Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(6): 886-889

Received: 13-09-2019
Accepted: 15-10-2019

D Sudha Rani
Scientist (Entomology),
Agricultural Research Station,
Garikapadu, Krishna,
Andhra Pradesh, India

Y Padmalatha
Principal Scientist (Agronomy),
Agricultural Research Station,
Garikapadu, Krishna,
Andhra Pradesh, India

Corresponding Author:
D Sudha Rani
Scientist (Entomology),
Agricultural Research Station,
Garikapadu, Krishna,
Andhra Pradesh, India

Field evaluation of insecticides against gallmidge infesting rice

D Sudha Rani and Y Padmalatha

Abstract
Field trials were conducted to evaluate the bio efficacy of granular and foliar spray recommended insecticides against gallmidge infesting rice both at nursery and transplanted crop. The insecticides both in form of granular and foliar application were evaluate in sole and combinations for four successive seasons *i.e*., *rabi* 2016-17, *kharif* 2017, *rabi* 2017-18 and *kharif* 2018. The results inferred that among all the insecticides, carbofuran 3G applied at 10 DAS and 10 DAT had recorded significant per cent reduction of gallmidge infestation over control with 48.3, 60.8 and 67.8 per cent at 35, 45 and 55 DAT during *rabi* 2016-17, respectively. Similarly, during *kharif*, 2017 and *rabi*, 2017-18 also carbofuran 3G registered highest per cent reduction of gallmidge infestation over control with 67.7, 68.0 & 60.19 and 65.6, 72.9 & 77.6 per cent at 30, 40 and 50 DAT, respectively. The foliar application of insecticides at 10 DAT also exhibited superior efficacy over control in suppressing the gallmidge infestation during *rabi* 2016-17, *kharif* 2017 and *rabi* 2017-18 and hence, during *kharif*, 2018 reassessed the efficacy of various insecticides in combinations and the results indicated that the plots treated with carbofuran 3G at 10 DAS and chlorpyriphos 20 EC at 10 DAT had recorded least pest infestation of 3.5, 4.5 & 3.0 per cent silver shoots with 82.1, 78.2 & 86.8 per cent reduction over control at 30, 40 and 50 DAT, respectively.

Keywords: Rice, gallmidge, insecticides, field evaluation

Introduction
Rice is the predominant crop cultivated in India influencing the livelihood and economics of several people. It is being cultivated in an area of 44.11 M ha^{-1} with an annual productivity of 2391 Kg ha^{-1} [1]. The rice crop is prone to stress throughout the crop growth period due to attack from various insect pests. Among the various pests infesting rice, gallmidge is a regular and chronic pest especially in areas where staggered and delayed plantings was adopted. Rice gall midge, *Orseolia oryzae* (Wood-Mason) forms onion shoot galls in growing crops effecting the ear head formation resulting in stunted growth suppressing heading and enhancing tillering. The infestation by gallmidge in young seedling rice crop results in stunted growth besides bushy appearance with as many as 50 small tillers per hill [2]. Gallmidge incidence in rice initiates right from nursery stage and continuous till tillering stage and therefore nursery management plays vital role in managing this pest. For managing this pest the only reliable and trusted measure by farmers is application of insecticides. But, due to indiscriminate application of these chemicals at lethal, sub lethal dosages and in combinations leads to resurgence of the pest. Repeated application of single chemical or chemical with same mode of action may aggravate the pest incidence. So, there is a need to investigate alternative effective insecticides against the gall midge both at nursery and main field of rice crop. During the past few years there is an increased incidence of gallmidge especially in late *kharif* and *rabi* seasons in Krishna district of Andhra Pradesh. Many farmers were relying on granular application for managing the pest after transplantation and followed by foliar sprays in combinations which are not recommended and thereby increasing the cost of cultivation incurred on plant protection measures. Hence, the present research trial was undertaken to evaluate the insecticides efficacy at field level against gallmidge infesting rice both at nursery and transplanted crop.

2. Materials and methods
The research trial was conducted at Agricultural Research station, Garikapadu for a period of four consecutive seasons *i.e*., *rabi* 2016-17, *kharif* 2017, *rabi* 2017-18 and *kharif* 2018 in randomized block design in a net plot area of 25 m^2.

A susceptible variety of rice BPT 5204 was used for experimental studies and no plant protection measures were undertaken during the entire study period. During the first three seasons of study the efficacy of chemicals individually were assessed by imposing the treatments (chemicals) during nursery stage and also at 10 days after transplantation. During the last season of study *i.e*., *kharif*, 2017 the efficacy of proven best insecticides in combination at nursery and also at 10 days after transplantation was reassessed. The infestation of gallmidge as influenced by application of various insecticides was recorded in terms of per cent silver shoots. The observations at 15 days interval on per cent silver shoots from each plot was recorded from randomly selected 20 hills. The per cent silver shoots and per cent reduction of silver shoots over control was calculated as per the formulae.

$$\text{Per cent silver shoots} = \frac{\text{Total number of silver shoots}}{\text{Total number of tillers}} \times 100$$

$$\text{Per cent reduction over control} = \frac{\text{Per cent damage of silver shoots in control plot - Per cent damage of silver shoots in treatment plots}}{\text{Per cent damage of silver shoots in control plot}} \times 100$$

3. Results and discussion

The efficacy of five insecticides *viz*., carbosulfan 5G, fipronil 0.3G, carbofuran 3G, phorate 10G and cartaphydrochloride 4G as granular application at 10 days after sowing (DAS) in nursery and 10 days after transplantation (DAT) in main field and three insecticides *viz*., monocrotophos 36 SL, chlorpyriphos 20 EC and fipronil 5 SC as foliar application at 10 days after transplantation was evaluated for three consecutive seasons to chose the best insecticide in suppressing the rice gallmidge infestation in terms of per cent silver shoots.

During *rabi*, 2016-17: Among various insecticides evaluated during *rabi*, 2016-17 against rice gallmidge application of carbofuran 3G at 10 DAS and 10 DAT recorded least infestation with 4.3, 3.0 and 1.8 per cent silver shoots as against highest in untreated control with 15.5, 18.5 and 16.5 per cent silver shoots at 35, 45 and 55 DAT, respectively. The suppression of pest as influenced by application of carbofuran 3G resulted in 48.3, 60.8 and 67.8 per cent reduction over control at 35, 45 and 55 DAT, respectively. The next better insecticide in order of efficacy was granular application of fipronil 0.3 G which has recorded 4.3, 3.0 and 1.8 per cent silver shoots with 47.1, 57.6 and 66.0 per cent reduction over control at 35, 45 and 55 DAT, respectively. The other treatments exerted less than 40, 50 and 55 per cent reduction over control and exerted no much influence in decreasing the gallmidge infestation (Table 1).

During *kharif*, 2017: The granular application of carbofuran 3G, phorate 10G and fipronil 0.3G had recorded least gallmidge infestation with 2.50, 2.00 & 3.00, 3.00, 3.80 & 4.20 and 3.15, 4.50 & 4.00 per cent silver shoots at 30, 40 and 50 DAT, respectively during *kharif*, 2017. The order of efficacy of these treatments *viz.*, carbofuran 3G, phorate 10G and fipronil 0.3G in terms of per cent reduction over control represents 64.7, 68.0 & 60.2; 61.4, 56.4 & 54.9 and 60.4, 54.1 and 55.9 per cent at 35, 45 and 55 DAT, respectively (Table 2).

During *rabi*, 2017-18: An analogous result was recorded during *rabi*, 2017-18 where in carbofuran 3G and phorate 10 G granules application both at 10 DAS and 10 DAT had recorded highest per cent reduction of pest infestation over control with 65.63 & 61.7, 72.9 & 71.5 and 77.6 & 74.9 at 30, 40 and 50 DAT, respectively. In plots treated with carbofuran 3G the per cent silver shoots recorded was 4.58, 3.15 & 2.55 and found on par to the plots treated with phorate 10G with 5.65, 3.50 & 3.15 per cent as against highest recorded in untreated control with 34.5, 37.5 and 42.8 at 30, 40 and 50 DAT, respectively (Table 3).

The study period for three seasons i.*e*., *rabi* 2016-17, *kharif* 2017 and *rabi* 2017-18 inferred that among various insecticides evaluated granular application of carbofuran 3G and phorate 10G at 10 DAS and 10 DAT had registered lowest pest infestation in terms of per cent silver shoots. However, it was also evident from the results that the foliar application of insecticides at 10 DAT also indexed significant efficacy with 35-58 per cent reduction over control. Keeping in view the constraint of resistance development in insect pests to insecticides upon their repeated usage, it is desirable to exploit the alternation of chemicals to manage a particular pest. Hence, during *kharif*, 2018 ten treatments in sole and combinations were evaluated against gallmidge infesting rice.

During *kharif*, 2017: The results inferred that among all the treatments the combination of granular insecticide carbofuran 3G at 10 DAS followed by foliar application of Chlorpyriphos 20 EC at 10 DAT had registered least gallmidge infestation with 3.5, 4.5 and 3.0 per cent silver shoots as against highest in control with 19.5, 20.6 and 22.8 per cent silver shoots at 30, 40 and 50 DAT, respectively. The order of efficacy of best combination treatments in terms of per cent reduction over control represents T_7 (carbofuran 3G + chlorpyriphos 20 EC) > T_8 (carbofuran 3G + monocrotophos 36 SL) > T_9 (carbofuran 3G + fipronil 5 SC) with 82.1, 78.2 & 86.8; 74.9, 71.8 & 84.6 and 74.4, 69.4 & 85.1 at 30, 40 and 50 DAT, respectively (Table 4).

The results are in accordance with the similar finding by Panda *et al*. (1988) [3] who pronounced that application of carbofuran 3G @ 1.5 Kg a.i. ha^{-1} and quinalphos spray @ 5 Kg a.i. ha^{-1} at 25 and 40 DAT were effective in managing the gall midge infesting rice with 79% increase in yield compared to control. Harinkhere, 1993 [4] confirmed that broadcasting carbofuran 3 G granules @ 1.0 Kg a.i.ha^{-1} at 30 DAT was most effective in reducing gall midge infestation in rice. The results are in accordance with the findings of Mardi *et al*.(2009) [5] who stated that the damage due to rice gallmidge was significantly lower in carbofuran 3G treated plots with 11.66 & 8.86 and 4.99 & 4.63 per cent hill and tiller damage at 20 and 40 DAT, respectively. The corresponding values in case of chloropyriphos 40EC and phorate 10 G treated plots was 12.49 & 9.97 and 13.33 & 10..42 at 20 DAT and 5.83 & 4.79 and 6.66 & 5.59 at 40 DAT, respectively. Visalakshmi [6] and coworkers evaluated various integrated pest management modules against major pests infesting rice and declared that incidence of gall midge was suppressed in module III and module I and the basis might be due to application of carbofuran 3G @ 1 Kg a.i. ha^{-1} in the nursery.

Table 1: Effect of insecticides on incidence of rice gallmidge during *rabi*, 2016-17

Treatments	Dose g a.i. /ha	%Silver shoots (per 20 hills) *					
		35 DAT	% ROC	45 DAT	% ROC	55DAT	% ROC
T1: Carbosulfan 5G	1.00	11.5 (19.82)	14.4	12.5 (20.70)	18.7	6.5 (14.77)	38.3
T2: Isazophos 3G	0.75	8.5 (16.95)	26.8	9.0 (17.46)	31.4	4.5 (12.25)	48.8
T3: Fipronil 0.3G	0.075	4.5 (12.25)	47.1	3.5 (10.78)	57.6	2.0 (8.13)	66.0
T4: Carbofuran 3G	1.25	4.3 (11.97)	48.3	3.0 (9.97)	60.8	1.8 (7.71)	67.8
T5: Phorate 10G	1.00	6.5 (14.77)[a]	36.2	6.0 (14.18)	54.3	3.5 (10.78) [a]	55.0
T6: Monocrotophos 36 SL	0.5	6.5 (14.77)[a]	36.2	5.0 (12.92) [a]	49.2	3.5 (10.78) [a]	55.0
T7: Chlorpyriphos 20 EC	0.5	6.0 (14.18)[a]	38.8	5.5 (13.56) [a]	47.5	3.0 (9.97)	58.4
T8: Fipronil 5 SC	0.05	6.5 (14.77)[a]	36.2	5.3 (13.31) [a]	47.7	5.0 (12.92)	46.0
T9: Control	-	15.5 (23.18)		18.5 (25.47)		16.5 (23.97)	
Ftest		Sig		Sig		Sig	
CD(0.05)		1.11		1.69		1.70	
CV%		9.80		15.31		23.35	

ROC: Reduction over control; T1 to T5 : Imposed at 10 DAS and 10 DAT; T6 to T8: Imposed at 10 DAT
*Arc-sine transformation #: square root transformation

Table 2: Effect of insecticides on incidence of rice gallmidge during *kharif*, 2017

Treatments	Dose g a.i./ha	%Silver shoots (per 20 hills) *					
		30 DAT	% ROC	40 DAT	% ROC	50 DAT	% ROC
T1: Carbosulfan 5G	1.00	11.50 (19.82)	23.2	19.50 (26.21)	2.0	18.30 (25.33)	3.35
T2: Fipronil 0.3G	0.075	3.15 [ab] (10.22)	60.4	4.50 [ab] (12.25)	54.1	4.00 [ab] (11.54)	55.9
T3: Carbofuran 3G	1.25	2.50[a] (9.10)	64.7	2.00 (8.13)	68.0	3.00 (9.97)	60.2
T4: Phorate 10G	1.00	3.00 [ab] (9.97)	61.4	3.80 [ab] (11.24)	56.4	4.20 [ab] (11.83)	54.9
T5: Cartaphydrochloride 4G	0.75	8.25 (16.69)	35.3	4.65 [ab] (12.45)	53.3	6.85 (15.17)	42.1
T6: Monocrotophos 36 SL	0.50	3.58 [ab] (10.91)	57.7	4.55 [ab] (12.32)	53.8	3.88 [ab] (11.36)	56.7
T7: Chlorpyriphos 20 EC	0.50	3.70 [ab] (11.09)	57.0	6.80 (15.12)	43.3	7.80 (16.22)	38.1
T8: Fipronil 5 SC	0.05	6.35 (14.60)	55.3	5.35 [b] (13.37)	49.9	4.85 [a] (12.72)	51.5
T9: Control	-	18.95 (25.81)	-	20.15 (26.67)	-	19.50 (26.21)	-
Ftest		Sig		Sig		Sig	
CD(0.05)		2.25		1.60		0.74	
CV%		21.59		24.66		38.45	

ROC: Reduction over control; T1 to T5: Imposed at 10 DAS and 10 DAT; T6 to T8: Imposed at 10 DAT
*Arc-sine transformation #: square root transformation

Table 3: Effect of insecticides on incidence of rice gallmidge during *rabi*, 2017-18

Treatments	Dose g a.i./ha	%Silver shoots (per 20 hills) *					
		30 DAT	% ROC	40 DAT	% ROC	50 DAT	% ROC
T1: Carbosulfan 5G	1.00	29.88 (33.10)	7.98	10.95 (19.32)	48.8	18.55 (25.51)	37.6
T2: Fipronil 0.3G	0.075	6.15 [a] (14.36)	60.1	4.50 [a] (14.36)	61.9	5.85 (14.0)	65.7
T3: Carbofuran 3G	1.25	4.58[a] (12.36)	65.6	3.15 [a] (10.22)	72.9	2.55 [a] (9.17)	77.6
T4: Phorate 10G	1.00	5.65 [a] (13.75)	61.7	3.50 [a] (10.78)	71.5	3.15 [a] (10.22)	74.9
T5: Cartaphydrochloride 4G	0.75	8.80 [a] (17.26)	52.0	7.55 [a] (15.95)	57.8	8.98 (17.44)	57.3
T6: Monocrotophos 36 SL	0.50	7.35 [a] (15.73)	56.3	4.55 [a] (12.32)	67.4	6.55 (14.83)	63.7
T7: Chlorpyriphos 20 EC	0.50	6.55 [a] (14.83)	55.9	5.85 [a] (14.00)	62.9	8.50 (16.95)	58.5
T8: Fipronil 5 SC	0.05	11.58 (19.89)	44.7	8.35 (16.80)	55.5	11.95 (20.22)	50.5
T9: Control	-	34.5 (35.97)	-	37.5 (37.76)	-	42.8 (40.86)	-
Ftest		Sig		Sig		Sig	
CD(0.05)		6.70		5.83		4.79	
CV%		20.20		20.19		14.85	

ROC: Reduction over control; T1 to T5 : Imposed at 10 DAS and 10 DAT; T6 to T8: Imposed at 10 DAT
*Arc-sine transformation #: square root transformation

Table 4: Effect of insecticides on incidence of rice gallmidge during *kharif*, 2018

Treatments	%Silver shoots (per 20 hills) *					
	30 DAT	% ROC	40 DAT	% ROC	50 DAT	% ROC
T1: Fipronil 0.3G	9.5 (17.95)	51.3	10.8 (19.19)	47.6	7.3 (15.68)	68.0
T2: Carbofuran 3G	8.3 (16.74)	57.4	8.5 (16.95)	58.7	6.2 (14.42)	72.8
T3: Phorate 10G	10.0 (18.43)	48.7	11.0 (19.37)	46.6	8.9 (17.36)	61.0
T4: Chlorantraniliprole 0.4%GR	9.8 (18.24)	49.7	9.5 (17.95)	53.9	8.5 (16.95)	62.7
T5: Monocrotophos 36 SL	8.9 (17.36)	54.4	9.0 (17.46)	56.3	8.1 (16.54)	64.5
T6: Chlorpyriphos 20 EC	8.0 (16.43)	59.0	10.2 (18.63)	50.5	6.0 (14.18)	73.7
T7:Carbofuran 3G + Chlorpyriphos 20 EC	3.5 (10.78)a	82.1	4.5 (12.25)	78.2	3.0 (9.97)a	86.8
T8:Carbofuran 3G + Monocrotophos 36 SL	4.9 (12.79)a	74.9	5.8 (13.94)a	71.8	3.5 (10.78)a	84.6
T9: Carbofuran 3G + Fipronil 5 SC	5.0 (12.92)a	74.4	6.3 (14.54)a	69.4	3.4 (10.63)a	85.1

T_{10}: Control	19.5 (26.21)	-	20.6 (26.99)	-	22.8 (28.52)	-
Ftest	Sig		Sig		Sig	
CD(0.05)	2.35		1.60		1.08	
CV%	11.59		10.57		13.48	

ROC: Reduction over control; T_1 to T_6 : Imposed at 10 DAS and 10 DAT; T_7 to T_9: Imposed granular form at 10 DAS and foliar application at 10 DAT.

*Arc-sine transformation #: square root transformation

4. Conclusion

From the present investigation of field experimentation on managing gallmidge infesting rice it was clearly evident that application of granular insecticide carbofuran 3G at 10 DAS and foliar application of chlorpyriphos 20 EC at 10 DAT were effective in suppressing the pest load in terms of per cent silver shoots.

5. References

1. Agricultural Statistics at a glance. Government of India Ministry of Agriculture & Farmers Welfare Department of Agriculture, Cooperation & Farmers Welfare Directorate of Economics and Statistic. 2016; https://eands.dacnet.nic.in
2. Kumar LV, Patil U, Prasannakumar MK, Chakravarthy AK. Bioefficacy of insecticides in nursery against Asian rice gall midge, *Orseolia oryzae* (Wood-Mason). Current Biotica. 2011; 5(3):323-329.
3. Panda SK, Samalo AP, Shi N. Effect of insecticidal protection for stem borers and gall midge on rice yields in Orissa, India. Oryza. 1988; 25(1):57-61.
4. Harinkhere JP, Kandalkar VS, Thakur SK. Effect of insecticidal application for control of rice gall midge. Journal of Soils and Crops. 1993; 3(1):60-62.
5. Mardi G, Pandey AC, Kumar SS. Occurrence and management of rice gall midge in transplanted rice (*Orseolia oryzae*, Wood Mason). Ecology Environment and Conservation. 2009; 15(2):361-365.
6. Visalakshmi V, Mohana Rao PR, Satyanarayana H. Evaluation of pest management modules in *kharif* rice. Journal of Crop and Weed. 2013; 9(2):165-167.