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Dynamics of insect-pests of paddy and its correlation with weather parameters

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Abstract
Rice is the stable food crop of more than 60 per cent of the world population. In this view, rice was sown in experimental plots. The experiment was laid out in Randomized block design with three replications. To monitor the pest net sweeping method was used. This investigation revealed that pest activity commenced from 35th Standard meteorological week (SMW) and continued to 41th SMW of the year 2018. Highest white ears (68 nos.) of *Scirpophaga incertulas* was found in 41th SMW, the maximum population (59 nos.) of *Cnapholocrocis medinalis* was recorded in the 37th SMW, the peak population of *Nephotettix spp* (95 nos.) was estimated in the 37th SMW, the highest number of *Leptocorisa acuta* (102 nos.) was recorded in the 41th SMV population. The results showed that the population of yellow stem borer, leaf folder, green leaf hopper and grasshoppers are positively correlated with maximum and minimum temperature, were as pollen feeders and Earhead bugs are showed negative correlation with maximum and minimum temperature respectively. The Relative Humidity (RH) is favourable for Earhead bug, Grasshopper and Pollen feeders are positive correlation except yellow stem borer, leaf folder and grasshopper. Sunshine hours favourable for all insects like Leaf folder, Green leaf hopper, Grasshoppers, Pollen feeders in rice. Since, it showed a positive correlation with sunshine hours except Yellow stem borer and Earhead bugs.

Keywords: rice, net sweeping, temperature, relative humidity, sunshine hours

Introduction
Rice is the stable food crop more than 60% of the world population. In India, rice crop occupying 44.1 million hectares land with production of about 110.15 million tonnes and productivity of 24.97 quintal/hectare (Anonymous, 2018) [2]. Among the various insect pests of paddy Yellow Stem Borer, leaf folder, rice gundhi bug, grasshopper, green leaf hopper, brown plant hopper. The insect physiology, behavior, development and species distribution may be affected in the changing climate. The population abundance of an insect species is manipulated by the host plant, natural enemies or extreme weather conditions. The current warning trend may change the climate pattern in the future, and provide more suitable conditions for propagations of most rice insect pests. In the development of pest management strategies a detailed knowledge of the influence of abiotic factors on the pest insects is essential. The population dynamics of insect pests are affect significantly known to weather and climatic conditions (Kennedy and Storer, 2000) [4]. Abiotic factors like temperature, day length, rainfall and relative humidity can be used as important components in forecasting and predicting the severity of insect pest population (Milford and Dugdale, 1990) [5]. Hence, considering the importance of insect-pests of rice an attempt has been made to study the population dynamics and its correlation with weather parameters.

Materials and Methods
For recording the population of insect-pests, the study was conducted at Experimental farm of Annamalai University, Chidambaram. Total experimental plot size measured 15x10m. The seedlings were transplanted in the experimental plot with spacing 10 cm between plant to plant and 15 cm row to row. 21 days old seedlings of CR Dhan 200 rice variety were transplanted in fortnight of November from the nursery sown 21 days ago, in experimental year. The normal cultural practices were performed throughout the growing season of the crop.

Methods of Data Collection
Data collection was started after twenty fifth days of transplanting and subsequent at weekly intervals, using also sweeping method as per need.

Net Sweeping
This sampling device is use full for catching immature and adult stages of insect pests present in the rice ecosystem. The observations on occurrence of major insect pests were recorded at 25th day after transplanting at weekly interval.one sample consists of 25 sweeps at each plot of the rice ecosystem. The insect collected while sampling were counted and collected and then transferred to transparent polythene bag which were returned to the laboratory for identification. All the samples were collected near the center of the ecosystem.

Experimental details
Specification of sweep net-30 cm diameter and 65 cm depth
Number of sweep in each sampling - 25 Sweeps
Time of sampling - Morning or late evening
Frequency of observation - Weekly interval

Major pests of paddy were observed on weekly basis. Week division was based on standard meteorological week. Observations of the meteorological data on maximum and

minimum temperature (ºC), morning (maximum) and evening (minimum) relative humidities (%) and sunshine hours were recorded on weekly basis from Faculty of Agriculture, Department of Agronomy meteorological observatory.

Table 1: Population dynamics of insect-pests on rice crop along with weather parameters

Standard week	Yellow stem borer (nos.)	Leaf folder (nos.)	Green leaf hopper (nos.)	Earhead bug (nos.)	Grasshopper (nos.)	Pollen feeder (nos.)	Max. temp ˚C	Mini. Temp ˚C	RH (%)	Sunshine Hrs.
35	45	48	67	0	75	0	33.8	24.2	89	3.6
36	0	0	71	0	73	46	35	25	84	7.4
37	61	59	95	25	97	53	35.2	25.7	86	7.6
38	51	42	75	47	86	66	34	25.2	86	4
39	46	52	77	46	81	98	33.3	24.9	88	7
40	0	0	74	74	76	87	30.5	24.7	97	4.4
41	68	47	65	102	0	81	33.6	25.2	87	5.6

Table 2: Correlation between insect-pests and weather parameters

Weather parameters	Yellow stem borer	Leaf folder	Green leaf hopper	Earhead bug	grasshopper	Pollen feeder
Max. temp	0.409	0.372	0.297	-0.551	0.111	-0.044
Mini. Temp	0.383	0.196	0.668	-0.234	0.013	-0.399
RH	-0.407	-0.356	-0.124	0.397	0.038	0.262
Sunshine	-0.002	0.031	0.527	-0.173	0.099	0.273

Results and Discussion

In rice, there was significant difference of pests population this was correlated with weather parameters. To monitor the pest net sweeping method was used. This investigation revealed that pest activity commenced from 35th Standard meteorological week (SMW) and continued to 41th SMW of the year 2018. Highest white ears (68 nos.) of *Scirpophaga incertulas* was found in 41th SMW, the maximum population (59 nos.) of *Cnapholocrocis medinalis* was recorded in the 37th SMW (Table. 1), the peak population of *Nephotettix spp* (95 nos.) was estimated in the 37th SMW, the highest number of *Leptocorisa acuta* (102 nos.) was recorded in the 41th SMV population. The results showed that the population of yellow stem borer (r=0.409), leaf folder (r=0.372), green leaf hopper (r=0.297) and grasshoppers (r=0.111) are positively correlated with maximum temperature, were as pollen feeders (r= -0.551) and Earhead bugs (r= -0.044) are showed negative correlation with maximum temperature respectively. Anonymous (2007) [1] found that the Sunshine hour and maximum temperature were positively correlated (correlation coefficient 0.2803 and 0.3336) with Leaf Folder incidence and negatively correlated with rainfall (correlation coefficient -0.3353). It's evident from that the population of yellow stem borer (r= 0.383), leaf folder (r= 0.196), green leaf hopper (r=0.668) and grasshoppers (r= 0.113) are positively correlated with minimum temperature (Table 2), were as pollen feeders (r= -0.399) and Earhead bugs (r= -0.234) are showed negative correlation with minimum temperature. Similar findings Jhansi Lakshmi *et al*., 2018 [3] reported that Yellow stem borer (YSB), *S. incertulas*, incidence showed significant positive correlation with minimum and average temperature, rain fall and wind velocity. The Relative Humidity (RH) is favourable for Earhead bugs (r= 0.397), grasshopper (r= 0.038) and pollen feeders (r= 0.262) are positive correlation except yellow stem borer (r= -0.407), leaf folder (r= -0.356), grasshopper (r= -0.124). Sunshine hours favourable for all insects like leaf folder (r= 0.031), green leaf hopper (r= 0.527), grasshoppers (r= 0.099), pollen feeders (r= 0.273) in rice. Since, it showed a positive correlation with sunshine hours except yellow stem borer (r= -0.02) and Earhead bugs (r= - 0.173) respectively.

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