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Efficacy of Insecticides on Rice Crop Against Rice Leaf Folder, *Cnaphalocrocis Medinalis* Guen. (Pyralidae: Lepidoptera)

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ABSTRACT
A field study was carried out during 2010 at experimental area Sindh Agriculture University Tandojam in RCBD to examine the reduction percentage in the population of *C. medinalis* on rice crop with three insecticides viz; Deltophos, Tracer, Thioluxan and impact of these insecticides was composed with control plot (untreated). The data showed the maximum reduction (76.19%) in the population of C.medinalis was recorded in the plots treated with Deltaphos followed by Tracer (65.93%) and Thioluxan (46.92%) after 1st spray on rice crop. In the second spray maximum reduction (71.08%) was also recorded in the plots treated with Deltaphos followed by Tracer (57.40%) and Thioluxan (30.15%). Similarly, after 3rd spray the maximum reduction (78.99%) was recorded in the plots treated with Deltaphos followed by Thioluxan (55.88%) and Tracer (54.34%) on rice crop. While, in fourth spray, the maximum reduction (71.92%) was recorded in plots treated with Deltaphos followed by Tracer (39.36%) and Thioluxan (14.36%) on rice crop. The results further indicated that the maximum yield (4783.00kg/ha¯1) was recorded in plots treated with Deltophos followed by Tracer (4486.46kg/ha ¯1) and Thioluxan (4033.66kg/ha¯1) as compared control (3066.50kg/ ha¯1).Highly significantly ($P < 0.01$) difference in the efficacy of insecticides was recorded during all sprays carried out in cropping season of rice crop.
Key word: *Oryza sativa*, *Cnaphalocrocis medinalis. Management and Insecticides.*

INTRODUCTION

Rice (*Oryza sativa* L.) is cultivated and consumed by 2500 million people in almost 112 countries.About 90% of the world's rice is grown and consumed in Asia (Ahmed et al., 2005). Rice is an important cereal crop which plays multifarious role in the economy of Pakistan (Sabir *et al.,* 2006). There are large numbers of insect pests, which damage rice crop right from nursery sowing to the harvest causing considerably high yield losses. About 128, different species of insect pests have been reported to attack rice crop in Pakistan (Ahmed, 2005). Insect pests damage rice crop at different stages of its growth. Among that leaf feeding insect pests are of major importance because of their ability to defoliate or to remove the chlorophyll content of the leaves leading to considerable reduction in yield. Rice leaf folder, *Cnaphalocrocis medinalis* (Guen. Pyralidae Lepidoptera) was considered as pests of minor importance have increased in abundance in late 1980's and have become major pests in many parts world (Ahmed *et al*., 2010). Paddy leaf folder is one of the most important insect pests (Gunathilangaraj *et al.,* 1986)**.** Out of the eight species of leaf folder, the most widespread and important one is *Cnaphalocrocis medinalis* (Guenee) (Bhatti *et al*., 1995). *C. medinalis* (LF) has been reported to attain the major pest status in some important paddy growing areas (Maragesan *et al*., 1987). Second instars Leaf folder larvae glues the growing paddy leaves longitudinally for accommodation and feeds on green foliage voraciously which results in papery dry leaves (Khan *et al*., 1989). Loss incurred to the growing paddy crop is insurmountable (Ahmed *et al*., 2010). Feeding often results in stunting, curling or yellowing of plant green foliage (Alvi *et al*., 2003). The extent of loss may extend up to 63 to 80 percent depending on agro-ecological situations as reported by (Rajendran *et al.,* 1986). The control of rice insect pests has often relied on extensive use of insecticides, which disrupt the beneficial insects and other insect fauna and also cause environmental contamination (Heong, 2005). The heavy use of insecticides and high fertilizer rates seem to favour leaf-folder population outbreaks (Gottfried and Fallil 1986). For the control of this pest in Asia, more than 25 per cent of applied pesticides are aimed to this pest in a year (Heong *et al*., 1997). In Sri Lanka, LF affects roughly 20 per cent of the total paddy field (Nugaliyadde *et al*., 1997). Application of Lorsban, Sumithion, Methyl Parathion, Denital and Thiodan gave more than 90% mortality of the insect larvae and were statistically at par in controlling the rice leaf-folder. Ramasubbaiah *et al.* (1980) tested fenthion, phosphamidin, fenitrothion, endosulphon dimethoate, quinalphos, diazinon and carbaryl against *C. medinalis* and reported that all insecticides gave effective control. Saroja and Raju (1982) studied the effect of some foliar insecticides against leaf folder and found that cypermethrin and fanvalerate provided effect control and increased the yield of rice significantly. Hence, this study was taken up and the results of which will be useful for the scientists to work out for an Eco-friendly Integrated Pest Management, thus it will support the ultimate beneficiary to the farming community (Ahmed *et al*., 2010).

MATERIAL AND METHOD

Experiment was conducted at Sindh Agriculture University Tandojam during 2010. Rice crop (IRRI-6) was grown to determine the population dynamics of *C. medinalis.* The experiment was laid out in a Randomized Complete Block Design with four treatments and three replications, in a field measuring about 1245m² (12 ghunta) with sub plot size 207m² (2 ghunta). The crop was transplanted on 1st week of July in 2010. All the agronomic practices were carried out accordingly. The population was recorded by counting the number of insect larvae from randomly selected 10 plants calculating average number of larvae per hills. Three insecticides were evaluated against rice leaf folder on rice crop.
The detail of treatments is given as under;

Trade name and formulation	Common name	Dose (acre)	Dose ml/sub plot
Deltaphos 10.5 EC	Trizophos	600 ml	30 ml
Thioluxan 10.5 EC	Endosulfan	1000 ml	50 ml
Tracer 480SL	Spinosad	100 ml	5 ml
Control	Without pesticides		

The insecticides were sprayed with the help of knapsack sprayer machine and sprays was done in the early morning. Four sprays was done during the morning hours, the 1st spray was done on 026-07-2010., while second, third and fourth sprays was applied at 15 days interval, respectively. Observations at each spray were taken one day before spray (Pre treatment observation) and three observations after spray (Post treatment observations) at the interval of 1 day, 3 day and after one week. To see the efficacy of pesticides reduction percentage was calculated as per the standard formula of Hinderson and Titten (1955).

$$\text{Percent mortality} = 1 - Ta \times \frac{Ca}{Tb} \times \frac{100}{Cb}$$

Where

Tb = Number of pest in treated plots before treatment.
Ta = Number of pest in treated plots after treatment.
Cb = Pest population in the control plots before treatment.
Ca = Pest population in the control plots after treatment.

Yield of the crop from each treatment was ascertained to compare the input of each treatment.

RESULTS

The experiment was carried out on the effect of some chemical insecticides on rice leaf folder, *Cnaphalocrocis medinalis* Guen. (Pyralidae : Lepidoptera) at Sindh Agriculture University Tandojam under field conditions during 2010. The results of present studies are given below:

The result on reduction in the population of *C. medinalis* was recorded after one, three and seven days after 1st spray of insecticides. Table1 revealed that the different pesticides reduce *C. medinalis* population progressively. All insecticides showed maximum reduction %age after 7th day of 1st sprays except Thioluxan, which reduced maximum population on 3rd day. The maximum reduction percentage was recorded in the plots treated with Deltophos (76.19%), followed by the plots treated with Tracer (65.93%). The maximum reduction (46.92%) brought by Thioluxan 3rd day of spray after that it reduced its efficacy and rice leaf folder enhanced it activates on the crop.

Table 1 Mean population and reduction %age of different pesticides against *C. medinalis* on rice crop after 1st spray by the application of insecticides.

Treatments	Pre Treatment population	Reduction percentage in population		
		1 DAS	3 DAS	7 DAS
Deltaphos	3.70	64.85%	70.24%	76.19%
Tracer	3.17	51.66%	62.40%	65.93%
Thioluxan	3.07	43.91%	46.92%	40.67%

DAS= Day After Spry

Figure 1 indicated that the total reduction %age of *C. medinalis* of different treatments during 1st spray. The data showed the maximum total mean reduction %age (76.19%) was recorded in the plots treated with Deltaphos followed by Tracer (65.93%). However, the minimum reduction %age was recorded in the plots treated with Thioluxan (46.92%) after 1st spray on rice crop.

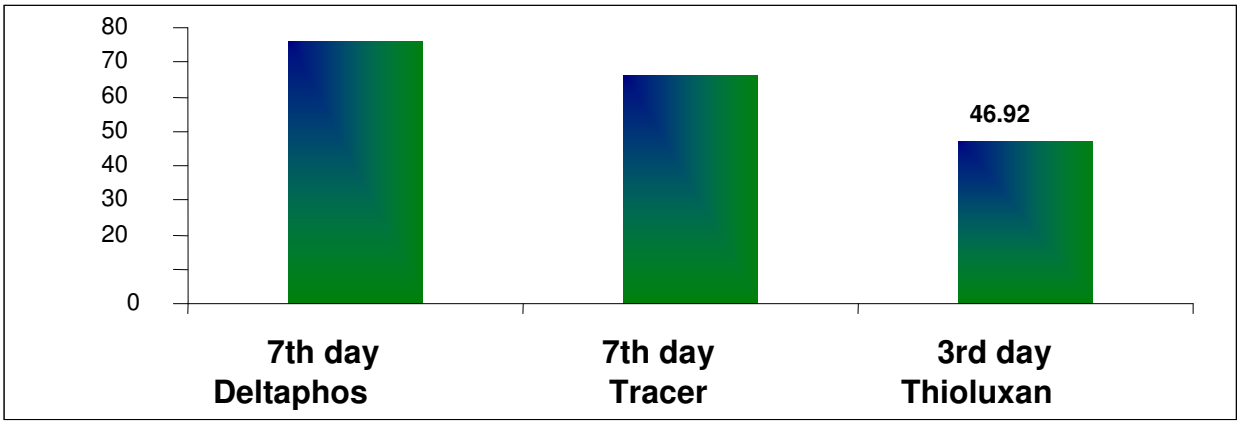

Figure 1 Total reduction %age in the population of *C. medinalis* after different time intervals of 1st spray by insecticides on rice crop.

The result of second spray showed that all insecticides behaved very similarly against rice leaf folder as record during the 1st spray. However, the efficacy with regard to time interval was changed a 1st during 2nd spray both Tracer and Thioluxan lost then efficacy after 3rd day. Table 2 showed that the maximum reduction (71.08%) was recorded in the plots treated with Deltophos followed, by Trace (57. 40%) and (30.15%) in Thioluxan respectively.

Table 2 Mean population and reduction %age of different pesticides against *C. medinalis* on rice crop after 2nd spray by the application of insecticides.

Treatments	Pre Treatment population	Reduction percentage in population		
		1 DAS	3 DAS	7 DAS
Deltaphos	1.93	49.04%	52.92%	71.08%
Tracer	2.03	35.09%	57.40%	53.38%
Thioluxan	2.07	28.00%	30.15%	17.27%

DAS= Day After Spry

Figure 2 indicated that the total mean reduction %age of *C. medinalis* of different treatments of 2nd spray. The data showed the maximum total mean reduction %age (71.08%) was recorded in the plots treated with Deltaphos followed by in the plots treated with Tracer (57.40%). However, the minimum reduction %age was recorded in the plots treated with Thioluxan (30.15%) after 2nd spray on rice crop.

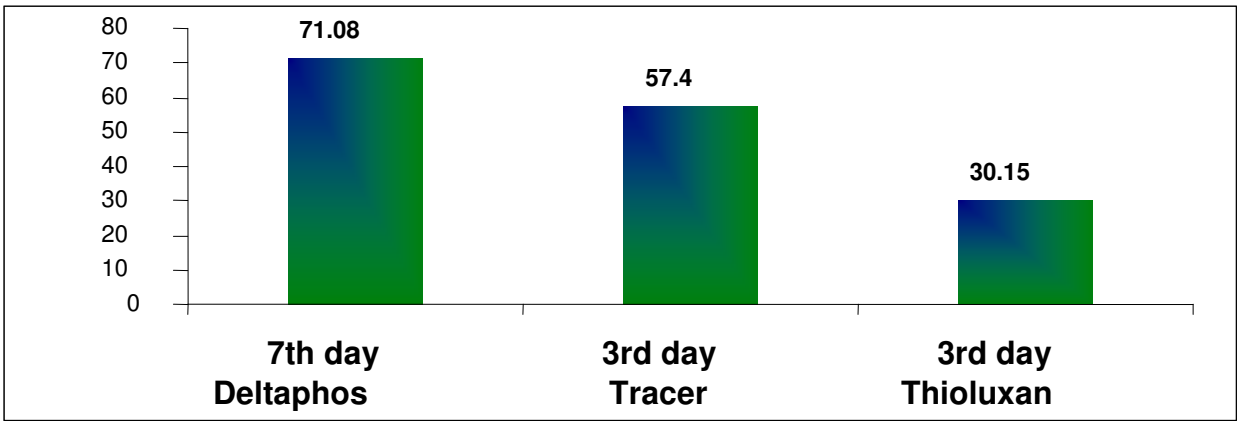

Figure 2 Total reduction %age in the population of *C. medinalis* after different time intervals of 2nd spray by insecticides on rice crop.

During 3rd spray the behavior of insecticides was recorded in contrast of the results of 1st spray. During 3rd spray all insecticides lost the efficacy after 3rd day of spray. The data in Table 3 showed that the maximum reduction percentage was recorded in the plots treated with Deltophos, (78.99%) followed by Thioluxan (55.88%) and Tracer (54.88%). However no significantly difference was recorded in the efficacy of Tracer and Thioluxan against rice leaf roller on rice crop.

Table 3 Mean population and reduction %age of different pesticides against *C. medinalis* on rice crop after 3rd spray by the application of insecticides.

Treatments	Pre Treatment population	Reduction percentage in population		
		1 DAS	3 DAS	7 DAS
Deltaphos	1.95	74.23%	78.99%	59.46%
Tracer	2.225	39.95%	54.34%	51.48%
Thioluxan	2.375	39.99%	55.88%	48.53%

DAS= Day After Spry

Figure 3 indicated that the total mean reduction %age in the population of *C. medinalis* by the application of different treatments during 3rd spray. The data showed the maximum reduction (78.99%) was recorded in the plots treated with Deltaphos followed by the plots treated with thioluxan (55.88%) and the plots treated with Tracer (54.34%).

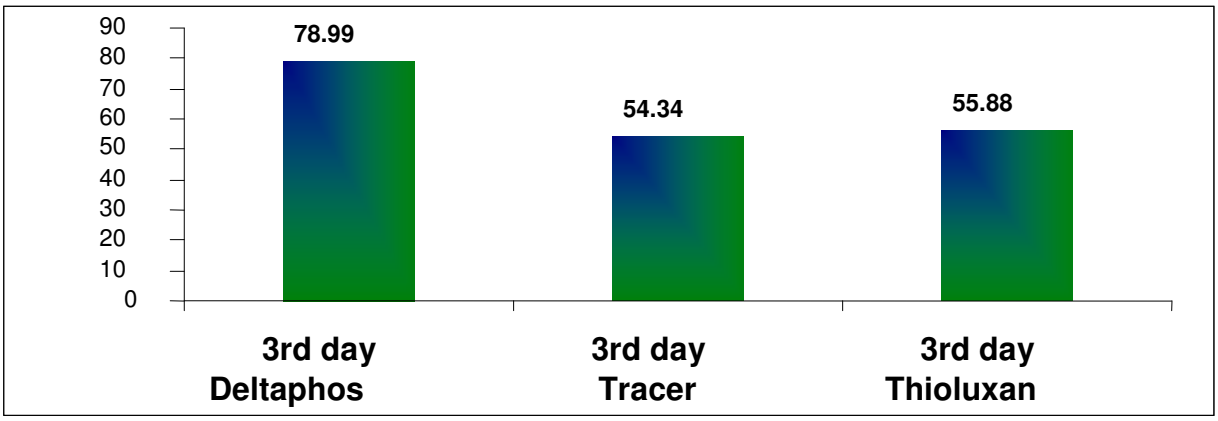

Figure 3 Total reduction %age in the population of *C. medinalis* after different time intervals of 3rd spray by insecticides on rice crop.

The data in Table 4 reveled that the performance of the insecticides during 4th spray the maximum reduction was recorded in the plots treated with Deltophos (71.92%), followed by the plots treated with Tracer (39.36%), and in the plots treated with Thioluxan (14.36%) at 1st day interval respectively.

Table 4 Mean population and reduction %age of different pesticides against *C. medinalis* on rice crop after 4th spray by the application of insecticides.

Treatments	Pre Treatment population	Reduction percentage in population		
		1 DAS	3 DAS	7 DAS
Deltaphos	1.00	71.92%	64.06%	35.15%
Tracer	1.25	39.36%	33.30%	19.21%
Thioluxan	1.25	14.36%	6.29%	6.35%

DAS= Day After Spry

However, Figure 4 showed that the maximum reduction %age in *C. medinalis population that is* recorded in the plots treated with Deltaphos (71.92%) followed by in plots treated with Tracer (39.36%). However, the minimum reduction %age was recorded in the plots treated with Thioluxan (14.36%) after 4th spray on rice crop.

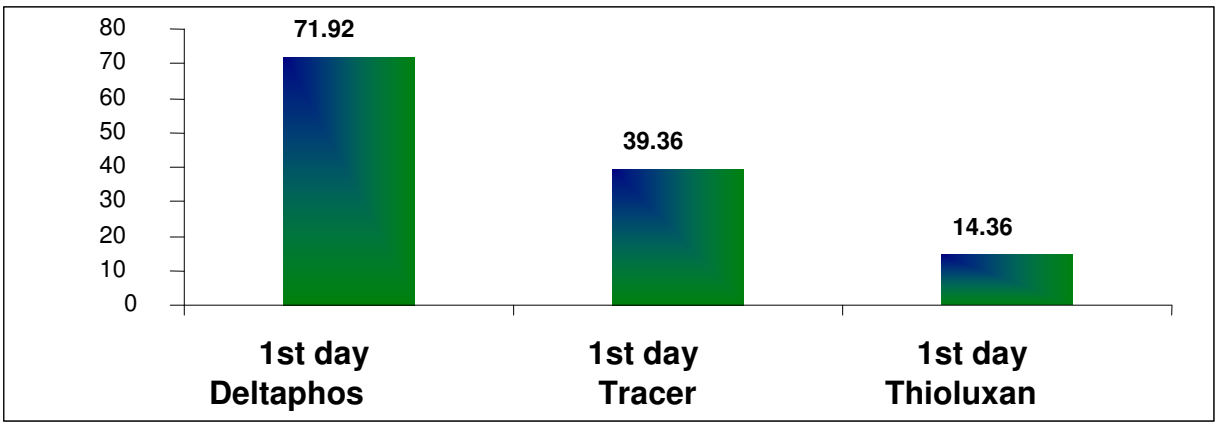

Figure 4 Total reduction %age in the population of *C. medinalis* after different time intervals of 4th spray by insecticides on rice crop.

All insecticidal treatments gave the significantly more yield as compared untreated plots. Table 5 showed that the average paddy yield obtained after harvesting. The highest average paddy yield was obtained in the plots treated with Deltaphos (4783.00kg/ha¯1), followed by the plots treated with Tracer (4486.46kg/ha ¯1) and the plots treated with Thioluxan (4033.66kg/ha¯1) as compared control (3066.50kg/ ha¯1). Increase in average yield over control (1716.50 kg/ ha¯1) was recorded in plots treated with Deltophos. The average yield obtained in the treated plots with the application of Thioluxan (967.16 kg/ha¯1) was statistically lower than the other former insecticides.

Table 5 Average yield of rice crop after control operations of rice leaf-folder, *C. medinalis* at Sindh Agriculture University Tandojam during 2010.

TREATMENTS	Average yield (kg/ ha ¯1)	Increase in yield over control(kg/ ha ¯1)
Deltaphos	4783.00	1716.50
Tracer	4486.46	1419.96
Thioluxan	4033.66	967.16
Control	3066.50	

DISCUSSION

Present results partly corroborates to those of Misra *et al*. (2012) and Kaushik and Deb (2011) who have noted that the population suppression capacity of monocrotophos and cypermethrin was essentially prudent in some regions of India. The rice leaf folder population before and after application of insecticides were averagely counted. When the rice leaf folder was appeared on the rice field sprays with different chemical insecticides against rice leaf folder. The rice field was sprayed till sizeable reduction was brought by the different chemical products which were testes against rice leaf folder. In the same patteren Ramasubbaiah *et al.* (1980) noted that fenthion, phosphamidin, fenitrothion, endosulphon dimethoate, quinalphos, diazinon and carbaryl could effectively suppress LF menace. The rice field was sprayed six times since the appearance of rice leaf folder onto them the 1st spray was done. The data reveal that maximum reduction numbers in rice leaf folder population was recorded with one week after spray in all treatments during all six sprays. Saroja and Raju (1982) have viewed that cypermethrin and fanvalerate are best suitable pesticide to suppress rice leaf folder population and accordingly to maximize paddy yield. Our findings are in agreement with their of Bhanu *et al.* (2008) who have noted considerable variations in the efficacy of pesticides in field condition. Wakil *et al*. (2001) from Pakistan have reported that not all the pesticides were equally effective to check leaf folder attack.

Data further reveled that the maximum reduction percentage of rice leaf folder population was recorded as (73.22%) in the plots treated with Deltaphos followed by in the plots treated with Tracer (64.17%). However, the minimum reduction %age was recorded in the plots treated with Thioluxan (43.80%) during all for applications of insecticides on rice crop. The plots treated with Deltaphos gave the highest reduction in the population of rice leaf folder followed by Tracer and Thioluxan. The reduction in the population caused by these insecticides was statistically at par. Thioluxan significantly lower mortality than the former pesticides. Our results are in partial agreement with those of Mishra *et al*. (1998) and Kaushik and Deb (2011) who observed that monocrotophos and cypermethrin gave good control of rice leaf-folder and were at par statistically. All insecticidal treatments significantly out yielded the untreated plots. The highest average paddy yield was obtained in plots treated with the application of Deltaphos followed by Tracer, Thioluxan and Control. Our results are almost similar to the Saroja and Raju (1982) who obtained similar increase in yield by controlling *C. medinalis* damage by the application of synthetic pyrethroids.

Conclusion

The Deltophos pesticide proved better to control rice leaf folder as compared Tracer in rice field . Maximum reduction in the population of *C. medinalis* was recorded very next day of application. All insecticides lost their effect within in a week.

Recommendations

The insecticide Daltaphos should be used an excellent and rapid tool to diminish rice leaf folder population in rice field. Spraying of Deltaphos should be kept continue at week interval until a sizeable reduction in the population of RLF is achieved.

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