IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Occurrence And Abundance Of White Backed Planthopper (Wbph), *Sogatella Furcifera* (Horvath) In Rice Fields Of Eastern Vidarbha, India

***Madhukar F. Jadhao**

Department of Zoology, S. N. Mor College, Tumsar- 441912, Dist- Bhandara (Maharashtra), India

ABSTRACT

Of the various species of sap suckers in rice ecosystem belonging to order Homoptera, white backed planthopper (WBPH), *Sogatella furcifera* was observed as a dominant insect pest infesting rice crop commonly in both *rabi* and *kharif* seasons. The peak density of WBPH during *rabi* season was much lower as compared to the *kharif* season. The infestation of WBPH was recorded at an early stage of the crop. The correlation analysis study revealed that WBPH exhibited negative significant correlation with minimum temperature and morning relative humidity during *kharif* season. The linear regression equations obtained from the present data would be helpful in predicting the occurrence of WBPH in the rice fields of eastern Vidarbha of Maharashtra (Central India).

Key words: Abundance, Dominant, Eastern Vidarbha, Sap suckers, *Sogatella furcifera.*

INTRODUCTION

Among the major food crops, rice (paddy), *Oryza sativa* L. is the only one that is almost exclusively human food providing about 80% of the calories to over two billion Asians (Chang, 1984). Rice in India is considered as a staple food for over 55% population and is cultivated in almost all the states of the country. Despite having the largest area under rice under cultivation, its yield is among the lowest in the world (Rangi, 1993). The insect pests constitute one of the major yields limiting biotic factors for rice crop throughout the world. The present investigation describes the seasonal fluctuation of WBPH and correlation of its population with weather parameters in the rice fields of eastern Vidarbha region (central India) in relation to climatic conditions of this region.

MATERIALS AND METHODS

The survey for population fluctuation study of white backed planthopper (WBPH), *Sogatella furcifera* was carried out in the farmer's fields of Bhandara and Gondia districts of eastern Vidarbha (central India) during both *kharif* (monsoon crop) and *rabi* (summer crop) rice seasons from 2021 to 2022. Monitoring of the occurrence and abundance of WBPH in rice fields was made visually as well as by insect collection net from five randomly selected spots in the rice fields.

The population of *S. furcifera* was assessed by counting the number of adults per hill at weekly interval from five randomly selected spots in each rice field site under observation. Information on weather parameters was also collected from the meteorological department. The statistical analysis of the data and weather parameters were carried out by Pearson correlation and bilinear regression by using software SPSS 7.0 version.

RESULTS AND DISCUSSIONS

Out of 5 species of sap suckers identified in the present investigation, populations of *S. furcifera* were always high during *kharif* season as compared to other three leafhopper species, such as *Nephotettix* spp., *Recilia dorsalis* and *Pyrilla perpusilla;* therefore, it is recorded as a dominant pest. Remaining species of sap feeders were considered as minor pests due to less incidence of infestation whereas Brown planthopper, *Nilaparvata lugens* was found to be a major pest of rice in eastern Maharashtra. Rajendran and Devarajah, (1990) observed WBPH as major pest in three districts of Sri Lanka. In India, WBPH status also varies considerably in different states. In Karnataka, Punjab, Haryana, Madhya Pradesh and Uttar Pradesh, *S. furcifera* was recorded as the dominant pest of rice (Sharma *et al.* (1996), Vijay Kumar and Patil (2004) and Subhash Chander *et al.* (2003).

Nature and symptoms of damage

In the present investigation, the nature and symptoms of damage were observed to be different in case of *N. lugens* and *S. furcifera*. *N. lugens* infested the rice crop at all stages of plant growth. *S. furcifera* prefers a young crop and both adults and nymphs suck sap primarily at the base of the rice plants which leads to yellowing of the lower leaves (the symptoms start from the leaf-tips backwards) reducing vigour and plant growth, and ultimately reduction in tillers and panicles. As seedlings are attacked in the nursery stage, infestation is generaly carried through eggs into transplanted crop. The rice plants affected by *S. furcifera* appeared uniformly in large areas throughout the field rather than as localized 'hopper burn' as in the damage by *N. lugens*. This may be due to the difference in the distribution patterns of the two plant hopper species, *N. lugens* and *S. furcifera*. Under favorable conditions, *S. furcifera* produces several generations and causes heavy damage to the rice crop. *S. furcifera* has become a serious threat to rice crops in most of rice growing countries including India, causing 10-100 per cent yield losses (Chaterjee, 1971). In India, it is known as the worst pest in Madhya Pradesh (Patel and Tiwari, 1967), Punjab (Atwal *et al*. 1967), West Bengal (Chatterjee, 1971) and Himachal Pradesh (Pawar and Bhalla, 1974). *S. furcifera* is observed as a major pest of rice under irrigated conditions during the *kharif* season in Karnataka, India (Vijay Kumar and Patil 2004).

Population fluctuation and correlation regression analysis on weather parameters-

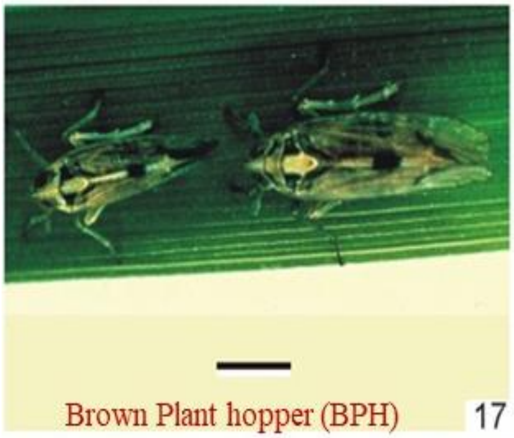
During the present investigation *N. lugens* and *S. furcifera* both coexisted in the rice ecosystem infesting the rice crop at its early and late stage, respectively. Although populations of *N. lugens* and *S. furcifera* persisted in both *kharif* and *rabi* seasons throughout the year, the population density of either one of them was high in any given season (Table 1, 2, 3 and 4). This suggests that if *N. lugens* population is high in *kharif* or *rabi* season, the population of *S. furcifera* will be low and vice-versa which may be due to the inter-specific competition in between these two species. In *kharif* season usually the population density of both the hoppers was always high as compared to *rabi* seasons but more damage to the rice crop at late stage was only due to the *N. lugens* resulting into 'hopper burns.' A mixed population of *N. lugens* and *S. furcifera* was also observed by Panda *et al*. (1995).

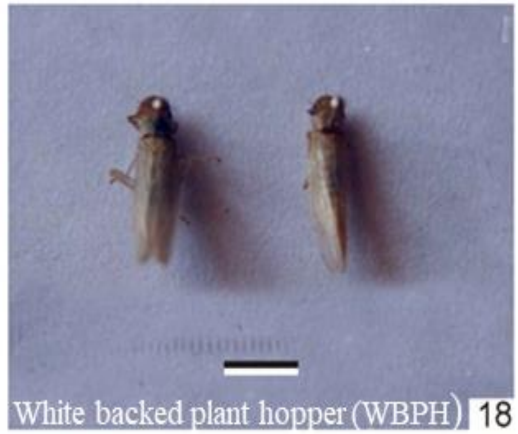
In present study the incidence of *S. furcifera*/hill suggest that there may be carry over of hopper populations from one season to the next due to continuous cropping of rice in eastern Vidarbha during *rabi* and *kharif* seasons.

Peaks of mixed populations of *N. lugens* and *S. furcifera* in early May and late May to early June were reported in Guangdong province of China (Li *et al*., 2003), whereas two peaks every year, one in mid-September and the second in early to mid-October were also recorded by Lu *et al*. (2003) in China. During the present investigation, 2-3 peaks of WBPH populations were noted only during *kharif* season. (Table 1, 2, 3 and 4). The population peaks of WBPH might be indicating its generations.

The rice crop receiving large amounts of nitrogenous fertilizers are mostly attached by planthoppers and there is also a difference in oviposition and survival of hatched nymphs (Cordero and Newsom, 1962; Suenaga, 1963; Lamey *et al*., 1964; Bae, 1966). The spraying of organic phosphorous pesticide in mid-season (during first generation) induced a population resurgence of second generations of both BPH and WBPH.

The average maximum temperature was observed as a congenial climatic factor for the increase in population of WBPH, whereas relative humidity was the negative contributing factor for the population of BPH and WBPH (Reddy *et al*., 1983). In the present investigation, population of *S. furcifera* did not show significant correlation with any of the weather parameters in *rabi* season (Table 5). However, during *kharif* season (Table 6) population of WBPH showed negative significant correlation with minimum temperature and relative humidity and confirmed the findings of Reddy *et al*., 1983. WBPH, which was previously only a minor pest of rice in the Kuttanad region of Kerala, India, reached the status of a major pest during the *rabi* season of 1997-98. The population of WBPH was at its peak during January 1998. This was thought to be due to the temperature of 32-34^{o}C, humidity of 85-88%, and prolonged monsoon with intermittent rains (Ambikadevi *et al*., 1998). In warm and humid climatic conditions, the plant hoppers remain active through out the year and their population fluctuates according to the availability of the host plants, activity of natural enemies and other environmental factors in the locality (Pathak, 1967).


Brown Plant hopper (BPH)
17


White backed plant hopper (WBPH)
18


Damage caused by BPH

Table 1. Population dynamics of *Sogatella furcifera* (WBPH)- *Rabi* 2021

Month & Week	DAT	Mean Population of WBPH/hill	Weather Parameters			
			Temperature (°C)		Relative Humidity (%)	
			Maximum	Minimum	Morning	Evening
Feb II	07	0.7	28.0	21.5	74	64
Feb III	14	1.6	30.5	22.0	72	65
Feb IV	21	2.6	31.0	22.5	59	49
Mar I	28	1.6	35.0	28.5	69	48
Mar II	35	2.6	32.0	19.0	41	41
Mar III	42	4.8	35.0	28.0	53	45
Mar IV	49	4.0	34.5	26.0	72	45
Mar V	56	1.8	36.0	26.0	52	38
April I	63	0.8	39.0	32.0	44	36
April II	70	4.0	39.0	31.0	52	39
April III	77	2.6	42.5	34.0	43	28
April IV	84	5.6	43.0	34.5	37	24
May I	91	3.2	41.5	33.0	44	35

DAT- Days after transplanting, **WBPH-**White backed plant hopper.

Table 2. Population dynamics of *Sogatella furcifera* (WBPH)- *Rabi* 2022

Month & Week	DAT	Mean Population of WBPH/hill	Temperature (°C)			
			Temperature (°C)		Relative Humidity (%)	
			Maximum	Minimum	Morning	Evening
Feb II	07	1.4	30	14.3	78	33
Feb III	14	1.6	30	16.5	66	28
Feb IV	21	0.4	35	19	64	23
Mar I	28	0.0	34.5	18	50	20
Mar II	35	0.0	33.5	19.5	53	29
Mar III	42	0.0	39.5	25.5	57	21
Mar IV	49	0.0	41.5	21	51	16
Mar V	56	0.0	38	24	52	37
April I	63	0.0	40.5	31	48	25
April II	70	1.4	44	34	23	12
April III	77	0.6	43.5	33.5	43	18
April IV	84	0.8	42	33	48	25
May I	91	0.0	39.5	32	49	28
May II	98	0.0	41.5	30.5	60	36
May III	105	0.0	44	34	33	16

Table 3. Population dynamics of *Sogatella furcifera* (WBPH)- *Kharif* 2021

Month & Week	DAT	Mean Population of WBPH/hill	Weather Parameters			
			Temperature (°C)		Relative Humidity (%)	
			Maximum	Minimum	Morning	Evening
Aug. IV	07	0.0	28	24	92	87
Aug. V	14	0.8	29	26	92	92
Sept. I	21	1.2	27	24	92	81
Sept. II	28	0.8	29	25	92	92
Sept. III	35	0.1	32	27	83	75
Sept. IV	42	0.0	31	25	96	78
Oct. I	49	0.2	33	24	83	72
Oct. II	56	0.8	33.5	25	57	76
Oct. III	63	0.4	33	22	84	63
Oct. IV	70	1.4	29	20	78	60
Nov. I	77	1.2	33	24	84	71
Nov. II	84	0.4	33	21	74	56
Nov. III	91	0.0	30.5	19	81	49

DAT- Days after transplanting, **WBPH-**White backed plant hopper.

Table 4. Population dynamics of *Sogatella furcifera* (WBPH)- *Kharif* 2022

Month & Week	DAT	Mean Population of WBPH/hill	Weather Parameters			
			Temperature (°C)		Relative Humidity (%)	
			Maximum	Minimum	Morning	Evening
Aug. V	07	0.6	33	26	80	51
Sept. I	14	2.8	33	25.5	84	81
Sept. II	21	1.8	34	26	77	62
Sept. III	28	2.0	33	26	84	75
Sept. IV	35	5.0	33	27	81	75
Oct. I	42	3.8	32.5	26	84	66
Oct. II	49	3.7	35	25	71	60
Oct. III	56	7.4	31	24	68	60
Oct. IV	63	11.6	32	21	62	49
Oct. V	70	2.8	33	21	68	51
Nov. I	77	11.6	31.5	21	65	57
Nov. II	84	10.8	33	24	79	59
Nov. III	91	10.8	31.5	19	72	42

Table 5. Correlation between weather parameters and population of WBPH- *Rabi* 2021 and 2022

WPPH	Weather Parameters	Rabi 2018		Rabi 2019	
		Correlation Coefficient (r)	Regression Equations	Correlation Coefficient (r)	Regression Equations
H_1	A_1	0.463	H_1= -2.421+ 0.144 A_1	-0.327	H_2= 2.001+ (-0.041) A_1
	A_2	0.378	H_1= -0.184 + 0.107 A_2	-0.165	H_2= 0.764 + (-0.014) A_2
	A_3	-0.369	H_1= 5.089 + (-0.042) A_3	0.148	H_2= 0.064 + 0.007) A_3
	A_4	-0.543	H_1= 5.500 + (-0.63) A_4	-0.062	H_2= 0.535 + (-0.005) A_4
	A_5	0.036	H_1= 2.631 + 0.017 A_5	-0.143	H_2= 0.621 + (-0.025) A_5

H_1- *Sogatella furcifera* (WBPH),
A_1- Max.Temp; **A_2-** Min.Temp; **A_3-** Relative Humidity (Mor.), **A_4-** Relative Humidity (Eve.), **A_5-** Wind velocity.
***** -Correlation is significant at 0.05 (5%) levels; ****** -Correlation is significant at 0.01 (1%) levels.

Table 6. Correlation between weather parameters and population of *Sogatella furcifera* (WBPH)- *kharif* 2021 and 2022

WPPH	Weather Parameters	Rabi 2018		Rabi 2019	
		Correlation Coefficient (r)	Regression Equations	Correlation Coefficient (r)	Regression Equations
H_1	A_1	-0.227	H_1= 2.211 + (-0.054) A_1	-0.529	H_2= 68.962 + (-1.931) A_1
	A_2	-0.064	H_1= 0.873 + (-0.014) A_2	**-0.735****	H_2= 33.670 + (-1.163) A_2
	A_3	-0.169	H_1= 1.281 + (-0.009) A_3	**-0.582***	H_2= 28.041+ (-0.298) A_3
	A_4	0.109	H_1= 0.252 + (-0.004) A_4	-0.464	H_2= 16.077 + (-0.170) A_4
	A_5	-0.133	H_1= 0.710 + (-0.019) A_5	-0.494	H_2= 8.285 + (-0.843) A_5

BIBLIOGRAPHY

1. Ambikadevi, D., Haseena, B., Thomas, G. and Bhasker, H. Whitebacked planthopper, *Sogatella furcifera* (Horvath) (Homoptera: Delphacidae) a major pest of rice in Kuttanand, Kerala. *Insect Environment*, 4 (2), 1998, 36.
2. Atwal, A.S., Choudhari, J.P. and Sohi, B.S. Studies on the biology and control of *Sogatella furcifera* Horv. (Delphacidae: Homoptera) in Punjab. *Journal of Research, Punjab Agricultural Univeristy*, 4 (4), 1967, 547-555.
3. Bae, S.H. Studies on some aspects of the life history and habits of the brown planthopper, *Nilaparvata lugens* (Stal). (*Thesis*, Master of Science in Entomology, Univ. of the Philippines, Coll. Agr., Los Barrios, Laguna, Philippines,1966.
4. Chang, T.T. Crop history and genetic conservation: rice- A case study. *Iowa state Journal of Research*, 59, 1984, 425-455.
5. Chatterjee, P.B. Outbreaks, and new records. *Plant Protection Bulletin*, F.A.O. 19 (1): 19-22 and 19 (2), 1971, 43-46.
6. Cordero, A.D. and Newsom, L.D. Suitability of *Oryza* torhe grasses as hosts of *Sogata* orisicola miner. *Journal of Economic Entomology*, 55, 1962, 868-71.
7. Lamey, H.A., McMillian, W.W.and Hendrick, R.D. Host ranges of the hoja blanca virus and its insect vector. *Phytopathology*, 54, 1964, 536-41.
8. Li, J., Liu, G.H. and Liang, G.W. New trend of whitebacked planthopper population dynamics in early rice fields. *Plant Protection*, 29 (3), 2003, 25-28.
9. Lu, Y.Y., Li, J. and Liang, G.W. Dynamics of population of whitebacked planthopper and brown planthopper in late rice fields. *Journal of Hauzhong Agricultural University*, 22 (3), 2003, 228-231.
10. Patel, R.K. and Tiwari, R.D. Note on Delphacid Menace of Paddy. *Indian Journal of Agricultural Science*, 37(6), 1967, 456-457.
11. Pathak, M.D. Biology of some insect pests of rice. *Annual Review of Entomology*, 13, 1967, 257-294.
12. Pawar, A.D. and Bhalla, O.P. Pest complex of rice in Himachal Pradesh. *Indian Journal of Entomology*, 36 (4), 1974, 358-359.
13. Rajendram, G.F. and Devarajah, F.R. Survey of some rice insect pests and their predators in three districts of Shri Lanka. *Journal of the National Science Council of Shri Lanka*, 18(1), 1990, 79-92.
14. Rangi, P.S. Production, and marketing problems of rice in the Punjab State. *Agricultural Marketing*, 35 (4), 1993, 4-7.
15. Reddy, M.S., Rao, P.K., Rao, B.H.K. and Rao, G.N. Preliminary studies on the seasonal prevalence of certain Homoptera occurring on rice at Hyderabad. *Indian Journal of Entomology*, 45, 1983, 20-26.
16. Sharma, D.R., Singh, D.P., Jaswant Singh, Dhaliwal, G.S. and Singh, J. Extent of damage and pattern of emergence from over-wintering larvae of rice stem borer in Punjab. *Indian Journal of Ecology*, 23 (2), 1996, 104-108.

17. Suenaga, H. Analytical studies on the ecology of two species of planthoppers, the whitebacked planthopper (*Sogatella furcifera* Horvath) and the brown planthopper (*Nilaparvata lugens* Stal), with special reference to their outbreaks (in Japanese). *Bull. Kyushu Agric. Exp. Stn*., 3, 1963, 1-52.
18. Subhas Chander, Aggarwal, P.K., Naveen, K. and Swaruprani, D.N. Changes in Pest profiles in rice-wheat cropping system in Indo-gangetic plains. *Annals of Plant Protection Science*, 11 (2), 2003, 258-263.
19. Vijay Kumar and Patil, B.V. Insect Pest fauna of rice in Tungabhadra Project area of Karnataka, during *kharif* season. *Karnataka Journal of Agricultural Science*, 17 (3), 2004, 580-581.