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Study on Population Dynamics of Green Leaf Hopper (GLH) and its Correlation with Different Weather Parameters under Staggered Planting of Different Aromatic Paddy varieties

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ABSTRACT: An experiment was taken up in the Agro-meteorology field, Central Research Farm of Orissa University of Agriculture and Technology (OUAT), Bhubaneswar during the year 2017-2018 for studying the population build up and population dynamics of Green Leaf Hopper (GLH) and its correlation with different weather parameters *viz.*, temperature (Max. & Min.), RH (Max. & Min.), Rainfall (Max. & Min.) & Sunshine Hours under staggered planting condition with 12 different climatic dates starting from the monsoon period *i.e.,* 16th July 2017 to the winter period *i.e.,* 1st January 2018 at a regular interval of 15 days by involving with three aromatic rice varieties such as Pusa Sugandh –II, Geetanjali and Poorna Bhog. The highest occurrence of the pest was observed during the last week of October and 1st week of November with date of planting on 16th September. So far as the relation of GLH population with different climatic parameters was concerned, GLH was observed with the peak occurrence at temperature (max.) of 32-34°C, temperature (min.) of 24-26°C, high morning relative humidity of 90-95% and 60-95% of evening relative humidity, 2-4 sunshine hours and 40-60 mm rainfall.

Keywords: Paddy, Green Leaf Hopper (GLH), Correlation, Climatic parameters, Staggered planting.

INTRODUCTION

Paddy is one of the most prominent cereal crops in the world. Many of the aromatic paddy varieties are found to be susceptible to insect pests thereby making it inefficient for cultivation and ultimately are discarded by the farmers which are adopted due to growing demand for aromatic rice in the market of our country & abroad in recent years. Different climatic parameters e.g., rainfall, temperature and humidity are the vital influential parameters for development of paddy insect pests in the grass-root condition. Paddy crop is attacked by huge number of insect pests, but potential damage is caused by few important pests in the field conditions. Potential losses occurred by the destructive insect pests are the main bottle-neck in obtaining the high yield in paddy crop. Green leafhoppers (GLH) are the commonly available type of leafhoppers in rice fields and are primarily critical as they spread one of the deadly viral diseases called *Tungro* virus (Bhattacharyya *et al.*, 2002). Both the nymphal and adult stages of the pest feed on the abaxial surface of the leaf blades of paddy rather than the adaxial surface. They prefer to feed on the lateral parts of the leaves preferably leaf blades rather than the middle parts of the leaf *i.e.,* leaf sheaths (Reddy *et al.*, 1983). Green Leaf Hopper have higher affinity towards the paddy plants which have been fertilized with large quantity of nitrogeneous fertilizers. So far as the aromatic (basmati) rice varieties are concerned, it was revealed that, population of sucking pest like Brown Plant Hopper (BPH) showed non-significant negative correlation with BPH population (Kumar and Patil 2004).

MATERIALS AND METHODS

The geospatial location of Odisha is situated at a higher elevation of 25.9 m above MSL at 20°15′N latitude and 85°52′ E longitude and East & in the South East Coastal Plain of the country. The unique climatic condition of Bhubaneswar is relatively hot and humid with moderate rainfall throughout the year. The annual mean temperature (Max.) during the year 2017 was 35.3°C while the annual mean temperature (Min.) was 22.6°C. Bhubaneswar was felt hot and humid during the summer season (March to June 2017) with temperatures ranging between 26.5-35.6°C. Similarly, winter season from December 2017 and January 2018wasvery cold and dry with a temperature ranging from 15–28°C. It was observed that May 2017 being the warmest month, when the daily temperatures range from 32–42°C whereas, January 2018, being the coolest month, had temperatures ranging from 15–28°C in Bhubaneswar. The current study was taken up

with the inception during the kharif season of the year 2017 and ended with the season rabi 2017-2018 at the Research farm of College of Agriculture, Bhubaneswar of Orissa University of Agriculture and Technology (OUAT), Bhubaneswar and the data pertaining to the population of GLH were recorded with respect to aromatic paddy varieties under prevailing climatic conditions of the aforementioned location. Present study on investigation of population variation &infestation of Green Leaf Hopper (GLH) was taken up to study the effect of climatic conditions there on under the staggered planting condition with 12 different climatic dates starting from 16th July 2017 to 1st January 2018 at 15 days interval on three aromatic varieties of paddy such as Pusa Sugandh –II, Geetanjali and Poorna Bhog. However, planting dates of 1st October and 16th October 2027 were discarded likely due high sterility percentage occurred for low temperature. The whole investigation was taken up with normal agronomic practices followed in the prevailing experimental site and farmers those who approximately follow the same agricultural practices were adopted for this experiment. The observations were recorded at seven days interval with observation on number of green leaf hopper per 5 hills to study about population dynamics of green leaf hopper throughout the cropping season and process of correlation was taken up with weather parameters under staggered planting of aromatic rice. During the course of investigation, observation of different climatic conditions had been undertaken in respect of weather conditions *viz.*, Temperatures (Max. and Min.), Rainfall (Max. and Min.), Relative Humidity (Max. and Min.) and bright sunshine hours and the population dynamics of GLH was correlated with the abiotic factors for the current study.

RESULT AND DISCUSSION

Study on population built up of Green Leaf Hopper (GLH) under different sowing periods. The GLH infestation was observed during the sowing dates starting from 1st date (16th July) to 11th date of planting (16th December). The number of GLH varied from 0.10 to 0.70per hill (Table 1). But, the infestation of GLH was found initiating from the 2nd week of August and was going on up to last week of January during the period of investigation. Though the population built up of GLH was observed within a range of periods from the month of August to January, the highest occurrence was observed during the last week of October and 1st week of November in 16th September date of planting *i.e.* (0.7GLH/hill). In case of sucking pests of paddy, it was found that, the period of occurrence of Brown Plant Hopper & Green Leaf Hopper was low from July to August and maximum population was observed in mid-September (Kumar *et al.*, 2013 ; Kumar *et al.*, 2019). Further, the period of occurrence was observed to be highest during the initiation of winter during last of September to end of November (Kalita *et al.*, 2015).

Table 1: Weekly GLH Population observed per hill.

Week after planting	Different dates of planting (15 days interval)											
	16th Jul	1st Aug	16th Aug	1st Sep	16th Sep	1st Oct	16th Oct	1st Nov	16th Nov	1st Dec	16th Dec	1st Jan
Week 1	0	0	0	0	0	Plantation was discarded due to high percentage of sterility occurring in aromatic paddy		0	0	0.1	0	0
Week 2	0	0	0.1	0.5	0			0	0.2	0.2	0.1	0
Week 3	0	0	0.1	0.2	0.3			0.2	0.5	0.3	0.2	0
Week 4	0	0	0.6	0.5	0.2			0.2	0.3	0.1	0	0
Week 5	0.2	0.3	0.2	0.3	0.5			0	0.2	0.1	0	0
Week 6	0.2	0.1	0.3	0.3	0.7			0.4	0	0.3	0.2	0
Week 7	0.3	0.1	1	0.4	0.7			0.2	0	0	0	0
Week 8	0.2	0.3	0.2	0.1	0.2			0.8	0	0	0	0
Week 9	0.3	0.2	0.3	0	0			0.1	0	0.2	0	0
Week 10	0	0	0.3	0	0			0.1	0	0	0	0
Week 11	0	0	0	0	0			0	0	0	0	0
Week 12	0	0	0	0	0			0	0	0	0	0
Week 13	0	0	0	0	0			0	0	0	0	0
Week 14	0	0	0	0	0			0	0	0	0	0

Suitable climatic conditions for GLH population built up. During the investigation period, the infestation of GLH was recorded at a range of temperature (max.) from (26-38°C), minimum temperature (min.) from 11-26°C, relative humidity at morning from 82.01-96.01%, relative humidity at afternoon from 20.04-85.03%, rain fall ranging from 0-160mm. with 1-10 hours of sunshine. The peak occurrence of GLH was observed at maximum temperature (32-34°C), minimum temperature (24-26°C), high morning relative humidity of 90-95% and evening relative humidity of 60-95%, 2-4 sunshine hours, with 40-60 mm rainfall prevailing the pest population (Fig 1).These findings were in accordance with the studies, where it had been observed that, GLH population was supported within the favourable temperature (max.) & temperature (min.) ranges of 25-40°C and 12-28°C respectively (Madhuri *et al.*, 2017). So far as the relative humidity was concerned, it was inferred that, GLH population was seen surging within the morning relative humidity of 87-95% and evening relative humidity of 60-93%, which is in accordance with the present investigation (Shamim *et al.*, 2009).

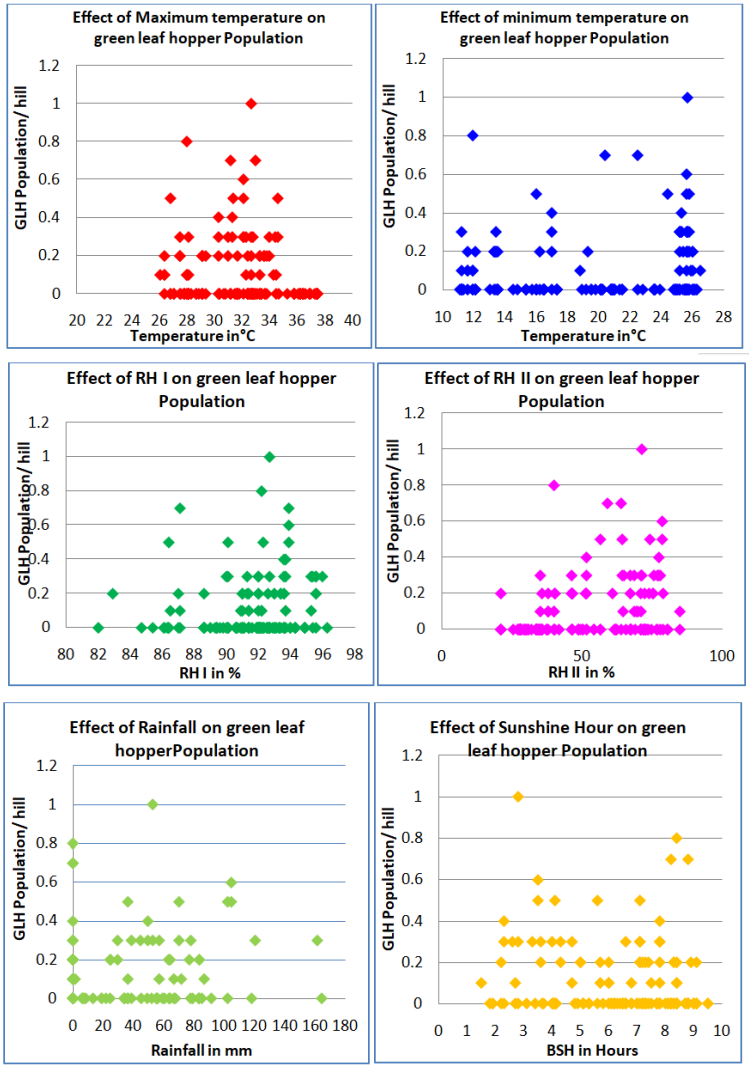

Fig. 1. Graphs depicting relationship between population dynamics of Green Leaf Hopper with different favourable weather parameters.

Study on correlation in respect of Green Leaf Hopper with different weather parameters. It was found that, the correlation study between GLH population and different weather parameters had significant relation in different plantings schedules *viz.*, 1st September, 16th November, 1st December and 16th December out of all 12 planting dates (Table 2). The GLH population was found positively correlated with the temperature (min.) and evening relative humidity with r value (Correlation co-efficient) of (0.61) and (0.57) respectively and negatively correlated with bright sunshine hour(-0.57) on 1st September date of planting. During 16th November date of planting, it was observed that, positive correlation was observed with evening relative humidity and rainfall with r value (0.73) and (0.73) respectively. During 1st December date of planting, GLH showed negative correlation with temperature (max.) and temperature (min.) with r value of (-0.57) and (-0.51) respectively. During 16th December date of planting, negative correlation was observed with temperature (max.) with r value of (-0.53).It was reported that, GLH showed positive correlation with morning relative humidity whereas showed negative correlation with temperature (max.) and evening relative humidity (Singh *et al.*, 2020). Further, the study during the year 2018-19 in Uttar Pradesh revealed that, GLH population showed significant negative correlation with rainfall, but showed a positive non-significant correlation with temperature (max.) (Sachan *et al.*, 2006; Mahanta *et al.*, 2020).

The GLH infestation was observed in almost all of the planting dates starting from 1st date of planting (16th July) to 11th date of planting (16th December). However, GLH infestation was incepted from 2nd week of August 2017 and was built up upto last week of January 2018. The GLH population was up surging from August 2017 to January 2018.It was found that, the highest occurrence was noted during last week of October to 1st week of November in 16th September planting date followed by second peak occurrence during 2nd week of September in 16th August planting. The peak occurrence of GLH was observed at a temperature (max.) range of (32-34°C), temperature (min.) of (24-26°C), high morning relative humidity of 90-95% and evening relative humidity of 60-95%,

along with rainfall of 40-60mm.prevailing the pest population.

The GLH population was found in positive correlation with temperature (min.) and evening RH with r value of (0.61) and (0.57) respectively and negatively correlated with bright sunshine hour of (-0.57).

Table 2: Correlation studies of GLH population density with weather parameters.

Weather Parameters	Different dates of planting (15 days interval)										
	16th Jul	1stAug	16th Aug	1st Sep	16th Sep	1stOct	16thOct	1st Nov	16th Nov	1st Dec	16thDec
Max. Temp (TX)	0.34221	0.00778	0.05591	0.4447	0.41808	Plantation was discarded due to high percentage of sterility occurring in aromatic paddy		-0.3255	-0.4017	**-0.571**	**-0.5384**
	0.2311	0.9789	0.8494	0.1111	0.121			0.1739	0.0882	0.0165	0.0384
Min. Temp. (TN)	0.0672	-0.2291	0.40132	**0.6138**	0.3929			-0.3357	-0.0804	**-0.511**	-0.415
	0.8193	0.4306	0.155	0.0195	0.1474			0.16	0.7435	0.0357	0.124
Max. Relative Humidity (RH1)	-0.14839	0.28109	0.36348	0.4177	-0.0664			0.20117	-0.117	0.2060	0.07984
	0.6127	0.3303	0.2014	0.1372	0.8141			0.4089	0.6332	0.4276	0.7773
Min. Relative Humidity (RH2)	-0.08965	-0.1724	0.25398	**0.5798**	0.37713			0.1878	**0.73472**	0.2561	0.18575
	0.7605	0.5556	0.3809	0.0297	0.1658			0.4414	0.0003	0.3211	0.5075
Rain Fall (RF)	0.23344	0.08972	0.26763	0.5157	0.09138			-0.18	**0.73729**	0.0201	-0.1274
	0.4218	0.7604	0.3549	0.0591	0.746			0.4608	0.0003	0.939	0.6509
Sun shine hours (SS)	0.36419	-0.1811	-0.6036	**-0.5763**	0.21539			0.21878	-0.4136	0.0611	-0.1726
	0.2005	0.5353	0.0223	0.031	0.4407			0.3682	0.0783	0.8158	0.5383

CONCLUSIONS

GLH population was found in almost all the planting dates except 1st January. During last week of October (43 SMW) followed by 2nd week of September (37 SMW),the maximum GLH population was found at a maximum temperature range of 33-35°C, minimum temperature range of 15-27°C with high humidity and sunshine. It was found that, GLH was correlated with all-weather parameters in different dates of planting mainly in positive correlation with relative humidity and rainfall whereas in negative correlation with temperature.

FUTURE SCOPE

This study related to population dynamics of Green Leaf Hopper (GLH) and its correlation with weather parameters in different aromatic paddy varieties will provide a broad idea to the readers regarding behavior of population fluctuation of GLH with respect to the weather parameters. Apart from this, the study on GLH population will pave a way forward for the researchers to evaluate and manipulate different weather parameters in order to avoid the GLH population, thereby prevent the spread of viral diseases like *Tungro* virus in paddy field.

REFERENCES

Bhattacharyya, A., Datta, B. and Choudhury, A. (2002). Homopteran rice pests in Sundarbans biosphere reserve. *Insect Environment*, *8*(4), 191-192.

Kalita H., Avasthe, R. K. and Ramesh, K. (2015). Effect of Weather Parameters on Population Build-up of Different Insect Pests of Rice and Their Natural Enemies, *Indian Journal of Hill Farming*, *28* (1), 69-72.

Kumar, D., Raghuraman, M., Singh, J., Waza, S. and Kumar, K. (2013). Occurrence of insect-pests and natural enemies in rice (*Oryza sativa* L.) agro-ecosystem, *International Journal of Plant Protection, 6*(2), 266-270.

Kumar, S., Singh, H., Yadav, A., Kumar, A. and Shanker, R. (2019). Seasonal abundance of brown plant hopper, *Nilaparvatalugens* (Stal.) in basmati rice and correlation of abiotic factors under Meerut region, *Journal of Entomology and Zoology Studies*, *7*(6), 882-885.

Kumar, V. and Patil, B. V. (2004). Occurrence of minor insect pests of paddy in Tungabhadra project area of Karnataka, *Karnataka Journal of Agricultural Sciences*, *17*(4), 825-826.

Madhuri, G., Dash, P. C. and Rout, K. K. (2017). Effect of Weather Parameters on Population Dynamics of Paddy Pests. *International Journal of Current Microbiology & Applied Sciences*, *6*(10), 2049-2053.

Mahanta, P. K., Raju, S. V. S. and Giri, G. S. (2020). Influence of environmental factors on seasonal incidence of sucking pests of rice. *Journal of Pharmacognosy and Phytochemistry*, *9*(3), 822-825.

Reddy, M. S., Rao, P. K., Rao, B. H. K. and Rao, G. N. (1983). Preliminary studies on the seasonal prevalence of certain Homoptera occurring on rice at Hyderabad. *Indian Journal of Entomol*ogy, *45*(1), 20-28.

Sachan, S. K., Singh, D. V. and Chaudhary, A. S. (2006). Seasonal abundance of insect pests associated with basmati rice. *Annals of Plant Protection Sciences*, *14*(1), 247-248.

Shamim, M., Shekh, A. M., Patel, V. J., Dodia, J. F., Korat, D. M. and Mehta, A. M. (2009). Effect of weather parameters on population dynamics of green leaf hopper and white backed plant hopper in paddy grown in middle Gujarat region. *Journal of Agrometeorology, 11*(2), 172-174.

Singh, D., Umrao, R. S., Verma, K., Kumar, A. and Vikrant. (2020). Population Dynamics of Major Insect-pests of Rice and their Natural Enemies and its Correlation with Weather Parameters in Central U.P. *Int. J. Curr. Microbiol. App. Sci., 9*(2), 1517-1531.

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