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## Surveillance of pest population on different non-scented and scented rice cultivars under changing management scenario

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### Abstract

A field survey on 10 non-scented and 4 scented rice varieties to observe the incidence of different major pest species as well as parasites and predators (natural enemies) of rice at fortnightly interval was undertaken at Majhian, Dakshin Dinajpur district. The result revealed that *Scirpophaga incertulas* (rice stem borer) and *Nephotettix* spp., *Cofana* spp. and *Nilaparvata lugens* (hopper complex) were maximum during September – October whereas population of leaf folder was maximum in the month of October at vegetative stage and *Leptocorisa* spp. was maximum during October- November at flowering and milky stage. The highest leaf folder (*Cnaphalocrocis medinalis*) population was recorded on Sawrna Sub-1 (2 folded leaf with larva/hill) and the population of the pest was suppressed by *Apantellis* sp. (pupal mass 1/5hills on an avg. and adult emergence was 18.74/pupal mass). The natural enemy population both on non scented and scented rice cultivars was 0.07-0.16 and 0.05-1.81, respectively.

**Keywords:** Scented rice, non-scented rice, *Apantellis* sp., yellow stem borer, hopper complex

### Introduction

Paddy (*Oryza sativa* L.) is one of the major cereal crop of Asia and in the world, India is the second largest producers after China. West Bengal ranks first in area and production in the country. In West Bengal total production of aman rice 10983.992 thousand tonnes over 4008.662 thousand hectare cultivated area. In the district of Dakshin Dinajpur, average productivity is about 2829.67 kg per hectare with total production 462.884 thousand tones obtained from cultivated area of 163.582 thousand ha (Department of Statistics and Programme Implementation, Government of West Bengal 2016) [1].

The crop is attacked by more than 100 nos. of insect pest's species from the germination to till harvest causing crop damage resulting yield loss. The losses caused by different rice pests have been estimated to about 25-30% by considering various rice ecosystem (Sachan *et al.*, 2006 & Dhaliwal *et al.*, 2010) [6, 2].

The important natural biological agents of rice pests are large number of predators and parasitoids present in the rice field. Predation is most common among insect pests and a few successful cases of biological control have been possible through predators. Predators include a variety of spiders, and insects such as carabid beetles, coccinellid beetles commonly known as lady bird beetles, aquatic and terrestrial predatory bugs and dragon flies (Heinrichs, 1994) [5]. Keeping the economic importance of different major pests of rice and the role of the natural enemies in their management, the following survey was undertaken to find out the population dynamic of different insect pests as well as their natural enemies at different stage of crop growth during different months.

### Materials & Method

Survey was carried out at Majhian in the district of Dakshin Dinajpur on 10 (ten) non-scented rice cultivars viz. i) MTU-7029, ii) MTU-1075, iii) MTU-1064, iv) Swarna Sub-1, v) Pratiksha, vi) BPT-5204, vii) Naveen, viii) Gontra Bidhan-1, ix) IET-4094 & x) Heera were taken and 04 (four) scented rice varieties viz. i) Tulaippanji, ii) Kataribhog, iii) Kalonunia & iv) Chinichakar. The field incidence was assessed by quadrat method (2mx2m) and the incidence of different rice pests and their natural biocontrol agents was taken through visual estimation (individuals/hill) in kharif season (2016-17). The survey was conducted at fortnightly interval till harvest to monitor insect pests on unsprayed paddy field on randomly

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selected 20 hills. Fortnightly observations were taken from middle of August to second fortnight of November based on the fluctuation of pest's population on different rice cultivars.

The percent of incidence and number of pest population per hill and the population of bio-control agents per hill were estimated by using the following formulae.

$$\text{Percent (\%)} \text{ incidence of rice stem borer} = \frac{\text{Number of dead heart/White earhead}}{\text{Total number of tiller in a hill}} \times 100$$

$$\text{Total number of pest population per hill (Particular species)} = \frac{\text{Total number of pest counted (Particular species)}}{\text{Total number of hills observed}}$$

$$\text{Total number of parasite and predators population per hill (Particular species)} = \frac{\text{Total number of parasite and predators counted (Particular species)}}{\text{Total number of hills observed}}$$

## Results & Discussion

The present investigation revealed that almost all the economically important pests found in all selected rice fields and they produced their identifying characters of damage symptoms. Yellow stem borer produces 'Dead heart' symptom at growing stage of rice and 'white ear' at reproductive stage. The grown up larvae fasten the leaves margins longitudinally with a sticky substances and feed the green tissue inside the folded leaves by scrapping. The scrapped leaves become white membranous with white

streaks. Caseworm larvae fold the leaves and cut leave make a funnel. The larvae with funnel hang on the plant by thread and feed the green tissue inside. The severely affected crop field showing a grazing by cattle. Green leaf hopper as well as white backed plant hopper (*Sogatella furcifera*) produces yellow or brown leaves whereas brown plant hopper produces "Hopper burn" symptom. Gundhi bug mainly damages at the reproductive stage by puncturing the particular grain during milk development but they remain exists throughout the crop season.

**Table 1:** Lists of important insect pests found in rice field at Majhian, Dakshin Dinajpur, West Bengal

Sl. No.	Common name	Scientific name	Order : Family
1.	Yellow Stem Borer (YSB)	<i>Scirpophaga incertulas</i> (Walker)	Lepidoptera: Pyralidae
2.	Leaf folder	<i>Cnaphalocrocis medinalis</i> (Guenee)	Lepidoptera: Pyralidae
3.	Case Worm	<i>Nymphula depunctalis</i> (Guenee)	Lepidoptera: Pyralidae
4.	Brown plant hopper(BPH)	<i>Nilaparvata lugens</i> Stal	Hemiptera: Delphacidae
5.	Green leaf hopper(GLH)	<i>Nephotettix virescens</i> (Distant)	Hemiptera: Cicadellidae
6.	White backed plant hopper(WBPH)	<i>Sogatella furcifera</i> Hovorth	Hemiptera: Delphacidae
7.	Gundhi bug	<i>Leptocoryza acuta</i> Thunb	Hemiptera: Alydidae

From the result it was found that 7 insect pests and 6 predators & 1 parasite were observed in the rice field. Both the aromatic and non-aromatic rice cultivars were highly damaged by the insect pests at vegetative and reproductive stage. The maximum pests and parasite & predators population were recorded at vegetative as well as reproductive stage of the crop since 1<sup>st</sup> fortnight of September to 2<sup>nd</sup> fortnight of November. The highest yellow stem borer (*Scirpophaga incertulas*) infestation % was 3.6(1<sup>st</sup> half of September) and 4.8, (2<sup>nd</sup> half of October) on non-aromatic rice whereas on aromatic rice, it was 1.1 (2<sup>nd</sup> half of September) and 1.4% (1<sup>st</sup> half of November) respectively. But in case of hopper complex, *Nilaparvata lugens*, *Nephotettix* spp., and *Cofana* spp. it was 13.1, 10.41 & 5.7 respectively and it was found maximum during 2<sup>nd</sup> half of October. The hopper complex in non-aromatic rice was 10.25, 9.82 and 6.54 whereas in case of aromatic rice it was 10.38, 9.81 & 5.81 during the 2<sup>nd</sup> half of October to 1<sup>st</sup> half of November respectively. The maximum leaf folder population was 0.81 & 0.9 at vegetative stage during 1<sup>st</sup> half of October whereas the maximum population of *Leptocoris* spp. was 0.42 & 0.32 at milky stage during November (Table-2).

The natural enemy population was found throughout the crop season. In case of non-aromatic rice during 2<sup>nd</sup> half of September to 2<sup>nd</sup> half of October, the maximum average population was 0.11, 0.15, 0.14 and 0.16 whereas in aromatic rice, the maximum average population obtained during 2<sup>nd</sup> half of September to 2<sup>nd</sup> half of October was 0.07, 1.81, 0.11 and 0.11 (Table-3).

Among the ten non-aromatic rice cultivars, yellow stem borer infestation was high in MTU-7029 (0.15) followed by MTU-1075 (0.12) whereas the severity of leaf folder attack was highest on Sawrna Sub-1 (2.04) followed by Naveen (1.52). In case of Tulaipanji cultivar other than the three local races of scented rice, the maximum pest population of stem borer (*Scirpophaga incertulas*), leaf hopper (*Nephotettix virescens*) and brown plant hopper (*Nilaparvata lugens*) was found 0.19, 10.58 and 11.36, respectively. The highest leaf folder population was recorded on Sawrna Sub-1 (2 folded leaf with larva/hill). However, the population of the pest was suppressed by *Apantellis* sp. (pupal mass was 1/5 hills on an avg. but adult emergence was 18.74/pupal mass). Observation on economically important pests, parasite and predators on the different rice cultivars is shown in Table-4.

The present survey and fortnightly observation were done on yellow stem borer, green leaf hopper, leaf folder, brown plant hopper, caseworm, white backed plant hopper and gundhi bug on different rice cultivars of both non-aromatic and aromatic in local races. The present investigation resembles the finding of Saini *et al.*, 2015 [8]; Singh and Singh, 2017 [7].

Among these insect pests, population of yellow stem borer, white backed plant hopper, brown plant hopper and green leaf hopper were high during vegetative and reproductive stage while leaf folder and case worm population was found high only at vegetative stage but gundhi bug population was maximum at reproductive stage.

Sharma, A.K. and U.K. Bisen (2013) [7] found 188 number of rice stem borer (*Tryporyza incertulas*) and 4756 number of

moths of Rice leaf folder (*Cnaphalocrocis medinalis*) in the highest catch. In light trap conducted during July to December, they obtained 10967 number of *Nilaparvata lugens* and 10803 number of *Nephotettix sp* which are most important species of the order Lepidoptera.

The rice gundhi bug was recorded at only reproductive stage of crop. The stages of the pest both nymph and adults suck the sap from individual grains and make them chaffy. It was reported that the gundhi bug population from 2<sup>nd</sup> half of September was increased gradually and the population per hill was peak on 2<sup>nd</sup> half of October to 1<sup>st</sup> half of November (Gupta *et al.* 2018) [4].

Maximum number of natural bio-control agents are found in rice field in the northern parts of West Bengal including 49 predators and 7 parasitoids among them different species of spiders prevailing in maximum number followed by coleopterans. (Chakraborty *et al.* 2016) [1].

Viswanathan, K. and Kalode, M.B. (1984) [10] reported that they were screened 108 rice varieties to test the susceptibility against two species of green leaf hoppers (*N. virescens* & *N. nigropictus*) among them 32 varieties suffered more severely and remaining 76 suffered significantly less damage by *N. virescens*, while *N. nigropictus* but Ptb18, Ptb 2 and Ptb7 were found more resistant against the two species of green leaf hopper at Hyderabad, India.

**Table 2:** Showing fortnight pest population per hill on different non-scented rice & scented rice varieties.

Fortnight	Non-scented rice varieties							Scented rice varieties						
	YSB %	LF	CW	GLH	BPH	WBPH	GB	YSB%	LF	CW	GLH	BPH	WBPH	GB
31.08.2015	1.2	0.01	0.1	5.2	3.1	3.0	0.0	0	0	0	0	0	0	0
15.09.2015	3.6	0.07	0.3	9.2	5.3	2.6	0.19	0.76	0.13	0	4.2	0	0.2	0
30.09.2015	1.3	0.4	0.2	10.8	4.5	3.8	0.22	1.1	0.15	0.1	6.1	1.5	0.8	0
15.10.2015	2.1	0.81	0.15	11.2	8.12	4.63	0.31	0.1	0.9	0.2	8.75	7.82	4.86	0.03
30.10.2015	4.8	0.18	0	13.1	10.41	5.7	0.35	0.8	0.12	0	10.25	9.82	6.54	0.25
15.11.2015	1.4	0	0	10.2	7.85	3.1	0.42	1.4	0.04	0	10.38	9.81	5.81	0.32
30.11.2015	0	0	0	0	0	0	0.12	0	0	0	0	0	0.12	0.06

YSB= Yellow stem borer, LF= Leaf folder, CW= Case worm, GLH= Green leaf hopper, BPH= Brown plant hopper, WBPH= white backed plant hopper & GB= Gundhi bug

**Table 3:** Showing fortnight natural enemies population per hill on different non-scented rice & scented rice varieties.

Fortnight	Non-scented rice varieties							Average	Scented rice varieties							Average
	1	2	3	4	5	6	7		1	2	3	4	5	6	7	
31.08.2015	0.05	0.13	0.05	0.05	0.11	0.11	0	0.07	0.11	0.08	0.05	0.06	0.07	0	0	0.05
15.09.2015	0.07	0.14	0.12	0.11	0.16	0.17	0	0.11	0.12	0.07	0.11	0.09	0.12	0.02	0	0.07
30.09.2015	0.06	0.07	0.11	0.22	0.17	0.2	0.22	0.15	0.11	0.07	0.11	0.08	0.21	0.09	0.12	1.81
15.10.2015	0.05	0.18	0.07	0.08	0.12	0.15	0.36	0.14	0.16	0.12	0.09	0.06	0.22	0.07	0.08	0.11
30.10.2015	0.13	0.18	0.16	0.12	0.26	0.12	0.12	0.16	0.18	0.11	0.11	0.12	0.19	0.03	0.01	0.11
15.11.2015	0.08	0.07	0.06	0.1	0.15	0.11	0	0.08	0.15	0.06	0.07	0.1	0.13	0	0	0.07
30.11.2015	0.07	0.29	0.05	0.07	0.08	0.06	0	0.09	0.14	0.26	0.06	0.09	0.05	0	0	0.09

\*1- Spiders, 2 - Coccinellids, 3 - Robber fly, 4 - Dragon fly, 5 - Damsel fly, 6 - Wasps & 7 - *Apantelis* (Pupal mass)

**Table 4:** Showing pests and natural enemies' population per hill on different non-aromatic and aromatic rice varieties.

Rice cultivars	Average pests population on per hill							Average natural enemies population per hill						
	YSB %	LF	CW	GLH	BPH	WLH	GB	1	2	3	4	5	6	7
MTU-7029	0.15	0.64	0.027	8.42	7.32	4.60	0.41	0.307	0.221	0.071	0.021	0.064	0.04	0.007
MTU-1075	0.12	1.17	0.034	6.58	11.42	9.12	0.45	0.391	0.228	0.172	0.029	0.041	0.071	0.041
MTU-1064	0.05	0.64	0.091	10.02	10.12	4.80	0.60	0.271	0.173	0.111	0.021	0.062	0.062	0.011
Swarna Sub-1	0.04	2.04	0.052	10.04	11.20	3.40	0.34	0.291	0.28	0.362	0.014	0.064	0.021	0.03
Pratiksha	0.05	0.70	0.063	11.14	9.22	7.20	0.28	0.392	0.271	0.112	0.015	0.021	0.002	0.002
BPT-5204	0.11	1.20	0.061	10.28	8.24	10.14	0.21	0.428	0.123	0.231	0.007	0.022	0.011	0.014
Naveen	0.1	1.52	0.028	10.78	8.04	11.40	0.24	0.227	0.241	0.062	0.011	0.062	0.006	0.012
Gontra Bidhan-1	0.06	1.41	0.086	7.92	10.80	4.12	0.23	0.336	0.157	0.041	0.006	0.081	0.005	0.061
IET-4094	0.07	0.92	0.051	8.10	13.82	5.36	0.30	0.264	0.109	0.03	0.007	0.064	0.022	0.013
Heera	0.06	0.52	0.091	6.08	10.08	8.46	0.15	0.257	0.289	0.061	0.005	0.031	0.004	0.071
Tulaipanji	0.19	0.29	0.028	10.58	11.36	3.62	0.23	0.342	0.328	0.112	0.014	0.012	0.013	0.064
Kataribhog	0.005	0.20	0.047	8.10	8.32	4.58	0.27	0.264	0.207	0.162	0.016	0.011	0.005	0.061
Kalonunia	0.005	0.36	0.014	8.36	4.50	8.90	0.35	0.241	0.228	0.062	0.005	0.014	0.008	0.066
Chinichaka	0.006	0.18	0.012	7.64	4.68	5.04	0.24	0.29	0.157	0.041	0.012	0.022	0.042	0.091

1 - Spiders, 2 - Coccinellids, 3 - *Apantelis* (Pupal mass), 4 - Robber fly, 5 - Dragon fly, 6 - Damsel fly, 7 - Wasps

## Conclusion

In aman rice, the majority of arthropod insect pests are infesting at vegetative stage and only one pest, gundhi bug (*Leptocoris spp.*) is known to attack at reproductive stage. In rice ecosystem, the destructive insect pest populations remain at low level by the action of predators (Spiders, dragonfly, damselfly, robberfly) and parasite (*Apantelis spp.*). The

parasite, (*Apantelis spp.*) can effectively reduce the foliage feeder like leaf folder. An outbreak of rice insect pests may be reduced and their decent numbers indicates the good health of rice crop. It may be concluded that natural enemies help in the management of insect pests infesting rice crop through their predatory and parasitic action.

## Reference

1. Chakraborty K, Moitra MN, Sanyal AK, Rath PC. Important Natural enemies of paddy insect pests in the upper Gangetic plains of West Bengal, International Journal of Plant, Animal and Environmental Sciences. 2016; 6(1):35-40.
2. Dhaliwal GS, V Jindal, Dhawan AK. Insect pest problems and crop losses: Changing trends. Indian J Ecol. 2010; 37:1-7.
3. Districtwise Estimates of Yield Rate and Production of Nineteen Major Crops of West Bengal during 2014-15. Bureau of Applied Economics and Statistics, Department of Statistics and Programme Implementation, Government of West Bengal, 2016, 27.
4. Gupta K, Kumar A, Patel GP, Navneet. Seasonal incidence of Gundhi bug on rice under agro-climatic condition of Allahabad. International Journal of Chemical Studies. 2018; 6(3):1516-1518.
5. Heinrichs EA. Impact of insecticides on the resistance and resurgence of Rice plant hoppers. Plant hoppers: Their ecology and management, 1994, 571-598.
6. Sachan SK, Sing DV, Chaudhury AS. Seasonal abundance of insect pests associated with basmati rice. Ann. Pl. Protec. Sci. 2006; 14(1):218-220.
7. Sharma AK, Bisen. UK Taxonomic documentation of insect pest fauna of vegetable ecosystem collected in light trap. International Journal of Environmental Science: Development and Monitoring (IJESDM). 2013; 4(3):4-11.
8. Saini UP, Sachan SK, Pratap A, Singh B, Kumar K. Insect pests associated with Basmati rice in western plain zone of U.P. Plants Archives. 2015; 15(2):775-777.
9. Singh S, Singh BK. Survey and fortnight observation to find out major insect pests of rice crop (*Oryza sativa*) in Patna district of Bihar. Journal of Entomology and Zoology Studies. 2017; 5(1):766-769.
10. Viswanathan K, MB Kalode. Comparative study on varietal resistance to rice green leaf hoppers *Nephotettix virescens* (Distant) and *N. nigropictus* (Stal). Proc. Indian Acad. Sci. (Anim. Sci.). 1984; 93(I):55-63.