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Evaluation of biopesticides against rice black bug

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ABSTRACT

Rice black bug is the major pest of rice in Thiruvallur and Kancheepuram districts. Yield loss at 10 bugs per hill in susceptible cultivars was estimated as 23%. In this context, biopesticide like neem oil (3%), *Metarhizium anisopliae* (1 x 10^8 spores) and new molecules profenophos (1000 ml/ha.) were tested against black bug. The results revealed that black bug population was found to be significantly low in profenophos (1000 ml/ha.) sprayed plots 2.0 no./hill. Population reduction was 60.8% followed by *Metarhizium anisopliae* (1 x 10^8 spores) applied plots. In neem oil applied plots black bug population ranged from 3.0 no/hill to 3.3 no. /hill whereas control plot recorded the maximum population of 5.1 bugs / hill.

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INTRODUCTION

Black bug is common in rainfed and irrigated wetland environment during the vegetative and reproductive stages of the rice crop. It prefers continuously cropped irrigated rice areas, poorly drained fields and more nitrogen applied plots. Feeding damage resulted in half-filled and empty grains (Cuaterno, 2007). Yield losses were due to unfilled grains, reduction in tiller number and less grains per panicle. Per cent yield loss at 10 bugs per hill ranged from 14.7 per cent in resistant cultivars and 23 per cent in susceptible cultivars (Heinrichs *et al.,* 1987).

Black bug is found to be highly phototropic and it is attracted to light traps in large numbers. Black bug catches were high during the full moon week. Attraction of black bug was significantly high in 80, 125 watts mercury vapour lamp and significantly low in 40 watts lamp (Saroja *et al*., 1993). A large number of catches found in street light was coincided with catches in petromax light traps and the highest number of bugs were trapped in both sources during the full moon (Ferrer and Shepard, 1987). Second generation black bugs moved to light trap from previous stubbles during full moon (Barrion *et al.,* 2008).

Because of the severity of the black bug damage in many parts of the world, attempts were made to check the pest population through botanicals, biocontrol agents and chemicals.

Spraying of green muscardine fungus *M. anisopliae* spore concentration @ 1 x 10^8 was very effective against black bug (Cuaterno, 2007). Heinrichs *et al* (1985) suggested foliar spray of dimethoate and malathion had high efficiency in controlling the black bug. Hence, the present study aimed at the evaluation of different treatments *viz*., botanical/biocontrol agents and chemicals against rice black bug.

MATERIALS AND METHODS

Field trials were conducted during sornavari and samba seasons during 2008-2010 with ADT 43 varieties. The experiments were laid out with 7 treatments and 4 replications in randomized block design. The treatment details were: draining of water + spraying of neem oil 3 per cent on 30, 45 and 60 days after transplanting (DAT)-T1), Draining of water + spraying of neem oil 3 per cent on 30 and 45 DAT + spraying of *Metarhizium anisopliae* spore concentration @ 1 x 10^8 -T2, T2 + need based spray of profenophos 50 EC @1000 ml/ha.-T3, Spraying of *M. anisopliae* spore concentration @ 1 x 10^8 alone after the incidence of black bug - T4, Application of farm yard manure @ 12.5 t/ha. + need based spray of profenophos 50 EC @1000 ml/ha - T5, Need based spray of profenophos 50 EC @ 1000 ml/ha.- T6, Control- T7.

The black bug population and the extent of damage was recorded. The pest count was taken on 5 randomly selected plants before and 2, 5 and 7 days after treatment. Grain yield per plot (20 m^2) also was recorded and then converted to kg/ha. The statistical method used was LSD.

RESULTS AND DISCUSSION

The pest incidence during sornavari 2009 was found to be negligible. During sornavari, 2008, a field trial was conducted during sornavari 2008 with ADT 43 rice variety with 7 treatments and 4 replications. Among the seven treatments, black bug population was found to be low (2.2 no./hill) in profenophos (1000 ml/ha.) applied plot which resulted in 56.4 per cent reduction in population followed by *Metarhizium anisopliae* (1 x 10^8 spores) applied plot which recorded the black bug population of 2.55 no./hill. In neem oil applied plots, black bug population ranged from 2.9 to 3.3 no./hill. However, control plot recorded the black bug population of 5.05 no./hill. Grain yield was high (3416 kg/ha.) in the plots receiving the spray of profenophos 50 EC @ 1000 ml/ha. followed by *M. anisopliae* applied plots. In neem oil applied plots the grain yield was ranged from 2916.7 kg/ha to 3229.2 kg/ha. However, control recorded the grain yield of 2937.5 kg/ha (Table 1).

Table 1. Effect of different treatments on black bug population and grain yield.

Treatment(s)	Black bug population (no/hill)	Per cent reduction over control	Grain yield (Kg/ha.)
T1	3.3 (1.81)	34.7	3125
T2	3.0 (1.73)	40.6	3229.2
T3	2.9 (1.70)	42.6	2916.7
T4	2.55 (1.59)	49.5	3291.7
T5	2.25 (1.50)	55.4	3312.5
T6	2.2 (1.48)	56.4	3416.7
T7	5.05 (2.25)		2937.5
SE(d)	0.07		119.2
CD (0.05)	0.15		250.4

A field trial was conducted during sornavari 2009 with TKM 9 rice variety with 7 treatments and 4 replications. Black bug population was found to be significantly low (1.15 no./hill) in profenophos (1000 ml/ha.) applied plots which resulted in 64.1 per cent reduction in black bug population. *Metarhizium anisopliae* applied plot which recorded the black bug population of 2.8 no./hill. In neem oil applied plots black bug population ranged from 3.0 no/hill to 3.3 no. /hill whereas control plot recorded the maximum population of 5.15 bugs / hill. Grain yield was high in profenophos sprayed plot followed by the plots receiving *M. anisopliae* (3000 kg/ha). In neem oil applied plots, the grain yield was ranged from 2729 kg/ha to 3146 kg/ha. However control plot was recorded the grain yield of 2958 kg/ha (Table 2).

Table 2. Effect of different treatments on black bug population and grain yield

Treatments	Black bug (no./hill)	Per cent reduction over control	Yield (kg/ha.)
T1	3.3 (1.81)	35.9	2875.0
T2	3.1 (1.76)	39.8	2729.0
T3	3.0 (1.73)	41.7	2896.0
T4	2.8 (1.67)	45.6	3000.0
T5	2.1 (1.45)	59.2	3604.0
T6	1.85 (1.36)	64.1	3500.0
T7	5.15 (2.27)		2771.0
SE (d)	0.05		219.5
CD (0.05)	0.11		461.0

The two years study revealed that spraying of profenophos 50 EC @ 1000 ml/ha. resulted in 60.8 per cent reduction in black bug population. Spraying of *M. anisopliae* spore concentration of 1 x 10^8 resulted in 47.1 per cent reduction bug population. In neem oil applied plots, reduction in black bug population was 37.3 to 41.2 per cent. Mean grain yield (3458 kg/ha) and C:B ratio was found to be high in profenophos treated plot (1:1.7).

The two years study revealed that spraying of profenophos 50 EC @ 1000 ml/ha. resulted in 60.8 per cent reduction in black bug population. Rao (1977) reported that spraying of monocrotophos, deltamethrin, permethrin, dimethoate or malathion was very effective in controlling rice black bug.

Spraying of phosphamidon, fenthion or methyl dematon was effectively controlled the pest (Sundarababu *et al*., 1984). Spraying of *M. anisopliae* spore concentration of 1 x 10^8 resulted in 47.1 per cent reduction bug population. *M. anisopliae* applied plot which recorded the black bug population of 2.8 no./hill. *M. anisopliae* and *Paecilomyces lilacinus* significantly controlled both the nymphs and adults of rice black bug (Saroja *et al*., 1993). Cuaterno (2007) reported that spraying of *M. anisopliae* spore concentration @ 1 x 10^8 was very effective in controlling the rice black bug. *M. anisopliae* is a systemic fungi and it infest and grow well on the rice black bug. In neem oil applied plots, reduction in black bug population was 37.3 to 41.2 per cent whereas control plot recorded the maximum population of 5.15 bugs / hill. Cuaterno (2007) revealed that neem seed kernel extract (NSKE) 5 % was found to be significantly superior in controlling the rice black bug.

Field experiments on evaluation of bio-pesticides against rice black bug was conducted with bio-pesticides *viz.,* neem oil (3%), *M. anisopliae* (1 x 10^8 spores) and new molecules profenophos (1000 ml/ha.) in Rice Research Station, Tirur, Thiruvallur dt during 2008 and 2009. The results revealed that black bug population was found to be significantly low in profenophos (1000 ml/ha.) sprayed plots 2.0 no./hill. Population reduction was 60.8 per cent followed by *M. anisopliae* (1 x 10^8 spores) applied plots. In neem oil applied plots black bug population ranged from 3.0 no/hill to 3.3 no. /hill whereas control plot recorded the maximum population of 5.1 bugs / hill.

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