

Evaluation of Bio Efficacy of Insecticides Against Sucking Pests of Rice and their Effects on Natural Enemies

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ABSTRACT

Field experiment was conducted at research farm of Indira Gandhi Krishi Vishwa Vidyalaya, Raipur to evaluate the bio-efficacy of insecticides against sucking pests of rice during two *kharif* season 2011-12 and 2012-13. The new chemical insecticide MAIBA -01SC was evaluated for its bio efficacy against sucking insect pests like BPH, GLH and WBPH of Rice in the department of Entomology, IGKV, Raipur during the year 2011-12 and 2012-13 in *Kharif* season. During the bio efficacy trial, the effect of all tested doses of MAIBA -01SC-1500 effectively control the population of BPH, GLH and WBPH in Rice. It was also observed that MAIBA -01SC-1500 at all dosages levels tested for bio efficacy has no influence/effect on the natural enemy under field condition.

Key words Rice pests, rice.

Chhattisgarh State is known as the rice bowl of India because nearly 74-76 per cent area during rainy season is under rice cultivation. In Chhattisgarh there are 5 agro-ecosystems in which rice is cultivated with different practices (Anonymous, 2009 Two species of green leaf hopper, *Nephotettix virescens* (Distant) and *N. nigropictus* (Stal.) are most common in upland transplanted rice ecosystem at Raipur rice agro-ecosystem. Both nymphs and adults suck the sap from the phloem. While direct damage seldom causes economic loss, viral disease (rice tungro, grassy stunt and yellow orange leaf) transmitted by both the species results in economic loss. Particularly in tungro endemic areas, suitable prophylactic measures need to be taken up. Pest outbreaks are sudden explosive increases in a pest population which are often associated with changes in the ecosystem caused by external environmental disturbances include very dry weather, elevated temperatures, floods, gales, and pesticide sprays (Heong, 2009). Two species viz., Brown plant hopper (BPH), *Nilaparvata lugens* (Stal.), white backed plant hopper (WBPH), *Sogatella furcifera* (Horvath) (Hemiptera: Delphacidae) are of economic importance. Besides direct damage to crop by nymphs and adults sucking phloem sap and leading to hopper burn, BPH also transmits viral disease like rice ragged stunt virus and rice grassy stunt virus (Watanabe & Kitagawa, 2000). In Chhattisgarh, BPH has assumed greater importance due to its severe outbreak in 1975 and consequent yield losses reported to the extent of 34.3 per cent (Gangrade *et al.*, 1978). In 1960s and 1970s, with the beginning of green revolution, the cropping

systems and cultural practices were mostly focused to achieve higher yield using huge amount of chemical fertilizers in rice varieties, while the excessive use of nitrogen fertilizer was considered to be one of the key factors in shifting of BPH from minor to major insect pest (Dyck and Thomas, 1979). The brown planthopper, *Nilaparvata lugens* (BPH), is one of the major pests of rice and damage to the rice crop is caused directly by feeding on the phloem (Sogawa, 1982) and indirectly by transmitting plant viral diseases like grassy stunt and wilted stunt viruses. Resurgence of brown planthopper (BPH), *Nilaparvata lugens* (Stål.) after insecticide application is a common phenomenon in rice in south east Asia including south India. The aim of this study was to determine the effects of insecticides on pests and natural enemies in rice field between the developments stages of rice. It is hoped that the findings from the study can contribute to the more ecological precise ways in dealing with outbreaks and control of insect pests of rice. In order to evolve effective and economic pest control, it is necessary to evaluate the new groups and new formulations of chemicals. Hence, the present study was undertaken.

MATERIAL AND METHODS

Observations on population of Brown plant hopper (*Nilaparvata lugens*) and Green leaf hopper, was recorded at pretreatment and post treatment from ten randomly selected plants and the data were converted into population per hill. Yield per plot (size 4X6 m²) was recorded and converted into quintal/ha. Phytotoxicity symptoms on epinasty, hyponasty, yellowing and stunting etc. were recorded in 0 – 10 scale at 1, 3, 7 and 14 days after treatment, where 0 = No phytotoxicity and 100 = complete killed were also recorded. Rice variety swarna were growing with spacing 10X15 cm in both *kharif* season 2011-12 and 2012-13. Randomized block design were used with three replication and 8 treatments. The cumulative data were statistically analyzed after appropriate transformation (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Average pest population per hill:

It is evident from observations, the brown plant hopper population ranged between 5.06 (2.34) to 6.83 (2.71) and 5.80 (2.50) to 6.60 (2.66) per hill respectively during *kharif* 2011-12 and 2012-13 (table – 2 & 3). The number of insects per hill was almost uniform in all the treatments and statistically no significant difference was observed. After post treatment observations (3, 5, 7 and 10 days after 1st

Table 1. Insecticidal treatments (name) along with dosages.

S. No.	Insecticides	Dosage (ml/ha)
1	MAIBA -01SC	1000
2	MAIBA -01SC	1250
3	MAIBA -01SC	1500
4	MAIBA -01SC	2500* (For phytotoxicity)
5	MAIBA -01SC	5000*(For phytotoxicity)
6	Acephate 75 SP	1000
7	Buprofezin 25 SC	800
8	Imidacloprid 17.8 SL	125
9	Untreated control	-

* For phytotoxicity and effect on natural enemies only

and 2nd spray of 2011-12 and 12-13) all the tested doses of insecticides were found significantly superior over untreated control. During this period MAIBA-01 SC-1500 ml/ha was found to be the best effective treatment and minimized the BPH population, whereas Buprofezin 25% SC @ 800 ml/ha was recorded the least effective treatment.

Data (table – 4& 5) revealed that in pretreatment observations, the green leaf hopper population ranged

between 8.87 (3.06) to 10.10 (3.25) per hill and 6.73 (2.68) to 7.10 (2.75) per hill respectively during *kharif* 2011-12 and 2012-13. The number of insects per hill was almost uniform in all the treatments and statistically no significant difference was observed. After post treatment observations (3, 5, 7 and 10 days after 1st and 2nd spray of 2011-12 and 12-13) all the tested doses of insecticides were found significantly superior over untreated control. During this period MAIBA-01 SC-1500 ml/ha was found to be the best effective

Table 2. Average number of brown plant hopper population per hill after first, second and third spray during *kharif* 2011-12

Treatments	Dose g.a.i./ha	Pre treatment	Post treatments														
			First Spray					Second Spray					Third Spray				
			3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean
MAIBA-01 SC	1000	5.00 (2.34)	3.23 (1.65)	3.00 (1.87)	2.97 (1.86)	3.00 (1.87)	3.05 (1.81)	2.60 (1.76)	2.30 (1.67)	2.13 (1.62)	1.73 (1.49)	2.19 (1.64)	1.70 (1.48)	1.63 (1.45)	1.53 (1.42)	1.50 (2.00)	1.59 (1.59)
MAIBA-01 SC	1250	6.83 (2.71)	2.90 (1.84)	2.57 (3.07)	2.23 (1.65)	2.00 (1.58)	2.43 (2.04)	2.00 (1.58)	1.67 (1.47)	1.53 (1.42)	1.40 (1.37)	1.65 (1.46)	1.40 (1.37)	1.30 (1.37)	1.27 (1.33)	1.10 (1.26)	1.27 (1.33)
MAIBA-01 SC	1500	5.80 (2.50)	2.33 (1.68)	2.20 (1.64)	1.70 (1.48)	1.43 (1.38)	1.92 (1.55)	1.37 (1.36)	1.13 (1.27)	1.00 (1.22)	1.03 (1.23)	1.13 (1.27)	1.00 (1.22)	0.93 (1.19)	0.87 (1.17)	0.77 (1.12)	0.89 (1.18)
Acephate 75 SP	1000	5.63 (2.47)	3.87 (2.09)	3.57 (2.01)	3.00 (1.87)	3.97 (2.11)	3.60 (2.02)	3.17 (1.91)	2.97 (1.86)	2.93 (1.85)	2.80 (1.81)	2.97 (1.86)	2.70 (1.78)	2.60 (1.76)	2.50 (1.73)	2.43 (1.71)	2.56 (1.75)
Buprofezin 25% SC	800	5.23 (2.39)	3.13 (1.90)	3.00 (1.91)	2.90 (1.84)	2.47 (1.71)	2.88 (1.84)	2.13 (2.63)	2.10 (1.61)	2.00 (1.58)	1.93 (1.55)	2.04 (1.84)	1.93 (1.55)	1.80 (1.51)	1.73 (1.49)	1.60 (1.44)	1.77 (1.50)
Imidacloprid 17.8% SL	125	6.13 (2.57)	3.23 (1.93)	3.17 (1.91)	3.00 (1.87)	2.93 (1.85)	3.08 (1.89)	2.63 (1.76)	2.33 (1.68)	2.13 (2.63)	2.03 (1.59)	2.28 (1.92)	1.90 (1.54)	1.73 (1.49)	1.60 (1.44)	1.53 (1.42)	1.69 (1.47)
Untreated control	-	5.73 (2.49)	6.83 (2.70)	7.00 (2.87)	6.90 (2.72)	6.80 (2.70)	6.88 (2.75)	7.13 (2.76)	6.67 (2.67)	6.80 (2.70)	5.73 (2.49)	6.58 (2.66)	5.30 (2.40)	5.67 (2.48)	5.87 (2.52)	5.90 (2.52)	5.69 (2.48)
SE (m)		0.30	0.12	0.10	0.10	0.09		0.11	0.09	0.10	0.12		0.12	0.09	0.10	0.09	
CD at 5%		NS	0.38	0.31	0.30	0.27		0.33	0.28	0.31	0.37		0.37	0.28	0.30	0.27	

() Figures in parentheses are square root transformed values

Table 3. Average number of brown plant hopper population per hill after first, second and third spray during *kharif* 2012-13

Treatments	Dose g.a.i./ha	Pre-treatment	Post treatments															
			First Spray					Second Spray					Third Spray					
			3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean	
MAIBA-01 SC	1000		6.17 (2.58)	3.63 (2.00)	3.07 (1.88)	2.90 (1.84)	2.73 (1.79)	3.08 (1.88)	2.63 (1.76)	2.53 (1.74)	2.37 (1.69)	2.13 (1.62)	2.42 (1.70)	1.93 (1.55)	1.83 (1.52)	1.70 (1.48)	1.53 (1.42)	1.75 (1.49)
MAIBA-01 SC	1250		6.13 (2.57)	3.03 (1.87)	2.67 (1.78)	2.43 (1.71)	2.30 (1.67)	2.61 (1.76)	1.93 (1.55)	1.80 (1.51)	1.70 (1.48)	1.50 (1.41)	1.73 (1.49)	1.63 (1.45)	1.50 (1.41)	1.30 (1.34)	1.33 (1.35)	1.44 (1.39)
MAIBA-01 SC	1500		5.80 (2.50)	2.70 (1.87)	2.27 (1.66)	2.03 (1.59)	2.00 (1.58)	2.25 (1.68)	1.60 (1.44)	1.37 (1.36)	1.23 (1.31)	1.17 (1.29)	1.34 (1.35)	1.00 (1.22)	0.87 (1.17)	0.80 (1.14)	0.70 (1.09)	0.84 (1.16)
Acephate 75 SP	1000		5.90 (2.52)	2.13 (1.78)	2.00 (1.58)	1.80 (1.51)	1.63 (1.45)	1.89 (1.58)	1.03 (1.23)	0.83 (1.15)	0.80 (1.14)	0.70 (1.09)	0.84 (1.15)	0.83 (1.15)	0.80 (1.14)	0.70 (1.09)	0.70 (1.09)	0.76 (1.12)
Buprofezin 25% SC	800		6.17 (2.58)	3.63 (2.03)	3.20 (1.92)	3.03 (1.87)	2.97 (1.86)	3.21 (1.92)	2.83 (1.82)	2.67 (1.78)	2.43 (1.71)	2.13 (1.62)	2.52 (1.73)	2.03 (1.59)	1.90 (1.54)	1.60 (1.44)	1.43 (1.38)	1.74 (1.49)
Imidacloprid 17.8% SL	125		6.37 (2.62)	3.90 (2.09)	3.70 (2.04)	3.63 (2.03)	3.13 (1.90)	3.59 (2.02)	3.03 (1.87)	2.93 (1.85)	2.73 (1.79)	2.73 (1.79)	2.86 (1.83)	2.43 (1.71)	2.40 (1.70)	2.37 (1.69)	2.10 (1.61)	2.33 (1.68)
Untreated control	-		6.60 (2.66)	6.67 (2.67)	6.70 (2.68)	6.87 (2.71)	6.00 (2.54)	6.56 (2.65)	6.13 (2.57)	6.10 (2.56)	6.13 (2.57)	6.23 (2.59)	6.15 (2.57)	5.90 (2.52)	5.80 (2.50)	6.00 (2.54)	6.03 (2.55)	5.93 (2.53)
SE (m)			0.18	0.07	0.08	0.07	0.08		0.06	0.06	0.07	0.08		0.09	0.06	0.07	0.08	
CD at 5%			NS	0.22	0.24	0.21	0.24		0.19	0.18	0.22	0.25		0.27	0.19	0.22	0.24	

() Figures in parentheses are square root transformed values

Table 4. Average number of green leaf hopper population per hill after first, second and third spray during *kharif* 2011-12

Treatments	Dose g.a.i./ha	Pre-treatment	Post treatments															
			First Spray					Second Spray					Third Spray					
			3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean	
MAIBA-01SC	1000		10.10 (3.25)	6.67 (2.67)	6.33 (2.51)	5.97 (2.34)	5.83 (2.34)	6.20 (2.47)	5.73 (2.49)	5.50 (2.44)	5.20 (2.38)	5.00 (2.34)	5.36 (2.41)	4.87 (2.31)	4.70 (2.28)	4.60 (2.25)	4.10 (2.14)	4.57 (2.28)
MAIBA-01SC	1250		9.87 (3.22)	6.43 (2.63)	6.10 (2.56)	5.70 (2.48)	5.53 (2.45)	5.94 (2.53)	5.13 (2.37)	4.90 (2.32)	4.76 (2.29)	4.60 (2.25)	4.85 (2.31)	4.53 (2.24)	4.23 (2.17)	3.90 (2.09)	3.87 (2.09)	4.13 (2.15)
MAIBA-01SC	1500		9.90 (3.22)	5.23 (2.39)	5.00 (2.34)	4.40 (2.21)	4.23 (2.17)	4.72 (2.28)	4.00 (2.12)	3.96 (2.11)	3.70 (2.04)	3.60 (2.02)	3.82 (2.07)	3.53 (2.00)	3.13 (1.90)	3.00 (1.87)	3.10 (1.89)	3.19 (1.92)
Acephate 75 SP	1000		8.87 (3.06)	7.10 (2.75)	6.97 (2.73)	6.60 (2.66)	6.37 (2.62)	6.76 (2.69)	6.63 (2.67)	6.53 (2.65)	6.40 (2.62)	5.90 (2.52)	6.37 (2.62)	5.80 (2.50)	5.73 (2.49)	5.70 (2.48)	5.53 (2.45)	5.69 (2.48)
Buprofezin 25 % SC	800		9.90 (3.22)	6.13 (2.57)	6.00 (2.54)	5.73 (2.49)	5.60 (2.46)	5.87 (2.52)	5.20 (2.38)	5.00 (2.34)	4.70 (2.28)	4.30 (2.41)	4.80 (2.35)	4.60 (2.25)	4.43 (2.22)	4.30 (2.19)	4.00 (2.12)	4.33 (2.20)
Imidacloprid 17.8% SL	125		9.73 (3.19)	6.60 (2.66)	6.17 (2.58)	5.83 (2.51)	5.77 (2.50)	6.09 (2.56)	5.63 (2.47)	5.40 (2.42)	5.00 (2.34)	4.60 (2.25)	5.16 (2.37)	4.60 (2.25)	4.43 (2.22)	4.33 (2.19)	4.03 (2.13)	4.35 (2.20)
Untreated control	-		9.67 (3.18)	9.90 (3.22)	10.00 (3.22)	9.67 (3.18)	9.57 (3.17)	9.79 (3.20)	8.83 (3.05)	8.90 (3.06)	9.00 (3.08)	9.00 (3.20)	8.93 (3.10)	9.80 (3.20)	9.00 (3.08)	9.13 (3.10)	8.93 (3.07)	9.22 (3.11)
SE (m)			0.12	0.09	0.10	0.08	0.09		0.09	0.08	0.06	0.07		0.07	0.08	0.07	0.08	
CD at 5%			NS	0.27	0.30	0.25	0.28		0.27	0.24	0.20	0.21		0.22	0.25	0.22	0.24	

() Figures in parentheses are square root transformed values

Table 5. Average number of green leaf hopper population per hill after first, second and third spray during *kharif* 2012-13

Treatments	Dose g.a.i./ha	Pre treatment	Post treatments														
			First Spray					Second Spray					Third Spray				
			3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean
MAIBA-01 SC	1000	7.10 (2.75)	4.83 (2.30)	4.70 (2.28)	4.10 (2.14)	4.00 (2.12)	4.41 (2.21)	3.43 (1.98)	3.13 (1.90)	3.00 (1.87)	2.83 (1.82)	3.10 (1.89)	2.73 (1.79)	2.50 (1.73)	1.87 (1.53)	1.77 (1.50)	2.22 (1.64)
MAIBA-01 SC	1250	6.77 (2.69)	4.13 (2.15)	4.47 (2.22)	3.70 (2.04)	3.40 (1.97)	3.93 (2.10)	3.10 (1.89)	2.87 (1.83)	2.83 (1.82)	2.63 (1.76)	2.86 (1.83)	2.53 (1.74)	2.33 (1.68)	1.60 (1.44)	1.43 (1.38)	1.97 (1.56)
MAIBA-01 SC	1500	7.00 (2.73)	4.00 (2.12)	3.87 (2.09)	3.43 (1.98)	3.10 (1.89)	3.60 (2.02)	2.10 (1.61)	2.10 (1.61)	2.03 (1.59)	2.03 (1.59)	2.07 (1.60)	2.13 (1.62)	2.03 (1.59)	1.10 (1.26)	1.00 (1.22)	1.57 (1.42)
Acephate 75 SP	1000	6.73 (2.68)	3.80 (2.07)	3.33 (1.95)	3.00 (1.87)	2.73 (1.79)	3.22 (1.92)	2.03 (1.59)	1.73 (1.49)	1.60 (1.44)	1.50 (1.41)	1.72 (1.48)	1.63 (1.54)	1.40 (1.37)	0.83 (1.15)	0.80 (1.14)	1.17 (1.30)
Buprofezin 25% SC	800	7.00 (2.73)	4.97 (2.33)	4.70 (2.28)	4.67 (2.27)	4.13 (2.15)	4.62 (2.26)	4.00 (2.12)	3.93 (2.10)	3.60 (2.02)	3.70 (2.04)	3.81 (2.07)	3.73 (2.05)	3.67 (2.04)	3.40 (1.97)	3.53 (2.00)	3.58 (2.02)
Imidacloprid 17.8% SL	125	7.10 (2.75)	5.13 (2.37)	5.00 (2.34)	5.10 (2.36)	4.67 (2.27)	4.98 (2.34)	4.53 (2.24)	4.67 (2.27)	4.60 (2.25)	4.50 (2.23)	4.58 (2.25)	4.53 (2.24)	4.40 (2.21)	4.83 (2.30)	4.73 (2.28)	4.62 (2.26)
Untreated control	-	6.90 (2.72)	6.93 (2.72)	7.00 (2.73)	7.80 (2.88)	7.30 (2.79)	7.26 (2.78)	7.23 (2.78)	6.93 (2.72)	7.10 (2.75)	7.13 (2.76)	7.10 (2.75)	7.83 (2.88)	7.10 (2.75)	7.37 (2.80)	7.53 (2.83)	7.46 (2.82)
SE (m)		0.18	0.06	0.07	0.07	0.06		0.08	0.06	0.09	0.07		0.07	0.08	0.07	0.06	
CD at 5%		NS	0.19	0.21	0.22	0.18		0.24	0.18	0.27	0.21		0.21	0.24	0.21	0.18	

() Figures in parentheses are square root transformed values

Table 6. Average number of white back plant hopper population per hill after first, second and third spray during *kharif* 2011-12

Treatments	Dose g.a.i./ha	Pre treatment	Post treatments														
			First Spray					Second Spray					Third Spray				
			3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean
MAIBA -01SC	1000	5.70 (2.48)	4.13 (2.15)	3.97 (2.11)	3.60 (2.02)	4.07 (2.13)	3.94 (2.10)	3.73 (2.05)	3.53 (2.00)	3.20 (1.92)	3.53 (2.00)	3.50 (1.99)	3.47 (1.99)	3.33 (1.95)	3.17 (2.67)	3.00 (1.87)	3.24 (2.12)
MAIBA -01SC	1250	5.67 (2.48)	3.67 (2.48)	3.53 (2.00)	3.10 (1.89)	3.17 (1.91)	3.37 (2.07)	3.10 (1.89)	3.07 (1.88)	2.86 (1.83)	2.97 (1.86)	3.00 (1.87)	3.00 (1.87)	2.93 (1.85)	2.80 (1.81)	2.63 (1.76)	2.84 (1.82)
MAIBA -01SC	1500	5.83 (2.51)	2.73 (1.79)	2.43 (1.71)	2.23 (1.65)	2.20 (1.64)	2.40 (1.70)	2.27 (1.66)	2.13 (1.62)	2.03 (1.59)	2.00 (1.58)	2.11 (1.61)	2.00 (1.58)	1.87 (1.53)	1.77 (1.50)	1.60 (1.44)	1.81 (1.51)
Acephate 75 SP	1000	6.10 (2.56)	4.80 (2.30)	4.73 (2.27)	4.63 (2.20)	4.57 (2.25)	4.68 (2.26)	4.43 (2.22)	4.63 (2.26)	3.90 (2.09)	3.93 (2.10)	4.22 (2.17)	3.73 (2.05)	3.43 (1.98)	3.50 (2.00)	3.43 (1.98)	3.52 (2.00)
Buprofezin 25% SC	800	5.93 (2.53)	3.60 (2.02)	3.53 (2.00)	3.10 (1.89)	3.30 (1.94)	3.38 (1.96)	3.20 (1.94)	3.27 (1.94)	3.40 (1.97)	3.40 (1.97)	3.32 (1.96)	3.27 (1.94)	3.10 (1.87)	3.00 (1.87)	3.10 (1.89)	3.12 (1.89)
Imidacloprid 17.8% SL	125	5.97 (2.54)	3.93 (2.10)	3.83 (2.08)	3.73 (2.05)	3.70 (2.04)	3.80 (2.07)	3.63 (2.03)	4.47 (2.22)	3.90 (2.09)	3.90 (2.09)	3.98 (2.11)	3.73 (2.05)	2.70 (1.78)	2.67 (1.78)	2.77 (1.80)	2.97 (1.85)
Untreated control	-	5.93 (2.53)	6.00 (2.54)	5.77 (2.50)	5.87 (2.52)	5.97 (2.54)	5.90 (2.53)	5.83 (2.51)	5.90 (2.52)	6.10 (2.56)	6.13 (2.57)	5.99 (2.54)	5.97 (2.54)	5.77 (2.50)	5.73 (2.49)	5.80 (2.50)	5.82 (2.51)
SE (m)		0.13	0.06	0.08	0.06	0.07		0.06	0.06	0.07	0.08		0.07	0.06	0.07	0.08	
CD at 5%		NS	0.20	0.24	0.18	0.21		0.19	0.18	0.21	0.25		0.21	0.18	0.21	0.25	

() Figures in parentheses are square root transformed values

Table 7. Average number of white back plant hopper population per hill after first, second and third spray during *kharif* 2012-13

Treatments	Dose g.a.i./ ha	Pre treat ment	Post treatments														
			First Spray					Second Spray					Third Spray				
			3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean	3 days	5 days	7 days	10 days	Mean
MAIBA-01 SC	1000	5.23 (2.39)	3.33 (1.95)	3.10 (1.89)	2.87 (1.80)	2.67 (1.78)	2.99 (1.86)	2.50 (1.73)	2.47 (1.72)	2.40 (1.70)	2.53 (1.74)	2.48 (1.72)	2.47 (1.72)	2.40 (1.70)	2.30 (1.67)	2.10 (1.61)	2.32 (1.68)
MAIBA-01 SC	1250	5.13 (2.37)	3.00 (1.87)	2.80 (1.81)	2.50 (1.73)	2.23 (1.65)	2.63 (1.77)	1.97 (1.57)	1.87 (1.53)	1.73 (1.49)	1.60 (1.44)	1.79 (1.51)	1.50 (1.41)	1.43 (1.38)	1.30 (1.34)	1.13 (1.27)	1.34 (1.35)
MAIBA-01 SC	1500	5.43 (2.43)	2.73 (1.79)	2.47 (1.72)	2.33 (1.68)	2.00 (1.58)	2.38 (1.69)	1.63 (1.45)	1.50 (1.41)	1.40 (1.37)	1.33 (1.35)	1.47 (1.40)	1.20 (1.30)	1.10 (1.26)	1.00 (1.22)	0.83 (1.15)	1.03 (1.23)
Acephate 75 SP	1000	4.93 (2.33)	2.20 (1.64)	2.00 (1.58)	1.87 (1.50)	1.67 (1.47)	1.94 (1.55)	1.23 (1.31)	1.10 (1.26)	1.03 (1.23)	1.00 (1.22)	1.09 (1.26)	0.93 (1.19)	0.83 (1.15)	0.80 (1.14)	0.70 (1.09)	0.82 (1.14)
Buprofezin 25% SC	800	4.70 (2.28)	3.43 (1.98)	3.20 (1.92)	3.13 (1.90)	3.00 (1.87)	3.19 (1.92)	2.80 (1.81)	2.60 (1.76)	2.53 (1.74)	2.50 (1.73)	2.61 (1.76)	2.33 (1.95)	2.13 (1.62)	2.10 (1.61)	2.00 (1.58)	2.14 (1.69)
Imidacloprid 17.8% SL	125	5.33 (2.41)	3.80 (2.04)	3.63 (2.03)	3.50 (2.00)	3.40 (1.97)	3.58 (2.01)	3.00 (1.87)	2.80 (1.81)	2.73 (1.79)	2.83 (1.82)	2.84 (1.82)	2.70 (1.78)	2.67 (1.78)	2.73 (1.79)	2.53 (1.74)	2.66 (1.77)
Control		5.00 (2.34)	5.67 (2.48)	5.60 (2.46)	5.90 (2.52)	5.70 (2.48)	5.72 (2.49)	5.87 (2.52)	5.80 (2.50)	5.73 (2.49)	5.83 (2.51)	5.81 (2.51)	5.70 (2.49)	5.87 (2.52)	5.80 (2.50)	5.97 (2.54)	5.84 (2.51)
SE (m)		0.10	0.05	0.06	0.04	0.04	0.05	0.06	0.06	0.07			0.06	0.06	0.06	0.05	
CD at 5%		NS	0.14	0.17	0.12	0.12	0.15	0.18	0.19	0.24			0.20	0.19	0.17	0.15	

() Figures in parentheses are square root transformed values

Table 8. Average number of spider population per hill after first, second and third spray during *kharif* 2011-12

Treatments	Dose ml/ha	Pre- treatment	Post treatments														
			First Spray					Second Spray									
			1 days	3 days	7 days	14 days	Mean	1 days	3 days	7 days	14 days	Mean	1 days	3 days	7 days	14 days	Mean
MAIBA - 01SC	1000	1.00 (1.22)	0.90 (1.18)	1.00 (1.22)	1.00 (1.21)	0.93 (1.19)	0.96 (1.20)	0.97 (1.21)	1.00 (1.22)	0.90 (1.18)	0.90 (1.18)	0.94 (1.20)	0.97 (1.21)	1.00 (1.21)	0.8 (1.14)	0.9 (1.18)	0.92 (1.19)
MAIBA - 01SC	1250	1.03 (1.23)	0.93 (1.19)	1.03 (1.23)	0.93 (1.19)	0.90 (1.18)	0.95 (1.20)	0.93 (1.19)	1.03 (1.14)	0.80 (1.14)	1.00 (1.22)	0.94 (1.17)	0.93 (1.19)	0.93 (1.19)	0.8 (1.14)	1 (1.22)	0.92 (1.19)
MAIBA - 01SC	1500	0.93 (1.19)	0.80 (1.14)	0.97 (1.21)	0.93 (1.19)	1.00 (1.22)	0.93 (1.19)	0.90 (1.18)	0.90 (1.18)	0.90 (1.18)	0.97 (1.21)	0.92 (1.19)	0.90 (1.18)	0.93 (1.19)	0.9 (1.18)	0.97 (1.21)	0.93 (1.19)
Acephate 75 SP	1000	0.97 (1.21)	0.77 (1.12)	0.90 (1.18)	1.00 (1.22)	1.03 (1.23)	0.93 (1.19)	0.90 (1.18)	1.00 (1.22)	0.70 (1.09)	0.80 (1.14)	0.85 (1.16)	0.90 (1.18)	1.00 (1.22)	0.7 (1.09)	0.8 (1.14)	0.85 (1.16)
Buprofezin 25 % SC	800	0.80 (1.14)	0.60 (1.04)	0.90 (1.18)	1.03 (1.23)	0.90 (1.18)	0.86 (1.16)	0.87 (1.17)	1.03 (1.23)	0.93 (1.19)	0.83 (1.15)	0.92 (1.19)	0.87 (1.17)	1.03 (1.23)	0.93 (1.19)	0.83 (1.15)	0.92 (1.19)
Imidacloprid 17.8% SL	125	0.90 (1.18)	0.63 (1.06)	0.80 (1.14)	1.03 (1.23)	0.80 (1.14)	0.82 (1.14)	0.80 (1.14)	1.00 (1.22)	0.80 (1.14)	0.93 (1.19)	0.88 (1.17)	0.80 (1.14)	1.03 (1.23)	0.8 (1.14)	0.93 (1.19)	0.89 (1.18)
Untreated control	-	0.93 (1.19)	0.83 (1.15)	0.80 (1.14)	1.00 (1.22)	0.97 (1.21)	0.90 (1.18)	0.93 (1.19)	1.03 (1.23)	0.93 (1.19)	0.87 (1.17)	0.94 (1.20)	0.93 (1.19)	1.00 (1.22)	0.93 (1.19)	0.87 (1.17)	0.93 (1.19)
SE (m)		0.03	0.02	0.02	0.01	0.02	0.02	0.03	0.01	0.02			0.02	0.01	0.01	0.02	
CD at 5%		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	

() Figures in parentheses are square root transformed values

Table 9. Average number of spider population per hill after first and second spray during *kharif* 2012-13

Treatments	Dose ml/ha	Pretreatment	Post treatments														
			First Spray					Second Spray					Third Spray				
			1 days	3 days	7 days	14 days	Mean	1 days	3 days	7 days	14 days	Mean	1 days	3 days	7 days	14 days	mean
MAIBA - 01SC	1000	0.33 (0.91)	0.63 (1.06)	0.90 (1.18)	0.70 (1.09)	0.83 (1.15)	0.77 (1.12)	0.70 (1.09)	0.90 (1.18)	0.90 (1.18)	0.93 (1.19)	0.86 (1.16)	0.70 (1.09)	0.83 (1.15)	0.90 (1.18)	0.93 (1.19)	0.84 (1.15)
MAIBA - 01SC	1250	0.40 (0.94)	0.60 (1.04)	0.67 (1.08)	0.80 (1.14)	0.80 (1.14)	0.72 (1.10)	0.90 (1.18)	0.83 (1.19)	0.80 (1.14)	0.93 (1.19)	0.87 (1.18)	0.80 (1.14)	0.80 (1.14)	0.80 (1.14)	0.93 (1.19)	0.83 (1.15)
MAIBA - 01SC	1500	0.50 (1.00)	0.70 (1.09)	0.70 (1.09)	0.87 (1.17)	0.93 (1.19)	0.80 (1.14)	0.70 (1.09)	0.90 (1.18)	0.90 (1.18)	0.80 (1.14)	0.83 (1.15)	0.87 (1.17)	0.93 (1.19)	0.90 (1.18)	0.80 (1.14)	0.88 (1.17)
Acephate 75 SP	1000	0.37 (0.93)	0.73 (1.10)	0.80 (1.14)	0.90 (1.18)	0.87 (1.17)	0.83 (1.15)	0.83 (1.15)	0.70 (1.09)	0.73 (1.10)	0.83 (1.15)	0.77 (1.12)	0.90 (1.18)	0.87 (1.17)	0.73 (1.10)	0.83 (1.15)	0.83 (1.15)
Buprofezin 25 % SC	800	0.30 (0.89)	0.63 (1.06)	0.87 (1.17)	0.93 (1.19)	0.80 (1.14)	0.81 (1.14)	0.77 (1.09)	0.80 (1.14)	0.70 (1.09)	0.70 (1.09)	0.74 (1.10)	0.93 (1.19)	0.80 (1.14)	0.70 (1.09)	0.70 (1.09)	0.78 (1.13)
Imidacloprid 17.8% SL	125	0.40 (0.94)	0.80 (1.14)	0.80 (1.14)	0.83 (1.15)	0.67 (1.08)	0.78 (1.13)	0.80 (1.14)	0.67 (1.08)	0.80 (1.14)	0.80 (1.14)	0.77 (1.13)	0.83 (1.15)	0.67 (1.08)	0.80 (1.14)	0.80 (1.14)	0.78 (1.13)
Untreated control	-	0.47 (0.98)	0.83 (1.15)	0.70 (1.09)	0.80 (1.14)	0.93 (1.19)	0.82 (1.14)	0.90 (1.18)	0.77 (1.12)	0.83 (1.15)	0.83 (1.15)	0.83 (1.15)	0.80 (1.14)	0.93 (1.19)	0.83 (1.15)	0.83 (1.15)	0.83 (1.16)
SE (m)		0.02	0.01	0.03	0.03	0.02		0.01	0.02	0.02	0.03		0.03	0.02	0.02	0.03	
CD at 5%		NS	NS	NS	NS	NS		NS	NS	NS	NS		NS	NS	NS	NS	

() Figures in parentheses are square root transformed values.

treatment and minimized the GLH population, whereas Buprofezin 25% SC @ 800 ml/ha was recorded the least effective treatment.

Perusal of the data (Table 6& 7) revealed that white backed plant hopper population ranged between 5.67 (2.48) to 6.10 (2.56) and 4.70 (2.28) to 5.33 (2.41) per hill respectively during *kharif* 2011-12 and 2012-13. The number of insects per hill was almost uniform in all the treatments and

statistically no significant difference was observed. After post treatment observations (3, 5, 7 and 10 days after 1st and 2nd spray of 2011-12 and 12-13) all the tested doses of insecticides were found significantly superior over untreated control. During this period MAIBA-01 SC-1500 ml/ha was found to be the best effective treatment and minimized the BPH population, whereas Buprofezin 25% SC @ 800 ml/ha was recorded the least effective treatment.

Table 10. Yield of rice in Kg/ha during *kharif* 2011-12 and 2012-13

Treatments	Dose (g.a.i./ha)	Yield (Kg/ha)	
		2011-12.	2012-13.
MAIBA-01 SC	1000	2520.00	2450.00
MAIBA-01 SC	1250	2658.00	2560.00
MAIBA-01 SC	1500	2790.00	2710.00
Acephate 75 SP	1000	2313.00	2723.00
Buprofezin 25% SC	800	2428.00	2328.00
Imidacloprid 17.8% SL	125	2472.00	2272.00
Untreated control		2056.00	1996.00
SE (m)		112	107
CD at 5%		332	318

RESULTS OF PHYTOTOXICITY DURING 2011-12 AND 2012-13

Table 11. Data on Epinasty, Hyponasty and Yellowing

Treatments	Dose ml/ha	observations											
		Epinasty				Hyponasty				Yellowing			
		1	3	7	14	1	3	7	14	1	3	7	14
MAIBA -01SC	2500	0	0	0	0	0	0	0	0	0	0	0	0
MAIBA -01SC	5000	0	0	0	0	0	0	0	0	0	0	0	0

Table 12. Data on stunting, wilting and Necrosis

Treatments	Dose ml/ha	observations											
		stunting				wilting				Necrosis			
		1	3	7	14	1	3	7	14	1	3	7	14
MAIBA -01SC	2500	0	0	0	0	0	0	0	0	0	0	0	0
MAIBA -01SC	5000	0	0	0	0	0	0	0	0	0	0	0	0

These findings also corroborate with the reports of Zang and Zang (1996) stated that imidacloprid was very effective against BPH on rice. In Andhra Pradesh the synthetic pyrethroids, cypermethrin (0.005%) and deltamethrin (0.0025%) showed moderate toxicity to BPH and WBPH, but were highly toxic to GLH under green house conditions (Krishnaiah *et al.*, 1996). Thiamethoxam 25 WG @ 25 g a.i./ha and imidacloprid 17.8 SL @ 50 g a.i./ha were equally effective against brown planthopper on rice (Hegde, 2005). Heinrichs (1984) observed the resurgence of *N. lugens* after the application of methyl parathion and decamethrin at 55 and 65 days after planting. 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. Hegde And Nidagundi 2009 also reported that buprofezin 25 SC @ 1 ml/l recorded the lowest plant hopper population at 10 days after spray. The next best treatment was buprofezin 25 SC @ 0.75 ml/l which recorded lower planthopper population and was at par with standard check thiamethoxam 25 WG @ 0.2 g/l, while imidacloprid 17.8 SL @ 0.3 ml/l was on par with buprofezin 25 SC @ 0.75 ml/l and significantly superior to all the remaining treatments. Buprofezin at all dosages tested recorded significantly higher predatory mirid bug population over other treatments. Buprofezin 25 SC @ 1 ml/l recorded highest yield and was on par with Buprofezin 25 SC @ 0.75 ml/l.

Yield of rice in Kg/ha during kharif 2011-12 and 2012-13:

The significantly highest yield 2790 and 2710 kg/ha were recorded in MAIBA-01 SC-1500 ml/ha ml/ha, respectively during kharif 2011-12 and 2012-13. However, the lowest grain yield 2313 Kg/ha was observed in Acephate 75 SP-1000 ml/ha during 2011-12 and 2272.00 kg/ha was recorded in Imidacloprid 17.8% SL- 125 during 2012-13 (Table -10).

Average number of spider population per hill:

Perusal of the data (Table 8 & 9) revealed that in pretreatment observations, the spider population ranged between 0.80 (1.14) to 1.03 (1.23) per hill and 0.30 (0.93) to 0.50 (1.00) per hill, respectively during season 2011-12 and 2012-13. The number of spiders per hill was almost uniform in all the treatments and statistically no significant difference was observed. After post treatment observations (3, 5, 7 and 10 days after 1st and 2nd spray of 2011-12 and 2012-13) all the tested doses of insecticides were found harmless.

Phytotoxicity:

Perusal of the data (Table 11 & 12) revealed that Phytotoxicity symptoms on epinasty, hyponasty, yellowing and stunting etc. were recorded in 0 – 10 scale at 1, 3, 7 and 14 days after treatment, where 0 = No phytotoxicity and 100 = complete killed were also recorded. There were no phytotoxicity symptoms at any doses of MAIBA -01 SC in Rice crop during 2011-12 and 2012-13.

CONCLUSION

The new chemical insecticide MAIBA -01SC was evaluated for its bio efficacy against sucking insect pests like BPH, GLH and WBPH of Rice in the department of Entomology, IGKV, Raipur during the year 2011-12 and 2012-13 in kharif season. During the bio efficacy trial, the effect of all tested doses of MAIBA -01 SC-1500ml/ha effectively control the population of BPH, GLH and WBPH in Rice. It was also observed that MAIBA -01 SC-1500ml/ha at all dosages levels tested for bio efficacy has no influence/ effect on the natural enemy under field condition.

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