagar Uttarakhand, India
*Email: aafreenrehman100@gmail.com (corresponding author)

ABSTRACT

This study analyses the diversity of leafhopper fauna at six locations (Wadura, Arampora, Dangiwacha, Imberzalwari from District Baramulla and Chogul and Chetkak from District Kupwara) occurring on various fruit crops and weeds. Diversity indices such as species diversity index, evenness index, richness index and abundance were computed. These reveal that six species infest these, of which those infesting fruit trees include *Empoasca decipiens, Empoasca fabae, Agallia* spp.*, Aconeurella erebrus* and *Exitianus indicus*; and *Stirellus* spp., *Maiestas dorsalis, Macrosteles quadrilineatus, Exitianus indicus* and one plant hopper species viz., *Laodelphax striatellus* infest weeds. Maximum abundance was observed to be of *A. decedens* on fruit trees and *Stirellus* spp. on the weed flora.

Keywords: Kashmir, fruit crops, weeds, leafhoppers, planthoppers, diversity indices, abundance, species diversity, richness,

The present study on the fauna of leafhoppers and planthoppers from Kashmir was done to analyse their diversity. These damage crops by either feeding on plant sap or indirectly serving as vectors for plant pathogens. The Cicadellidae (leafhopper) family causes significant harm to crops (Nielson, 1968). Many species feed on herbaceous or woody dicotyledonous plants, while about 1/3 of the tribes specialize on grass and sedge hosts (Zahniser and Dietrich, 2013). Leafhoppers (Cicadellidae) comprise the largest family of Hemiptera with 24,000 described species in over 2600 genera (Dmitriev, 2021). Planthoppers feed on plant sap and damage the plant tissue by ovipositing that lead to wilting of plants (Reissig et al., 1986). Planthoppers can be differentiated from other 'hoppers' by their Y-shaped anal veins in the forewing, and the thick three-segmented antennae (Bay, 2021). This study focuses on the diversity of these hoppers on fruit trees and weeds in some locations of North Kashmir

MATERIALS AND METHODS

The present study was carried by surveying different fruit crops (apple, grapes and walnut) and weeds (white clover, Bermuda grass and wild mint) at different locations viz. a) Wadura; b) Imberzalwari; c) Dangiwacha d) Arampora e) Chogal and f) Chetkak. Hoppers were collected using sweep nets, light traps and sticky traps, killed in ethyl acetate, and sent to IARI, New Delhi for identification. Species diversity for each crop and location was worked out adding up the total number of species found in each community. Different parameters were used to find diversity such as: a) Relative Abundance: = ni/ N x 100 where, ni = Number of Individuals of a single species and N = Total number of individuals of all species b) Species Diversity Index (H): $-\sum_{i=1}^{S} pi\ lnpi$ where H = Shannon- Wiener Biodiversity Index, pi = Relative abundance of each species. ln pi = Natural log of pi. and S = Total number of species. c) Species Richness Index (Ma) = S-1/ 1n N (Pielou, 1975) Where, S = Total number of species collected, N = Total number of individuals in all the species d) Species evenness index: = H/ 1n S where, H = Shannon-Wiener biodiversity Index and S = Total number of species in the community.

RESULTS AND DISCUSSION

The data on the fauna of hoppers on fruit trees and weeds in North Kashmir revealed six species- on fruit trees these include *Assymetrasca decedens, Empoasca decipiens, Empoasca fabae, Agallia* spp.*, Aconeurella erebrus* and *Exitianus indicus;* while on weeds these were *Stirellus* spp., *Maiestas dorsalis, Macrosteles quadrilineatus, Laodelphax striatellus, Exitianus indicus* and *Erythria* spp. (Fig. 1-11). Apple was infested by many species, of which the most abundant was *A. decedens* on apple, grapes and walnut. Of the ones on weeds viz., white clover, Bermuda grass and wild mint, the most abundant species was *Stirellus* spp. (Table 1).

Table 1. Diversity indices and relative abundance of hoppers on fruit crops and weeds in North Kashmir

Crop	Location	MRA						N	S	H	J	Ma
		Assymetrasca decedens	*Empoasca decepiens*	*Empoasca fabae*	*Agallia* spp.	*Aconurella erebrus*	*Exitianus indicus*					
Apple	Wadura	23.80	19.04	19.04	14.28	14.28	9.58	21	6	1.753	0.978	5.671
	Imberzalwari	36.36	27.27	18.18	18.18	0	0	11	4	1.342	0.968	3.582
	Arampora	42.85	28.57	14.28	14.28	0	0	7	4	1.277	0.921	3.486
	Dangiwacha	21.21	18.18	21.21	15.15	15.15	9.09	33	6	1.757	0.980	5.714
	Chogul	23.07	19.23	23.07	15.38	15.38	3.84	26	6	1.695	0.946	5.693
	Chetkak	26.66	20	20	13.3	13.3	6.66	15	6	1.714	0.956	5.630
	Mean	28.99	22.05	19.30	15.09	9.69	4.86	18.83	5.33	1.589	0.958	4.963
Grapes	Wadura	36.36	27.27	18.18	18.18	0	0	11	4	1.342	0.968	3.582
	Imberzalwari	37.5	25	25	12.5	0	0	8	4	1.320	0.952	3.519
	Arampora	60	20	20	0	0	0	5	6	0.950	0.864	2.378
	Dangiwacha	31.57	26.31	21.05	21.05	0	0	19	6	1.371	0.989	3.660
	Chogul	33.33	26.66	20	20	0	0	15	6	1.362	0.982	3.630
	Chetkak	37.5	37.5	12.5	12.5	0	0	8	4	1.320	0.952	3.519
	Mean	39.38	27.12	19.46	14.04	0	0	11	3.83	1.267	0.943	3.381
Walnut	Wadura	38.88	33.33	27.77	0	0	0	36	3	1.089	0.991	2.720
	Imberzalwari	40	33.33	26.66	0	0	0	30	3	1.085	0.987	2.705
	Arampora	35.48	32.25	29.03	0	0	0	31	3	1.085	0.987	2.705
	Dangiwacha	37.20	32.55	30.23	0	0	0	43	3	1.094	0.996	2.734
	Chogul	38.46	33.33	28.20	0	0	0	39	3	1.090	0.992	2.727
	Chetkak	37.93	34.40	27.58	0	0	0	29	3	1.090	0.992	2.703
	Mean	37.99	33.19	28.24	-	-	-	34.67	-	1.090	0.992	2.716
		Stirellus spp.	*Maiestas dorsalis*	*Macrosteles quadrilineatus*	*Laodelphax striatellus*	*Exitianus indicus*	*Erythria* spp.					
White clover	Wadura	50.68	20.54	13.69	10.95	4.10	0	73	5	1.753	0.978	5.671
	Imberzalwari	59.32	16.94	13.55	10.16	0	0	59	4	1.342	0.968	3.582
	Arampora	62.26	15.09	13.20	9.43	0	0	53	4	1.277	0.921	3.486
	Dangiwacha	45.97	20.68	13.79	13.79	5.74	0	87	5	1.757	0.980	5.714
	Chogul	48.10	20.25	13.92	12.65	5.06	0	79	5	1.695	0.946	5.693
	Chetkak	51.51	21.21	13.63	10.60	3.03	0	66	5	1.714	0.956	5.630
	Mean	52.97	19.12	13.63	11.26	2.99	0	69.50	4.66	1.589	0.958	4.963
Bermuda grass	Wadura	61.40	15.78	12.28	0	5.26	5.26	57	4	1.342	0.968	3.582
	Imberzalwari	62.5	15	12.5	0	10	0	40	4	1.320	0.952	3.519
	Arampora	68.75	12.5	12.5	0	6.25	0	32	4	0.950	0.864	2.378
	Dangiwacha	56.92	18.46	13.84	0	7.69	3.07	65	4	1.371	0.989	3.660
	Chogul	60	16.66	13.33	0	5	5	60	4	1.362	0.982	3.630
	Chetkak	66.66	14.58	10.41	0	6.25	2.08	48	4	1.320	0.952	3.519
	Mean	62.71	15.49	12.47	0	6.74	2.56	50.33	4	1.267	0.943	3.381
Wild mint	Wadura	40.54	32.43	0	27.02	0	0	37	3	1.089	0.991	2.720
	Imberzalwari	39.39	33.33	0	27.27	0	0	33	3	1.085	0.987	2.705
	Arampora	38.09	33.33	0	28.57	0	0	21	3	1.085	0.987	2.705
	Dangiwacha	39.53	32.55	0	27.90	0	0	43	3	1.094	0.996	2.734
	Chogul	40	32.5	0	27.5	0	0	40	3	1.090	0.992	2.727
	Chetkak	44.82	31.03	0	24.13	0	0	29	3	1.090	0.992	2.703
	Mean	40.39	32.95	0	27.06	0	0	33.83	3	1.090	0.992	2.716

N = Total no. of individuals of identified species observed/ five sweep nets; MRA: Mean Relative Abundance; S = Total number of identified species; H = Species diversity index; J =Species evenness index; Ma= Species richness index.

Fig. 1. *Empoasca decepiens*; 2. *Empoasca fabae*; 3. *Agallia* spp.; 4. *Aconeurella erebrus*; 5. *Exitianus indicus*; 6. *Stirellus* spp.; 7. *Maiestas dorsalis*; 8. *Macrosteles quadrilineatus*; 9. *Laodelphax striatellus*; 10. *Assymetrasca decedens*; 11. *Erythria* spp.

Diversity indices given in Table 1, reveal that among fruit trees, the value of species diversity index for was maximum of 1.589 on apple and 1.090 on walnut, and of the weeds it was maximum of 1.257 on white clover. Species composition and abundance is usually affected by a combination of geographical and environmental factors including vegetation, topography, altitude, climate, habitat and human influence (Wasowska, 2004). Moreover, altitude also plays an important role in the distribution of plant and animal species with large numbers being recorded at lower altitudes which might be related to temperature which decreases with altitude (Alexander and Hillard, 1969). Hopkin's (1919) bioclimatic law states that there is a four day delay in the hatching of insect eggs for every 400 feet increase in altitude which could affect the population density and abundance of species along altitudinal gradient. A greater species diversity also occurs at lower altitudes due to longer seasons (Alexander and Hillard, 1969).

REFERENCES

Alexander G, Hillard J R. 1969. Altitudinal and seasonal distribution of Ortopterain the rocky mountains of Northern Colorrado. Ecological Monographs 38: 385-430.

Bay, N. 2021. Fulgoroidea Checklist: Planthoppers.www.nickeybay.com

Dmitriev, D.A. 2021. World Auchenorrhyncha Database. http://dmitriev.speciesfile.org

Nielson M W. 1968. The leafhopper vectors of phytopathogenic viruses (Homoptera, Cicadellidae). Taxonomy, biology and virus transmission. United States Department of Agriculture Technical Bulletin No. 1382. 386 pp.

Reissig W H, Heinrichs E A, Litsinger J A, Moody K, Fiedler L, Mew T W. 1986. Illustrated guide to integrated pest management in rice in tropical Asia. Manila (Philippines): International Rice Research Institute. 411 pp.

Thirumalai G, Prabakaran S. 2014. A Checklist of Membracidae from India Southern regional centre, Zoological survey of India, Chennai. pp. 1-11.

Wasowska M. 2004. Impact of humidity and mowing on chrysomelid communities (Coleoptera: Chrysomelidae) in meadows of the Wierzbanowka valley (Pogorze Wielickie hills, Southern Poland). Biologia 59: 601-611.

Zahniser, J.N. and Dietrich, C.H. 2013. A review of the tribes of Deltocephalinae (Hemiptera: Auchenorrhyncha: Cicadellidae). European Journal of Taxonomy 45: 1-21.

(Manuscript Received: July, 2021;
Revised: December, 2021;
Accepted: December, 2021;
Online Published: April, 2022)
Online First in www.entosocindia.org and
indianentomology.org Ref. No. e21181