Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

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A study on total pest population present in aman paddy at North Tripura in respect to their economic threshold level (ETL) status

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Abstract
Paddy is the main crop cultivated in the region of North Tripura. Most of the farmers grow MTU 7029 (Swarna) variety during Aman season. The study aims to find out different types of pests attacked to varying stages of growth and also find out whether they cross their ETL level or not. The study has been carried out at the farmers' field of four different villages under the Laljuri R.D block. It has been observed that rice hispa, leaf folder, yellow stem borer, and various bugs are the major pest present over the paddy population. Among the total set of the population no insect crossed their Economic Threshold Level (ETL) according to IIRR, NCIPM-ICAR guideline, in a field five random places have been selected and the number of tiller per plant and number of leaf per tiller has been counted, among per plant every seven-day interval the presence of different pests has been recorded. The pest data were evaluated, and it has been observed that no insect crossed their Economic Threshold Level (ETL).

Keywords: Economic threshold level, rice, swarna, pest count

Introduction

Tripura is one of the constituent states in the North-Eastern Hill Region of India. The economy of the state mainly depends upon agriculture. The state Tripura is categorized by wide valleys which are separated by the evergreen hills. The climatic condition is very cold in winter, warm and highly humid during summer. The cultivated land is around 10% of the total geographical area of the state. Soil condition is red, yellow and acidic with low fertility. Rice is one of the most important crops of the state. Production of rice is also below the national level, although rice is grown in both valleys and hills region. The crop is cultivated in three seasons, viz. *aus, aman,* and *boro*. (Debnath *et al*., 2017) [3]. The state has produced 711.8 thousand tonnes of rice form an area of 254.3 thousand ha with an average productivity of 2.8 t/ha (GOI, 2016) (Debnath *et al*., 2017) [3].

Rice is the main cereal crop of Tripura that covers146314 ha. Production of *Aman*rice in Tripura is 439674 MT during 2014-15. (DAFW-GOT) [4]. Most of the farmers grow MTU 7029 (Swarna) variety during Aman season. North Tripura district includes both plane and hilly areas with rainfall average rainfall1 870.1 mm (GOT, 2014) [4]. This district also contains ecologically sensitive biodiversity, which lies in the Jampui hills. Almost all the areas in rice production come under a rainfed situation. Transplanting is starting with the onset of monsoon. In July to September, the weather condition is warm and humid. This climatic condition is beneficial for the development of various pests; it is a major problem in increasing rice production in this environment. (Pathak *et al*., 2002) [8]. Many insect pest species appear sporadically but do not cause economic losses, although some species cause significant damage, and they are incredibly vital. (Ignacimuthu, 2003) [5]. The present study was conducted to find out if any of the insects cross the economic threshold level.

Materials and Methods

Data were collected from selected villages under the Laljuri R.D block of North Tripura District. Four villages of the block were chosen as a fixed village, and the rest of the villages were selected as a random village. From each fixed village, four farmers were selected as a fixed farmer, and rests are a random farmer. Each week the field data from 16 fixed farmers along with 16 random farmers had been collected. Random data was collected from any

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village under this block. The main aim of the collection of random data was to cross-check the total pest population present in the crop of this region.

First of all, the data has been collected from the field, and the mean performance of each pest was calculated. The mean data were compared with the standard ETL level given by NCIPM. There are several kinds of mean in various branches of statistics.

For a data set, the arithmetic mean, also called the mathematical expectation or average, is the middle value of a distinct set of numbers: especially, the sum of the values divided by the number of values. The arithmetic mean of a set of numbers $x_1, x_2, ..., x_n$ is typically denoted by, pronounced "*x* bar." If the data set were based on a series of observations obtained by the sample from the statistical population, the arithmetic mean is the sample mean (denoted) to differentiate it from the mean of the original distribution, the population mean.

The mean values of the data recorded were computed as follows-

Mean ($\bar{x}$) = Sum of all observations/Total number of observation

Graphical representations include a wide variety of technique that are used to clarify, interpret, and analyse data by plotting points and drawing line segments, surfaces, and erstwhile geometric forms or symbols.

Table 1: Economic threshold level (ETL) of major pests of rice crop

Yellow stem borer	1 egg-mass/m^2
Root-knot nematode	1 nematode/g soil
BLB: Kresek Phase	2-3 plants/m^2
Leaf-folder	2 Fully damaged leaves (FDL) with larva/hill
Stem borer	2 egg-mass/m^2 or 10% dead heart or 1 moth/m2 or 25 moths/
Gall midge	1 gall/m2 or 10% Silver shoot
Brown plant hopper/WBPH	10-15 hoppers/hill
Rice hispa	2 adults or 2 dead leaf /hill
Rice caseworm	2 FDL/hill
Swarming caterpillar	1 damaged tiller/hill or 2 larvae/ m^2
Foliar blast	3-5 lesions/leaf
Brown spot	2-3 spots/leaf & 2-3 infected plants/ m^2
Sheath blight	Lesions of 5-6 mm in length & 2-3 infected plants/m^2
Sheath-rot	Lesion length 2-3 mm on sheath & 3-5 infected plants/ m^2
BLB	2-3 infected leaves/m^2
Tungro	1 Tungro infected plants/m^2& 2 GLH/hill (in fungus endemic areas)
Stem borers	2 egg-mass/m^2 or 1 moth/m^2 or 25 moths / trap / week
Leaf-folders	2 FDL/hill
BPH/WBPH	15-20 hoppers/hill
Swarming caterpillar	1 damaged tiller/hill or 2 larvae/ m^2
Neck blast	2-5 neck infected plants/m^2
Sheath-rot	5 infected plants/m^2
Gundhi bug	2 bugs/hill
Rice panicle mite	No ETL

ICAR-NCIPM, 2014

Results

The data was collected from five random places of a field where the data has been collected form a square meter. The total number of plants present in each square meter has been recorded. It has been recorded that the average number of plants present in each square meter is 20.042.

The total number of tiller and leaf of four random plants from each square meter has been recorded, and it has been observed that,

The numbers of tiller present in plants are 9.269. The number of leaves present in the plant is 30.131.

The study has been carried out at each and every stage, from sowing to maturity of the randomly selected plants. And it has been observed that rice hispa, leaf folder, yellow stem borer, and different bugs are the major pest present in the field. Besides this, Brown plant hopper, various caterpillars, etc were also present in a very low amount.

The mean performance of different pests present over the plant population is described under table-2. The result indicates that among all the available pests, Rice Hispa is more abundant with a number of 0.481 insects/ hill, although it is far below the ETL level, which is 2 adults/ hill hence possess no economic threat to the crop. Leaf folder comes second in abundance with 0.463 insect/ hill which is also bellow prescribed ETL level.

Table 2: Mean performance of major pests present in the field.

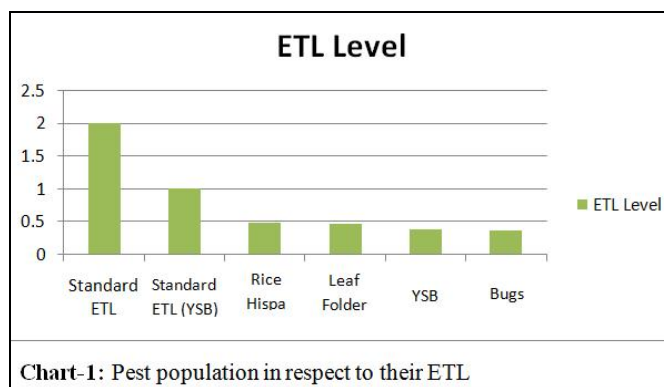| Rice Hispa / hill	Leaf folder / hill	Yellow stem borer egg mass / m^2	Bugs / hill
0.481	0.463	0.383	0.375

Chart-1: Pest population in respect to their ETL

(Y-axis: Number of insects, X-axis: type of insects)

The weekly mean performance of different pests present over the plant population is described under table-3.

Table-3: Weekly pest availability over the field

Week	Rice Hispa / hill	Leaf folder / hill	Yellow stem borer egg mass / m^2	Bugs / hill
1	0.156	0.031	0.000	0.000
2	0.424	0.215	0.000	0.000
3	0.327	0.354	0.022	0.000
4	0.215	0.399	0.125	0.000
5	0.322	0.459	0.199	0.021
6	0.326	0.354	0.265	0.033
7	0.215	0.404	0.202	0.013
8	0.102	0.326	0.343	0.126
9	0.125	0.420	0.457	0.165
10	0.024	0.469	0.490	0.357
11	0.016	0.490	0.690	0.533
12	0.000	0.490	0.459	0.597
13	0.000	0.569	0.479	0.690
14	0.000	0.690	0.690	0.760

In the case of Rice Hispa, Leaf Folder, and Bugs, the standard ETL level is two bugs/ hill, and in the case of Yellow Stem Borer, the standard ETL level is one egg mass/ m^2. The highest level of Rice Hispa infestation was observed on 2nd week, while Leaf folder infestation was higher in later stages especially in the 14th week. The infestation of Yellow stem borer and bugs were also increased in later stages or during crop maturity as their highest infestation was observed in the 14th week.

Discussion

The experiment result indicates that although rice hispa, leaf folder, and other pests are present in the rice field and their number is below Economic threshold level (ETL) hence does not possess any serious threat which contradicts with the study conducted by Adhikari *et al.* (2011) [1] at West Bengal. This may be due to the fact that despite both West Bengal and Tripura are the rice-growing area, but the climatic condition of Tripura is not the same as West Bengal. However, a similar kind of result has been observed by Khan (2013) [7] at Patuakhali, Bangladesh, which is may be due to the fact that Patuakhali, Bangladesh, has a similar kind of Climatic condition as Tripura. Except for Rice Hispa, the infestation of other pests such as Leaf folder, Yellow stem borer, etc. are more prominent during the later stages, especially after the 10th week.

Summary and Conclusion

The modern concept of agriculture practice suggests that scientific management of pests. Pest is an integral part of our ecosystem. If we go for total control of pests, it will be harmful to other living and non-living organisms of the eco system. To manage the pest scientifically, we go for scientific management. ETL is the standard that describes the level of a pest; if any pest crossed its ETL only, then we go for management of that pest.

Present studies show that there are rice hispa, leaf folder, yellow stem borer, and bugs are the major pests present in the population, but no pest crossed their standard ETL level. Hence the study concluded that cultivated variety Swarna (MTU-7029) is suitable for cultivation in that region with respect to their pest attack.

Future Scope of Study

It has been observed that there is a massive problem of rodents; hence, the study and management of rodents are most important in that region to develop the farmer's income.

Bacterial leaf blight is the major disease that causes huge damage to the crop. The study, along with the management of BLB and other diseases, is important to increase the productivity of the crop.

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