INTERNATIONAL JOURNAL OF PLANT PROTECTION
VOLUME 9 | ISSUE 1 | APRIL, 2016 | 40-46

● e ISSN-0976-6855 | Visit us : *www.researchjournal.co.in*

IJPP

RESEARCH PAPER

DOI : 10.15740/HAS/IJPP/9.1/40-46

Comparative efficacy of newer insecticides against brown planthopper, *Nilaparvata lugens* Stal.

■ RANDEEP KR KUSHWAHA*, VIJAY KR KOSHTA AND SANJAY SHARMA

Department of Entomology, Indira Gandhi Agriculture University, RAIPUR (C.G.) INDIA

ARITCLE INFO

Received : 24.09.2015
Revised : 07.02.2016
Accepted : 21.02.2016

KEY WORDS :
BPH, *Nilaparvata lugens*, Comparative bioefficacy of newer insecticides, Insecticides evaluation

ABSTRACT

Comparative bioefficacy of few newer insecticides were tested against brown planthopper of rice under greenhouse conditions, IGKV, Raipur during 2013 and 2014. The mean of cumulative mortality during first year clearly indicated that all the insecticidal treatments were significantly superior over untreated control within ten DAT. The highest cumulative mortality (100.00%) of BPH was observed in bifenthrin 10 EC and chlorpyriphos 50 EC + cypermethrin 5 EC. It was followed by fipronil of (98.00%) and minimum (44.00%) in indoxacarb 14.5 SC whereas, during second year, all the insecticidal treatments were also significantly superior over untreated control within ten DAT and similar trend of the maximum cumulative mortality of BPH was noticed in bifenthrin 10 EC and chlorpyriphos 50 EC + cypermethrin 5 EC followed by fipronil of (96.00%) with the minimum (50.00%) in indoxacarb 14.5 SC. On the basis of overall compared the efficacy of different tested insecticides against BPH population of two years mean, revealed bifenthrin 10 EC chlorpyriphos 50 EC + cypermethrin 5 EC to be highly effective (100.00%) with quick knock down effect in controlling BPH whereas, fipronil 5 SC and monocrotophos 36 SL were also effective but it tooks time for getting (97.00%) and (77.00%) control. Descending order of mortality of BPH was observed with different insecticidal treatments as bifenthrin (T_4) < chlorpyriphos + cypermethrin (T_6) <fipronil (T_3) < monocrotophos (T_1) < imidacloprid (T_2) < indoxacarb (T_5) on the basis of all the observations.

How to view point the article : Kushwaha, Randeep Kr, Koshta, Vijay Kr and Sharma, Sanjay (2016). Comparative efficacy of newer insecticides against brown planthopper, *Nilaparvata lugens* Stal.. *Internat. J. Plant Protec.*, **9**(1) : 40-46.

*Corresponding author:
Email: rndp2010@gmail.com

INTRODUCTION

India possesses largest area among rice growing countries and the second rank in production (FAO, 2008). Rice has been produced 132013 mt of rice in India from an area of 44.0 mha in 2009 (FAO, 2010). Most of the hopper burned fields observed in India, Indonesia, Philippines, and Sri Lanka received the insecticides before outbreak. Detailed investigations have been made in the past few years on the insecticide induced BPH resurgence in rice (Chelliah, 1979; Chelliah and Heinrichs,

1980; Raman, 1981; Heinrichs *et al*., 1982a and 1982 b and Reissig *et al.,* 1982a, b). The continuous use of insecticides has destroyed the natural equilibrium between *N. lugens* and its natural enemies in India. Pests which survived, build-up faster because of either the absence of natural enemies or very low populations which were ineffective in preventing build -up of hoppers population (Kulshreshtha and Kalode, 1976). Kushwaha (2009) had observed the application of PII-504 20 SG followed by imidacloprid 17.5 SL applied @ 0.3 g and 0.25 ml / lit. water was found highly effective to minimizing BPH population with knock down effect. Shakti (2006) recorded the highest grain yield of paddy *i.e*. 46.58 q/ha and minimum hopper incidence with the application of imidacloprid + ethiprole @ 125 ml + 375 ml/ha as compared to untreated control 36.89 q/ha. Mehra (2003) reported the application of imidacloprid 200 SL @ 150 ml/ha as the most effective treatment against BPH, GM and GLH of paddy. But there was no effect of the insecticides on different biological parameters on paddy crop *viz.*, plant height, panicle length, total tillers number of grains per panicle and yield. Mandawi (2002) noticed the application of cartap 4 G @ 1000g a.i./ha at 50 DAT as the best effective treatment against GM, BPH, SB, LF, and CW of paddy. The cartap hydrochloride 4G at 12, 24, 36, 48, and 72 hrs. after treatment were showed maximum nymphal mortality of BPH under glass house conditions and economic analysis of insecticides revealed that when applied phorate 10 G @ 1000g a.i./ha had maximum benefit cost ratio *i.e*. 3: 80 followed by phosphamidon 10 G @ 500g a.i./ha. Bae and Hyumn (1999) conducted study on the effect of two systemic insecticides against BPH population on pots of paddy under laboratory conditions. Buprofezin, isoprothiolane affected the nymphal period at the dosage applied. Treatments of nymphs with buprofezin especially at the earlier instars, reduces adult life span, the residual effect of buprofezin was about 30 days on pots. Isoprothiolane was found most effective when early instar nymphs were predominated.

MATERIAL AND METHODS

Investigation was carried out at the Entomology glass house of IGKV. In this experiment, second instar nymphs were released on the potted TN-1 plant covered with transparent plastic sheet to restrict the movement of insects. Nymphs were allowed for accommodating themselves in the plant up to two days. Ten nymphs / plant were maintained before the insecticidal treatments. The different type of insecticidal solutions *vz.*, monocrotophos 36 SL @ 2.50ml/lit., imidacloprid 17.8 SL @ 0.25 ml/lit., fipronil 5 SC @ 2.00 ml/lit., bifenthrin 10 EC @ 1.0 ml/lit., indoxacarb 14.5SC @ 0.35 ml/lit. and chlorpyriphos 50 EC + cypermethrin 5EC @ 2.0 ml/ L were sprayed on each plant and the nymphal mortality for each plant was recorded at 1, 3, 5, 7, and 10 days after treatment. BPH population counts were calculated in the form of per cent mortality. Data obtained from Completely Randomize Design (CRD) experiments were analyzed statistically as per the procedure standardized by Cocharan and Cox (1957) with appropriate transformations. Total data of mean BPH population were analyzed after square root transformation where x = BPH population.

RESULTS AND DISCUSSION

Pretreatment population of BPH for different treatments was homogenous. Post treatment observations in the form of insect mortality under each treatment were recorded at the periodical intervals is presented in Table 1a, 1b, 1c and Fig. 1a, 1b, 1c, 1d the observations recorded at periodical intervals.

During first year, all the insecticidal treatments were significantly superior over untreated control within ten DAT. The bifenthrin 10 EC was recorded maximum mortality (96.00%) of BPH at one DAT and (100.00%) at three, five, seven and ten DAT, respectively with minimum (18.00%), (34.00%), (40.00%) and (44.00%) in indoxacarb 14.5 SC at one, three, five, seven and ten DAT, respectively. Whereas, during second year, the maximum mortality (92.00%) at one DAT and (100.00%) at three, five, seven and ten DAT was noticed in bifenthrin 10 EC, respectively with minimum (18.00%), (36.00%) and (40.00%) in indoxacarb 14.5 SC at one, three and five DAT while (50.00%) was exhibited in both the imidacloprid 17.8 SL and indoxacarb 14.5 SC at seven and ten DAT, respectively. On the basis of two years, maximum cumulative mortality (94.00%) of BPH was recorded in bifenthrin 10 EC. It was followed by chlorpyriphos 50 EC + cypermethrin 5 EC (90.00%) with the minimum (18.00%) in indoxacarb 14.5 SC at one DAT while at three DAT, highest mortality (100.00%) was observed in bifenthrin 10 EC followed by chlorpyriphos 50 EC + cypermethrin 5 EC (97.00%) with

the minimum (35.00%) in indoxacarb 14.5 SC. Whereas, (100.00%) mortality was noticed in both bifenthrin 10 EC and chlorpyriphos 50 EC + cypermethrin 5 EC at five, seven and ten DAT and minimum (42.00%) at five and (47.00%) at seven and ten DAT, respectively.

On the basis of overall compared the efficacy of different tested insecticides against BPH population of two years mean, the maximum cumulative mortality (100.00%) of BPH was noticed in bifenthrin 10 EC and chlorpyriphos 50 EC + cypermethrin 5 EC and minimum

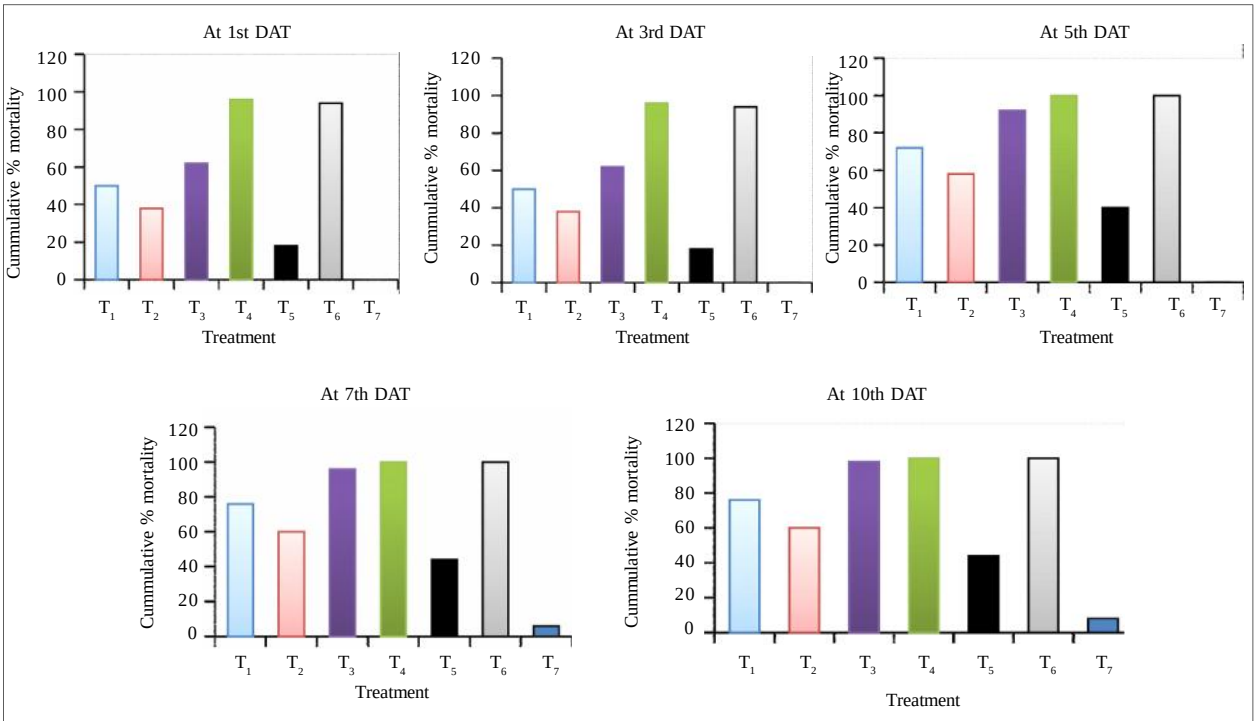

Fig. 1a : Compretive bioefficacy of newer insecticides against BPH at different DAT during 2012

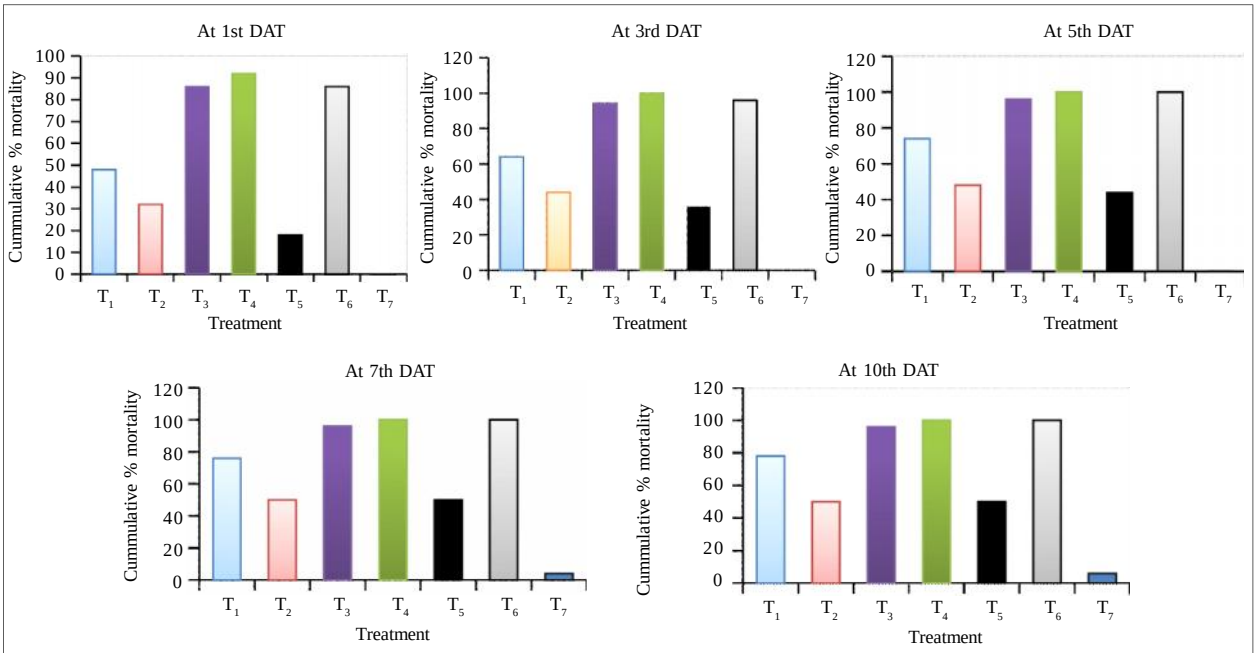

Fig. 1b : Compretive bioefficacy of newer insecticides against BPH at different DAT during 2013

(47.00%) in indoxacarb 14.5 SC. It was found that bifenthrin 10 EC and chlorpyriphos 50 + cypermethrin 5 EC was highly effective in controlling BPH. However, fipronil and monocrotophos were also effective. Imidacloprid and indoxacarb could not defeat the conventional insecticides in terms of killing BPH. Jena *et al*. (2000) have reported that imidacloprid kills 100 per cent BPH population within six days of application.

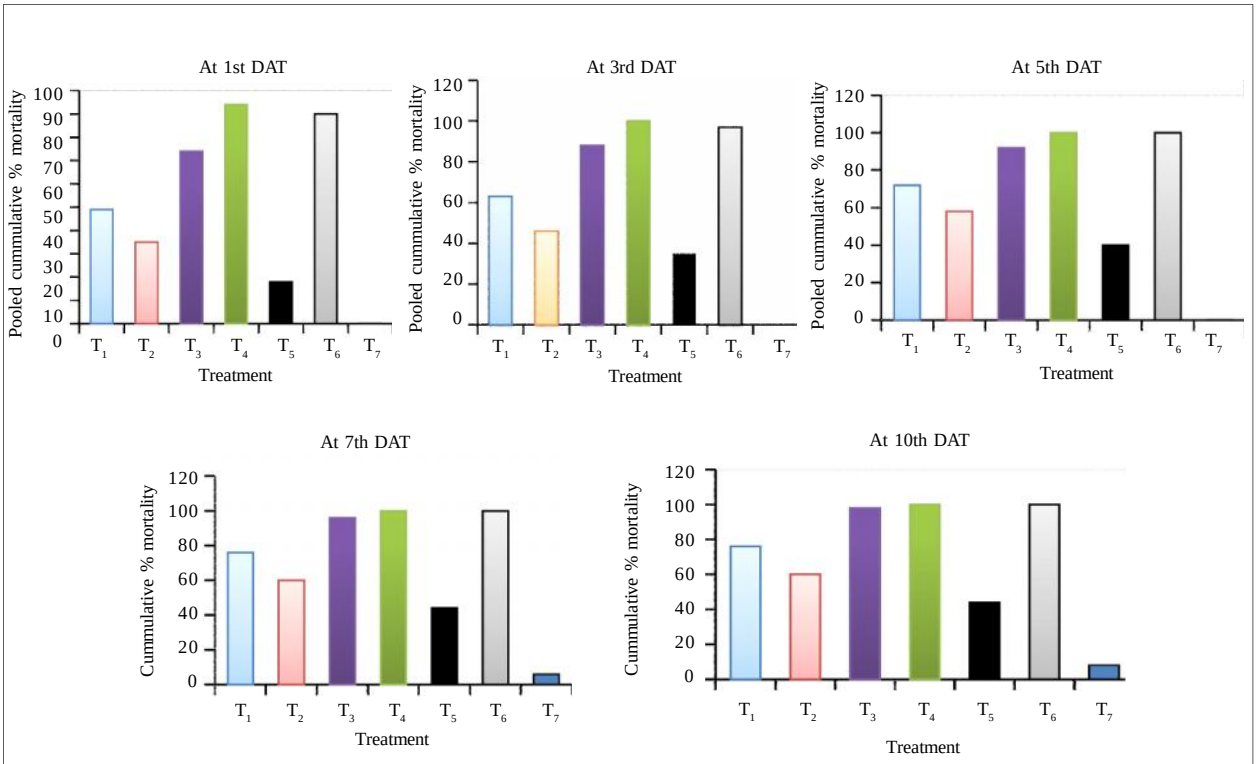

Fig. 1c : Pooled mean of compretive bioefficacy of newer insecticides against BPH at different DAT during 2012 and 2013

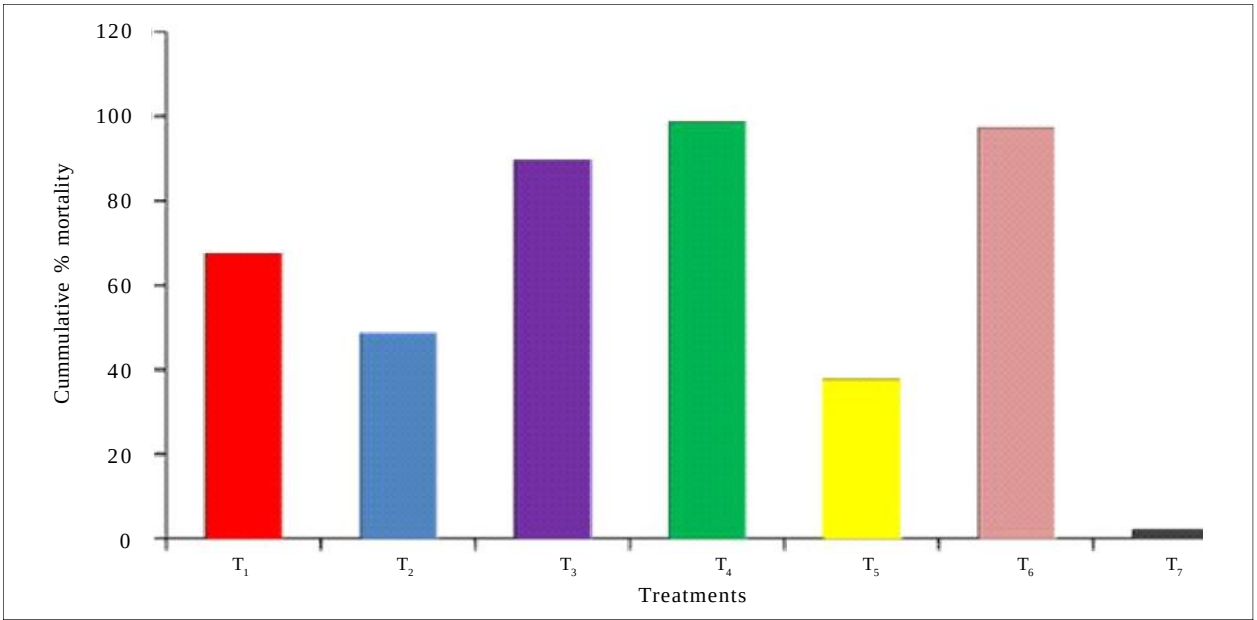

Fig. 1d : Pooled mean of compretive per cent mortality of BPH against different insecticides within ten DAT

Table 1a : Comparative bioefficacy of newer insecticides against brown planthopper, *Nilaparvata lugens* Stal. at different DAT during 2012

Treatment No.	Treatment Name	Dose/lit. water (in ml)	Cumulative % mortality of BPH				
			1st DAT	3rd DAT	5th DAT	7th DAT	10th DAT
T_1	Monocrotophos 36 SL	2.50	50.00	62.00	72.00	76.00	76.00
			(7.11)	(7.91)	(8.51)	(8.75)	(8.75)
T_2	Imidacloprid 17.8 SL	0.25	38.00	48.00	58.00	60.00	60.00
			(6.20)	(6.96)	(7.65)	(7.78)	(7.78)
T_3	Fipronil 5 SC	2.00	62.00	82.00	92.00	96.00	98.00
			(7.91)	(9.08)	(9.62)	(9.82)	(9.92)
T_4	Bifenthrin 10 EC	1.00	96.00	100.00	100.00	100.00	100.00
			(9.82)	(10.02)	(10.02)	(10.02)	(10.02)
T_5	Indoxacarb 14.5 SC	0.35	18.00	34.00	40.00	44.00	44.00
			(4.30)	(5.87)	(6.36)	(6.67)	(6.67)
T_6	Chlorpyriphos 50 EC + Cypermethrin 5 EC	2.00	94.00	98.00	100.00	100.00	100.00
			(9.72)	(9.92)	(10.02)	(10.02)	(10.02)
T_7	Control	Untreated	0.00	0.00	0.00	6.00	8.00
			(0.71)	(0.71)	(0.71)	(2.55)	(2.92)
S.E.±			0.49	0.63	0.55	0.50	0.27
C.D. (P=0.05)			0.64	0.82	0.72	0.65	0.35
CV (%)			17.10	53.98	64.08	79.17	71.08

*Average of 5 Replications,
*Figures in parentheses are square root transformation = X + 0.5
*Released 20 BPH each replication

Table 1b : Comparative bioefficacy of newer insecticides against brown planthopper, *Nilaparvata lugens* Stal. at different DAT during 2013

Treatment No.	Treatment Name	Dose/lit. water (in ml)	Cumulative % mortality of BPH				
			1st DAT	3rd DAT	5th DAT	7th DAT	10th DAT
T_1	Monocrotophos 36 SL	2.50	48.00	64.00	74.00	76.00	78.00
			(6.96)	(8.03)	(8.63)	(8.75)	(8.86)
T_2	Imidacloprid 17.8SL	0.25	32.00	44.00	48.00	50.00	50.00
			(5.70)	(6.67)	(6.96)	(7.11)	(7.11)
T_3	Fipronil 5 SC	2.00	86.00	94.00	96.00	96.00	96.00
			(9.30)	(9.72)	(9.82)	(9.82)	(9.82)
T_4	Bifenthrin 10 EC	1.00	92.00	100.00	100.00	100.00	100.00
			(9.62)	(10.02)	(10.02)	(10.02)	(10.02)
T_5	Indoxacarb 14.5 SC	0.35	18.00	36.00	44.00	50.00	50.00
			(4.30)	(6.04)	(6.67)	(7.11)	(7.11)
T_6	Chlorpyriphos 50 + Cypermethrin 5 EC	2.00	86.00	96.00	100.00	100.00	100.00
			(9.30)	(9.82)	(10.02)	(10.02)	(10.02)
T_7	Control	Untreated	0.00	0.00	0.00	4.00	6.00
			(0.71)	(0.71)	(0.71)	(2.12)	(2.55)
S.E.±			0.29	0.58	0.53	0.42	0.27
C.D. (P=0.05)			0.38	0.75	0.69	0.55	0.35
CV (%)			10.25	45.46	72.41	87.88	71.08

*Average of 5 Replications,
*Figures in parentheses are square root transformation = X + 0.5
*Released 20 BPH each replication

Table 1c : Pooled mean of comparative bioefficacy of newer insecticides against brown planthopper, *Nilaparvata lugens* Stal. at different DAT during 2012 and 2013

Treatment No.	Treatment Name	Dose/lit. water (in ml)	Pooled per cent cumulative mortality of BPH				
			1st DAT	3rd DAT	5th DAT	7th DAT	10th DAT
T_1	Monocrotophos 36 SL	2.50	49.00 (7.04)	63.00 (7.97)	73.00 (7.57)	76.00 (8.75)	77.00 (8.80)
T_2	Imidacloprid 17.8SL	0.25	35.00 (5.96)	46.00 (6.82)	53.00 (7.31)	55.00 (7.45)	55.00 (7.45)
T_3	Fipronil 5 SC	2.00	74.00 (8.63)	88.00 (9.41)	94.00 (9.72)	96.00 (9.82)	97.00 (9.87)
T_4	Bifenthrin 10 EC	1.00	94.00 (9.72)	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)
T_5	Indoxacarb 14.5 SC	0.35	18.00 (4.30)	35.00 (5.96)	42.00 (6.52)	47.00 (6.89)	47.00 (7.89)
T_6	Chlorpyriphos 50 + Cypermethrin 5 EC	2.00	90.00 (9.51)	97.00 (9.87)	100.00 (10.02)	100.00 (10.02)	100.00 (10.02)
T_7	Control	Untreated	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	5.00 (2.35)	7.00 (2.74)

Similarly Mehra (2003), has also reported imidacloprid to be the best in minimizing Brown plant hopper population under laboratory conditions.

Conclusion :

The comparative bioefficacy of different insecticides tested against BPH population revealed bifenthrin 10 EC and chlorpyriphos 50 EC + cypermethrin 5 EC to be highly effective (100.00%) with quick knock down effect in controlling BPH whereas, fipronil 5 SC were also effective but it tooks time for getting (97.00%) control.

REFERENCES

Bae, Y.H. and Hyumn, J.S. (1999). Studies on the effects of systemic applications of several insecticides on the population of the brown plant hopper, *Nilaparvata lugens* Stall . Some properties of Buprofezin and Isoprothiolane in their effects upon the BPH population. *Korean J. Appl. Entomol*., **28** (2) : 61-68.

Chelliah, S. (1979). Insecticide application and brown planthopper, *Nilaparvata lugens* (Stål) resurgence in rice. A report of research conducted from July 8, 1977 to July 7, 1979. Department of Entomology, *International Rice Research Institute,* Los Baños, Philippines. 69 p. (mimeo.).

Chelliah, S. and Heinrichs, E.A. (1980). Factors affecting insecticide induced resurgence of the brown planthopper, *Nilaparvata lugens* on rice. *Environ. Entomol.*, **9**:773-777.

Cochran, W.G. and Cox, G.M. (1957). Experimental designs. Second edition. John Willey and Sons. New York.

Food and Agriculture Organization (FAO), (2008). *FAOSTAT*: Agricultural Production.

Food and Agriculture Organization (FAO), (2010). *FAOSTAT*: Agricultural Production.

Heinrichs, E.A., Aquino, G.B., Chelliah, S., Valencia, S.L. and Reissig, W.H. (1982a). Resurgence of *Nilaparvata lugens* (Stål) populations as influenced by methods and timing of insecticide application in lowland rice. *Environ. Entomol*., **11**:78-84.

Jena, M., Dani, R.C. and Rajomani, S. (2000). Efficacy of some new insecticides against brown plant hopper, *Nilaparvata lugens* Stall. *Oryza*, **37** (3) : 262-264.

Kulshreshtha, J.P. and Kalode, M.B. (1976). Work done on threshold of economic injury of brown planthopper, *N. luges* and rice gall midge, *P. oryzae* in India. Paper presented at the International Rice Research Institute, Los Baños, Philippines. Asian rice planthoppers. *JARQ*, **44** (3): 225-230.

Kushwaha, R.K. (2009). Evaluation of newer insecticides against brown planthopper, *Nilaparvata lugens* Stal. under glasshouse conditions M.Sc. (Ag.) Thesis, Indira Gandhi Krishi Vishvavidyala, Raipur, C.G. (INDIA).

Mandavi, N. (2002). Studies on bioefficacy of granular insecticides against major insect pests of rice, M.Sc. (Ag.) Thesis, Indira Gandhi Krishi Vishvavidyala, Raipur, C.G. (INDIA).

Mehra, V.P. (2003). Bioefficacy of confidor insecticides and evaluation of advance rice breeding lines against brown planthopper, *Nilaparvata lugens*, Stal., M.Sc. (Ag.) Thesis,

Indira Gandhi Krishi Vishvavidyala, Raipur, C.G. (INDIA).

Raman, K. (1981). Studies on the influence of foliar application of insecticides on the resurgence of brown planthopper, *Nilaparvata lugens* (Stål) in rice. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore, India. 48 p.

Reissig, W.H., Heinrichs, E.A. and Valencia, S.L. (1982a). Insecticide-induced resurgence of the brown planthopper, *Nilaparvata lugens* on rice varieties with different levels of resistance. *Environ. Entomol*., **11**:165-168.

Reissig, W.H., Heinrichs, E.A. and Valencia, S.L. (1982b). Effects of insecticides on *Nilaparvata lugens* and its predators: spiders, Microvelia atrolineata and Cyrtorhinus lividipennis. *Environ. Entomol*., **11**:193-199.

Shakti, S. (2006). Studies on brown planthopper infestation at farmers' field and bioefficacy of some newer insecticides, M.Sc. (Ag.) Thesis, Indira Gandhi Krishi Vishvavidyala, Raipur, C.G. (INDIA).