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Seasonal abundance of rice sucking pests under different rice ecosystems in Cauvery command areas of Karnataka

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Abstract
An experiment was carried out under field conditions at the Zonal Agricultural Research Station (ZARS), Vishveshvaraiah Canal(V. C) Farm, Mandya district of Karnatakato study the population status of major sucking insect pests of rice in different methods of planting. Incidence of BPH was started from last of July and its mean population was observed in mechanical transplanted rice of 4.40 followed by manual (3.87) drill sown (2.16) and aerobic method (1.06) nymphs and adults per hill respectively. Whereas WBPH was recorded at 30 DAT and incidence remained up to the 90 DAT and Ear head bug incidence started with panicle initiation stage and continued till dough stage of the crop, and its mean population was non-significant differences among the different methods of planting.

Keywords- Ear head bug, BPH, WBPH, Rice ecosystem

Introduction
Rice (*Oryza sativa* L.), is the important cereal food of world and India. In India rice is grown over an area of 42.86 M. ha. with a production 104.3 M. tonnes (*Anno.*, 2014). Rice is the major cereal crop of Mandya district covering 79,892 ha. with an average productivity of about 3.5 tonnes per hectare.Which is attacked by many insect in which plant hoppers one of them. The plant hoppers constitutes a large group of phytophagous insects in the order Hemiptera, which is distribute worldwide. All members of this group are plant feeders considered as pests. The brown planthopper (BPH), *Nilaparvata lugens* (Stål), and white backed planthopper (WBPH), *Sogatella frucifera* (Horváth), are the rice monophagous species, which are inevitably associated with rice in Asia. The BPH as the number one insect pest of rice in asia today primarly because of the unpredictically of the infestation and the dramatically severe damage it causes, they damage plant directly by sucking the plant tissues causing plant wilting and hopper burn. Rice earhead bug, though said to occur mainly in coastal and heavy rainfall tracts of the Karnataka state (Malnad), its spread to other areas cannot be ruled out. Rice cultivators, especially in rainfed rice ecosystem of Karnataka faced problems of earhead bug, *Leptocorisa spp* which is said to cause great loss in rice production (Prashanta *et al*., 2012) [6].
Recently, emphasis is being given on ecological based pest management strategies. The main components of any pest management programme is to study the incidence period of the pest, population distribution on crop and regular monitoring or survey of field. Seasonal incidence studies helps in planning need based application of insecticides as it clearly reveals the insect's peak activity as well as insect free periods during crop growth. The insect pest population fluctuations depending on various abiotic (environmental factors) and biotic (natural enemies) factors of an area.

Materials and Methods
A roving survey was conducted during kharif season (August to December) 2013 in different rice fields in Cauvery command area of mandya district of Karnataka. Looking to the specific conditions of mandya district, eight villages were selected and from each village two rice fields were selected for the study. From among the 16 rice fields, four rice fields each were selected with manual transplanting, mechanical transplanting, aerobic and drill sown rice. These rice fields were visited fortnightly and observations made on the incidence of different insect pests. The observation on insect pests occurrence was recorded on 20 hills in each field randomly and averaged to per hill basis for expression.
For Rice crop was raised in small plots of 100 sq. meters following recommended agronomic package of practices. On the bunds of each plot, flowering plants such as sesamum and cowpea were grown. The rice plots with natural flora were considered as control plot.

Each treatment was replicated on three plots. The observation on insect pest**s** occurrence was recorded at 15 days interval starting from planting to till harvest of the crop on 20 hills randomly and averaged to per hill basis for expression in both fields where the bunds are covered with the sesamum and cowpea. Similarly the same observation was recorded in control filed. Standard procedure was followed to record the observations on the incidence of insect pests of paddy as per Bentur *et al*. (2012) [2]. The damaged leaves and total leaves from 20 randomly selected hills were observed in each plot. The percentage of leaf damage was calculated as follows.

Plant hoppers

Observation on plant hoppers (BPH and WBPH), number of motile stages (adult and nymphs) on all the 20 hills was recorded by tapping and counted per hill basis.

Ear head bug

Observation on the number of adult and nymphs of ear head bugs was recorded on 20 hills and averaged to express in per hill basis.

Further, grains damaged by the bug and total number of grains in 20 panicles were also recorded. The per cent grain damage was calculated as follows.

$$\text{Per cent grain damaged} = \frac{\text{Number of ear head bug damaged grains}}{\text{Total number of grains}} \times 100$$

The statistically analyzed t-test was applied to know the significance differences between the different planting methods of rice such as Manual v/s Mechanical, Manual v/s Aerobic, Manual v/s Drill sown, Mechanical v/s Aerobic, Mechanical v/s Drill sown and Aerobic v/s Drill sown.

Results and Discussion

Abundance of rice sucking pests, under different rice ecosystems

The incidence of BPH population varied from 0.00 to 7.80 nymphs and adults per hill in the different methods of rice planting. The highest mean population was observed in mechanical transplanted rice of 4.40 followed by manual (3.87) drill sown (2.16) and aerobic (1.06) method. The results indicated significant difference between mechanical and aerobic and non-significant difference in remaining methods (Table 1), (Fig. 1). This is due to the preference of the pest rainfed and irrigated wet fields to upland rice and direct sown fields to transplanted fields. The present findings on the occurrence of BPH after 60 days of transplanting is in close agreement with the observations made by Nagangoud *et al*. (1999) [4]. Similarly, Hegde and Nagappa, 2011 [3], reported that planthopper was significantly higher in direct seeding and random planting over ICM and SRI support the present investigation.

The population of WBPH varied from 0.00 to 4.70 nymphs and adults per hill among the different methods of rice planting at different days of observation. The highest mean population was recorded in manual transplanted rice with 1.81 nymphs and adults per hill followed by mechanical, drill sown and aerobic rice with 1.66, 1.63 and 1.54 respectively. The results indicated non-significant difference among all the methods (Table 1) (Fig. 1). The present investigation is in conformity with Surendranath Reddy *et al*. (1983) [8] and Ngoan (1972) [5]. Whereas it differed from Naganagoud *et al*. (1999) [4].

Ear head bug population ranged from 0.00 to 3.40 in different methods of planting at different days of observation. The highest mean population of 1.26 was observed in manually transplanted method followed by mechanical, drill sown and aerobic method with 1.24, 1.00 and 0.46 respectively. There was non-significant differences among the different methods of planting (Table 1) (Fig. 1). Its population was recorded only during reproductive stage of the crop there was zero in vegetative stage of the crop. These results are similar with the study made by Prasad Kumar (2003) [7].

Table 1: Abundance of rice sucking pests in different rice ecosystems during kharif, 2013

DAT	Brown planthopper				White backed planthopper				Ear head bug			
	Manual	Mechanical	Aerobic	Drill sown	Manual	Mechanical	Aerobic	Drill sown	Manual	Mechanical	Aerobic	Drill sown
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	0.00	3.40	0.00	0.00	2.40	3.60	3.10	3.10	0.00	0.00	0.00	0.00
60	7.80	6.80	2.70	2.90	4.70	3.00	3.70	4.10	0.00	0.00	0.00	0.00
75	6.70	5.90	2.60	3.90	4.30	3.10	3.30	3.50	0.90	0.10	0.10	0.30
90	6.50	6.10	2.10	4.90	0.50	0.80	0.20	0.20	2.20	3.20	0.80	3.10
105	6.10	6.50	0.00	2.70	0.60	0.60	0.50	0.50	3.30	3.40	1.20	2.70
120	0.00	2.10	0.00	0.70	0.20	0.50	0.00	0.00	2.40	2.00	1.10	0.90
Mean	3.87	4.40	1.06	2.16	1.81	1.66	1.54	1.63	1.26	1.24	0.46	1.00
Manual v/s Mechanic	0.31				0.17				0.02			
Manual v/s Aerobic	1.91				0.27				1.43			
Manual v/s Drill	1.09				0.18				0.35			
Mechanical v/s Aerobic	2.27				0.13				1.25			
Mechanical v/s Drill sown	1.43				0.03				0.31			
Aerobic v/s Drill sown	1.23				0.09				0.99			

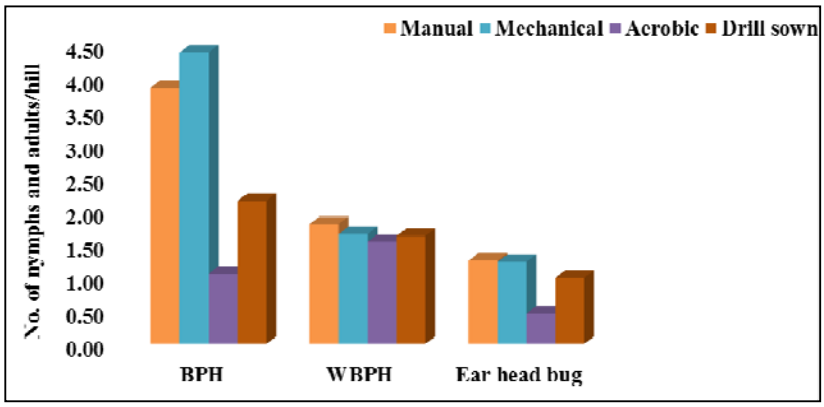

Fig 1: Abundance of sucking pests in different rice ecosystems during kharif, 2013

Abundance of rice sucking pests, where flowering plants used as bund flora.

The incidence of BPH population was observed at 60 DAT. The highest mean population was recorded in control plot of 2.09, followed by sesamum (1.77) and cowpea (1.61) (Table 2), (Fig. 2). The BPH incidence was observed at 60 DAT. Similarly WBPH incidence was recorded at 30 DAT and incidence remained up to the 90 DAT. The rice plot surrounded by the cowpea the number of nymphs and adults per hill varied from 0.00 to 2.90. Whereas as in case of the sesamum it was 0.00 to 3.90 and in control it was 0.00 to 4.00. The highest mean population was recorded in control plot (1.66), followed by sesamum (1.47) and cowpea (1.23) (Table 2), (Fig. 2).The incidence ranged from 0.00 to 0.10 in cowpea surrounded crop and in sesamum (0.01 to 1.90), similarly in control plot 0.00 to 2.10. The highest mean population was recorded in control plot (1.07) followed by sesamum and cowpea of 0.93 and 0.39, respectively (Table 2) (Fig. 2). This is due to cultivated flowering plants, namely sesamum and cowpea increased the activity of natural enemy population compared to without flowering plants or control field. These results are more or less similar to the Zhu *et al*. (2013) [9] who reported increased parasitism of eggs of planthoppers by *Anagrus* spp. by that growing the flowering plants such as *Sesamum indicum*, *Emilia sonchifolia* and *Impatiens balsamena*on the bunds of rice fields.

Table 2: Abundance of rice sucking pests in the rice fields with sesamum and cowpea on the bund, during kharif, 2013

DAT	Brown planthopper			White backed planthopper			Ear head bug		
	Cowpea±SD	Sesamum±SD	Control±SD	Cowpea±SD	Sesamum±SD	Control±SD	Cowpea±SD	Sesamum±SD	Control±SD
30	0.00± 0.00	0.00± 0.00	0.00± 0.00	0.20± 0.42	0.30± 0.67	0.40± 0.52	0.00± 0.00	0.00± 0.00	0.00± 0.00
45	0.00± 0.00	0.00± 0.00	0.00± 0.00	2.70± 2.36	3.00± 2.00	3.00± 1.66	0.00± 0.00	0.00± 0.00	0.00± 0.00
60	2.30± 2.00	2.60± 2.32	3.70± 2.11	2.90± 2.18	3.90± 2.02	4.00± 1.45	0.00± 0.00	0.00± 0.00	0.00± 0.00
75	2.10± 2.84	2.00± 1.85	2.30± 1.34	2.40± 2.37	3.00± 2.00	3.20± 1.37	0.00± 0.00	1.10± 0.74	1.60± 0.84
90	3.30± 1.83	3.40± 1.78	3.80± 1.48	0.40± 0.70	0.10± 0.32	1.00± 1.95	0.70± 0.67	1.80± 1.14	1.90± 0.94
105	3.60± 2.17	4.40± 1.43	3.50± 1.55	0.00± 0.00	0.00± 0.00	0.00± 0.00	0.90± 1.20	1.70± 1.25	1.90± 1.29
120	0.00± 0.00	0.00± 0.00	1.30± 1.89	0.00± 0.00	0.00± 0.00	0.00± 0.00	1.10± 0.74	1.90± 1.10	2.10± 0.88
Mean	1.61	1.77	2.09	1.23	1.47	1.66	0.39	0.93	1.07

DAT – Days after transplanting

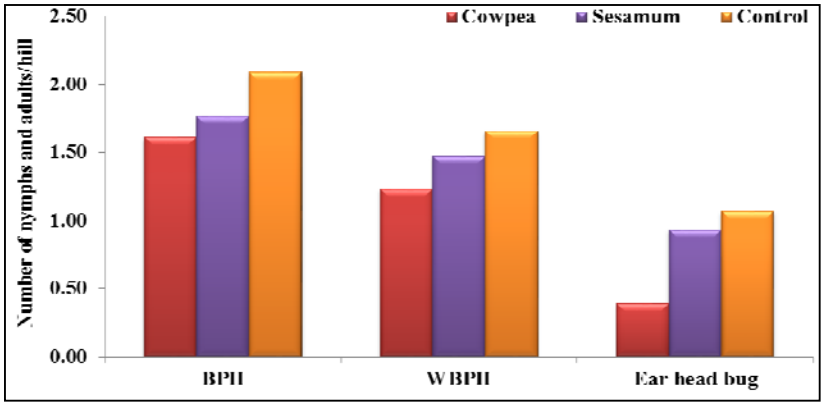

Fig 2: Abundance of sucking pests in the rice fields with sesamum and cowpea on the bunds.

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