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RESEARCH ARTICLE

MANAGEMENT OF ARMYWORM OUTBREAK IN RICE FIELD OF CHITWAN DISTRICT

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ABSTRACT

The outbreak of armyworm is uncertain and causing substantial yield loss in rice. Hence, an action research was carried out to evaluate the efficacy of different management treatments as, i) Emamectin benzoate 5 SG @ 0.3 gm/lit; ii) Cypermethrin 25 EC @ 1ml/lit; iii) Fenvalerate 20 EC @ 1 ml/lit; and iv. Untreated check against two armyworm species namely, *Mythimna separata* (Walker) and *Spodoptera litura* (Fabricius) during outbreak in rice field of Piple, Chitwan in October, 2013. The experiment was laid out in randomized complete block design with five replications. The efficacy study revealed that all treatments significantly reduced larval population and increased grain yield over untreated check ($p<0.05$). There was highest population reduction in Emamectin benzoate treated plots (90.24%) followed by Fenvalerate (79.31%) and Cypermethrin (70.77%). The significantly highest grain yield was obtained in Emamectin benzoate treated plots (2.01 mt/ha) followed by Cypermethrin (1.47 mt/ha), Fenvalerate (1.44 mt/ha) and untreated check (0.96 mt/ha). Increase in grain yield over untreated check was observed highest in Emamectin benzoate treated plots (90.24%) followed by Fenvalerate (79.31%) and Cypermethrin (70.77%). From this study, it was concluded that Emamectin benzoate is the most viable option for armyworm outbreak management.

INTRODUCTION

Rice is staple food crop of Nepal. It's contribution in GDP (7%) and AGDP (20%) shows its importance in daily livelihood of Nepalese economy (MoAD, 2013). Losses due to insect pests are regarded as one of the important production constraints in rice (Neupane, 2001).Among the great diversity of pest, the armyworm cause severe damage but damage is highly localized (Scott, 1991). The larvae of all instars feed mainly on leaves. Fourth and older instars larvae cause major harm. It not only roughly gnaw out and eating around the leaf blade but also damage inflorescences, ears, growth points and grains in the ears and cause heavy yield decline (GC and Keller, 2013). At least three species of armyworm namely, rice swarming caterpillar, *Spodoptera mauritia* (Boisd.); common cutworm, *Spodoptera litura* (Fabricius); and rice ear-cutting caterpillar, *Mythimna separata* (Walker) attacking rice in Asia (IRRI, 2003). In Nepal, the outbreak of armyworm species, *Mythimna separata* Walker (Lepidoptera: Noctuidae) has been frequently noticed on different years (2030 BS, 2055 BS) in maize and wheat crop of different ecological domains of Nepal (Neupane, 2001). In recent years, the outbreak has been common in rice in terai and hilly areas. Due to lack of efficient management options during its outbreak, grain yield of rice is significantly reduced. So, this research was conducted to recommend effective chemical method of pest management during armyworm outbreak in rice.

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MATERIALS AND METHODS

The study was conducted at Piple VDC of Chitwan district during outbreak of two armyworm species namely, *Mythimna separata* Walker and *Spodoptera litura* (Fabricius) in October, 2013. Five farmers field were selected based on high intensity of armyworm infestation and the fields were divided into four equal plots representing a treatment. The treatments were T_1 = Cypermethrin 25 EC @ 1ml/lit of water; T_2 = Fenvalerate 20 EC @ 1 ml/lit of water; T_3 = Emamectin benzoate 5 SG @ 0.3 g/lit of water and T_4 = Untreated check.

The larval population was sampled and determined a day before application of treatments. Five sample units each comprising one square meter was taken from each treatment. The first and second spray was done on October 10, 2013 and October 17, 2013 respectively in evening hours (4:00 pm-7:00 pm). The larval population was determined three day after each spray and mean larval population was calculated.

Table 1. Effect of treatments on armyworm larval density under Chitwan condition, 2013

Treatments	Larval population/m^2		Population reduction over untreated check (%)
	Pre-spray	Three day after spray	
Cypermethrin 25 EC @ 1 ml/lit of water	34.00	10.4 [b] (0.88)	70.77
Fenvalerate 20 EC @ 1 ml/lit of water	38.80	8.4 [b] (0.84)	79.31
Emamectin benzoate 5 SG @ 0.3 g/lit of water	37.20	3.8 [c] (0.50)	90.24
Untreated Check	34.40	36.0 [a] (1.39)	-
CV (%)	7.7	20.0	-
LSD at 5%	0.16	0.25	-
F-test	Ns	**	-

Figures in the parentheses indicate log transformed values, Means followed by same alphabet do not differ significantly by DMRT at p<0.05, ns = non significant, ** = significant at p<0.01

The rice grain was harvested from each experimental plot and yield per hectare was determined. The data from all experiments were recorded and tabulated using spreadsheet and analyzed by GEN-STAT, Discovery edition. Mean comparison among the treatments were done by Duncan Multiple Range Test (DMRT) to differentiate treatment's effect at p<0.05. The population reduction over untreated check (%) was determined by using abbott's formula,

Population reduction over untreated check (%) = [1-{(Ta x Cb)/ (Tb x Cb)} x 100]

Where,

Ta= Population in treatment after spray; Tb= Population in treatment before spray
Ca= Population in untreated check after spray; Cb= Population in untreated check before spray

While comparing the yield from different treatments percent increase in grain yield over untreated check was calculated by the formula,

Increase in yield over untreated check (%) = [(T-C)/C] x 100

Where,

T = grain yield from treatment plot; C = grain yield from untreated check plot

RESULTS AND DISCUSSION

Before spray, there was no significant difference in larval density (p>0.05). The mean larval density three days after spray was significantly lowest ($3.8/m^2$) in the treatment Emamectin benzoate over all other treatments. Highest percent reduction in larval population over untreated check was recorded in the treatment Emamectin benzoate (90.28%) followed by Fenvalerate (79.31%) and Cypermethrin (70.77%) (Table 1). The highest grain yield (2.01 mt/ha) was recorded in Emamectin benzoate treated plots with 90.24 percent increase in yield over untreated check (Table 2). The efficacy of Emamectin benzoate in several lepidopteran pests was proved by Braham and Haji (2009), Chatterjee and Mondal (2012) and Ghatak *et al.* (2009). Janson *et al.* (1996) reported that Emamectin benzoate is approximately 1500-fold more potent against certain armyworm species and 2-5-fold potent against *Spodoptera exigua*, *Trichoplusiani*, and *Plutella xylostella.* Cook *et al.* (2004) experimented with new insecticide and found that indoxacarb, pyridalyl, spinosad, methoxyfenozide, and Emamectin benzoate controlled beet armyworm infestations up to 10 day after treatment compared to the non-treated control.

Table 2. Effect of treatments on grain yield of rice under Chitwan condition, 2013

Treatments	Grain yield (mt/ha)	Increase in yield over untreated check (%)
Cypermethrin 25 EC @ 1ml/lit of water	1.47 [b]	52.60
Fenvalerate 20 EC @ 1 ml/lit of water	1.44 [b]	49.48
Emamectin benzoate 5 SG @ 0.3 g/lit of water	2.01 [a]	108.52
Untreated Check	0.96 [c]	-
CV (%)	20.5	-
LSD at 5%	0.42	-
F-test	**	-

Means followed by same alphabet do not differ significantly by DMRT at p<0.05, ** = significant at p<0.01

Eckel *et al.* (1996) recommended application of Emamectin benzoate @ 0.0075 lb ai/acre for low to moderate infestations and @ 0.015 lb ai/acre for severe infestation for lepdopteran pest in vegetable production especially for *Spodoptera exigua* (Hubner) and other *Spodoptera* spp. Other effective treatments, Cypermethrin (1.47 mt/ha) and Fenvalerate (1.44 mt/ha) were themselves at par in terms of grain yield and showed 52.60 and 49.48 percent increase in yield over untreated check, respectively (Table 2).

Conclusion

All treatments used in the experiment; Emamectin benzoate, Cypermethrin and Fenvalerate were efficient to manage armyworm, however, there was the highest (93.48%) population reduction and higher increase in grain yield (90.2%) in Emamectin benzoate treated plots over untreated check. Hence, it can be used as best options of chemical management during armyworm outbreak in rice.

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