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Evaluation of an insect growth regulator buprofezin 70 DF for eco-friendly management of rice brown planthopper, *Nilaparvata lugens* (Stal)

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Abstract
Studies on bio-efficacy of new formulation of buprofezin 70% DF was conducted during *kharif* 2014-15 and 2015-16 for two years at Krishi Vigyan Kendra, Gangavathi and the results revealed that, buprofezin 70% DF @ 175g a.i/ha was optimum to manage BPH incidence effectively up to 15 days after spraying and found on par with buprofezin 25%SC @ 200g a.i/ha and superior over Ace hate 75%SP @ 750g a.i/ha. Buprofezin 70%DF found non phytotoxic to rice crop. As the new formulation is dry flow able form the dosage per liter is less compared to old formulation and it has fine particle size giving good coverage.

Keywords: Brown plant hopper, buprofezin 70 DF, growth regulator

Introduction
Rice (*Oryza sativa* L.) is an important staple food crop for more than two third of the population of India and the total area under rice in Karnataka is 1.42 m ha with an annual production of 3.5 million tonnes and the productivity is about 2.63 tons per ha [1]. Among so many biotic and abiotic constraints of rice production insect, mite and nematode pests are the key biotic stresses limiting rice production in India, Over 100 species of insect pests attack the rice crop at various stages of its growth, of which 20 are economically important [3]. Among the major insect pests, brown planthopper *Nilaparvatha lugens* (Stal) (BPH) is predominant in Tungabhadra project area of North Karnataka. However, BPH cause huge crop loss of 10-70 per cent [5]. Homopterous insect brown plant hopper (BPH) 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 [2]. 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. Buprofezin is especially effective against homopteran pests, such as planthopper [8], 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 plant hoppers and leafhoppers without any adverse effects on their predators and parasitoids. Since the chemical inhibits larval molting, egg-laying and/or induces oviposit ion of unmatchable 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, the experiment was conducted to evaluate the effectiveness of buprofezin 70 DF an insect growth regulator for eco-friendly management of brown planthopper as strategic research for possibility of incorporating this in Integrated Pest Management Programme in rice cultivation.

Materials and Methods

Experiment was carried out at Krishi Vigyan Kendra, Gangavati, UAS Raichur, Karnataka during *kharif* 2014 and 2015 in a Randomized block design with 5 treatments and 4 replications. The insecticide was applied when the population of pest reached ETL.

Table 1: Treatment details for bio efficacy studies

Sl. No.	Treatments	Dosage/ha	
		G.A.I	Formulation
T1	Buprofezin 70%DF	150	214.3g
T2	Buprofezin 70%DF	175	250g
T3	Buprofezin 25% SC	200	800ml
T4	Acephate 75% SP	750	1000g
T5	Untreated Control	-	---

Method of observations

The observations on brown plant hopper was recorded by counting the number of hoppers per hill in 10 randomly selected hills in each plot before spray, 3, 5, 10 and 15 days after each spray.

Phytotoxicity

The observations on phytotoxicity symptoms *viz*., leaf injury on tips and leaf surface, wilting, necrosis, vein clearing, epinasty, hyponasty etc. were recorded before & 3, 7 and 15 days after first spray following 0-10 visual rating score as mentioned below.

Score	Per cent leaves / plants with phytotoxicity symptom	Score	Per cent leaves / plants with phytotoxicity symptom
0	0	6	51-60
1	1-10	7	61-70
2	11-20	8	71-80
3	21-30	9	81-90
4	31-40	10	91-100
5	41-50		

An observation on population of brown plant hopper was taken at pre treatment and post treatment at regular intervals and data was analyzed statistically.

Results

Bio efficacy of buprofezin 70% DF on brown planthopper

The brown plant hopper population ranged from 28.13 to 32.16 hoppers per hill before spraying. Buprofezin 70% DF @ 175g a.i./ha treatment recorded lowest BPH population (5.23 hoppers/hill) and was found significantly superior over standard check treatments including lower dose of same test sample at 15 days after 1st spraying. Buprofezin 25 SC was found on par with buprofezin 70 DF at 175g. A.I with a population of 6.13 hoppers per hill. Untreated control recorded a high population of 47.32 hoppers per hill after 15 days after spray. Similar trend was found after the second spray (Table 2).

The brown plant hopper population ranged from 30.20 to 31.15 hoppers per hill before spraying. Buprofezin 70% DF @ 175g a.i./ha treatment recorded lowest BPH population (9.22 hoppers/hill) followed by buprofezin 25 SC (10.23 hoppers/hill) and was found significantly superior over standard check treatments including lower dose of same test sample at 15 days after 1st spraying. Untreated control recorded a high population of 58.30 hoppers per hill after 15 days after spray. Similar trend was found after the second spray (Table 2a).

Grain Yield

Buprofezin 70% DF @ 175g a.i./ha recorded the maximum grain yield of 64.22 quintals/ha and lower dose of buprofezin 70% DF @ 150g a.i./ha (60.39 q/ha) and the standard checks, buprofezin 25% SC @ 800g a.i./ha (63.47 q/ha) and ace hate 75% SP @ 750g a.i./ha recorded lowest grain yield of 58.84 q/ha which was next best to untreated control (48.31 q/ha) (Table 2).

Buprofezin 70% DF @ 175g A.I./ha recorded the maximum grain yield of 65.50 quintals/ha and lower dose of buprofezin 70% DF @ 150g a.i./ha (63.30 q/ha) and the standard checks, buprofezin 25%SC @ 800g a.i./ha (64.60 q/ha) and ace hate 75% SP @ 750g a.i./ha recorded lowest grain yield of 58.65 q/ha which was next best to untreated control (46.57 q/ha) (Table 2a).

Table 2: Effect of Buprofezin 70% DF against rice brown plant hopper (Kharif 2014)

Sl. No.	Treatments	Dosage/ha (G.AI/ha)	BPH/hill during 1st spray					BPH/hill during 2nd spray				Yield
			Before	3 DAS	5 DAS	10 DAS	15 DAS	3 DAS	5 DAS	10 DAS	15 DAS	(q/ha)
T1	Buprofezin 70% DF	150	30.32	24.22	19.55	14.52	16.42	11.30	7.45	5.64	10.74	60.39
			(5.54)	(4.97)	(4.48)	(3.88)	(4.11)	(3.51)	(2.91)	(2.58)	(3.42)	
T2	Buprofezin 70% DF	175	32.16	19.12	6.13	5.23	9.63	5.74	3.52	2.46	1.67	64.22
			(5.71)	(4.37)	(2.57)	(2.39)	(3.18)	(2.59)	(2.13)	(1.86)	(1.63)	
T3	Buprofezin 25% SC	200	29.35	20.22	8.16	6.13	9.32	6.74	4.42	3.38	2.52	63.47
			(5.46)	(4.48)	(2.83)	(2.43)	(2.81)	(2.56)	(1.98)	(1.68)	(1.55)	
T4	Acephate 75% SP	750	28.13	25.13	19.66	18.13	16.25	12.50	8.78	11.74	21.68	58.84
			(5.35)	(5.05)	(4.47)	(4.26)	(4.06)	(3.67)	(3.13)	(3.57)	(4.76)	
T5	UTC	---	30.12	36.52	40.56	47.32	51.23	59.12	63.30	57.82	49.88	48.31

Table 2a: Effect of Buprofezin 70% DF against rice brown planthopper (Kharif 2015)

Sl. No.	Treatments	Dosage/ha (g.ai/ha)	BPH/hill during 1st spray					BPH/hill during 2nd spray				Yield
			Before	3 DAS	5 DAS	10 DAS	15 DAS	3 DAS	5 DAS	10 DAS	15 DAS	(q/ha)
T1	Buprofezin 70% DF	150	30.20 (5.54)	26.12 (5.16)	18.15 (4.26)	12.84 (3.6)	14.30 (3.85)	13.22 (3.69)	9.40 (3.11)	7.35 (2.77)	13.20 (3.70)	63.30
T2	Buprofezin 70% DF	175	31.15 (5.61)	19.10 (4.36)	9.00 (3.07)	7.10 (2.76)	9.22 (3.10)	8.20 (2.95)	5.50 (2.43)	4.10 (2.12)	2.75 (1.79)	65.50
T3	Buprofezin 25% SC	200	30.25 (5.55)	20.21 (4.46)	9.12 (3.02)	7.24 (2.68)	10.23 (3.43)	8.46 (2.85)	6.12 (2.47)	4.86 (2.20)	3.12 (1.76)	64.60
T4	Acephate 75% SP	750	31.10 (5.62)	22.40 (4.78)	17.34 (4.22)	16.44 (4.08)	28.32 (5.34)	24.15 (4.95)	21.90 (4.71)	16.52 (4.09)	18.2 (4.26)	58.65
T5	UTC	-	30.50 (5.57)	41.22 (6.44)	46.15 (6.83)	52.62 (7.29)	58.30 (7.67)	55.10 (7.45)	62.20 (7.92)	58.40 (7.67)	64.35 (8.05)	46.57
	SEm ±		0.09	0.27	0.25	0.25	0.29	0.26	0.21	0.21	0.27	0.37
	CD		0.28	0.80	0.74	0.74	0.87	0.80	0.64	0.63	0.82	1.12

Pooled Data

Pooled data of both years clearly revealed that buprofezin 70% DF @ 175 g.a.i is optimum in controlling the brown planthopper from reaching ETL even after 15 days after spraing and which is on par with earlier formulation buprofezin 25 SC (Table 2b).

Table 2b: Effect of insecticide Buprofezin 70% DF against rice brown planthopper (Pooled data)

Sl. No.	Treatments	Dosage/ha (GA.I./ha)	BPH/hill during 1st spray					BPH/hill during 2nd spray				Yield
			Before	3 DAS	5 DAS	10 DAS	15 DAS	3 DAS	5 DAS	10 DAS	15 DAS	(q/ha)
T1	Buprofezin 70% DF	150	30.26	25.17	18.85	13.68	15.36	12.26	8.43	6.50	11.97	61.85
			(5.54)	(5.05)	(4.40)	(3.75)	(3.96)	(3.60)	(3.01)	(2.68)	(3.56	
T2	Buprofezin 70% DF	175	31.66	19.11	7.57	6.17	9.43	6.97	4.61	3.28	2.21	64.86
			(5.67)	(4.40)	(2.83)	(2.57)	(3.14)	(2.77)	(2.28)	(1.99)	(1.71)	
T3	Buprofezin 25% SC	200	29.80	20.22	8.64	6.69	9.78	7.60	5.27	4.12	2.82	64.03
			(5.50)	(4.43)	(2.93)	(2.56)	(3.12)	(2.71)	(2.23)	(1.94)	(1.66)	
T4	Acephate 75% SP	750	29.62	23.77	18.50	17.29	22.29	25.26	23.06	19.04	18.72	58.75
			(5.49)	(4.93)	(4.31)	(4.18)	(4.73)	(5.06)	(4.85)	(4.36)	(4.34)	
T5	UTC	---	30.31	38.87	43.36	49.97	54.77	57.11	62.75	58.11	57.12	47.44
			(5.55)	(6.26)	(6.60)	(7.10)	(7.43)	(7.59)	(7.72)	(7.66)	(7.58)	
	SEm ±		0.09	0.25	0.24	0.25	0.25	0.28	0.25	0.22	0.24	0.37
	CD		0.26	0.78	0.75	0.77	0.77	0.86	0.77	0.68	0.73	1.12

Phytotoxicity

Buprofezin 70% DF at all the doses tested did not show any of the phytotoxicity symptoms on the crop at all the intervals of observations (Tables 3)

Table 3: Phytotoxicity of insecticide Buprofezin 70% DF on rice

Sl. No	Treatments	Dosage/ha (GA.I.)	Phytotoxicity particulars (mean of four replications)					
			Leaf tip injury	Wilting	Vein clearing	Necrosis	Epinasty	Hyponasty
T1	Buprofezin 70% DF	175	0	0	0	0	0	0
T2	Buprofezin 70% DF	350	0	0	0	0	0	0
T3	Buprofezin 70% DF	700	0	0	0	0	0	0
T4	Buprofezin 25% SC	200	0	0	0	0	0	0
T5	Untreated control	---	0	0	0	0	0	0

Discussion

There are no reports regarding the efficacy of the formulation, Dry Flowable (DF) of buprofezin against brown planthopper in rice used in the present study (buprofezin 70% DF). However regarding the other formulations In Thailand, effective control of cotton leafhopper, *Amrasca biguttula* (Ishida) with buprofezin 10% WP [4]. Buprofezin as most effective insecticide in Faisalabad, Pakistan against nymph population of whitefly may supported the present findings [6]. buprofezin 25% SC caused significant reduction of cotton leafhopper (*A. devastans*) on cotton in Guntur of Andhra Pradesh [7]. There is no report regarding the use of buprofezin in rice. However, the literature clearly indicates its efficacy against jassid in other crops which are in line with the findings of the present investigation. Moreover, the investigation also depicted the efficacy of the new formulation against brown plant hopper in rice which is having fine particle size which helps in good coverage of insecticide on plant. New formulations are always helpful in monitoring insecticide resistance. Since the quantity of insecticide required is less it is good for environment and human health. As the new formulation is dry flow able form the dosage per liter is less compared to old formulation and it has fine particle size giving good coverage. So buprofezin 70 DF can be recommended for the management of rice brown planthopper and best suits in IPM

Summary and conclusion.

Studies on bio-efficacy of Buprofezin 70%DF during kharif 2014 and 2015 revealed that, Buprofezin 70%DF @ 175g

a.i./ha was optimum to manage BPH incidence effectively up to 15 days after spraying and was found effective dosage. It was found on par with buprofezin 25% SC @ 200g a.i/ha and superior over Ace hate 75% SP @ 750g a.i/ha. Buprofezin 70% DF found non phytotoxic to rice crop.

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References

1. Anonymous. Progress Report Directorate of Rice Research, Hyderabad, Andhra Pradesh, 2015.
2. Grayson B.T, Green M.B, Copping L.G. Buprofezin a Reliable IGR for the Control of Rice Pests *Pest Management in Rice*, 1990, 210-222.
3. Kalode M.B, I.C Pasalu. Pest management in rice, Indian Farming. 1986; 9:31-34.
4. Kittiboonya S, Sahaya S, Jee-rajunya K. Efficacy test of some insecticides for controlling cotton leafhopper, *Amrasca biguttula* (Ishida), *Entomology and Zoology Gazette.* 2002; 24(1):39-47.
5. Kulshreshta J.P. Field problems in 2. Brown planthopper epidemics in Kerala (India), Rice Entomological Newsletter. 1974; 1:3-4.
6. Nadeem M.K, Nadeem S, Hasnain M, Ahmed S, Ash-faq M. Comparative Efficacy of some Insecti-cides against cotton whitefly *Bemisia Tabaci* (Gennadius) (Homoptera: Aleyrodidae) under natural field conditions *Nucleus* 2011; 48(2):159.
7. Ramalakshmi V, Rao G.M.V.P, Madhumathi T. Bioefficacy of novel insecticides against Cotton Leafhopper, *Amrasca devas tans Annals of Plant Protection Science.* 2012; 20(2):280-282.
8. Wang Y, Gao C, Shen J, Zhang J, Huang Y, Li W *et al.* Buprofezin resistance selection, susceptibility survey and analysis of fitness costs in *Nilaparvata lugens* (Homoptera: Delphacidae) *Management Science*. 2008; 64:1050-1056.