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Comparative efficacy of certain commercial and natural neem products against leaf folder, *Cnaphalocrocis medinalis* (Guenee) on paddy

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Abstract

A field experiment was conducted during Kharif season 2019 at central crop research farm, Department of Entomology, SHUATS, Prayagraj, (UP). A replicated field trial was conducted in a Randomized block design at central crop research farm. The objective was to include the commercial and natural neem products to control the leaf folder, (*Cnaphalocrocis medinalis*). A spray was given in two intervals. There were seven treatments each replicated thrice. Among seven treatments the combination of Neem oil + NSKE proved the best efficacy with 9.85 in first spray and 7.25 in the second spray and also 40.25 q/ha increased by 23.75 q/ha compared to control plot in yield and B:C ratio is 1:5.90 were recorded followed by Neem oil proved efficacy with 8.35 in second spray and yield with 38.75 q/ha and B:C ratio is 1:5.72. It could be concluded that for the management of Rice Leaf folder (*Cnaphalocrocis medinalis*) on Rice crop, recommended treatment schedule of Neem oil + NSKE proved to be most effective and economical.

Keywords: efficacy, cost-benefit ratio, *Cnaphalocrocis medinalis*

Introduction

Rice (*Oryza sativa* L.) is a life and princess of cereals, the staple food of 65% of the total population in India. Among the rice growing countries, India has the largest area under rice in the world (about 44.6m.ha) i.e., 28% of the world's production, and ranks second next to China. The share of India to world's production is near about 22.1 percent. Rice is grown in many countries in the world however the major five countries in rice growing areas are India (47.94 million hectares), China (30.58 million hectares), Indonesia (13.84 million hectares), Thailand (12.37 million hectares) and Bangladesh (11.77 million hectares). Rice leaf folders are important pests of upland and low land rice in several Asian countries. During the last decade the pests have become an increasingly important threat to rice production (Khan *et al.*, 1989) [6]. From the eight species composing the leaf folder complex of rice, the most important species is *Cnaphalocrocis medinalis* (Guenee). In their studies, 17.5% damaged leaves resulted in 16.5% yield loss, and 21.3% yield loss corresponded to 26.6% damaged leaves (Bautista *et al.*, 1984) [3]. In recent years, various types of insecticides belonging to different chemical groups have been used to manage the pests and excessive reliance on these chemicals has led to the problem of resistance, resurgence, environmental pollution and health threat to the consumers thus it has become essential to use the organic products and biological ways to reduce and control the damage to environment and human health as well as to reduce the pest incidence, pesticide resurgence and pest outbreak. The Indian neem tree, *Azadirachta indica* A. Juss (Meliaceae), has been found to be a promising source of natural pesticides, given that several constituents of its leaves and seed show marked insect control potential. Neem is a natural soil conditioner that helps to improve the quality of soil but also prevents plants from being destroyed by certain pests and insects. Neem products reduce insect growth in crops and plants. Neem products are used as neem insecticide, neem pesticide, neem pest fumigant, neem fertilizer, neem manure, neem compost, neem urea coating agent and neem soil conditioner. Keeping all these things in view to improve rice production the present investigation was undertaken on the basis of the objectives, first one is to compare the efficacy of certain commercialized and natural neem products against leaf folder in paddy and the second one is to calculate the cost benefit ratio of neem products.

Materials and Methods

The experiment was conducted during the kharif season 2019 at Sam Higginbottom University of Agriculture technology and Sciences Rewa road Prayagraj UP, Central research field. Prayagraj is situated at 25.4358° North latitude, 81.8 4 6 3° East longitude and at an altitude of 98 mts above sea level. The climate is typically semi-arid and subtropical. The maximum temperature reaches up to 39.4°C. The site selected was uniform, cultivable with typical sandy loam soil having good drainage.

Preparation and application of botanicals

A measured quantity of solution or powder was mixed with a little quantity of water, stirred well there after sprayings were given by using a hand compression sprayer during evening hours. The plot in each treatment was sprayed with respective botanical ensuring uniform coverage of insecticide. The sprayer and accessories were thoroughly washed before changing the treatment and also rinsed with the spray fluid of the botanical applied next. Spray solution was applied with the help of Hand compression sprayer. Spraying was done at 40 days and 60 days after transplanting during dawn and dusk time where there were no wind currents. The treatments were control, Neem oil @ 10 lit/ha, Neemcake @ 200 kg/ha, NSKE @ 25 kg/ha, Achook @ 500 kg/ha, Nimbecidine @ 3 lit/ha, Neemoil @ 10 lit/ha + NSKE 10 kg/ha, Bioneem @ 5 ml/lit.

Methods of recording observations

The observations on the number of rice leaf folder pest were recorded from the five randomly tagged plants from each plot. The observations were recorded a day before followed by 7th, 14th days after spraying. Folded leaves due to rice leaf folder pest were recorded from each net plot and the population was worked out per plant. The first spraying of Neem oil, Neem cake, NSKE, Achook, Nimbecidine, Neem oil + NSKE, Bioneem and Untreated were done as soon as the folded leaves were found due to *Cnaphalocrocis medinalis* larvae was observed on the plants at ETL 5%. Subsequent applications were undertaken at a interval of 20 days. Thus, the applications of the treatments were undertaken on the following dates. (1st application: 26-08-2019, 2nd application: 15-09-2019). Extent of infestation of leaf folder was recorded after counting the number of leaves having more than 1/3 damaged leaf area (DL %) was calculated using the following formula.

$$\text{Percent infestation} = \frac{\text{Number of damaged leaves per hill}}{\text{Total no. of leaves per hill}} \times 100$$

Statistical analysis

Experimental data collected were subjected to statistical analysis by adapting fisher's method of analysis of variance (ANOVA) as outlined by (Gomez and Gomez, 1984). Critical Differences (CD) were calculated with F-test was found significant at 5% level.

Results and Discussion

Mean infestation of first spray

All the treatments were significantly superior to control in reducing infestation percent of leaf folder which were mean of 7 and 14DAS after application of spray. Neemoil + NSKE was found significantly superior (9.85%), these findings were supported by the Mahapatro (2000)^[7]. Followed by Neem oil (11.20%), similar findings are also reported by Baitha *et al.* (2000)^[2]. NSKE (11.70%) was the next best treatment these similar findings are those of Sakia and Parmeswaran (2002)^[10]. The treatment (Nimbecidine 11.89%) was found next best treatment similar findings were reported by Patel *et al.*, (2011)^[8]. Next best treatment proved to be the Neemcake (12.10%) which is in line with findings of Ambethgar (1996)^[1]. Achook (13.33%) and Bioneem (14.82%) were found to be least effective but comparatively superior over the control these results were supportive with Kalita *et al.* (2009)^[5] and Prabalsakia and Parmeswaran (2000)^[9]. Among all the treatments lowest percent of infestation was recorded in T₆. The treatments T₅ and T₃ are found par with each other. The next treatments T₃ and T₁ are found par with each other.

Mean infestation of second spray

All the insecticides were significantly superior over control in reducing the infestation percent of leaf folder which were recorded at 7, and 14 DAS mean after application Neemoil + NSKE was found significantly superior (7.25%) these findings was reported earlier by Mahapatro (2000)^[7]. Neem oil (8.35%) was found to be next best treatment these findings were also supported by the Baitha *et al.* (2000)^[2] Next best treatment was NSKE (9.25%) was supported earlier by Sakia and Parmeswaran (2002). Next best treatments were Neem cake (9.40%), Nimbecidine (9.65%) these findings were supported by Ambethgar (1996)^[1], Patel. HN *et al.* (2011)^[8] The results of Achook and Bioneem were (10.75%), (11.50%) found to be least effective among all the treatments these findings were supported by Kalita *et al.* (2009)^[5] and Prabalsakia and Parmeswaran (2000)^[9]. The treatments T₃ and T₂ are found par with each other.

Yield

The yield among the treatments was significant. The highest yield was recorded in Neem oil + NSKE (40.25 q/ha) by Mahapatro (2000)^[7]. followed by Neem oil (38.75 q/ha) Baitha *et al.* (2000)^[2], NSKE (35.75q/ha) Sakia and Parmeswaran (2002)^[10], Neem cake (32.25q/ha) Ambethgar (1996)^[1], Nimbecidine (31.00 q/ha) Patel *et al.* (2011)^[8], Achook (28.75 q/ha) Kalita *et al.* (2009)^[5], Bioneem (26.50 q/ha) Prabalsakia and Parmeswaran (2000)^[9], as compared to control (16.30 q/ha).The highest yield was recorded in T₆.

Economics

The highest B:C ratio (1:5.910) was observed in the 7th treatment (Neem oil + Neem Seed Kernel Extract (NSKE)).

Table 1: Effect of Neem product treatments on the incidence of Rice leaf folder (*Cnaphalocrocis medinalis*) infestation after first spray, second spray, yield and economics of Rice.

Treatments	First spray (mean)	Second spray (mean)	Mean yield (q/ha)	B:C Ratio
T ₀ Control	25.30	28.5	16.50	1:2.52
T ₁ Neem oil	11.20	8.35	38.75	1:5.720
T ₂ Neem cake	12.10	9.40	32.25	1:4.485
T ₃ NSKE	11.70	9.25	35.75	1:5.386
T ₄ Achook	13.33	10.75	28.75	1:4.266
T ₅ Nimbecidine	11.89	9.65	31.00	1:4.517
T ₆ Neem oil + NSKE	9.85	7.25	40.25	1:5.910
T ₇ Bioneem	14.82	11.50	26.50	1:3.908
F-test	S	S	-	-
C.V.	4.903	15.198	-	-
C.D.	1.60	3.08	-	-

Conclusion

It could be concluded that for the management of Rice Leaf folder (*Cnaphalocrocis medinalis*) on Rice crop, recommended treatment schedule of Neem oil + NSKE proved to be most effective and economical. The use of treatments such as Neem oil, NSKE, Neem cake, Nimbecidine, Achook for the management is also effective.

2002, 10.

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