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Seasonal incidence of rice swarming caterpillar, *Spodoptera mauritia* boisd. Infesting paddy (*Oryza sativa* L.) Nursery

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Abstract
Seasonal incidence of Rice swarming caterpillar, *Spodoptera mauritia* Boisd. Infesting paddy was recorded during June to August 2017, at Regional Agricultural Research Station, Warangal, and Telangana, India. Study revealed that the no incidence of Rice swarming caterpillar, (0.00 caterpillar/tray) was observed during 1st week of August (31st Standard Meteorological Week). The population of Rice swarming caterpillar suddenly increased and reached to its peak in the 3rd week of August (33rd SMW) with a mean of 150.5 caterpillar/tray in nursery, when the mean atmosphere temperature and relative humidity were 26.99 ^{0}C and 80.23 per cent, respectively. Thereafter, the population declined gradually and reached to a minimum level of 10.00/tray during 4th week of August (34th SMW). This result revealed that prolonged dry condition followed by heavy rainfall favoured the outbreak of *S. mauritia* and exhibited a significant positive correlation with relative humidity and total rainfall, however negatively non-significant with temperature.

Keywords: S. *mauritia*, Correlation, Paddy, Outbreak, Rainfall, Temperature

1. Introduction
Rice being staple food crop of India covers around 1.05 Million hectares with the production and productivity of 2.96 Million tonnes and 2830 kg per hectare respectively in the state of Telangana (Agricultural Statistics at a Glance, 2016). The pest spectrum of the crop varies in time and space according to variations taking place in the agroecologies that is regulated by changes in the biotic and abiotic factors as well as ever changing farming practices [1]. The pest spectrum of a crop varies from region to region and season to season depending upon the variations in agro climatic situations [1]. Out of nearly 1000 insect pest species recorded on paddy, only two dozen insect and mites found as key pest in different rice ecologies in India [1]. In recent years, because of climate change, the Rice swarming caterpillar (*Spodoptera mauritia* Boisd.) is becoming a major pest in states like telangana, orrisa and assam causing severe loss to paddy at nursery stage [1, 4].
Rice swarming caterpillar, *S. mauritia* though is a sporadic pest but become severe indeed whenever it appears, occurs in large numbers [2]. As the name indicates, the caterpillar has the tendency to migrate from field to field in large swarms [2]. The swarm practically grazes a field like cattle and when one field is completely finished, the swarm marches on in regular army formation to the adjoining field. Because of the behavior, this pest is also referred to as army worm [2]. The number of generations varies in different regions of the country. For last few seasons, the swarming caterpillar, *Spodoptera mauritia* became as major pest in Odisha, Bihar and Jharkhand during kharif-2007-09, 2012, 2013 and devastated paddy crop in early stage in considerable areas [3]. It was claimed that a prolonged period of drought for a month or more followed by heavy rainfall create conditions favourable for the outbreak of pest [4].
Insect pests are limiting factor in reducing the production of paddy. The indiscriminate use of synthetic pesticides have lead to pest build up and cause an imbalance of natural enemies, resulting in pest resurgence and secondary pest outbreaks [5]. The knowledge of seasonal incidence of rice swarming caterpillar will be useful in evolving proper management schedule, present study was carried out.

2. Materials and Methods
2.1 Experiment details
Observations made during kharif, 2017 at Regional Agricultural Research Station, Warangal, Telangana, India to record the seasonal incidence of rice swarming caterpillar infesting paddy nursery (Telangana sona or RNR 15068) raised under natural conditions in plastic trays for

Mechanical transplantation. The larval population of *S. mauritia* was recorded as number of larvae per tray on five randomly selected trays and expressed as larvae per tray basis.

2.2 Statistical analysis

The data were subjected to statistical analysis and correlation coefficient was worked out between the population of larvae and abiotic factors by Karl pearson's coefficient of correlation formula:

$$r_{xy} = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sqrt{\left[\sum X^2 - \frac{(\sum X)^2}{n}\right]\left[\sum Y^2 - \frac{(\sum Y)^2}{n}\right]}}$$

Where,
rxy = Simple correlation coefficient
X = Variable i.e. abiotic component. (Average temperature, relative humidity and total rainfall)
Y = Variable i.e. mean number of insect pests per tray
n = Number of observations.
The correlation coefficient (r) values were subjected to the test of significance using t-test:

$$t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2} \sim t_{n-2} \text{ d.f.}$$

The calculated t-value obtained was compared with tabulated t-value at 5 % level of significance.

3. Result and Discussion

The mean population of rice swarming caterpillar (*S. mauritia*) and correlation with weather parameter are presented in Table 1 and Fig. 2.

Rice swarming caterpillar, *Spodoptera mauritia* Boisd

Paddy was sown in the month of July, 2017 at Regional Agricultural Research Station, Warangal, Telangana, India. During the month of August 2017, major outbreak of swarming caterpillar was observed in paddy (Fig 1). Damage by this pest was observed on an average, 150.5 of larvae per tray with damage of 80-90 per cent was recorded during 33rd standard meteorological week (SMW) i.e., 14th to 20th August (3rd week) appearing in severe form in nursery. Though larval population was not noticed in initial stages of nursery but changes in climate resulted in increase of the pest populaton and reached to its peak level by third week of August with a mean population of 150.5 larvae/tray, when the mean atmosphere temperature was 26.99 °C and relative humidity was 80.20 per cent. Thereafter, the population declined gradually and reached to a minimum level of 10.00 larvae/tray during 34th SMW *i.e.* 21nd - 27th August (4th week) during which period, the temperature, relative humidity and total rainfall were 27.31°C, 78.60 per cent and 35.80 mm, respectively. Analysis of observations between the pest population and weather parameters exhibited a significant positive correlation with relative humidity (r = 0.308101) and total rainfall (r = 0.761301) while, non significant correlation with mean atmospheric temperature(r = - 0.05098). It can be concluded from the present study that incidence of *S. mauritia* can be observed during prolonged dry condition followed by heavy rainfall. In India, incidences of this pest were reported from Tamil Nadu in 1935 [6] and later from Kerala and Orissa in 1943 and 1952, respectively [6, 7]. In confirmation with the current results with regard to outbreak of *S.mauritia* due to prolonged drought followed by heavy rain was observed [4]. The reason for outbreak might be drought killing the natural enemies of the pest, as well as flooded condition of the crop favoring *S. mauritia* larvae to concentrate only on rice plants in nursery [4].

The present study revealed that rice swarming caterpillar, *S.mauritia* appeared severe form during third week of August *i.e.* 150.5 larvae/tray (33rd SMW) because of prolonged dry conditions of two weeks (30 to 32 SMW) followed by heavy rainfall (141.20 mm). This will help us in development of pest forecasting models and scheduling management strategies in paddy for rice swarming caterpillar in initial stages of crop growth.

4. Acknowledgements

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Table 1: Seasonal incidence of rice swarming caterpillar, *S. mauritia* infesting paddy nursery during *kharif*, 2017

SMW No.	Date	Mean Temperature (°C)	Mean Relative Humidity (%)	Rainfall (mm)	Average no. of *Spodoptera mauritia* larvae/tray
23	5 Jun -11 Jun	32.07	71.79	31.60	0.00
24	12 Jun -18 Jun	29.40	74.43	17.60	0.00
25	19 Jun – 25 Jun	26.37	81.29	86.80	0.00
26	26 Jun – 2 Jul	25.54	78.00	62.00	0.00
27	3 Jul – 9 Jul	26.04	80.29	11.00	0.00
28	10 Jul – 16 Jul	26.19	79.69	58.30	0.00
29	17 Jul – 23 Jul	25.93	78.93	41.50	0.00
30	24 Jul – 30 Jul	27.66	75.36	2.00	0.00
31	31 Jul – 6 Aug	27.61	75.25	4.00	0.00
32	7 Aug – 13 Aug	26.34	76.00	2.00	0.00
33	14 Aug – 20 Aug	26.99	80.23	141.20	150.50
34	21 Aug – 27 Aug	27.31	78.60	35.80	10.00
Coefficient of Correlation (r) for population and mean atmospheric Temperature					-0.05098
Coefficient of correlation (r) for population and mean relative humidity					0.308101
Coefficient of correlation (r) for population and total rainfall					0.761301

* Significant at 5% level of significance
SMW: Standard Meteorological Week

Fig 1: Infestation of *S.mauritia* in paddy nursery

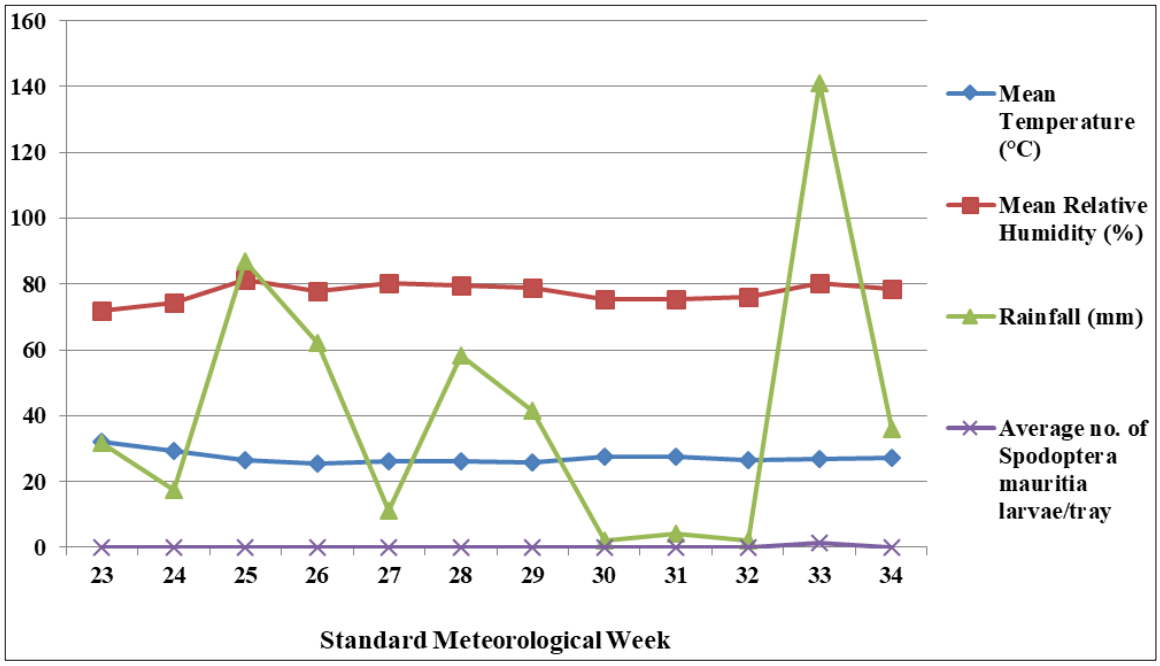

Fig 2: Seasonal incidence of *Spodoptera mauritia* Boisd. in paddy nursery during *Kharif*, 2017

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