

Original Research Article

Status of Insect Pest in Rice Ecosystem in Jharkhand

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ABSTRACT

Rice is the major staple food in Asian country as well as India & Jharkhand. Rice production decrease, among various reasons of low production of rice, insect pest complex are one of the major factors for lowering down the yield. Pest scenario of a rice crop varies from region to region, due to variation in the agro-climatic condition of that region. We have conducted pest survey and surveillance for visualization of real pest problem of an area and formulating an IPM model. The result revealed that as many as two dozen insect pests but only seventeen are more prominent was to attack rice crop in the field condition. We found nine insect (Yellow stem borer, Gall midge, Leaf folder, Earhead / gundhi bug, Green leafhopper, BPH, Rice hispa, Termite, Grass hoppers) prevalence in almost the whole state were to attack rice crop in the field condition as low to severe form. And out of seventeen six (Yellow stem borer, Gall midge, Leaf folder, Earhead / gundhi bug, BPH, and Termite) are major pest status in 24 districts in Jharkhand, rests seven (Green leafhopper, Rice hispa, Grass hoppers, Rice Mealy Bug, Root/white Grubs, Whorl maggot and Thrips) are minor and four (Case Warm, Swarming Caterpillar, Hairy Caterpillar and Cut Warm) are sporadic pest status in Jharkhand state. Depending upon topography, land is broadly classified into six groups by state. In *Don I* & *Don II*, major pest are found YSB, RH, CW, RLF, GLH, RGB, BPH, RGH, & GM and *Don III* & *Tanr III* is medium land in this region major problem of pest are YSB, RH, RLF, GLH, RGB, RMB, BPH, RGH, SwC, BhC, Thrips, and GM. *Tanr I* & *Tanr II* pure upland condition in this area major problem of Termite, YSB, RH & WG.

Keywords

Insect pest, rice ecosystem, staple food

Introduction

Rice is the major staple food in Asian country as well as India and Jharkhand. Rice covers around 16.78960 lakh hectare areas out of total cultivable area of 38.00 lakh hectares with net sown area of 25.75 lakh hectares, the production and productivity are 4988.065 thousand tone and 2971 kg per

hectare respectively in the state of Jharkhand (Anonymous, 2018). The pest spectrum of the crop varies in time and space according to variations taking place in the agro-ecologies that is regulated by changes in the biotic and an abiotic factor as well as ever changing farming practices. The pest

spectrum of a crop varies from region to region and season to season depending upon the variations in agro climatic situations. Out of nearly 1000 insect pest species recorded on paddy, only two dozen insect & mites found as key pest in different rice ecologies in India (Prakash *et al.*, 2008).

Out of one dozen insect pests species prevailing in rice agro- ecosystem in the state, half of a dozen of them are considered as major insect pests which are responsible for causing loss in yield ranging from 20-35 percent in general (Prasad *et al.*, 2006 and Krishnaiah *et al.*, 2008). Rice production decrease, among various reasons of low production of rice, insect pest complex are one of the major factors for lowering down the yield. Visualization of real pest problem of an area is the pre-requisite for formulating a sustainable IPM strategy.

Keeping these points in view pest survey and surveillance was conducted for two consecutive years to reckon the insect pests scenario of rice-ecosystem in Jharkhand.

Materials and Methods

In order to explore information on the insect pests scenario associated with rice in different district and different rice ecology of Jharkhand, roving survey and surveillance was periodically conducted for two consecutive years, 2016 to 2017 during Kharif season. For the purpose of conducting pests monitoring, farmers field of different rice ecology in different districts were undertaken to visualize the pest problems on rice. A pocket lens (10X) and insect collecting net, glass vials, and polythene bags were used for collecting appropriate technical literature. Some insects were identified on the spot / farm and some of them for their, proper identification in the laboratory some of them were brought

to laboratory for detailed study. Periodically, intensity of the respective insect pest (s) were measured in terms of pest population Per unit area/ row length in some cases, whereas intensity of pest attack were determined by measuring percentage of infested plants with the respective insect species. Intensity of injury caused by the pest species recorded at different observations was worked during the respective years. Overall mean of two years of observation were calculated insect wise and correlate with insect status in different district and rice ecology. Based on their abundance, density, mode of injury and nature of damage, mode of occurrences and, pest status (severity as pest) they were properly categorized into different groups (Table-2). On the basis of extent of injury made to rice plants by the particular, insect species, they were grouped in to pest of negligible, minor, mild, major and severe economic importance. Keeping in view their mode of occurrence and frequency, the pest was treated as occasional, regular, sporadic, rare, epidemic, and endemic in terms of appearance (Table- 2). Overall information explored from the field investigation was Compiled and presented in Table 1, Table 2 & Table 3.

Results and Discussion

The status of important insect pests in different rice growing district and ecology in Jharkhand is presented in Tables 1, 2 & 3.

Table 1 contains information on insect pest fauna in different district in Jharkhand. The result revealed that as many as two dozen insect pests but only seventeen are more prominent was to attack rice crop in the field condition. We are found nine insect (Yellow stem borer, Gall midge, Leaf folder, Earhead / gundhi bug, Green leafhopper, BPH, Rice hispa, Termite, Grass hoppers) prevalence in

almost the whole state were to attack rice crop in the field condition as low to severe form. And out of seventeen six (Yellow stem borer, Gall midge, Leaf folder, Earhead / gundhi bug, BPH, and Termite) are major pest status in 24 districts in Jharkhand, rests seven (Green leafhopper, Rice hispa, Grass hoppers, Rice Mealy Bug, Root/white Grubs, Whorl maggot and Thrips) are minor and four (Case Worm, Swarming Caterpillar, Hairy Caterpillar and Cut Warm) are sporadic pest status in Jharkhand state (Table 2).

Prasad *et al.*, (2006) and Krishhaiah *et al.*, (2008) obtained more or less similar observations. The results were found that 19 insect pests belong to 7 order and 13 families were to attack rice crop in the field condition. A total 19 insect pest species belong to 11 major, 8 minor and 4 sporadic pests in rice growing area in Jharkhand. Based on mode of injuries caused and % of damage by the insect species, to the crops, they could be categorized in groups such as major pest of rice are yellow stem borers, leaf folder, gundhi bug, gall midge, rice hispa, grass hopper, case worm, swarming caterpillar, black hairy caterpillar, army worm, termite, whorl maggot and root grub where major economic significance.

Minor pest of rice are brown plant hopper, green leaf hopper, rice thrips, rice mealy bug, rice skipper and white grub where minor economic importance. However, rice hispa, army worm, black hairy caterpillar and swarming caterpillar were found to occur in sporadic pests in mode of appearance and caused considerable extent of damage to rice crop in the Jharkhand region, whenever the occasionally occurred.

In the Jharkhand state water holding capacity of soil is very low due to porous nature of the soil and undulating

topography. Depending upon topography, soils are broadly classified into six groups, in which groups upland farther divided in to three groups *Tanr* I to *Tanr* III and low land also divided in to three groups *Don* I to *Don* III, *Don* I- low land, *Don* II- Shallow land and *Don* III Drought prone shallow land and *Don* III & *Tanr* III are together called medium land (Table 3).

Don I (low land) is one of the major rice growing areas of about 6.3 lakh ha. *Don* I (low land), that area having most dominant pest is yellow stem borer attack rice nursery to maturity stage and more damage at tillering & panicle stage throughout the state.

Asian rice gall midge infests rice crop during early stage and Rice hispa also infests rice crop during early stage, case warm is a major problem in low land and rice grass hopper presence in this region rice crop. Prasad *et al.*, (2006) are almost in agreement with the results of present results.

Don II (Shallow land) is the major rice growing areas about 6.7 lakh ha in Jharkhand. In this region major pest of rice infest on shallow land rice growing area. Insect pests are major biotic stress of this fragile ecology.

The major insect pests of shallow rainfed lowland rice include rice yellow stem borer, *Scirpophaga incertulas*; rice leaf folder, *Cnaphalocrocis medinalis*; caseworm; *Nymphula depunctalis*. Asian rice gall midge and Rice hispa *Dicladispa armigera* are infests rice crop during early stage rice crop. BPH are the regular pests during early crop stage when fields water for longer period. Rice hybrids grown in this ecology are prone to rice leaf folders. Rice earhead bug infest at milking stage. Prasad *et al.*, (2006) expressed almost similar.

Table.1 District-wise distribution of the major insect pests of rice in Jharkhand

S.N.	District	YSB	GM	BP H	RGB	RH	RL F	GLH	CW	RMB	RGH	BhC	WG	CtW	WM	SwC	Termite	Thrips
1.	Dumka	***	*	**	**	*	**	*	**	*	*	*	*	*	*	*	**	*
2.	Ranchi	***	**	***	*	**	***	*	*	#	*	#	#	*	#	*	**	#
3.	Chatra	***	**	***	**	*	*	*		#	**	#	#	*	*	*	*	*
4.	Garhwa	**	**	**	*	**	*	**	*	*	**	#	#	*	*	**	**	*
5.	East Singhbhum	***	*	**	**	*	**	**	**	#	**	#	*	*	#	*	*	*
6.	West Singhbhum	***	*	**	**	*	**	**	**	#	**	#	*	*	#	*	*	*
7.	Ramgarh	***	**	***	**	*	**	**	*	#	*	#	#	*	*	*	**	*
8.	Saraikela Kharsawa	**	**	*	**	*	*	**	**	#	**	#	#	*	#	*	*	*
9.	Khunti	**	***	**	**	*	**	**	*	#	**	#	#	*	#	*	**	#
10.	Palamu	**	*	*	**	*	**	**	*	#	*	#	#	#	#	#	**	#
11.	Bokaro	**	*	*	**	*	*	*	#	#	*	*	#	#	#	#	**	#
12.	Lohardaga	***	*	*	**	*	**	*	**	#	*	#	#	*	*	*	**	*
13.	Gumla	***	*	***	**	*	**	*	**	#	**	#	#	#	*	*	**	#
14.	Latehar	***	**	*	*	*	*	**	**	#	**	#	#	#	#	*	*	#
15.	Simdega	**	***	#	*	*	*	*	**	#	**	#	#	#	#	*	*	#
16.	Jamtara	**	**	**	**	*	*	*	*	#	*	#	#	#	#	#	*	#
17.	Giridih	**	*	**	**	*	**	*	*	#	*	#	#	#	#	#	*	#
18.	Godda	***	**	***	**	**	**	**	*	#	*	#	#	*	*	*	*	#
19.	Hazaribagh	***	**	***	**	*	**	**	**	#	*	#	#	*	*	*	**	*
20.	Pakur	***	#	***	*	*	**	**	**	#	*	*	#	*	#	*	*	*
21.	Sahibganj	***	#	***	*	*	**	**	**	#	**	*	#	*	#	*	*	*
22.	Deoghar	**	#	**	**	*	*	*	*	#	*	#	#	#	#	#	*	#
23.	Dhanbad	**	#	#	**	*	**	*	#	#	*	*	#	#	#	#	*	#
24.	Koderma	**	#	*	**	*	*	*	#	#	*	#	#	#	#	#	*	#

YSB = Yellow stem borer, GM = gall midge, CW = case worm, RH = rice hispa, RLF = rice leaf folder, GLH = green leaf hopper, RGB = rice gundhi bug, RMB = rice mealy bug, WG = white grub, BPH = brown plant hopper, RGH = rice grass hopper, SwC = swarming caterpillar, BhC = brown hairy caterpillar, CtW = Cut worm, WM = whorl maggot, * = low, ** = moderate, *** = severe, # = Negligible.

Table.2 Status of rice insect pests in different district of Jharkhand

SN	Name of Pests	Status	Intensity	Occurrence in Districts
1	Yellow Stem Borer	Major	Moderate to Severe	Almost the whole state (low to mild incidence). Transplanted rice harboured more incidence as compared to direct sown rice.
2	Gall Midge	Major	Low to Moderate	Gall midge incidence was observed more or less in the whole state. However, the intensity of gall midge incidence was higher in the gall midge endemic areas like Simdega, Khunti, Lohardagga, Gumla, Latehar, Saraikela- Kharsawan, Bishun Garh areas of Hazaribag district and certain parts of Ranchi district. The incidence of gall midge was more pronounced during the period of middle of August to end of September probably on account of somewhat delayed rains.
3	Leaf Folder	Major	Low to Moderate	Almost the whole state particularly in transplanted rice during August to October.
4	Earhead / Gundhi Bug	Major	Low to Moderate	Almost all the 24 districts were affected. Upland rice and some early transplanted rice were more prone to the attack of gundhi bug in milky stage of rice crop
5	Green Leafhopper	Minor	Low to Moderate	Almost the whole state is low but some selected area in moderate condition.
6	BPH	Major	Low to Moderate	Slight (traces) incidence of BPH was noticed in certain areas of all districts and Ranchi, Hazaribagh, Ramgarh, Godda, Sahabganj, Pankur, Dumka, Chatra, Gumla Deogarh, Giridih and Jamtara districts of some selected area are severe during, Kharif season
7	Rice Hispa	Minor	Low to Moderate	More or less the whole state (low to mild incidence in transplanted rice situation) during July & August.
8	Case Warm	Sporadic	Negligible to Low	Only low land areas of rice cultivation in transplanted rice situation in August to September (mild to severe pest pressure).
9	Swarming Caterpillar	Sporadic	Negligible to Low	Almost the whole state is negligible condition but swarming caterpillar is sporadic pest in Jharkhand.
10	Thrips	Minor	Negligible to Low	Almost the whole state is negligible condition in rice nursery.
11	Termite	Major	Low to Moderate	Whole state of Jharkhand in upland situation particularly in direct seeded rice in the months of June, July & August.
12	Grass Hoppers	Minor	Low to Moderate	Almost the whole state is low to moderate population.
13	Hairy Caterpillar	Sporadic	Negligible to Low	Almost the whole state is negligible condition but in some area are low condition
14	Cut Warm	Sporadic	Negligible to Low	Almost the whole state is negligible condition but in some area are low condition
15	Rice Mealy Bug	Minor	Negligible to Low	Almost the whole state is negligible condition but in some area are low condition
16	Root/white Grubs	Minor	Negligible to Low	Almost the whole state is negligible condition but in some area are low condition
17	Whorl maggot	Minor	Negligible to Low	Almost the whole state is negligible condition but in some area are low condition

Table.3 Ecology-wise key insect pest of rice in Jharkhand

Group	Sub group	Type	Description of land	Rice pest ecology
Don land	Don- I	Low land	Clay-loam soil, lowest in toposequence, suitable for long duration rice crop	YSB, RH, CW, GM, RGH,
Don land	Don -II	Shallow land	Clay loam soil and Best for rice production, Rarely faces drought, Suitable for medium duration rice	YSB, RH, CW, RLF, GLH, RGB,, BPH, RGH,, GM
Don land	Don- III	Drought prone shallow land	Clay loam soil, transitional lands between don & <i>tanr</i> , upper toposequence and suitable for short duration rice	YSB, RH, RLF, GLH, RGB, RMB, BPH, RGH, SwC, BhC, Thrips, GM
<i>Tanr</i> land	<i>Tanr</i> - III	Upland	Sandy loam soil, sloppy, poor soil fertility, shallow soil depth, low WHC, Near foothills and acidic in nature	Termite, GM, CW, YSB, RH, RLF, GLH, RGB, RMB, BPH, RGH, SwC, BhC, Thrips
<i>Tanr</i> land	<i>Tanr</i> – II	Upland	Sandy loam soil, gentle sloppy, good soil depth, low WHC, poor in organic matter, erosion prone, acidic in nature. Land used for vegetables, maize and rice seedlings	Termite, YSB, RH, WG
<i>Tanr</i> land	<i>Tanr</i> - I	Upland	Loam soil and land immediately adjacent to the houses. Land used for vegetables, maize and rice seedlings	Termite, YSB, RH, WG

YSB = Yellow stem borer, GM = gall midge, CW = case worm, RH = rice hispa, RLF = rice leaf folder, GLH = green leaf hopper, RGB = rice gundhi bug, RMB = rice mealy bug, WG = white grub, BPH = brown plant hopper, RGH = rice grass hopper, SwC = swarming caterpillar, BhC = brown hairy caterpillar, CtW = Cut worm, WM = whorl maggot, * = low, ** = moderate, *** = severe, # = Negligible.

Don III land and *Tanr* III land together called medium land about 3.7 lakh ha land in this are used for rice growing in Shallow lowland & upland drought prone ecology, yellow stem borer, gall midge, swarming caterpillar, mealy bugs, leaf folder, gundhi bug, green leaf hopper, BPH, rice grass hopper, rice hispa, black hairy caterpillar, thirps and termite are major problems and Prasad *et al.*, (2006) and Prasad and Prasad, 2011 expressed more or less similar views.

Tanr I & *Tanr* II land are Loam soil and land immediately adjacent to the houses. Land used for rice seedlings and very few

area direct seeded rice grown. In this region there is major problem of termite, rice gundhi bug at milking stage and yellow stem borer. Prasad *et al.*, (2006) & Prasad, 2011 expressed more or less similar views. Prakash *et al.*, 2004 similar views for upland rice hill area.

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