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Research Article

Evaluation of bio-pesticide *Metarhizium anisoplea* against brown plant hopper (*Nilaparvatha lugens*) and its efficiency on the improvement of the productivity of paddy

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ABSTRACT

Increase in dose of *Metarhizium anisoplea* from 2kg/ha to3 kg/ha decreased the BPH counts at 7 days after spraying. This was on par with Thiomethoxam. Similar beneficial effect was also noticed on the seed yield of paddy. Sparaying of *Metarhizium anisoplea* @ 2.5 kg/ha recorded significantly higher seed yield of paddy (8060 kg/ha) over *Metarhizium anisoplea* @ 2 kg /ha (7643 kg/ha), Clothiandidin (6701kg/ha) and control (5922 kg/ha). This was at par with Thiomethoxam (8313 kg/ha) and Imidachloraprid (7843 kg/ha). The *Metarhizium anisoplea* 2. 5 kg/ha was not found to be phytotoxic and it was safer to natural enemies.

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INTRODUCTION

Rice (*Oryza sativa*) is a major field crop of India, covering the large area in the country. In order to meet the growing demand of the ever increasing population, we need to produce more rice every year. But the rice production is limited by both biotic and abiotic stresses of which insect pests alone cause about 25 per cent losses (Dhaliwal *et al*., 2007). Over 100 species of insect attack and feed on rice crop from nursery to maturity and also in storage. Of these dozen are consistently reported on major pests of economic importance, through the damage caused by them varies in time and space. Hence, we also need to reduce the yield losses due to major pests and diseases.

Among the plant hoppers, brown plant hopper (BPH) *Nilaparvatha lugens* (Stal.) and white backed plant hopper (WBPH) *Sogatella fucifera*(Horvath) are of importance in India. The third species, smaller brown plant hopper(SBPH) *Laodelphax stritellus*(Fallen) has also been reported (Shukla, 1979) but not in abundance belongs to the order Homoptera, family Delphacidae with piercing and sucking mouth parts. The plant hoppers suck the plant sap from the phloem vessels through their proboscis, due to this plant starts wilting with outer most leaves drying first and then the entire plant dries up.

The BPH damage is more often seen in well irrigated densely planted fields with high doses of nitrogen and frequent insecticide application. The insect immigrate into the freshly planted crop and colonize. The nymph and adult stay at the base of the rice plant and suck the plant sap. As a result of feeding by second and third generation of insect, plants turn yellow and dry up rapidly. During early phase of infestation, round yellow patches appear in the field which soon turn brownish due to the drying up of the plants. This condition is called as "hopper burn". Hopper burn is caused mainly by brown plant hopper (BPH) *Nilaparvatha lugens* (Stal.), threatens a global rice crop, particularly in Asia. The patches of infestation may then spread out and cover the entire field. Long term reliance on chemical control has caused high brown plant hopper resistance to common insecticides. For instance, Imidacloprid has been compromised by development in BPH and other sucking pest since 1990 and is no longer recommended for BPH control (Liu *et al*., 2005 and 2008). Thus, cautious use of this chemical is necessary for its prolonged market life. An alternative strategy is to reduce the chemical

pressure on BPH by exploiting the knock down action of chemical and the longer effect of fungal biocontrol agents such as *Beauveria bassiana*(Balsamo) and *Metarhizium anisoplea* (Metschin Khoff)Sorokin. Crop loss is usually considerable and complete destruction of the crop occurs in severe cases. *Nilaparvatha lugens* (Stal.) is a vector of the rice ragged stunt virus(RRSV) and rice grassy stunt virus (RGSV).

Brown plant hopper (BPH) menace is one of the important factors attributed in declining the productivity of paddy in Tungabhadra Project area of Karnataka. The recommended chemicals are not fulfilling the requirements in control of this pest and they are not fully safe to the natural enemies. Hence, the present bio-pesticide, *Metarhizium anisoplea* was evaluated against BPH and its efficiency on the improvement of the productivity of paddy was studied.

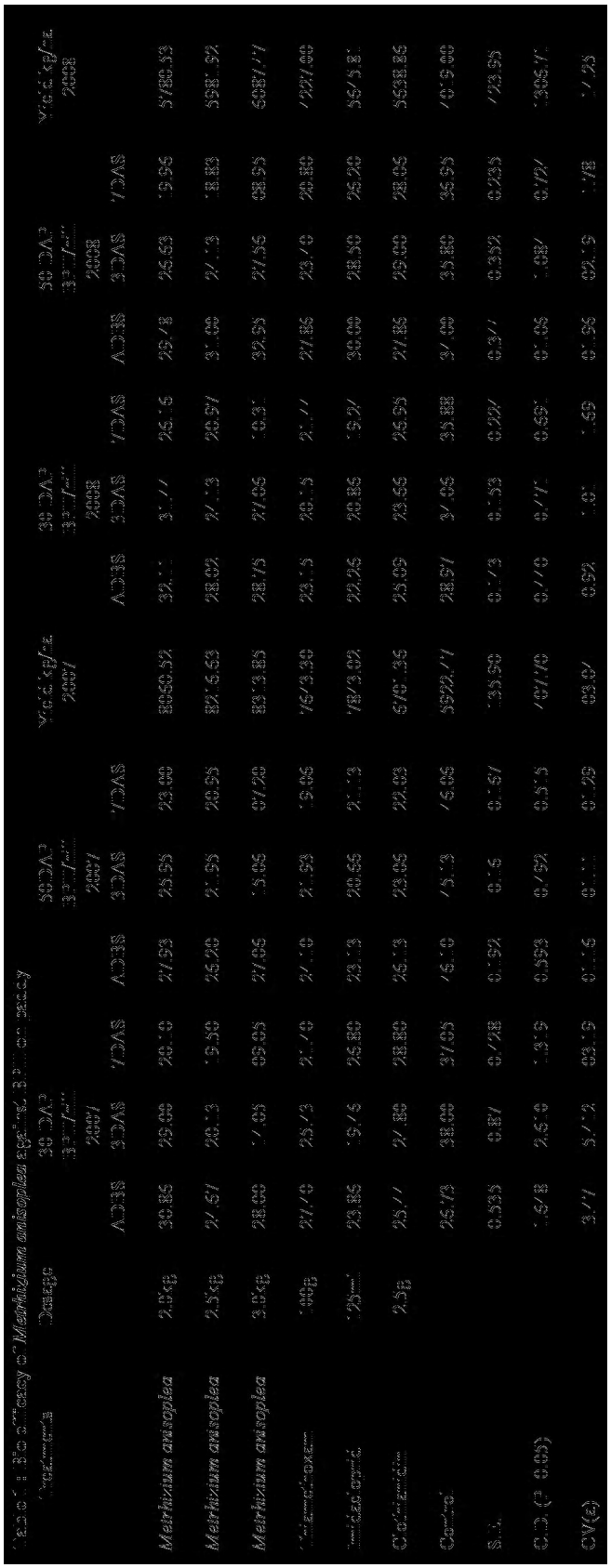
MATERIALS AND METHODS

Two experiments were conducted to study the comparative efficacy of bio-pesticide, *Metarhizium anisoplea* in comparision with other insecticides in the suppression of brown plant hopper, *Nilaparvatha lugens(*Stal.).The first experiment was conducted during *Kharif* 2007 in which *Metarhizium anisoplea (*3kg, 2.5kg and 2kg/ha) was compared with Thiamethoxam 25 WG (100 g/ha), Imidacloprid 17.8 SL(125 ml/ha), Clothianidin 50 WG (25g/ha)and water spray against brown plant hopper, *Nilaparvatha lugens* (Stal.). A field experiment was conducted at Agricultural Research Station, Siruguppa, Karnataka, in deep block soil under irrigated conditions during *Kharif* 2007. The experiment was laid out in randomized block design with three replications. The rice seedlings of variety, BPT 5204 (susceptible to BPH) was planted by giving a spacing of 20 cm x 10 cm. The crop was fertilized with 150:75:75 kg NPK/ha. The first spray was given on 30th DAP (days after planting) and 2nd spray was applied 3rd week after 1st spray. Initial counts of nymphs and adults of rice plant hoppers were made inside the day before the first spray by sampling early in the morning (*i.e.* prior to dew drying).Five sample sites were fixed at equal intervals along the middle line of each plot. At each site, all nymphs and adults on two hills were gently patted into a white tray and immediately counted. BPH adults were distinguished as much as possible from those of the white backed plant hopper (WBPH), *Sogatella furcifera*(Howarth), at the counting time, but their nymphs were pooled. After the first spray, plant hopper densities(count per two hill sample) were monitored weekly using the same sampling method. Field sampling was always terminated prior to 9:30 am. As insects tended to fall into the paddy field, the counts of living ones were used for computing field efficacies of all treatments. The plant hopper counts were made at one day before spray and 3 days and 7 days after spray on 10 randomly selected hills in each plot starting from 30th DAP till 55th DAP to know the comparative efficacy of bio-pesticide, *Metarhizium anisoplea* and other chemicals against it. The yield in terms of kg/ha was recorded from each experimental plot.

The second experiment was conducted during *Kharif* 2008 in which the same bio-pesticide at three levels of *Metarhizium anisoplea* (2 kg, 2.5 kg and 3 kg/ha) and same chemical insecticides were sprayed. The spray was given immediately after reaching plant hopper population reach above ETL in experimental plot. Same recommended package of practices, and susceptible paddy variety BPT 5204 was used for planting. The plant hopper counts were made from 10 randomly selected hills in each plot before and after 3 day and 7 days after imposing the treatments. The yield expressed in terms of kg/ha recorded separately from each experimental plot.

RESULTS AND DISCUSSION

The data of Table 1 revealed that increase in dose of *Metarhizium anisoplea* from kg/ha to3 kg/ha decreased the BPH counts at 7 days after spraying. This was on par with Thiomethoxam. Similar beneficial effect was also noticed on the seed yield of paddy. Similar observations were made by Huynh *et al.* (1999) who reported that the isolates of of fungi *Beauveria bassiyana* and *Metarhzium anisoplea* were effective Isolates were collected and purified from different sites namely, Omon (Vietnam), Hyderabad, Pantnagar, Tamilnadu and showed that both the fungi *B.bassiana*, *M.anisoplea* were relatively high ranging from 60-80 per cent and they could last rather long from 7 to 21days after spraying . Similar observation was made by Vothi (2005), from Vietnam , two registered bioinsectcides namely, OMETAR and BIOVIP have been produced from entomophaggous fungi ,*Metarzium anisopleae* and *Beauveria bassiana,* respectively to control insect pests and could reduce production costs. Sparaying of *Metarhizium anisoplea* @ 2.5 kg/ha recorded significantly higher seed yield of paddy (8060 kg/ha) over *Metarhizium anisoplea* @ 2 kg /ha (7643 kg/ha), Clothiandidin (6701kg/ha) and control (5922 kg/ha). This was at par with Imidachloraprid (7843 kg/ha). The *Metarhizium anisoplea* was not found to be phytotoxic and it was safer to natural enemies.The present findings are in agreement with findings of (Rachappa *et al.,* 2005). Mycopathogen, *Metarhizium anisopliae* was evaluated against brown plant hopper, *Nilaparvata lugens* in paddy and significantly less number of BPH were seen in plots treated with the higher dosage of *M.anisopleae*(@ $2x10^{12}$ conidia /ha) when compared to untreated check and higher dose of the fungus was effective as lower dosage of used in sequence with chemical pesticides but was inferior to insecticides alone in reducing hopper population.



Conclusion:

The new bio-pesticide, *Metarhizium anisoplea* was effective against BPH and the optimum dose was 2. 5 kg/ha and it was not phgotoxic.

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