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Population dynamics of white backed plant hopper and its correlation with weather parameters under staggered planting

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Abstract

An experiment was conducted in Agrometeorology field, Central Research Farm, Orissa University of Agriculture and Technology Bhubaneswar during 2017-2018, to study the population dynamics of White Backed Plant Hopper and its correlation with weather parameters under staggered planting with 12 dates starting from 16th July 2017 to 1st January 2018 at 15 days interval and three varieties such as Geetanjali, Poorna Bhog and Pusa sugandh –II. The incidence of WBPH was highest at vegetative stage of crop. WBPH occurrence was highest in 1st August planting date, and WBPH infestation was found positively correlated with both maximum, minimum temperature and sunshine. The WBPH peak Population was found at a maximum temperature from 27- 34 °C, minimum temperature of 11-26°C, morning relative humidity 82-96% and evening relative humidity up to 85%. The infestation was preferred very less rainfall only upto 10 mm.

Keywords: Plant hopper, correlation, weather parameters under staggered planting

Introduction

Globally rice is one of the most important cereal crop. With growing demand for aromatic rice in the local and international market in recent years, many of them found to be susceptible to insect pests therefore discarded by the farmers. Climatic factors e.g., rainfall, temperature and humidity are the key factors for development of any rice insect pest. Paddy crop in the field is attacked by numerous guilds of insect pests, but few causes significant losses. Losses caused by the insect pests are the main constraint in achieving high yield of rice. The WBPH severely attacked seedling do not grow. They are stunted, wilt, and eventually die. The nymph and adults suck cell sap at the base of rice plant and the leaf surface. The number of grains and the panicle length decreases when rice is infested at the panicle initiation stage. During the heading stage, damaged glumes become brown and some remain unfilled. Grains do not fill fully and ripening is delayed when plants are attacked at the maturation period.

Materials and Methods

The geographic situation of Odisha situated at an elevation of 25.9 m above mean sea level at 20° 15' N latitude and 85° 52' E longitude and East & South East Coastal Plain of Odisha. The general climatic condition of Bhubaneswar is hot and humid. The annual mean maximum temperature of 2017 is 35.3 °C and annual mean minimum temperature is 22.6 °C. Summer season (March to June) is hot and humid, with temperatures ranging 26.4-35.7 °C. Winter season (December and January) is cold and dry with temperature ranging 15–28 °C. May is the hottest month, when daily temperatures range from 32–42 °C. January, the coolest month, has temperatures varying from 15–28 °C. The present study was carried out during Kharif 2017 and Rabi 2017-2018 at Research farm of College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar, and the data were recorded to WBPH of aromatic rice, under prevailing weather conditions. Present investigation was carried out to study the effect of weather parameters on infestation of White Backed Plant Hopper under staggered planting with 12 dates starting from 16th July 2017 to 1st January 2018 at 15 days interval and three varieties such as Geetanjali, Poorna Bhog and Pusa sugandh-II, but 1st October and 16th October planting dates were discarded as because of high percentage of sterility due to low temperature and the normal agronomic practices were follow in the crop grown under the prevailing condition at Research farm of College of Agriculture, Orissa University of

Agriculture and Technology, Bhubaneswar and approximately same agricultural practices farmers were also adopted. The Observations were made at weekly intervals throughout the crop season, number of brown plant hopper per 5 hills were recorded, to study about population dynamics of White Backed Plant hopper and its correlation with weather parameters under staggered planting in aromatic rice. To know the peak period of WBPH incidence during aromatic rice growth period. During the course of investigation the weather parameters viz., maximum and minimum temperatures, rainfall, relative humidity and bright sunshine hours were recorded and the population of WBPH was correlated with the abiotic factors.

Results and Discussion

Population built up of White Backed Plant Hopper

The WBPH infestation was found most planting date starting from 1st date (16th July) to 11th date of planting (16th December). The number of pest per hill varied from 0.1 to 1.7 (Table 1). However, the infestation of WBPH was first found from 2nd week of August (SMW 33) and was continued up to second week of January (SMW 1). Though the population of WBPH was built up from August to January, but the highest occurrence was observed during second week of November i.e. WK6 after planting (1.7 WBPH/hill) in 1st august date of planting and second peak occurrence was observed during 3rd week of September in 1st September date of planting.

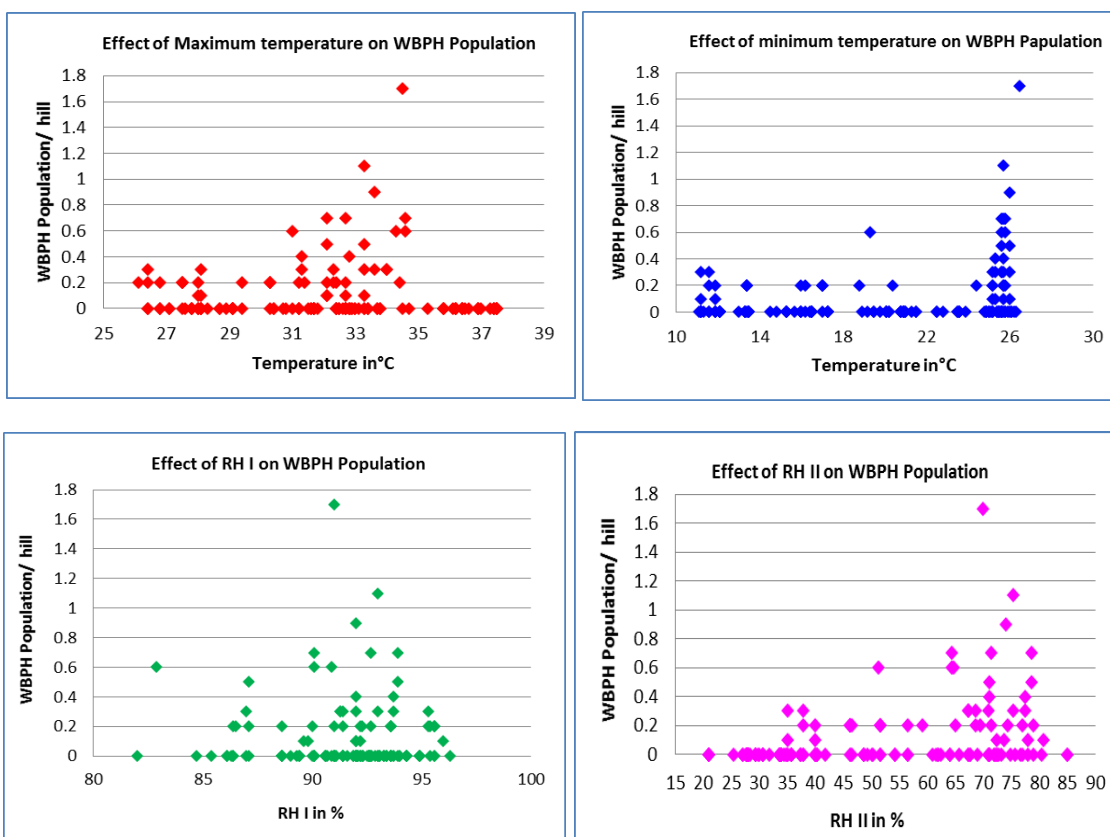
Table 1: Weekly WBPH Population per Hill

Week after planting	16-Jul	1-Aug	16-Aug	1-Sep	16-Sep	1-Nov	16-Nov	1-Dec	16-Dec	1-Jan
WK1	0	0	0	0	0	0	0	0.2	0	0
WK2	0	0	0	0.7	0	0	0	0.2	0	0
WK3	0	0.1	0.5	1.1	0	0.2	0.2	0.2	0.2	0
WK4	0	0.1	0.5	0.6	0	0	0.2	0	0	0
WK5	0.2	0.2	0.3	0.2	0.2	0	0.2	0	0	0
WK6	0.3	1.7	0.7	0.3	0	0.2	0.2	0.1	0	0
WK7	0.1	0.6	0.7	0.3	0.2	0.2	0	0	0	0
WK8	0.9	0.4	0.3	0.2	0.6	0.1	0	0	0	0
WK9	0.2	0.1	0.4	0	0	0.3	0	0	0	0
WK10	0	0	0.3	0	0	0.3	0	0	0	0
WK11	0	0	0	0	0	0	0	0	0	0
WK12	0	0	0	0	0	0	0	0	0	0
WK13	0	0	0	0	0	0	0	0	0	0
WK14	0	0	0	0	0	0	0	0	0	0

Favourable weather parameters for WBPH Population built up

The WBPH infestation was found at arrange of maximum temperature from (27- 37 °C), minimum temperature (11- 26 °C), relative humidity at morning (82-96%), relative humidity at afternoon of (20-85%), rain fall (0-160mm), with 2-10hours

of sunshine. The WBPH infestation was highest at low rainfall with weekly cumulative rainfall of 0 to 10mm and aggravated by maximum temperature (33-35 °C), minimum temperature (22-27°C), high morning relative humidity 90-92% and evening relative humidity 70-75%, with 6-8 sunshine hours (Fig1).



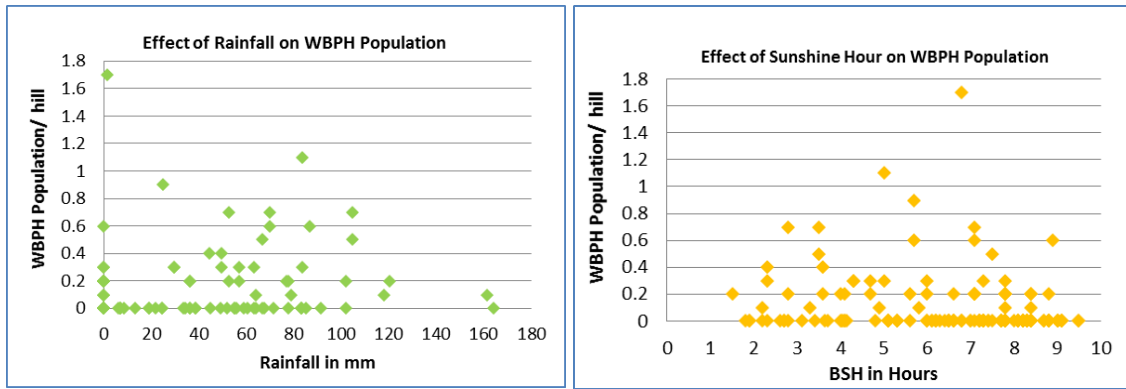


Fig 1: Favourable weather parameters for WBPH population

Correlation studies of White Backed Plant Hopper with weather parameters

The correlation between WBPH Population and different weather parameters revealed significant correlation in most of the planting date starting from 1st August to 1st December except 16th December and 1st January dates of planting (Table 2). The WBPH infestation was found positively correlated with both maximum temperature and minimum temperature and sunshine hour with r value of (0.56), (0.67) and (0.51) in 1st August planting date. In 16th August date of planting WBPH was positively correlated with correlated minimum r value of (0.52). In 1st September date of planting WBPH was

positively correlated with minimum temperature, evening relative humidity and rainfall with r value (0.53), (0.58), (0.61). In 16th September date of planting WBPH was negatively correlated (-0.69) with morning relative humidity. In 1st November and 1st December dates of planting it was negatively correlated with maximum temperature of r value (-0.46) and (-0.49). In 1st December date of transplanting WBPH was positively correlated with evening relative humidity and rain fall with rainfall (0.74) and (0.48). In 16th November date of transplanting WBPH was positively correlated with evening relative humidity with r value (0.67) at 1% significance.

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

WP	16 th Jul	1 st Aug	16 th Aug	1 st Sep	16 th Sep	1 st Nov	16 th Nov	1 st Dec	16 th Dec
TX	0.3623	0.56784	0.39493	0.44088	0.11943	-0.4644	-0.4454	-0.4981	-0.3958
	0.203	0.0342	0.1623	0.1146	0.6716	0.0451	0.056	0.0419	0.1442
TN	0.27778	0.67971	0.5288	0.53972	0.06006	-0.4414	-0.1876	-0.101	-0.281
	0.3363	0.0075	0.0519	0.0464	0.8316	0.0585	0.4418	0.6997	0.3102
RH1	-0.22846	-0.1912	0.05666	0.40566	-0.6961	0.16199	0.07677	0.02258	-0.0921
	0.4321	0.5126	0.8474	0.1501	0.0039	0.5076	0.7547	0.9314	0.7439
RH2	-0.04992	-0.4349	0.12586	0.58855	-0.0337	0.16101	0.67506	0.74012	0.12039
	0.8654	0.1201	0.6681	0.0268	0.905	0.5102	0.0015	0.0007	0.6691
RF	-0.25379	-0.503	0.31953	0.61669	-0.0214	-0.2125	0.4291	0.48525	-0.0714
	0.3813	0.0667	0.2654	0.0188	0.9396	0.3823	0.0668	0.0483	0.8003
SS	0.40467	0.51715	-0.3512	-0.3727	0.30782	0.05702	-0.2086	-0.3955	-0.3145
	0.1512	0.0583	0.2182	0.1893	0.2644	0.8166	0.3912	0.116	0.2535

(Suenaga, 1963) [16] had also almost similar findings, that temperature around 27-28 °C is favorable for the development of WBPH. The population appeared in the 1st week of August following slight (2.0 mm) rainfall. The WBPH population is indirectly depends upon decreasing the temperature.

Table3: Response of variety towards population built up of White Backed Plant Hopper per Hill

Date of Transplanting	Geetanjali	Poorna Bhog	Pusa sugandh II
16 th Jul	0.09	0.04	0
1 st Aug	0.07	0.04	0.13
16 th Aug	0.01	0.2	0.10
1 st Sep	0.1	0.1	0.14
16 th Sep	0.11	0.1	0.03
1 st Nov	0.03	0.03	0.02
16 th Nov	0.03	0.02	0.01
1 st Dec	0.01	0.03	0.01
16 th Dec	0	0	0
1 st Jan	0	0	0
TOTAL	0.45	0.56	0.44

From above Table.3 it revealed that Poorna Bhog variety is most susceptible to white backed plant hoppers as compared to Getanjali and Pusa sugandh-II. Occurrence of WBPH was seen highest on 1st September date of planting in all three varieties. The 16th December and 1st January dates of planting all the three varieties are free from WBPH infestation.

Summary and Conclusion

WBPH population was also found in most of the planting dates. The highest occurrence was observed at 2nd week of November and 3rd week of September. The WBPH occurrence is high at a maximum temperature 32-34 °c, minimum 25-27 °c with high relative humidity. WBPH population was positively correlate with maximum and minimum temperature and sunshine hour. Basmati rice cv. Pusa Sugandh-II was resistance to insect pests and also a high yielding variety among three cultivars. Poorna Bhog was most susceptible variety to WBPH.

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