

Original Research Article

Evaluation of Insecticides and Biopesticides against Rice Stem Borer *Scirpophaga incertulas* (Walker) and Leaf Folder (*Cnaphalocrosis medinalis*) in Kharif Rice Under Farmers' Field Condition

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ABSTRACT

A field experiment was conducted during the kharif season of 2014 and 2015 under farmers field condition in Petarwar block of bokaro district to evaluate the efficacy of insecticides and biopesticide against rice stem borer and leaf folder. The experiment was comprising 4 treatments i.e; Farmers Practice (carbofuran 3G @4kg/ha at the time of occurrence), FP+T. chilonis 5 cards/ha, carbofuran 3G@30kg/ha in nursery at 5DBT+2 spray of fipronil 5%SC at 30 and 50 DAT in main field, and application of carbofuran 3G @30kg/ha in nursery at 5 DBT + T.chilonis card @5/ha. The lowest incidence of rice stem borer 3.3 and 3.6 and leaf folder 3.0 and 3.25 were recorded in fields treated with Carbofuran 3G @ 30 kg/ha at 5 DBT in nursery with application of 2 spray of Fipronil 5%SC at 30 & 50 DAT. The highest grain yield (30.3 q/ha), net return (Rs. 15050.00/ha) and maximum benefit : cost ratio (1.8) were recorded and found best with application of Carbofuran 3G @ 30 kg/ha along with 2 spray of Fipronil 5% at 30 and 50 DAT followed by application of Carbofuran 3G @ 30 kg/ha in nursery + *T.chilonis* @ 5 cards/ha.

Keywords

Rice Stem Borer
Scirpophaga incertulas
(Walker) and Leaf Folder
(*Cnaphalocrosis medinalis*)

Introduction

Rice is a major staple food crop of the state, it is necessary to increase the productivity of rice to meet the food requirement of the population. Not only the productivity has to be increased but it should be sustainable also over the years. There are over 70 pests infesting rice in India and 20 are of regular occurrence (Patha, 1975). The pest causes 25-30% damage to rice crop (Lal, 1996). Among the major pest attacking rice crop the stem borer, *Scirpophaga incertulas* (Walker) is the number one pest, which attack the crop both at vegetative and reproductive stages (Pasalu et.al., 2002). Recently much emphasis is being given on integrated pest management in rice.

(Patil, 1997, Senapati and Panda, 1998; Mathus *et al.*, 1999) some of the new granular insecticides have been tried as nursery and main field application for their efficacy against the major pest of rice in kharif season. Rice stem borer (*Scirpophaga incertulas*), Leaf folder (*Cnaphalocrosis medinalis*) have been reported from all major rice growing areas and causes severe damage to the rice crop. The young larvae of stem borer primarily enter to the leaf sheath and feed on the green tissue for 2-3 days after which the larvae enter to the basal parts usually 5-10cm above water level and at heading stage boring usually occurs at the peduncle node and the white ear head

formed. The leaf folder larvae cause injury to rice leaves by scrapping folding and webbing them upto 60%. (Prakash and Rao, 1999). In the present study use of some Trichocards in the field against rice stem borer the insect pest caused 25 to 30 percent yield loss in rice (Agarwala 1995, Sen 1956 and Shukla *et. Al*, 1986).

Recently some botanical products like Trichocards & neem products proved effective against some insect pest of rice, especially sucking pest (Saxena *et al.*, 1986). Hence keeping the above facts in mind the present study was undertaken to identify the most suitable insecticide and their combination with biopesticides against rice stem borer (*Scirpophaga incertulas*) (Walker) and leaf folder (*Cnaphalocrosis medinalis*) in kharif season in rice crop.

Materials and Methods

The field experiment was conducted during kharif season of 2014 and 2015 in Petarwar block of Bokaro district. The experiment was conducted in Randomized Block Design (RBD) with four treatments i.e; T₁ farmer practice- carbofuran 3G 4kg/ha T₂ farmer practice + use of *T. chilonis* @ 5card/ha (3 application at 7 days interval starting from 30 DAT), T₃ – nursery management, use of carbofuran 3G @ 30kg/ha 5 DBT+ 2 spray of fipronil 5% SC 2 ml/lt water 30 and 50 DAT, T₄ - nursery management, use of carbofuran 3G @ 30kg/ha 5 DBT+ use of *T. chilonis* @ 5card/ha (3 application at 7 days interval starting from 30 DAT), replicated in 10 farmers' fields as replication. The seed of rice variety (Lalat) was sown in nursery 15-20 June in both years. The 25-30 days old seedling were used for transplanting in main field. Transplanting was done at 20x15 cm spacing with recommended dose of fertilizer 120:60:40kg NPK/ha in all treatments. Insecticides and biopesticides were used as

per treatments in nursery plots. Five days prior to uprooting the seedlings granular insecticide with their specified dose were applied in nursery beds at saturation level. Foliar application of insecticides was done on 30 and 50 days after transplanting using a high volume knapsack sprayer using 500 liter of spray solution per hectare. Use of *Trichogramma chilonis* after 30 days after transplanting at seven days interval for 3 times. Observation on total tillers and dead hearts were recorded at 30 DAT and 50 DAT to assess stem borer damage at vegetative stage. Insect pest were recorded at 30 Days after spraying fipronil 5%SC on 20 randomly selected hills from each plot. Two season data on pests incidence and grain yield separately recorded the mean value of percentage increase over yield, cost of cultivation, net return and gross income were calculated on the basis of two years data.

Results and Discussion

Incidence of rice stem borer

During kharif season 2014 and 2015 insect pest under study, the minimum infestation of stem borer is (3.2%) and (3.4%) respectively were recorded in treatment with nursery management with Carbofuran 3G + 2 spray of Fipronil 5% SC at 30 and 50 DAT in both years. At 5 DBT, the plots treated with Carbofuran 3G @ 30kg/ha at nursery management + Fipronil 5% SC 2ml/lt water at 30DAT get lowest damage (3.2%). These results are in accordance with Sontakke and Dash (2000) who reported chlorpyrifos, ethoprophos, carbofuran, fipronil at 50DAT afforded effective control of stem borer. The other treatment nursery management with Carbofuran 3G + use of *T.chilonis* @ 5 cards/ha (3 application at 7 days interval) at 30 DAT (4.3%) and at par with the farmer treatments.

Table.1 Effect of insecticides on the incidence of stem borer, *Scirpophaga incertulas* (Walker) in rice

Treatments	Dose	Incidence of stem borer %						Reduction of incidence over FP%
		30 DAT			50 DAT			
		2014	2015	Mean	2014	2015	Mean	
FP (Carbofuran 3G) use at the incidence of pest	4kg /ha	15	16.4	15.7	19.1	21.3	20.2	-
FP+T. chilonis@5cards/ha (3 application at 7 days interval starting from 30 DAT)	30 kg/ha + 5 cards/ha	8.3	8.5	8.4	7.4	6.2	6.8	66.33
Nursery management of Carbofuran 3G +2 spray of Fipronil 5% SC	30 kg /ha 2ml water 30 & 50 DAT	3.2	3.4	3.3	3.5	3.6	3.6	82.17
Nursery management use of carbofuran 3G + use of T. chilonis	30kg/ha + 5 cards/ha 7 days interval after 30 DAT	4.3	4.6	4.5	4.3	4.6	4.6	77.22

DAT – Days after transplanting, DBT- Days before transplanting, FP – Farmers Practice

Table.2 Effect of insecticides on the incidence of leaf folder *Cnaphalocrocis medinalis* Guenee

Treatments	Dose	Incidence of leaf folder %							
		30 DAT			Reduction % of incidence over FP	50 DAT			Reduction% of incidence over FP
		2014	2015	Mean		2014	2015	Mean	
FP (Carbofuran 3G)	4kg /ha	12.2	13.4	12.8	-	14.7	15.2	14.95	-
FP+T. chilonis@5cards/ha (3 application at 7 days interval starting from 30 DAT)	30 kg/ha + 5 cards/ha	9.4	11.1	10.3	20.00	8.3	9.4	8.85	41.00
Nursery management of Carbofuran 3G +2 spray of Fipronil 5% SC	30 kg /ha 2ml water 30 & 50 DAT	2.8	3.2	3.0	77.00	3.1	3.4	3.25	78.26
Nursery management use of carbofuran 3G + use of T. chilonis	30kg/ha + 5 cards/ha 7 days interval after 30 DAT	4.2	4.0	4.1	68.00	4.4	4.5	4.45	70.23

Table.3 Effect of insecticides on yield (q/ha) of rice

Treatment	Dose	2014 Yield q/ha	% increase over FP	2015 Yield q/ha	% increase over FP	Mean Yield q/ha	% over FP
FP (Carbofuran 3G)	4kg /ha	27.5	-	24.5	-	26	-
FP+T. chilonis@5cards/ha (3 application at 7 days interval starting from 30 DAT)	30 kg/ha + 5 cards/ha	30.0	9.10	26.0	6.12	28	7.61
Nursery management of Carbofuran 3G +2 spray of Fipronil 5% SC	30 kg /ha 2ml water 30 & 50 DAT	32.1	16.7	28.5	16.32	30.3	16.51
Nursery management use of carbofuran 3G + use of T. chilonis	30kg/ha + 5 cards/ha 7 days interval after 30 DAT	31.2	13.5	27.1	10.61	29.15	12.05

Table.4 Effect of insecticides on cost of cultivation, gross return, net return, B: C ratio of rice cultivation

Treatments	Cost of cultivation			Gross Return Rs./ha			Net Return Rs./ha			B:C Ratio	
	2014	2015	Mean	2014	2015	Mean	2014	2015	Mean	2014	2015
FP (Carbofuran 3G)	20000	24000	22000	35150	34600	35025	15750	10300	13052	1.78	1.42
FP+T. chilonis@5cards/ha (3 application at 7 days interval starting from 30 DAT)	20300	24400	22350	39260	36400	37830	18960	12000	15480	1.93	1.49
Nursery management of Carbofuran 3G +2 spray of Fipronil 5% SC	20810	24850	22830	41730	39900	40815	20920	15050	17785	2.00	1.60
Nursery management use of carbofuran 3G + use of T. chilonis	20780	24700	22740	40560	37940	39250	19780	13240	16510	1.95	1.53

During the year 2015 the incidence of stem borer is minimum in combined treatment of technology option T₂ (3.4%) at par with technology option T₃ (4.6%). In Farmers practice maximum incidence of stem borer (15%).

The mean stem borer incidence was maximum in farmers' practice (15.7%) and minimum in technology option T₂ (3.3%). On the basis of mean value, use of T.chilonis @ 5 cards/ha along with Carbofuran 3G @ 4kg/ha proved 46.49% and 66.33% efficient in reduction of stem borer at 30 and 50 DAT respectively. The

lowest occurrence of stem borer 3.3 and 3.6 was recorded with plot treated with Carbofuran 3G @ 30kg/ha in nursery plots +2 spray of fipronil5%SC @2ml/lit in plots at 30 and 50 DAT respectively. It showed most effective in control of stem borer and recorded 78.98 and 82.17% reduction in incidence of stem borer over Farmer practice at 30 and 50 DAT respectively followed by use of Carbofuran 3G @ 30kg/ha 5 DBT in nursery + T. chilonis @ 5 cards/ha in main fields and recorded 71.3% and 77.22% reduction in incidence of stem borer at 30 DAT respectively over Farmers practice (Carbofuran 3G @ 4kg/ha).

Incidence of leaf folder

Similar trend were recorded in control of leaf folder and use of carbofuran 3G@30kg/ha 5DBT with Fipronil 5% @ 2ml/lt recorded the lowest incidence of mean leaf folder 3.0 and 3.25 at 30 and 50 DAT respectively which was 77.0 and 78.26% reduction in incidence over Farmers practice (use of carbofuran 3G @ 4kg/ha). Field treated with Carbofuran 3G along with T.chilonis cards @5/ha recorded 20.0 and 41.0 reduction in incidence of leaf folder at 30 and 50 DAT respectively on the 2 year mean value basis.

Grain yield and economics

The lowest yield of rice was recorded 26.0 q/ha with Farmers practice of insect pest management where use of insecticide Carbofuran 3G @4 kg/ha as per occurrence of stem borer and leaf folder. Use of T. chilonis and along with carbofuran 3G @4 kg/ha increased the yield of 7.61% over farmers practice use of carbofuran 3G above. Our observation are in comparable with the results of Gupta, Singh and Singh, (2006) who observed carbofuran and phorate were also effective against stem borer. The maximum grain yield 30.3q/ha was obtained with field treated recommended dose of Carbofuran 3G @ 30 kg/ha in nursery plot 5 DBT along with 2 spray of Fipronil 5%SC and recorded 16.5% higher than Farmers practice followed by nursery management with carbofuran 3G at 5DBT along with T.chilonis 5cards/ha and recorded grain yield (29.15q/ha) which was 12.0% higher than that of farmers practice. In the present study Gross return (Rs40815/ha), net return (Rs15050/ha) and B: C ratio (1.8) never found highest with field applied carbofuran 3G @4 kg/ha in nursery management along with 2 spray of fipronil @30 and 50 DAT. It is obvious that

realization of higher gross returns and net returns was the result of higher grain yield with the best treatment.

On the basis of reduction in incidence of rice stem borer and leaf folder and result of yield and Economics of rice cultivation under investification. It is concluded that the application of carbofuran 3G @30kg/ha in nursery at 5DBT along with 2 spray of Fipronil 5%SC at 30 and 50 DAT proved most effective in control of rice stem borer and leaf folder under prevailing micro farming situation.

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