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Evaluation of indigenous technical knowledge (ITK) against rice leaf folder, *Cnaphalocrosis medinalis* (Guen.) at southern parts of Chhattisgarh, India

■ CHANDRA SHEKHAR NETAM*, A.K. GUPTA AND CHANDRAMANI SAHU

Department of Agricultural Entomology, Indira Gandhi Krishi Vishwavidyalaya, RAIPUR (C.G.) INDIA

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***Corresponding author:**
Email : csnetam169@gmail.com

ABSTRACT :

Among various factors responsible for low yield, losses due to insect-pests attack are of prime importance. Paddy crop is attacked by more than hundred insect species, of which fifteen are of major economic importance. Among these insect-pests, leaf folder, *Cnaphalocrosis medinalis* Guen is noticed as regular insect-pest at baster plateau zone. Present studies on evaluation of efficacy of indigenous technology against leaf folder. The results revealed that significantly least infestation (3.16%) with the highest grain yield, gross return and CB ratio of 38.32 q/ha, Rs. 50,199.20 and 2.39, respectively recorded in standard check chemical *i.e.* chlorpyriphos 20 EC. Among the ITK components, *Neem* had least leaf infestation (9.52%) with highest grain yield (31.52 q/ha), maximum gross return (Rs. 41,291.20) and maximum CB ratio (2.05).

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INTRODUCTION

Rice (*Oryza sativa* L.) is the most important and extensively cultivated food crop, which provides half of the daily food for one of every three persons on earth. In Asia alone, more than 2 billion people obtain 60 to 70 per cent of their energy intake from rice and its derivatives. In world, rice has occupied an area of 157.7 M ha, with a total production of 650.2 M.T. In India, total rice crop area is 42.56 M ha, production is 95.98 M.T. and average productivity is 22.40 q ha^{-1} (Anonymous, 2011a). Chhattisgarh state is popularly known as "rice bowl of India" because maximum area is covered under rice during *Kharif* and contribute major share in national rice production. Rice is cultivated in an area of 3.61 M ha with the production of 5.48 M.T. and productivity of 15.17 q ha^{-1} (Anonymous, 2011b).

Presently rice is cultivated in 112 countries covering continent and consumed by 2500 million people in the developing countries. Chhattisgarh state came into existence in 2001 and having three major agro-climatic zone like Chhattisgarh plain (16 district), Bastar plateau(6

district) Northern hills (5 district).The total geographic area of Baster is 32.63 lakh ha. Out of which only 6.55 lakh ha. is net sown area. About 61 per cent area (20 lakh ha.) is under forest. Rice is foremost crop, grown in about 4.63 lakh ha. area, which covers 70 per cent of net sown area. In bastar region, Gall midge, Leaf folder and Brown plant hopper are the most distractive pests of rice area. Farmers adopt traditional methods of cultivation with no or a little use of fertilizers and plant protection measures (Anonymous, 2013).

Among various factors responsible for low yield, losses due to insect-pests attack are of prime importance. Rice crop is attacked by more than hundred insect species, of which fifteen are of major economic importance. The extent of losses due to ravages of these insect pests varies greatly from area to area and season to season. Among these insect-pests, leaf folder is noticed as regular insect-pest at baster plateau zone. Leaf folder is a complex of species. Eight species of leaf folder have been recorded so for. Presently leaf folder, *Cnaphalocrosis medinalis* Guen is an important pest in almost all the rice-growing countries of Asia. Adult male of *C. medinalis* (Gnen.) is uncus short and obtuse with two oblong-oval processes covered with transverse rows of short hairs. Tegumen is short fringed with long hairs, vaincculum with the saccus large and V shaped. Valvae short and ovate and costa with a broad sclerotized patch and fringed with long hairs in tuff and sclerotizations of the sacculus narrow. In female bursa elongated oval in shape. Dactus with the cephalic part broad and distal part narrow. Signum composed of a round orocess with scobination and ovipositor short, with broad swollen lobe. Newly hatched larva is dull white or light yellow with a brown head. Full grown larva is greenish yellow with a light brown head capsule and measures about 20 mm in length.

The pest out break and consequent damage to the crop has been reported from various countries like, Japan (Wada *et al.*, 1980), Nepal (Pradhan and Shashi, 1968) and other countries (Heinrichs *et al.*,1985). In India severe damage due to this pest has been reported from Maharastra (Dongre *et al.*, 1971), M.P. (Gargav *et al.*, 1971), Orissa (Yadava *et al.*, 1972), Gujarat (Upadhyay *et al.*, 1975), West Bengal (Chatterjee, 1979), U.P. (Verma *et al.*,1979), Haryana (Ram, 1986) and Chhattisgarh (Srivastava, 1989). Leaf folder causes damage to crop from the month of August to October with moderate to severe infestation.

The losses due to insect pests during vegetative phase (50%) contributes more to yield reduction than the reproductive (30%) or ripening phase (20%) as reported by Gupta and Raghuraman (2003). Among the insect pests damaging rice crop at different stages of crop growth, the leaf feeding insect pests are of major importance because of their ability to defoliate or to remove the chlorophyll content of the leaves, which results in considerable reduction in the yield. Rice leaf folder was earlier considered pest of minor importance but it has become major insect pest with the introduction of high yielding rice varieties in the recent past (Waldbauer and Mariciano, 1979). Incidence of leaf folder was recorded upto 22.40 per cent during *Kharif* season at Jagdalpur as reported by Bhatnagar (2004). Farmers of plateau zone are not so aware for new plant protection techniques. They adopt their own system based on indigenous knowledge. Indigenous knowledge is an information base of a given culture and society that has to be conserved and evolved continuously use of different herbs and materials against insect-pests are rational and eco-friendly and economically. Therefore, to produce higher yield it is necessary to evaluate.

MATERIAL AND METHODS

A field experiment was laid out in Randomized Block Design with eight treatments replicated three times. Swarna variety of rice was transplanted on 3rd week of August, *Kharif* 2013-14 in plot size of 5 x 4 m. All the recommended agronomical practices were followed in raising the crop. Out of eight treatments, first six treatments were based on botanicals where in 5 twigs with 1 feet length of each botanical were inserted into respective plots of each replication in each treatment. Treatment seventh was insecticide formulation as (chlorpyriphos 20 EC) check treatment and treatment eight was presented as untreated control (Table A). For leaf folder infestation, observations on ten plants per plot were recorded randomly and counts of infested and total leaf were recorded. The data on per cent leaf folder infestation were transformed to arc sine. At harvest, seed yield per plot was also recorded and converted to seed yield in kg per hectare. The data on leaf folder infestation and yield was subjected to statistical analysis for critical differences. Economics of the treatments were also worked out.

Table A : Treatment details

Sr. No.	Treatments	Botanical name	Doses
1.	Bhelwa	*Semicarpus anacardium*	5 Twigs/plot
2.	*Neem*	*Azadirachta indica*	5 Twigs/plot
3.	Karra	*Cheistanthus collinus*	5 Twigs/plot
4.	Bantulsi	*Ocimum basilicum*	5 Twigs/plot
5.	Sulfi	*Caryota urens*	5 Twigs/plot
6.	Karanj	*Pongamia pinnalai*	5 Twigs/plot
7.	Chlorpyriphos 20 EC		2.7ml/plot size of 20m²
8.	Untreated control		Water spray

RESULTS AND DISCUSSION

The experiment was configured to Randomized Block Design with seven treatments having indigenous technology knowledge (ITK) components replicating thrice in a homogenous area with respect to soil fertility status. The treatments were imposed at 30 DAT and 60 DAT. The infestation of *Cnaphalocrosis medinalis* was observed on the crop during investigation. The infestation of *C. medinalis* before the spray was non significant among the treatments.

Table 1 : Efficacy of botanicals against leaf folder in rice under field condition

Sr. No.	Name of treatment	Dose	Leaf folder infestation (%)			Mean
			30 DAT	60 DAT	80 DAT	
T_1	Bhelwa	5 twigs/ plot	10.67 bc (19.05)	15.57 cd (23.18)	12.33 de (20.52)	12.85 d (20.91)
T_2	*Neem*	5 twigs/ plot	10.40 b (18.79)	10.59 b (18.98)	7.59 b (15.98)	9.52 b (17.94)
T_3	Karra	5 twigs/ plot	12.57 d (20.79)	11.91 b (20.19)	11.41 cd (19.71)	11.96 cd (20.22)
T_4	Bantulsi	5 twigs/ plot	11.84 cd (20.11)	14.17 c (22.09)	13.64 e (21.64)	13.21 d (21.28)
T_5	Sulfi	5 twigs/ plot	12.10 d (20.31)	14.52 c (22.54)	13.05 d (21.02)	13.22 d (21.29)
T_6	Karanj	5 twigs/ plot	10.26 b (18.67)	11.88 b (20.17)	10.63 c (19.00)	10.92 bc (19.20)
T_7	Chlorpyriphos	2.7 ml/ plot	3.23 a (10.33)	3.24 a (10.27)	3.03 a (9.99)	3.16 a (10.19)
T_8	Untreated control	—	14.59 e (22.44)	16.81 d (24.62)	15.99 f (23.41)	15.79 e (23.49)
	C.D. (P=0.05)		1.07	1.44	1.35	1.28
	S.E. ±		0.32	0.46	0.43	0.40

Figures in parentheses are $\sqrt{x + 0.5}$ transformed values, DAT = Day after transplanting

Table 2 : Seed yield as influenced by botanicals

Treatments	Yield (q/ha)	Gross income (Rs./ha)	Additional yield over untreated control (q/ha)	Additional income over untreated control (Rs./ha)	Cost of treatment +cost of cultivation (Rs./ha)	CB ratio
Bhelwa	27.25 c	35697.50	5.28	6916.8	20100	1.78
Neem	31.52 b	41291.20	9.55	12510.5	20100	2.05
Karra	28.78 bc	37701.80	6.81	8921.1	20100	1.88
Bantulsi	28.85 bc	39352.40	6.88	9012.8	20100	1.96
Sulfi	27.58 c	36129.80	5.61	7349.1	20100	1.80
Karanj	30.04 b	39352.40	8.07	10571.7	20100	1.96
Chlorpyriphos	38.32 a	50199.20	16.35	21418.5	21000	2.39
Control	21.97 d	28780.70				
C.D. (P=0.05)	3.55					
S.E.±	1.22					

AT 30 DAT, significantly least infestation was noticed in standard check chemical *i.e.* Chlorpyriphos 20 EC @ 2.7 ml/plot. Among the ITK components, Karanj @ 5 twigs/plot significantly recorded least infestation with 10.26 per cent leaf infestation and was on par with *Neem* and Bhelwa with 10.40 and 10.67 per cent leaf infestation, respectively. The latter was at par with Bantulsi with 11.84 per cent leaf infestation which inturn was at par with Sulfi and Karra with 12.10 and 12.57 per cent leaf infestation. Significantly maximum leaf infestation was recorded in untreated control with 14.59 per cent. AT 60 DAT, the standard check chemical had significantly least infestation over all the treatments. The next best treatment was *Neem* @ 5 twigs/plot with 10.59 per cent infestation which was significantly at par with Karra and Karanj with 11.99 and 11.88 per cent leaf infestation, respectively. Treatment Bantulsi, Sulfi, and Bhelwa were at par with each other. However, maximum leaf infestation (16.81%) was noticed in untreated plot and was at par with treatment Bhelwa (15.57%). The trend during 80 DAT was similar as that of 30 DAT and 60 DAT where, standard check chemical *i.e*. Chlopyriphos 20 EC @ 2.7ml/plot was significantly superior over all the treatments. Among the ITK component, treatment *Neem* gave minimum infestation with 7.59 per cent leaf infestation. Next best ITK component was Karanj (10.63% leaf infestation) followed by Karra (11.41% leaf infestation) which was at par with Bhelwa (12.33%) and Sulfi (13.05%). The latter was at par with Bantulsi (13.64%). Significantly maximum leaf infestation was recorded in untreated control (Table 1).

On the basis of mean per cent leaf infestation, besides the performance of standard check chemical, ITK component *i.e. Neem* was significantly superior (9.52% leaf infestation) followed by Karanj (10.92% leaf infestation) and it was at par with Karra (11.96% leaf infestation) which was on par with other treatments. All the treatments were significantly superior over untreated check. Significantly highest yield of 38.32 q/ha was recorded in treatment Chlorpyriphos 20 EC @ 2.7 ml/plot over all the treatments. Among the ITK components, *Neem* @ 5 twigs/plot recorded highest yield (31.52 q/ha) followed by Karanj (30.04 q/ha), Bantulsi (28.85 q/ha) and Karra (28.78 q/ha). Whereas, the lowest yield was recorded in Bhelwa treated plots (27.25 q/ha). Significantly lowest yield was noticed in untreated plot (21.97 q/ha). The highest gross returns of Rs. 50,199.20 recorded by Chlopyriphos 20 EC. The next better components who received highest gross returns were *Neem* (Rs. 41291.20), Karanj (Rs. 39352.40) and Bantulsi (Rs. 39352.40). The highest C:B ratio of 2.39 was recorded in Chlorpyriphos followed by *Neem* treatment (2.05) (Table 2). The efficacy of *Neem* and its products was reviewed and documented by several authors (Sannaveerappanavar and Viraktamath,1997) which lend support to the present findings.

Almost similar findings were reported by Patel *et al.* (2011) who revealed that treatment Chlopyriphos @ 0.05 per cent was significantly superior. Among the botanicals, nimbecidine was found more effective followed by neemrus against leaf roller and skipper of rice crop. This findings is particularly in accordance with the present ones where *Neem* twigs were found superior over all the botanicals followed by Karanj and Karra. Sharma (2008) revealed that broadcasting of Kodo straw at 10 DAT followed by insertion of Karra twigs at 25 DAT and one spray of *Neem* oil at 45 DAT gave minimum infestation of insect-pests in rice crop. While in the present investigation, insertion of *Neem* twigs gave the minimum leaf infestation followed by Karanj and Karra twigs.

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