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THE STUDY OF THE POPULATION STRUCTURE OF THE INSECT PEST OF RICE AND THEIR NATURAL PREDATORS, AND THE RELATIONSHIP BETWEEN SUCH FACTORS AND THE WEATHER VARIABLES IN UTTAR PRADESH

Dr.Rama Kant

Associate Professor-Agricultural Entomology

R.S.M.College Dhampur (Bijnor) UP

Abstract

This study focuses on the region of Uttar Pradesh, and some of the issues that are explored include the population dynamics of rice insect-pests as well as their interactions with abiotic variables. incidence and prevalence of insect-pests that eat rice as a food source. During both of the kharif seasons in 2015 and 2016, extensive crop monitoring of the paddy was carried out. According to the results of this investigation, the activity of the pests started during the 34th standard meteorological week (SMW) and continued until the 49th standard week. This activity persisted throughout the whole of the investigation. The 39th standard week was the time of year in which the maximum number of YSB dead hearts (Scirpophagaincertulas) were found. This was true for both years. The corresponding values for these percentages were 7.20 and 6.90 percent. During the months of Kharif in 2015 and 2016, the population of LF and GLH was at its highest point during the 44th standard week. This was true in terms of both the percentage and the number of sweeps. During the 39th standard week of the kharif season of 2015, the highest reported number of spiders was 4.95, whereas during the kharif season of 2016, the highest recorded number of spiders was 5.75.

Keywords: Paddy Crop,Spiders, Kharif Season, ScirpophagaIncertulas

INTRODUCTION

Rice (Oryza sativa L.) is the single most important crop farmed for human consumption since it is the major source of nourishment for about half of the world's population. Rice is a species of the Oryza genus. Oryza, the genus from which rice originates, is a part of the Gramineae family of plants. Rice. Rice, commonly known as Oryza sativa L., is a plant that is often grown in areas that are classified as either tropical or subtropical (Singh et al., 2012). Rice is the second most important crop farmed for human consumption in the world. It is responsible for feeding more than half of the world's population and provides between 20 and 80 percent of the daily dietary energy that is consumed by people in Asia. There are more than one hundred distinct species of insects that feed on the rice plant; of these, twenty of them have the potential to cause major economic damage (Pathok, 1977). Paddy crop faces the highest amount of damage as a consequence of an enormous range of insect and non-insect pests in a variety of ecological settings. These pests may be either insects or non-insects. Due to the fact that insects consume almost all of the crop plants' aerial components in addition to the root system that is found in the soil, insects are responsible for around 30–40 percent of the yearly production loss in rice (Prakash and Rao, 2003). Rice fields in India are plagued by a number of different insect pests, the most common of which are the stem borer, gall midge, brown plant hopper, and leaf folder. The brown plant hopper and the leaf folder are also additional pests. In addition to creatures that may be classified as pests, the ecology of rice is home to a wide variety of natural adversaries, such as predators and parasitoids, that help keep the pest population under control (Kennedy and Storer, 2000). Alterations in the dispersal and maturation patterns of various insect species are going to emerge very soon as a direct consequence of the recurrent effects of weather and the ongoing adjustments in the climatic conditions. The fluctuations in temperature patterns of the surrounding environment will almost certainly result in changes to the rates of development, voltinism, and survival of insects. These changes will, in turn, have an effect on the size, density, and genetic make-up of populations, as well as the degree to which host plants are exploited. In addition, these changes will have an effect on the degree to which host plants are exploited (Kennedy and Storer, 2000). The success of the development of insect herbivores is also indirectly reliant on climate. This is because environmental conditions have an impact on the physiology of plants, and plants in turn are influenced by environmental factors. Both plants and insects are susceptible to the intricate interactions that might arise as a consequence of changes in temperature and precipitation, as well as rises in CO levels and fluctuations in the availability of nutrients. These factors can all have an effect on the environment.

MATERIALS AND METHODS

During the "Kharif seasons of 2015 and 2016, the research was carried out at the Students Instruction Farm of the Chandra Shekhar Azad University of Agriculture and Technology in Kanpur -208002 (U.P.), with the goal of documenting the population dynamics of insect-pests. The overall size of the experimental area was 10 by 10 metres ($100m^2$). In the experimental plot, the seedlings were transplanted with a distance of 25 centimetres (cm) between each plant and 15 centimetres (cm) between each row." In both of the experimental years, 21-day-old seedlings of the Pusa Basmati-1 rice variety were transplanted in accordance with the prescribed agricultural techniques. The rice nursery had been sowed 21 days earlier (Kharif, 2015 and 2016).

METHOD OF DATA COLLECTION

After a period of fifteen days had elapsed after the transplant, the data gathering process started. From that point on, it took place on a weekly basis, and the sweeping operation was used whenever it was deemed required. Visual counts of the number of insects present on each hill in the plot were used to compile information on the abundance of insect-borne pests. The presence of insects was observed on a hill-by-hill basis, and the data from each hill was recorded. A total of 10 plants, or hills, from a plot that had been seeded with Pusa Basmati-1 were selected at random for the aim of compiling a list of the insects that were present in the area. The observations lasted right up until the crop was finally gathered for its final harvest. The observations and the documentation of them were done in the early hours of the morning.

RESULTS AND DISCUSSION

In order to research the population trends of insect pests that attack rice crops and their natural predators, and to investigate the relationship between these characteristics and the climatic conditions of Uttar Pradesh: In the Kharif seasons of 2015 and 2016, a total of 5 insect pests, such as "the yellow stem borer, leaf folder, rice, green leaf hopper, and gundhi bug, were observed attacking rice crops in varying numbers at various stages of the crop." These pests included the following: the yellow stem borer, leaf folder, rice, green leaf hopper, and gundhi bug. During the course of the inquiry, natural predators such as "the spider, dragon fly, damsel fly, and lady bird beetle were all documented." During the Kharif seasons of 2015 and 2016, researchers saw a number of insect pests as well as natural antagonists. These results are shown in Tables No. 1 and 2, in addition to Figures No. 1 and 2. In the environment of rice, the insects that caused the greatest damage were the rice leaf folders, stem borers, green leaf hoppers, and ear head bugs. Rice leaf folders, stem borers, and ear head bugs are the orders in which we have discussed the insect pests that have been mentioned thus far.

Leaf folder

The population of leaf folders showed "negative correlations with minimum temperature, relative humidity (E), and rainfall (-0.1665, -0.00673, and -0.08886, respectively), according to the findings of correlation studies performed on leaf folders." While the damage caused by leaf folders showed positive correlations with maximum temperature (0.044247) and it was found positively correlated with relative humidity morning (0.206228) during kharif in 2015, the damage caused by leaf folders showed positive correlations with maximum temperature (0.044 (Table No.2). During the kharif season of 2016, the population of leaf folders exhibited a positive association with both the highest temperature and the relative humidity (M) (0.05298 and 0.007635), however a negative correlation was discovered between leaf folder damage and the lowest temperature (-0.21408). During the trial year of Kharif in 2015 and 2016, the number of incidences of leaf folder revealed that the pest infestation was at its worst during the 44th standard week. They found that the percentage of rice that was infested with the rice leaf folder, also known as C. medinalisGuen., ranged from 1.4 to 33.2 percent during the months of July and October. Also in 1996, Kumar and colleagues made the observation that this data existed, and as a result, they arrived to the same findings. Rice leaf folder, also known as C. medinalis, has been a big concern in recent years and is responsible for large losses in crop yields. This pest is also responsible for significant losses in rice harvests. These results were found to be equivalent to those observed by Mishra and Mandal (2003). In the month of October, during the Kharif season, Kumar et al. (2003) found that the most activity of the leaf folder occurred. Their results were based on observations made in the field. Alvi et al. (2003) found that the activity of C. medinalis lasted from the second week of August through the second week of October in the year 2000. Their research was based on data collected during that time period. On the other hand, during the kharif season in the year 2001, the activity of C. medinalis lasted from the last week of August to the second week of October. It was found that the second week of October had the largest infection of leaf folders on leaves, which accounted for 61.9 percent of the overall leaf infestation. This week also saw the highest number of leaf infections (Chhavi et al., 2015). In addition to this, they observed that the highest temperatures and relative humidity in the morning were extremely significant, whilst the lowest temperatures had a negative influence on the growth of the population. According to the findings of their respective studies, Kumar et al. (2013) and Khan and Ramamurthy (2004) found that the population of rice leaf folders was highest in the month of October, with the first week of the month displaying the highest levels of activity. September came in second place. In addition to this, they said that the lowest temperatures had a detrimental effect on the development of the population. On the other side, the RH in the morning had a positive influence on the rise in population and contributed to its success.

Yellow stem borer

The population of yellow stem borer was shown to have an inverse relationship with the "lowest temperature, evening relative humidity, and rainfall (-0.02103, -0.00442, and -0.05886 respectively) (Table No.2)." There was a correlation between the maximum temperature (0.17806 degrees) and the relative humidity in the morning during the month of Kharif in 2015. This took place in 2015. (0.14476). During the kharif season of 2016, there was a negative link between the population and both the relative humidity (E) and the amount of rainfall (-0.1637 and -0.2498). During the 39th standard week of both experimental years, the yellow stem borer infestation was at its highest point (7.20 percent in 2015 and 6.90 percent in 2016). After that, the proportion of non-functioning hearts fell to 6.50 percent during the 40th standard week in kharif 2015 and to 4.20 percent during the 41st standard week in kharif 2016 correspondingly.

Green leaf hopper

Although there was a positive link between maximum temperature and relative humidity (E) [-0.04332 and -0.04021], there was a positive relationship between the population of green leaf hoppers and relative humidity [M] (0.207518). It had a negative correlation with both the lowest temperature and the rainfall that occurred during the Kharif season of 2015 (the corresponding values were -0.23824 and -0.16992, respectively) (Table No.2). In the year 2016, the month of Kharif had the highest average temperature, and there was a correlation between the population and that temperature (0.054658). According to the data of GLH, the greatest incidence was reported in the 44th, 45th, 43rd, and 42nd standard weeks of kharif, 2015, with 130, 122, 115, and 80 per five sweeps, respectively. These numbers are based on the number of times each week was swept. During the whole month of Kharif, this was consistently discovered (Table No.1). Bhatnagar (1989) stated that the highest population was recorded during the late rainy season from October to November in most parts of India. This occurred during the months of October and November. In addition to this, he said that the optimal conditions for hopper growth include weekly mean temperatures of 26.9 degrees Celsius, relative humidity of 66.5 percent, and total weekly rainfall ranging from 0 to 2.8 millimetres. Hoppers do very well in environments like this.

Gundhi bug

According to the findings of correlation studies, the population had a negative association with the lowest temperature, relative humidity (E), and rainfall (-0.2804, -0.12972, and -0.2664) in the experimental year Kharif, 2015 (Table No.2); however, it was negatively connected with the highest temperature (-0.01049). It was shown that there is a correlation between the number of gundhi bugs in an area and the relative humidity (M) (0.203846. According to the information that was presented on the occurrence of gundhi bug, the pests were at their most active during the 43rd, 42nd, and 44th standard weeks in Kharif, 2015, with 20.50, 17.90, and 14.75 per five sweeps, respectively (Table No.1). This information was gleaned from the aforementioned study. Several other studies, such as Sugimoto and Nugaliyadde (1995) and Artati, have also found similar results (2000). It has been recognised as a serious insect concern by a number of researchers, including Bhattacharya et al. (2006), Prasad and Prabhu (2010), and Behera et al. (2007), among others.

Spider

There was discovered to be a correlation between the maximum temperature and the relative humidity [M], and this correlation was positive (0.082223). (0.18292). The correlation of spiders was found to be inversely related to the lowest temperature, the relative humidity (E), and the rainfall in the month of Kharif in 2015 (-0.0011, -0.0379, and -0.18255, respectively) (Table No.2). In the year 2016, during the month of Kharif, researchers found a negative association between the number of spiders and the amount of rainfall (-0.3228) as well as the relative humidity (-0.2423). On the other hand, a correlation between it and the maximum possible temperature (0.179281), the lowest possible temperature (0.049984), and the relative humidity (M) [0.019678] was found to exist. This association was shown to be positive.

						Natural Enemies			
SW	Damage (%)		Avg. No. / 5 Sweep			Avg. No. / 5 Sweep			
	YSB	LF	LF	GLH	GB	Spider	Dgn. Fly	Dmsl. Fly	LBB
34	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35	0.26	0.00	1.95	6.50	0.00	4.25	1.50	0.00	3.80
36	0.90	0.00	3.96	7.75	0.00	3.25	1.15	0.00	4.25
37	2.25	1.00	3.10	10.50	0.00	2.75	0.75	0.00	4.50
38	4.60	1.20	2.90	16.00	0.00	0.80	0.75	0.00	4.60
39	7.20	1.45	3.93	10.25	12.10	3.85	1.50	1.75	4.75
40	6.50	1.76	4.83	36	13.95	2.75	1.15	1.00	3.25
41	4.20	2.00	5.95	51	14.15	2.00	0.75	0.85	2.70
42	3.50	2.24	3.92	80	17.90	4.95	1.50	3.35	4.75
43	3.40	2.87	4.96	115	20.50	3.10	.95	2.45	5.80
44	2.80	3.73	6.26	130	14.75	3.65	0.20	1.85	7.85

Table.1 Incidence of insect-pests o rice crop and their natural during Kharif, 2015

Insects	Weather Parameters				
	Temperature degree Celsius		Relative Humidity		Rainfall (mm)
	Min.	Max.	R.H. Morning	R.H. Evening	
Yellow Stem Borer DH/WE	0.06074	0.14552	0.05000	-0.1637	-0.2498
Leaf Folder DL	-0.21408	0.05298	0.007635	-0.43128	-0.2306
Leaf Folder	-0.20125	0.119707	-0.10203	-0.52282	-0.25528
Green Leaf Hopper	-0.28387	0.054658	-0.102	-0.5472	-0.26356
Gundhi Bug	-0.26738	0.143976	-0.123	-0.58325	-0.30749
Spider	0.049984	0.179281	0.019678	0.2423	-0.3228

Table.2 Analysis of the relationship between insect pests and their natural predators, as well as abiotic variables, during the Kharif season of 2015

Statistical analysis

A correlation study is carried out by using the information that was acquired on the bug population in addition to the weather factors in order to find connections between the two sets of data. This statistical analysis of the data was used to generate the outcomes of the inquiry, as well as the interpretations and inferences that follow from those findings. These were all developed using the information obtained from the study.

CONCLUSION

The results were obtained by applying this statistical analysis on the aforementioned data. It is feasible to get the conclusion that the crop was devoured by each and every one of the insects that have been detailed in this text. This is the conclusion that can be reached after reading this paragraph. Nevertheless, "the Yellow Stem Borer, the Leaf Folder, and the Gundhi Bug" are three of the insects that are possible to be classified as important insect pests in rice fields. Other insects that may be included in this category are the Gundhi Bug and the Leaf Folder. The natural predators of the insect pests that inhabit the environment in which rice is grown are an enormously significant component of the process of controlling pests.

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