



# Efficacy of new insecticide molecules against yellow stem borer and leaf folder in rice

Karthikeyan K\*

Regional Agricultural Research Station  
Kerala Agricultural University, Pattambi-679 306, Kerala, India  
\* Corresponding author email: entokarhi\_65@hotmail.com

Received: 22<sup>nd</sup> Feb 2019; Accepted: 25<sup>th</sup> April 2019

## Abstract

In order to find the efficacy of newer insecticides against rice yellow stem borer, *Scirpophaga incertulas* (Walker) and leaf folder, *Cnaphalocrocis medinalis* (Guenée). Field experiments were conducted during *Kharif* and *Rabi* seasons during 2015-16 at Regional Agricultural Research Station, Pattambi using the Jyothi rice variety. The insecticide molecules tested were DPX-RAB 55@ 237.5ml/ha, flubendiamide + thiacloprid 240SC @ 250 ml/ha, flubendiamide 480SC @ 50 ml/ha, thiacloprid 480 SC @ 250 ml/ha, chlorantraniliprole 18.5% SC @ 150 ml/ha with dinotefuran 20% SG @ 200 g/ha as check insecticide and an untreated control. The pooled results of two crop seasons revealed that chlorantraniliprole 18.5 % SC, flubendiamide 480 SC and flubendiamide + thiacloprid 240 SC were found superior against stem borer (dead hearts and white ears) and leaf folder with significantly lower per cent of leaf damage. Significantly higher grain yield was obtained from chlorantraniliprole 18.5 SC (4196 kg/ha) followed by flubendiamide 480 SC (3885 kg/ha) and flubendiamide + thiacloprid 240 SC (3321 kg/ha) treated plots.

**Keywords:** New insecticides, rice, yellow stem borer, leaf folder, DPX-RAB 55

## Introduction

Rice is a staple food crop of India grown in diverse ecologies leading the world in area and production but lower than the world productivity. Insect pests are major constraints limiting rice productivity besides diseases and weeds (Behura, *et al.*, 2011). Damage occurred during vegetative phase (50 per cent) contributes more to yield reduction than at reproductive (30 per cent) or ripening phase (20 per cent) (Gupta and Raghuraman, 2003). Yield losses in rice due to stem borer, *Scirpophaga incertulas* (Walker) varied between 11.2 – 40.1% and 27.6 – 71.7% due to dead heart and white ear damage, respectively, while it was 65% due to leaf folder, *Cnaphalocrocis medinalis* Guenee (Krishnaiah and Verma, 2010). Chlorantraniliprole 25% SC, a new insecticide found effective against major lepidopteran pests (Sidde Gowda, 2009). In order to find the efficacy of chlorantraniliprole 18.5 % SC molecule against major rice pests, experimental trials were conducted under field condition during *Kharif* 2015 and *Rabi* 2015-16 seasons.

## Materials and Methods

Field experiments were conducted at Regional Agricultural Research Station, Pattambi, Kerala Agricultural University during two cropping seasons *viz.*, *Kharif* 2015 and

*Rabi* 2015-16. Twenty five day old seedlings of cultivar Jyothi were transplanted in a plot of size 7 x 4 m with a spacing of 20 x 15 cm at the rate of two seedlings per hill. The experiment included seven treatments with five test insecticides using dinotefuran as check insecticide and an untreated control with four replications. The experiment was conducted in completely randomized block design. The sprays were made at 20, 40 and 60 days after transplanting with a hand operated knapsack sprayer of nine litre capacity. The observations were made a day before spraying and a week after spraying on per cent tiller damage (dead heart) at vegetative stage and white ears at reproductive stage for yellow stem borer and per cent damaged leaves in case of leaf folder. The grain yield was recorded in treatment wise after maturity. Data were subjected to ANOVA and the means were compared for significance using CD at 0.05 % level (Gomez and Gomez, 1984).

## Results and Discussion

### Effect on Stem Borer

The results of the first crop season (*Kharif* 15) showed flubendiamide 480 SC @50 ml/ha as most effective in reducing the yellow stem borer (dead heart) damage with

0.25, 0.66 per cent dead hearts at 30 and 50 DAT. Next best treatments were chlorantraniliprole 18.5%SC @ 150 ml/ha and flubendiamide + thiacloprid 480 SC treated plots with 0.25, 1.53 and 0.78, 1.73 per cent, respectively at 30 and 50 DAT and was superior to dinotefuran (check) treated plots which recorded 1.27 and 2.93 per cent dead hearts,

respectively at 30 and 50 DAT. In case of white ear damage at 80 DAT, chlorantraniliprole 18.5% SC recorded lowest white ear damage of 2.87 per cent followed by thiacloprid treated plots with 5.89 per cent and was superior over check insecticide (6.70 per cent white ears) (Table 1).

**Table 1. Effect of different insecticide treatments against rice Yellow stem borer and leaf folder (*Kharif* 2015)**

Trt. No	Treatments g /ml / ha	%DH 30DAT	%DH 50DAT	% WE 80DAT	%LF 45 DAT	%LF 60 DAT	Grain Yield (Kg/ha)
T1	DPX-RAB55 @ 237.5	2.30 (0.15)	4.71 (0.21)	8.86 (0.29)	19.73 (0.45)	13.44 (0.37)	3366
T2	Flubendiamide 240%g/L + Thiacloprid 240%g/L@ 250	0.78* (0.06)	1.73 (0.09)	12.38 (0.33)	3.10* (0.18)	3.30* (0.18)	3574
T3	Flubendiamide 480 SC @50	0.25* (0.03)	0.66* (0.06)	8.05 (0.29)	6.20* (0.25)	1.68* (0.13)	3638
T4	Thiacloprid 240 SC @250	2.04 (0.12)	1.61 (0.13)	5.89 (0.24)	17.88 (0.43)	12.95 (0.35)	3372
T5	Chlorantraniliprole18.5 % SC @150	0.28* (0.03)	1.53* (0.12)	2.87* (0.16)	2.95* (0.17)	2.58* (0.15)	3768
T6	Dinotefuran20SG @200	1.27 (0.11)	2.93 (0.16)	6.70 (0.26)	18.72 (0.43)	16.78 (0.42)	3405
T7	Control	6.47 (0.25)	5.87 (0.24)	10.86 (0.33)	10.44 (0.31)	12.55 (0.36)	3100
	CD (0.05%)	0.09	0.11	0.15	0.12	0.13	NS

SB: stem borer, WE: white ear, , LF: leaf folder

\* Figures in parentheses are arcsine transformed values

\*Figures followed by different letters are significantly different at p=0.05

During the second crop season in the following *Rabi* season, chlorantraniliprole 18.5 SC and flubendiamide + thiacloprid recorded lowest dead heart incidence of 1.65 per cent followed by flubendiamide with 1.68 % and were superior over check insecticide (3.19 per cent dead

hearts) at 50 DAT. Similarly, chlorantraniliprole 18.5%SC recorded lowest incidence of white ears of 5.60 per cent followed by flubendiamide 480SC and flubendiamide + thiacloprid 480 SC treated plots with 6.83 and 8.34 per cent, respectively (Table 2).

**Table 2. Effect of different insecticide treatments against rice pests (*Rabi* 2015-16)**

Trt. No	Treatments g /ml / ha	%DH 30DAT	%DH 50DAT	% WE (80 DAT)	% LF 45 DAT	% LF 65 DAT	Grain Yield (Kg/ha)
T1	DPX-RAB55 @ 237.5	9.18 (0.31)	2.68 (0.13)	14.47 (0.39)	13.66 (0.38)	7.44 (0.27)	3134
T2	Flubendiamide 240%g/L + Thiacloprid 240%g/L@ 250	10.24 (0.32)	1.65* (0.11)	8.34* (0.28)	4.19 * (0.20)	2.63* (0.16)	3067
T3	Flubendiamide 480 SC @50	9.02 (0.29)	1.68* (0.11)	6.83* (0.26)	2.69* (0.16)	2.13* (0.15)	4132*
T4	Thiacloprid 240 SC @250	9.51 (0.31)	2.07 (0.12)	14.07 (0.38)	21.28 (0.47)	9.24 (0.30)	3158
T5	Chlorantraniliprole18.5 % SC @150	8.01 (0.28)	1.65* (0.10)	5.60* (0.22)	4.11* (0.19)	2.10* (0.15)	4624*
T6	Dinotefuran20SG @200	5.14 (0.23)	3.19 (0.16)	9.81 (0.32)	19.67 (0.45)	8.44 (0.29)	3184
T7	Control	12.20 (0.35)	11.38 (0.34)	13.97 (0.38)	21.47 (0.48)	9.16 (0.31)	2690
	CD (0.05%)	NS	0.12	0.12	0.12	0.07	530

SB: stem borer, WE: white ear, LF: leaf folder,

\* Figures in parentheses are arcsine transformed values

\*Figures followed by different letters are significantly different at p=0.05

The pooled analysis of two crop seasons data showed that chlorantraniliprole 18.5%SC and flubendiamide 480 SC were most effective with 4.14 and 4.64 per cent dead hearts at 30 DAT while at 50 days after transplanting flubendiamide

480SC recorded lowest dead hearts (1.17 per cent) followed by chlorantraniliprole 18.5 SC and flubendiamide + thiacloprid 480 SC with 1.59 and 1.69 per cent dead hearts. With respect to white ears, chlorantraniliprole 18.5% SC



was most effective with lowest white ear damage (4.24 per cent) followed by flubendiamide and flubendiamide + thiacloprid 480 SC (7.44 and 8.26 %, respectively) which is statistically superior over check insecticide treated plots (10.36 %) (Table 3). These results were in confirmation with the earlier study of Karthikeyan and Christy (2014) and Srinivasan *et al.*, (2012) who reported that foliar

spraying with chlorantraniliprole 18.5% SC @ 30g a.i./ha reduced stem borer (dead heart and white ear) incidence. Sekh *et al.*, (2007) reported the efficacy of flubendiamide 480 SC against rice stem borer. Vinothkumar *et al.*, (2010) reported the efficacy of flubendiamide + thiacloprid 480 SC against tomato fruit borer larvae, aphids, white fly and leaf hoppers.

**Table 3. Effect of different insecticide treatments against rice pests (Pooled analysis)**

Trt. No	Treatments g/ml / ha	%DH 30DAT	%DH 50DAT	% WE	% LF 45 DAT	% LF 60 DAT	Grain Yield (Kg/ha)
T1	DPX-RAB 55 @ 237.5	5.74 (0.23)	3.70 (0.17)	11.66 (0.34)	16.70 (0.42)	10.44 (0.32)	3250
T2	Flubendiamide 240%g/L + Thiacloprid 240%g/L@ 250	5.51 (0.19)	1.69* (0.10)	8.26* (0.29)	3.64* (0.19)	2.96* (0.17)	3321*
T3	Flubendiamide 480 SC @50	4.64* (0.16)	1.17* (0.09)	7.44* (0.28)	4.44* (0.21)	1.91* (0.14)	3885*
T4	Thiacloprid 240 SC @250	5.78 (0.22)	1.84 (0.13)	9.98 (0.31)	19.58 (0.45)	11.10 (0.33)	3265
T5	Chlorantraniliprole 18.5% SC @ 150	4.14 * (0.16)	1.59* (0.11)	4.24* (0.19)	3.53* (0.18)	2.34* (0.15)	4196*
T6	Dinotefuran 20SG @200	5.20 (0.17)	3.06 (0.16)	10.36 (0.31)	15.20 (0.31)	12.61 (0.36)	3295
T7	Control	9.34 (0.30)	8.62 (0.29)	12.42 (0.36)	16.10 (0.40)	10.90 (0.34)	2895
	CD (0.05%)	0.11	0.11	0.11	0.22	0.13	877

SB: stem borer, WE: white ear, LF: leaf folder,

\* Figures in parentheses are arcsine transformed values

\*Figures followed by different letters are significantly different at p=0.05

### Effect on Leaf folder

During *Kharif* 2015, the incidence of leaf folder in terms of per cent damaged leaves was lowest in chlorantraniliprole 18.5 % SC (2.95 and 2.58 per cent) at 45 and 60 DAT followed by flubendiamide + thiacloprid 480 SC (3.10 and 3.30 per cent) and flubendiamide 480 SC (6.20 and 1.68 per cent) and were superior to all other treatments including the check (18.72 and 16.78 per cent) (Table 1). During the second crop season (*Rabi* 2015-16), lowest leaf folder damage was observed in flubendiamide 480 SC sprayed plots (2.69 and 2.13 per cent) followed by chlorantraniliprole 18.5% SC (2.69 and 2.13 per cent) and flubendiamide + thiacloprid 240 SC (4.19, 2.63 per cent) at 45 and 60 DAT and were significantly superior over check insecticide (19.67 and 8.44 per cent) (Table 2). The pooled analysis of two crop seasons data showed that chlorantraniliprole 18.5 SC showed the lowest leaf

folder damage with 3.53 and 2.43 per cent followed by flubendiamide 480 SC (4.44 and 1.91 per cent) and flubendiamide + thiacloprid 480 SC (3.64 and 2.96 per cent) at 45 and 60 DAT while check insecticide treated plot recorded higher leaf damage (15.20 and 12.61 per cent) (Table 3). These findings were in confirmation with the earlier study of Karthikeyan and Christy (2014) and Srinivasan *et al.*, (2012) who reported the efficacy of chlorantraniliprole 18.5 SC and flubendiamide 480 SC against rice leaf folder (Kulagod *et al.*, 2011 ; Haider *et al.*, 2014). Kumar *et al.*, (2010) reported that flubendiamide + thiacloprid 480 SC was found very effective to cotton boll worms, aphids, white flies and leaf hoppers. Sangamithra *et al.*, (2018) reported that the flubendiamide 24% + thiacloprid 24% SC w/v @ 84 + 84 g a.i / ha had incredible reduction of shoot and fruit borer and sucking pests of brinjal and was safer to natural enemies like spiders and coccinellids.

## Grain Yield

During the first crop season (*Kharif* 2015), there were no significant differences among treatments in grain yield (Table 1). During the second season, *Rabi* 2015-16, chlorantraniliprole 18.5 EC treated plots recorded significantly higher yield (4624 kg/ha) followed by flubendiamide 480 SC (4132 kg/ha) (Table 2). The pooled analysis of all the crop seasons also showed that chlorantraniliprole 18.5% SC treated plots recorded significantly higher grain yield of 4196 kg/ha followed by flubendiamide 480 SC (3885 kg/ha) and flubendiamide + thiacloprid 480 SC (3321 kg/ha) sprayed plots and control plots recorded lowest yield of 2895 kg/ha (Table 3). These findings are in agreement with previous reports of Karthikeyan and Christy (2014) and Haider *et al.* (2014) who found the increase in rice yield in chlorantraniliprole 18.5 EC and flubendiamide 480 SC treated plots.

## Acknowledgement

The authors express sincere thanks for funding from Indian Institute of Rice Research, Hyderabad under All India Co-ordinated Rice Improvement programme for conducting the trial.

## References

- Anonymous, 2012. Annual report: 2010-2011. Department of Agriculture and co-operation, Ministry of Agriculture, Government of India. p.31.
- Behura N., Sen P. and Kaur M.K. 2011. Introgression of yellow stem borer (*Scirpophaga incertulas*) resistant gene into cultivated rice (*Oryza sp.*) in to wild spp. *Indian Journal of Agricultural Sciences*. 81: 359-362.
- Gomez K.A. and Gomez A.A. 1984. In Statistical procedures for agricultural research. New York, USA: John Wiley, 1984, pp680. 5. Panse VG, Sukhatme PV. Statistical Met.
- Gupta GP. and Raghuraman M. 2003. Plant protection in suppressing for food security. *Indian Farming*. 53 (7): 31-34.
- Haider I, Akhter M and Sabir AM. 2014. Evaluation of different insecticides against rice leaf folder *Cnaphalocrocis medinalis* (Guenee) under field conditions. *Pakistan Journal of Zoology*. 46 (5):1458-1461.
- Karthikeyan K. and Christy MM. 2014. Efficacy of Chlorantraniliprole 18.5 EC against major pests of rice. *Indian Journal of Plant Protection*. 40 (4):276-279.
- Krishnaiah K. and Verma NRG. 2010. Changing Scenario in the Rice Ecosystem, Directorate of Rice research, Rajendranagar, Hyderabad. 28p from <http://www.rkmp.co.in>
- Kulagod SD, Hegde M, Nayak GV, Vastrad AS, Hughar PS. and Basavangoud K. 2011. Evaluation of insecticides and bio-rationals against yellow stem borer and leaf folder on rice crop. *Karnataka Journal of Agricultural Science*. 24 (2): 244-246.
- Kumar BV, Boomathi N, Kumaran N. and Kuttalam S. 2010. Combination of flubendiamide+thiacloprid 480 SC (RM) against bollworms and sucking pests of cotton. *Madras Agricultural Journal*. 97 (4/6) : 157-160.
- Sangamithra S, Vinothkumar B, Muthukrishnan N. and Manoharan T. 2018. Evaluation of bioefficacy of flubendiamide 24% w/v + thiacloprid 24% SC w/v against shoot and fruit borer and its sucking pests and its safety to non-target organisms in brinjal. *Journal of Entomology and Zoology Studies*. 6 (1): 245-249.
- Seh K, Nair N, Gosh SK. and Somachoudhury AK. 2007. Evaluation of flubendiamide 480 SC against stem borer and leaf folder of rice and effect on their natural enemies. *Pestology*. 31(1): 32-34.
- Srinivasan G, Fathima G, Gani AM. and Venkataraman NS. 2012. Chlorantraniliprole: A novel insecticide for rice ecosystem. Paper presented in 'International symposium on 100 years of rice science and looking' international symposium on 100 years of rice science and looking beyond' 9<sup>th</sup> to 12<sup>th</sup> Jan. 2012 held at TNAU, Coimbatore: pp 684-685.
- Vinothkumar B, Kumaran N, Kubendaran D. and Kuttalam S. 2010. Bioefficacy of flubendiamide + thiacloprid 480 SC against insect pests of tomato. *Pestology*. 34 (1) : 44-48.