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Species diversity of major insect pests of rice in Madurai district

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Abstract
A field experiment was conducted during Rabi 2016 – 2017 (Oct - Feb) at Agricultural College and Research Institute, Madurai to study the species diversity of major insect pests of rice. Three species of rice stem borers *viz.*, *Scirpophaga incertulas*, *Sesamia inferens*, *Chilo polychrysus* occurred among which the first was dominant. *S. incertulas* was predominant during December 2016 (68.96%), whereas *S. inferens* (38.38%) and *C. polychrysus* (30.23%) prevailed during September and November respectively. Three species of rice leaf folders *viz.*, *Cnaphalocrocis medinalis*, *Marasmia patnalis* and *Marasmia ruralis* occurred among which the first was dominant. *C. medinalis* was abundant during March 2017 (72.01%) whereas, *M. patnalis* (37.98%) and *M. ruralis* (22.92%) during December 2016 and January 2017 respectively. Among the leaf hopper species occurred, the abundance was more in *Nephotettix nigropictus* during January 2017 (72.33%), whereas, *N. virescens* (42.18%), *N. malayanus* (22.23%) and *Cofana spectra* (11.88%) during September, July and December 2016 respectively.

Keywords: Rice, species diversity, stem borers, leaf folders, leaf hoppers

Introduction
Rice, *Oryza sativa* L., forms staple food for more than 50 per cent of the world's population. The successful cultivation of rice is often hampered by an array of insect pests. The projected yield loss due to insect stress range from 20 to 30 per cent [1]. Pests, diseases and mismanagement contributed to the production loss by 42.23, 21.17 and 36.59 per cent respectively. Yield loss due to insect pests in rice has been estimated as 21 to 50 per cent [2]. Yield loss of YSB estimated across India varied from 11.2 to 40.1 per cent due to dead hearts and 27.6 to 71.7 per cent due to white ear [3].
Among the three species of rice leaf folders occur in Madurai district *viz*., *Cnaphalocrocis medinalis*, *Marasmia patnalis* and *Marasmia ruralis*, the incidence of *M. ruralis* was very meager and found throughout the year [4]. The author recorded the different species of rice stem borers *viz*., yellow stem borer, *S. incertulas*, *Chilo polychrysus*, *Chilo suppressalis* and *Sesamia inferens* in Malaya [5]. Begum and his coworkers recorded five species of rice leaf hoppers *viz*., *N. virescens*, *N. nigropictus*, *N. malayanus*, *N. parvus* and *N. cincticeps* in Bangladesh. The first two species were most important as their presence were higher in number almost all the year round [6]. The present investigation is to document the species diversity of major insect pests in rice.

Materials and Methods
A field experiment was conducted during Rabi 2016-2017 (Oct- Feb) at Agricultural College and Research Institute, Madurai and to study the species diversity of major insect pests of rice. The design adopted was Randomized block design with following 18 treatments and replicated twice. Rice stem borer, leaf folder moths and leaf hoppers species were collected by using a sweep net from the maximum tillering to flowering stages of the crop and brought to the laboratory and was examined under binocular microscope. The species of stem borers adults were differentiated based on dark spots on forewing, colouration of wing and size. The species of stem borer larvae was distinguished based on the colouration, apex of the labrum, medial notch, longitudinal stripes and spiracle. The different species of leaf folder larvae were distinguished based on the colouration, characters of pronotum and sub dorsal spots on the prothorax and size of larvae**.** The species of leaf hoppers were differentiated based on shape of the head, black band between compound eyes, black tinge on pronotum and black spot on the forewing.

The seasonal incidence of different species was recorded on short (MDU 6, ADT 37, CO 51), medium (ADT 39, ADT 49, TKM 13), long (CR 1009, I.W. Ponni, ADT 50) duration varieties, Scented rice (Pusa basmathi, Jeeraga samba), hybrid rice (CORH4, CORH3), land laces (Norungan, Nootripattu, Kallurundaikar), susceptible check (TN 1) and local ruling variety (ADT 45).

Results and Discussion

The prevalence of different species of stem borer, leaf folder and leaf hopper was observed during 2016 to 2017 (Table 1). The present study revealed that three species of rice stem borers occurred in Madurai district *viz*., *Scirpophaga incertulas*, *Sesamia inferens*, *Chilo polychrysus* among which the first was dominant. The incidence of *S. incertulas* and *S. inferens* was found throughout the year where as *C. polychrysus* was absent from July to October 2016 (Fig 1).

This is in line with findings of [7] who reported that during Kar and Pishanam seasons of 2013, among the 290 larvae collected in rice fields, the yellow stem borer, *S. incertulus* (96.79%) was found to the predominant species throughout the cropping season followed by dark headed borer, *C. polychrysus* (3.21%). While [8] reported that three stem borers species *viz*., Yellow stem borer, Pink stem borer and Dark headed borer were found in all the regions except in the hilly Zone where YSB was the only species present. Though YSB was recorded dominant in most of the regions, the PSB and DHB also showed noticeable increase in their proportions.

This is agreement with findings of [9] who reported that five stem borer species *viz.*, Yellow stem borer *S. incertulas*, Pink stem borer, *S. inferens*, Dark headed stem borer, *C. polychrysus*, Stripped stem borer, *C. suppressalis*, White stem borer *S. innotata* and nine different natural enemies were collected from the rice fields and recorded.

The present work is in agreement with findings of [10] who reported that three species of stem borer including *S. incertulas*, *C. suppressalis* and *S. innotata* were found attacking rice among them, *S. incertulas* dominated. In the present study, three species of rice leaf folders occurred in Madurai district *viz*., *Cnaphalocrocis medinalis*, *Marasmia patnalis M. ruralis* among which the first was dominant. The incidence of all the three species of leaf folder were found throughout the year. This is line with findings of [11] who reported three species *viz*., *C. medinalis*, *M. patnalis* and *M. ruralis*. The first two species were abundant in all sampling dates.

In the present study, four species of rice leafhoppers occurred in Madurai district viz., *Nephotettix virescens*, *N. nigropictus*, *N. malayanus* and *C. spectra*. The incidence of *N. virescens* and *N. nigropictus* was found throughout the year. Similar findings were reported by [6] who recorded five species of rice leaf hoppers viz., *N. virescens*, *N. nigropictus*, *N. malayanus*, *N. parvus and N. cincticeps*.

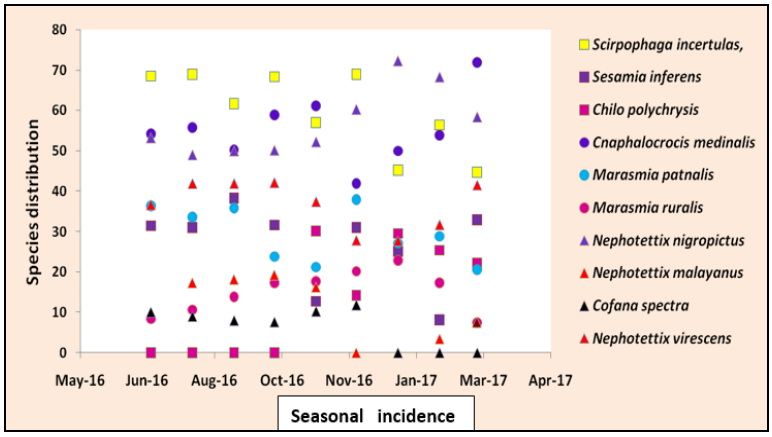

Fig 1: Species diversity of major insect pests of rice

Conclusion

Among the major insect pests, rice stem borers, *Scirpophaga incertulas*, rice leaf folders, *Cnaphalocrocis medinalis* and leafhoppers, *Nephotettix virescens*, *Nephotettix nigropictus*, *Nephotettix malayanus and Cofana spectra* were dominantly occurred in Madurai district.

Table 1: Diversity and abundance of different species of major insect pests of rice

Months	% Abundance*									
	Stem borer species			Leaf folder species			Leaf hopper species			
	YSB, *Scirpophaga incertulas*	PSB, *Sesamia inferens*	DHB, *Chilo polychrysus*	*Cnaphalocrocis medinalis*	*Marasmia patnalis*	*Marasmia ruralis*	GLH *Nephotettix virescens*	GLH, *Nephotettix nigropictus*	GLH *Nephotettix malayanus*	WLH, *Cofana spectra*
July 2016	68.50	31.50	0.00	54.25	36.42	8.33	36.65	53.25	22.23	10.10
August 2016	68.89	31.11	0.00	55.75	33.63	10.62	41.94	49.03	17.29	9.03
September 2016	61.62	38.38	0.00	50.26	35.90	13.85	41.95	50.00	18.12	8.05
October 2016	68.33	31.67	0.00	58.91	23.76	17.33	42.18	50.18	23.22	7.64
November 2016	56.98	12.79	30.23	61.18	21.18	17.65	37.42	52.26	16.19	10.32
December 2016	68.96	31.04	14.23	41.83	37.98	20.19	27.83	60.29	0.0	11.88
January 2017	45.22	25.22	29.57	50.00	27.08	22.92	27.67	72.33	0.0	0.00
February 2017	56.36	8.18	25.45	53.85	28.85	17.31	31.67	68.33	3.45	0.00
March 2017	44.68	32.97	22.34	72.01	20.53	7.37	41.57	58.43	7.49	0.00

*Mean of 50 individuals *YSB – Yellow stem borer; PSB – Pink stem borer; DHB – Dark headed borer
GLH- Green leaf hopper; WLH- White leaf hopper

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