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Population dynamics of insect pests of rice, and management of rice gundhi bug (*Leptocorisa acuta* Thunberg*)* through bio-pesticides in irrigated condition in Bundelkhand region

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Abstract
The "Population dynamics of insect pests on rice crop during *kharif* season" field trial was carried at the Organic Research farm Kargua Ji, Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Uttar Pradesh) during *Kharif* June to October 2023-24. According to the population results, the grass hopper (*Caelifera spp.*) in 2023-24 *Kharif* season was commenced from 28th standard week (July second week) with an average 0.69 no. of grass hopper per plant and gradually reached peak level of 8.37 no. of grass hopper per plant at 34th standard week (August last week). Brown plant hopper (*Nilaparvata lugens* Stal) was commenced from 29th standard week (July third week) with an average 3.37 brown plant hopper / plant and gradually reached peak level of 18.18 brown plant hopper / plant at 36 standard weeks (September second week). Yellow stem borer (*Scirpophaga incertulas* Walker) was commenced from 30th standard week (July fourth week) with an average 2.92 yellow stem borer /plant and gradually reached peak level of 17.09 yellow stem borer / plant at 35th standard week (September first week). Gundhi bug (*Leptocorisa acuta* Thunberg) was commenced from 31th standard week (August first week) with an average 1.08 nymph per plant and gradually reached peak level of 9.25 adult per plant at 36th standard week (September second week).

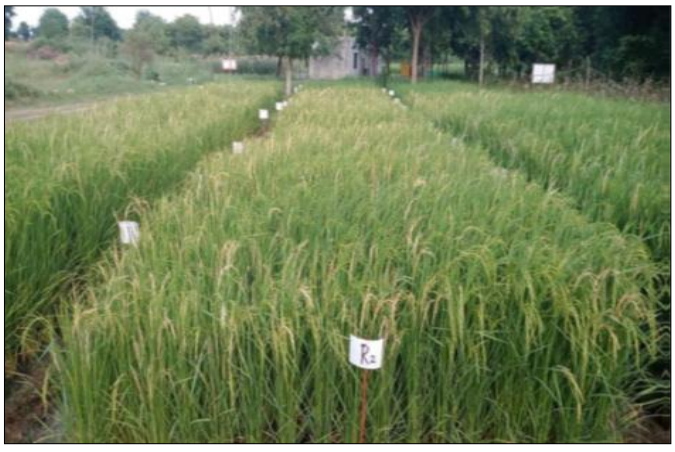
Objectives
1. To study the population dynamics of rice gundhi bug.
2. To study the management of rice gundhi bug (*Leptocorisa acuta* Thunberg*)* by different bio-pesticides.
3. To study the cost benefit ratio of rice gundhi bug.

Keywords: Rice, Gundhi bug, yellow stem borer, Brown plant hopper, Environmental factors

Introduction
Rice plant is called paddy. It is a plant of the grass family Gramineae (Poaceae) and its scientific name is '*Oryza sativa*'. Rice is believed to have originated in the Yangtze River region of China.

Rice (*Oryza sativa* L.) is one of the most important crops grown throughout the world and is staple foods for the half of the world's population (Khush *et al.,* 1997). Rice is the world's most important food crop and is the staple food for 50 % of the world's population (Barrion *et al*, 2007). It is cultivated in different regions of the world ranging from, all the tropical, sub-tropical nations to calm nations as well. Basmati rice is a special group of rice cultivars having long grain size, good quality and aroma. India is considered the largest exporter of Basmati Rice in the world. Basmati rice is grown mainly in the Himalayan regions, Haryana, Punjab and Western regions of Uttar Pradesh.

Rice is one of the most important staple foods of the world (70% of the population) as well as India (65% of the population). About 90% of the world's rice is produced and consumed in the Asian region and most staple food of South East Asia. More than 110 countries grow rice on one fifth of the world food grain crop area. The rice fragrance spreads to the entire world. It provides livelihood and food security to the about, 56% of the world population (7.46 billion) as well as 65% of the India population (1.32 billion). India shares 21% of the world rice production and occupies second position after China.



Material Methods

The present study entitled "Population dynamics of insect pests of rice, and management of rice gundhi bug (*Leptocorisa acuta* Thunberg*)* through bio-pesticides in irrigated condition in Bundelkhand region" was carried out at the experiment, Organic Research Farm Kargua Ji, the bio-pesticides. The study of population dynamics of rice gundhi bug was done and the efficacy of each respected bio-pesticides were determined on the basis of per cent infestation on rice gundhi bug due to the (*Leptocorisa acuta* Thunberg). Department of Entomology, Institute of Agricultural Sciences, Bundelkhand University Jhansi Uttar Pradesh during *Kharif* season of 2023-24. Geographical Jhansi is the District of Uttar Pradesh situated between the rivers Betwa and Pahuj at an average elevation of 285 m above mean sea level longitude 78˚59'E" and is situated at latitude 25˚27' 03.4" N at an altitude of 271 m above the mean sea level. The experiment was laid out in Randomized Block Design (RBD) with three replications. The treatment comprising of nine different treatments *i.e.*, T_1 (Neem oil, 5%), T_2 (NSKE, 5%), T_3 (*Bt.*, 2.0 kg/ha), T_4 (Karanj oil, 10%), T_5 (Garlic extract, 10%), T_6 (Tobacco extract, 5%), T_7 (*Metarrhizium anisoplae*, 2.0 kg/ha), T_8 (*Beauveria bassiana*, 2.0 kg/ha), T_9 (Water control). Sapling of rice variety PB-1718 was transplanting in the third week of July in well prepared experimental field at an area of 12m × 23m with the plotting size is 3.0 m × 2.20 m (W×L). The size keeping row to row and plant to plant distance of 25cm × 25cm, respectively.

The observations of insect pest population on rice crop were recorded at weekly five plants. The population of sucking pests *viz*., gundhi bug and Brown Plant Hopper was recorded visually (absolute count.) on tagged plant in early morning hours. The population was recorded first on upper surface of leaves and then on lower surface by gentile turning taking all possible care not to disturb them. The observations on rice gundhi bug were recorded on the same tagged plants. The ear infestation was recorded by counting the total number of damaged ears at weekly interval and grain infestation by counting the infested ear at each picking. The population of natural enemies was recorded on the same randomly selected and tagged plants. The data recorded on major insect pest and meteorological parameters was used for statistical analysis. To infer the results of seasonal incidence, sample correlation was worked out between pest population of insect pest, natural enemies and abiotic parameters, *viz*; maximum and minimum temperatures, relative humidity and rainfall.

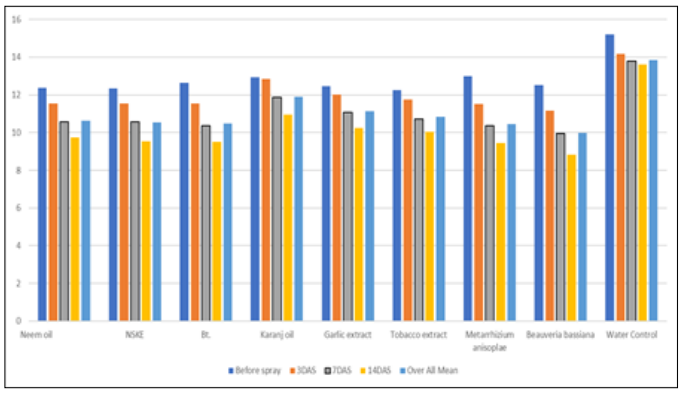
Method of Observation

The observation by the paper bag on per plant

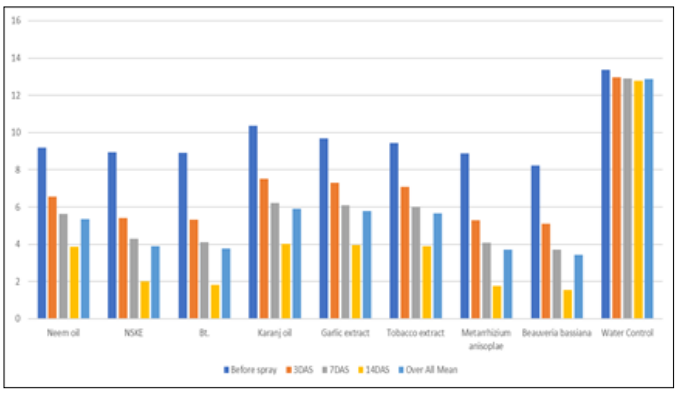
$$\text{Population dynamic \%} = \frac{\text{No. of insect pest per plant}}{\text{Total no. of insect pest}} \times 100$$

Results and Discussion

A review of data presented in table 1,2 and 3 reveals attributes of rice influenced by the bio-pesticides. The study of population dynamics of rice gundhi bug was done and the efficacy of each respected bio-pesticides were determined on the basis of per cent infestation on rice gundhi bug due to the (*Leptocorisa acuta* Thunberg). The average percentage infestation on rice gundhi bug was calculated to see the overall effects of various treatments. The experimentation, all three sprays against grain damage and one spray against ear damage were undertaken at an interval of 15 days commencing after emergence with eight treatments including control. A total of two grain damage and one ear damage rounds of spray were given based on ETL (Economic Threshold Level) which is 10-15% of the pest starting from last of July.



Graphical representation of effect of bio- pesticides against ear damage by rice gundhi bug (Leptocorisa acuta Thunberg) during Kharif 2023-24



Graphical representation of effect of effect bio-pesticides against grain damage by rice gundhi bug (Leptocorisa acuta Thunberg) during Kharif 2023-24

Conclusions

On the basis of number of populations per infestation. Gundhi bug, yellow stem borer, brown plant hopper, and Grass hopper were recorded as major insect pest in rice crop *Beauveria bassiana*. Significantly superior over all the bio-pesticides in reducing the gundhi bug, yellow stem borer, brown plant hopper, grass hopper infestation. Producing significantly higher yield. Result in more net profit and cost ratio.

Future scope

Large scale trials should be conducted to be comparing the efficacy of bio-pesticides with suitable insecticides against major insect-pests of rice and suitable for human health.

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