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TEMPORAL VARIATION OF INSECT PEST POPULATIONS OF RICE AND THEIR RELATIONSHP WITH METEOROLOGICAL VARIABLES IN BATALAGODA, SRI LANKA *

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INTRODUCTION

Insects attack all parts of the rice plant at all stages of plant growth, causing substantial loss to the crop yield (Rosenzweigh *et al,* 2001). Changes of climatic variables such as temperature, rainfall and humidity are negatively affected on the agricultural productivity through shifts in insect pest occurrence (Ladanyi and Horvath, 2010). Forecasting of insect pest outbreaks require data on insects and climatic information from a thoroughly maintained data base. In Sri Lanka, there are several meteorological stations have been recoding weather data for over the years, unfortunately, details on the insect pest population are limited. Therefore, the present study was designed to collect information on major insect pest of rice in order to study their population dynamics over the time.

MATERIALS AND METHODS

A light-trap survey was carried out at Rice Research and Development Institute (RRDI) at Batalagoda in Sri Lanka, during 2007-2014. Five major pests in paddy fields; Brown Planthopper (BPH), Green Leafhopper (GLH), White Back Plnthopper (WBPH), Zig Zag leafhopper (ZLH) and Paddy Bug (PB) were collected weekly. Climatic parameters; maximum & minimum temperature, rainfall and Relative humidity (morning & evening) were also recorded by the

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Meteorological Observatory of RRDI to investigate the effect of climatic factors on their population variations. The effect of climate variables on the population levels of collected species was evaluated using generalized linear models with a logarithmic link function for poison distribution. Generalized additive model (GAM) was used to investigate temporal trend of insect population over the time.

RESULTS AND DISCUSSION

Maximum temperature showed a significant (P<0.005) positive relationship on the population levels of the all species studied, while, the minimum temperature had a negative influence. Except for Brown planthoppers and Zig Zag leafhopper, population levels of all other species were negatively influenced by the rainfall. Relative humidity had significant negative impact on all insect species (Table 1).

Table 1 Relationship between insect pest population and climatic parameters based on the results as per the light-trap survey conducted during 2007-2014.

Variable	BPH		GLH		WBPH		ZLH		PB	
T max	0.23	0.000	0.55	<.000	0.30	<.000	0.36	<.000	0.21	0.000
T min	0.13	0.023	0.05	0.360	0.15	0.001	0.22	0.000	0.06	0.252
Rainfall	0.00	0.987	0.00	0.415	0.00	0.860	0.00	0.195	0.00	0.043
RH (M)	0.10	<.000	0.13	<.000	0.13	<.000	0.11	<.000	0.06	0.001
RH (E)	0.06	<.000	0.02	0.089	0.01	0.261	-0.0	<.000	0.03	0.002

Note: Estimate value-left and P value-right.

Brown plant hopper: The BPH population was much lower at the beginning of the *Maha* season and gradually increased and peak population level was recorded around February. Maximum and minimum temperature and morning and evening relative humidity is significantly influenced on the BPH populations (Table 1). The *Yala* season is beginning with higher BPH population in the field and compared to the *Maha* season, their population is higher in *Yala.* The BPH population was significantly high in year 2013 and the lowest population has been recorded in 2011.

Green Leaf hopper: Population of GLH was gradually to building up around December and reached the peak between February and March. The *Yala* season begun with higher population of GLH in the field and then decreased and become

stable at a low level after May. Maximum temperature, morning relative humidity affected significantly on the GLH populations.

White backed planthopper: Variation of population levels of white back planthopper was significantly different than the BPH and GLH. Maximum and minimum temperature and morning relative humidity were significantly influenced on the WBPH population levels. It seems WBPH preferred the environmental condition in *Maha* season, because, their population level increased from September onwards and reached to the peak level in February.

Zig-Zag leafhopper: The population levels of ZLH were significantly correlated with the maximum and minimum temperature, and evening and morning relative humidity Usually ZLH population is higher at the beginning of the *Yala season* in the field.

Paddy bug: Population levels of PB was significantly influenced by maximum temperature, rainfall and evening relative humidity (Table 1). Paddy bug population was high in *Maha* season compared to *Yala* season. However, their population increased at the latter part of each season, which was different than the hopper species.

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