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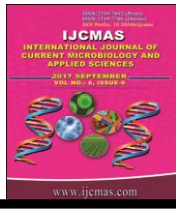

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Comparative Efficacy of Different Trade Formulations of Buprofezin 25SC against Brown Plant Hopper in Rice

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A B S T R A C T

The experiment was conducted in glasshouse to compare the efficacy of Buprofezin 25SC insecticide sold by the different manufacturers under different trade names against brown plant hopper *Nilaparvata lugens* Stal. (BPH) on rice cultivar TN-1 at Department of Entomology, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India for two cropping seasons during *kharif* 2011 and 2012. The treatment includes the Buprofezin 25SC sold by the different trade names viz., Applaud®, Lapa®, Java® and Apple® by manufacturers Tata Rallis India Pvt. Ltd., Syngenta India Pvt. Ltd., E.I.Du-pont India Pvt. Ltd. and Dhanuka Agrotech Pvt. Ltd., respectively @ 250 g a.i./ha. and an untreated control with three replication. Results revealed that Applaud® was highly effective with maximum mortality 97.8% followed by Lapa® (96.0%), Apple® (89.4%) and Java® (82.2%) against BPH.

Introduction

Rice is one of the major food crops that provide necessary calories and nutrients to humans. Rice is mainly grown in almost all parts of the world. In Asia, the rice fields are mainly located in the Eastern, Southeastern and Southern regions where favourable warm and rainy conditions prevail. Hence, the main cultivators of rice are the countries of China, India, Indonesia, Thailand and Japan, which account for more than 90% of the total global rice production (FAOSTAT, 2006). Homopterous insect brown plant hopper (BPH) is a important pests of rice in southeast and Far East Asia, because it causes direct damage by sucking plants sap which often results in the complete withering of the plants known as hopper burn and because it transmits viral diseases. In order to control BPH, several resistant varieties of rice were released in some areas, but their success was limited by the appearance of biotypes of BPH. Thus, insecticides have been mainly used for the control of BPH in rice production. What makes it more difficult to control them is that they have developed resistance to organophosphates, carbamates and even to

synthetic pyrethroids (Grayson *et. al.,* 1990). So there is a need for chemicals which is most effective against BPH, less toxic to mammals and effective at lower quantity will be the best substitute to older chemicals in integrated pest management. Wang *et al.,* (2008) found that buprofezin is especially effective against homopteran pests, such as planthopper, with very low risks to environment including human beings.

Buprofezin is the first insect growth regulator (IGR) registered in the world for the control of BPH. It also shows high activity on homopterous pest insects such as rice planthoppers and leafhoppers without any adverse effects on their predators and parasitoids. Since the chemical inhibits larval molting, egg-laying and/or induces oviposition of unhatchable eggs, it suppresses the population density of hoppers even in the progeny of the treated generation with long lasting activity in the paddy field. Buprofezin causes no resurgence of hoppers by itself nor with the combination of other insecticides, working rather preventive. The safe properties on non-target organisms and the stable control effects on pest insects have led this compound to a prominent IGR for integrated pest managements in rice crop. Therefore, present investigation was carried out in glasshouse to compare the efficacy of Buprofezin 25SC insecticide sold by the different manufacturers under different trade names against brown plant hopper *Nilaparvata lugens* Stal. (BPH) on rice cultivar TN-1.

Materials and Methods

The experiment was conducted in glasshouse to compare the efficacy of Buprofezin 25SC insecticide sold by the different manufacturers under different trade names against brown plant hopper *Nilaparvata lugens* Stal. (BPH) on rice cultivar TN-1 at Department of Entomology, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India for two cropping seasons during *kharif* 2011 and 2012. The treatment includes the Buprofezin 25SC sold by the different trade names viz., Applaud®, Lapa®, Java® and Apple® by manufacturers Tata Rallis India Pvt. Ltd., Syngenta India Pvt. Ltd., E.I.Du-pont India Pvt. Ltd. and Dhanuka Agrotech Pvt. Ltd., respectively @ 250 g a.i./ha and an untreated control with three replication. The test was conducted in plastic tray size of 42cmx32cmx7cm with the following procedures:

Mass rearing of brown plant hoppers

A laboratory population of *N. lugens* were maintained on the plants of *Oryza sativa* L. (cv:TN1) in pots in glasshouse. The temperature of glasshouse was maintained from 25 to 30°C during the study period. The 2^{nd} and 3^{rd} instar nymphs of BPH from this culture were were used for the infestation.

Seed germination

The seeds of BPH susceptible cultivar TN-1 were kept on plastic petridish containing double layered moist filter papers. Water was added to seeds which were removed after 24 hours. Thereafter, petridish was placed in incubator maintained at 30°C temperature for efficient germination. Sufficient moisture was maintained in each petridish till germinated seeds were sown into tray.

Preparation of seed bed for sowing

The plastic tray (42cm X 32cm X 7cm) was filled with well manured soil up to the sufficient height, so as to maintain 5 cm water level above soil surface. Soil was puddled properly and upper layer was leveled uniformly with the help of a smooth object to facilitate sowing.

Seed sowing and maintenance of seedlings

The germinated seeds of TN-1 were sown through broadcasting methods in plastic tray. After completing the sowing sufficient water was added daily up to the transplanting to ensure the healthy growth of seedlings.

Transplanting of TN-1 seedlings

Twenty one day (21 day) old seedlings were planted in tray with a row to row spacing of 4 cm apart, whereas, distance between seedlings was kept at 3 cm, so that, in each tray 10 rows could be accommodated and each row contained ten seedlings.

Infestation of seedlings with BPH

At 9 days after sowing (DAS) when the seedlings were 30 days old, trays were filled with 5 cm water level after which they were infested with 3rd instars nymphs of BPH from the BPH culture and total number of BPH nymphs per tray was counted.

Insecticide dose calculation and application

Different Four commercial formulations of Buprofezin 25SC were evaluated in this study in three replications. Each tray was considered as a single replication for each treatment. The dose of each insecticide and required water volume was calculated per hectare basis. The amount of each formulated insecticide was measured for the 500 ml of water, and insecticide was dissolved separately in 500 ml of water with proper mixing, before application. Twenty ml of spray volume was taken for the application to each replication of each treatment. In total, two applications were given at weekly interval by the hand sprayer.

The BPH population per tray was recorded before application and at the interval of 1, 3 and 7 days after each application and the percent mortality of BPH was calculated. Number of dead insects was the basis for judging the effectiveness of insecticides. The data thus generated were analysed in Complete Randomized Design (CRD) using STPR-3 software and test of significance as per Gomez and Gomez (1984).

Results and Discussion

Comparative efficacy of different formulations of Buprofezin 25SC during *Kharif* 2011 is presented in table 1, which indicates that per cent mortality of BPH among various treatments ranged from 54.4 to 73.1 % at 1day after Ist application. During this observation Applaud® gave the highest mortality (73.1%) while lowest in Apple® (60.0%). Lapa® and Java® showed 58.7 and 61.4 per cent while 54.4 per cent BPH died in untreated control. During this observation no significant difference was recorded in different treatments. After 3 and 7 days of Ist application mortality increased in all the treatments including untreated control. A further increase in the mortality was recorded at 1, 3 and 7 days after IInd application and during last observation it was significantly higher in case of Applaud®, Apple® and Lapa® as compared to Java® and untreated control. During *kharif* 2012 no significant difference in mortality of BPH was recorded at 1 day after Ist spraying in different treatment (Table 2). However, a wide difference was recorded in different formulations at 3 and 7 days after Ist application. At 3 and 7 days after Ist application Applaud® and Lapa® showed significantly higher mortality as compared to Apple® and Java®. A further increase in the mortality was recorded after IInd application in all the treatments. At 1, 3 and 7 days after IInd application Applaud® and Lapa® showed higher mortality as compared to Apple® and Java®.

Table.1 Comparative efficacy of different formulations of Buprofezin 25SC against *N. lugens* under glasshouse condition during *kharif* 2011

Chemical Name	Trade name	Manufacturer	Dose (g a.i./ha)	% BPH mortality					
				I application			II application		
				1DAS	3DAS	7DAS	1DAS	3DAS	7DAS
Buprofezin 25SC	Applaud®	Tata Rallis	250	73.1(59.4)*a	87.7(69.9)a	91.4(73.1)a	98.0(82.1)c	99.2(85.2)b	99.5(86.2)b
Buprofezin 25SC	Apple®	Dhanuka Agritech Ltd.	250	60.0(50.8)a	72.6(58.9)a	84.0(67.6)a	95.3(77.6)b	98.1(82.1)b	99.1(84.5)b
Buprofezin 25SC	Java®	E.I.Dupont	250	61.4(51.7)a	70.9(58.0)a	82.8(65.8)a	95.2(77.4)b	97.9(81.7)b	98.8(83.6)a
Buprofezin 25SC	Lapa®	Syngenta	250	58.7(50.1)a	82.7(65.5)a	88.5(70.2)a	97.2(80.5)bc	98.1(82.1)b	99.1(84.7)b
Control	-	-	-	54.4(47.6)a	77.5(61.7)a	83.2(65.7)a	89.7(71.2)a	92.8(74.7)a	94.3(77.3)a
S.Em.±	-	-	-	NS	NS	NS	1.1	1.3	2.0
CD at 5%	-	-	-	NS	NS	NS	3.6	4.3	6.4

* Figures within parenthesis are angular transformed values. NS= Not significant. DAS = Day after spraying
Means followed by a common letter in a column are not significantly different from each other by DMRT

Table.2 Comparative efficacy of different formulations of Buprofezin 25SC against *N. lugens* under glasshouse condition during *kharif* 2012

Chemical Name	Trade name	Manufacturer	Dose (g a.i./ha)	% BPH mortality					
				I application			II application		
				1DAS	3DAS	7DAS	1DAS	3DAS	7DAS
Buprofezin 25SC	Applaud®	Tata Rallis	250	28.1(31.0)*a	73.1(59.0)c	89.8(71.5)c	92.7(74.4)c	96.0(79.1)c	97.8(83.9)c
Buprofezin 25SC	Apple®	Dhanuka Agritech Ltd.	250	13.1(19.6) a	38.3(38.0)b	62.6(52.4)b	75.6(60.5)bc	80.5(63.9)bc	89.4(71.0)bc
Buprofezin 25SC	Java®	E.I.Dupont	250	7.6(15.8)a	19.6(26.1)ab	57.6(49.4)b	70.4(57.3)b	75.3(60.4)b	82.2(65.4)b
Buprofezin 25SC	Lapa®	Syngenta	250	13.4(21.4)a	71.2(57.6)c	87.4(69.1)c	91.2(72.8)c	93.6(75.3)bc	96.0(78.5)bc
Control	-	-	-	3.8(11.1)a	9.9(17.9)a	17.5(24.3)a	23.2(28.6)a	30.5(33.2)a	36.4(36.8)a
S.Em.±	-	-	-	NS	4.3	3.9	3.8	4.4	4.8
CD at 5%	-	-	-	NS	15.7	14.4	14.0	15.9	17.5

* Figures within parenthesis are angular transformed values. NS= Not significant. DAS = Day after spraying
Means followed by a common letter in a column are not significantly different from each other by DMRT

During last observation maximum mortality was observed in Applaud® (97.8%) followed by Lapa® (96.0%), Apple® (89.4%) and Java® (82.2%). The present study is in line with the findings of Heinrichs (1984) who reported that buprofezin (Applaud) was highly selective and effective at low rates against nymphs of *N. lugens, S. furcifera* and *Nephotettix virescens* (Distant).Wang *et al.*, (2008) reported that buprofezin was effective against homopteran insect pests, such as planthopper with very low risks to environment and human beings. He further, stated that buprofezin was recently recommended as one of the alternatives for highly toxic organophosphorous insecticides for controlling important insects on rice and also cautioned that over use of buprofezin might induce resistance. To avoid development of resistance to buprofezin, the chemicals may be alternated with other effective molecules.

Results revealed that Applaud® was highly effective against BPH followed by Lapa®, Apple® and Java®.

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