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ORIGINAL ARTICLE

Ecofriendly Management of Brown Plant Hopper (BPH), *Nilaparvata lugens* Stal in Paddy (On Farm Trails)

N.K singh[1], *Wajid Hasan[2] andSanjeev Kumar[3]
[1&3]KrishiVigyan Kendra, Nalanda, B.A.U, Sabour, Bhagalpur, Bihar
[2] KrishiVigyan Kendra, Jahanabad, B.A.U, Sabour, Bhagalpur, Bihar
*Email: entowajid@gmail.com

ABSTRACT
The study was carried out to manage the Brown plant hopper (BPH) Nilaparvata lugens with the treatment of Profenophos@1ml/lit with the treatments of Azadiractin 1500 ppm @3-4 ml/lit, cartap hydrochloride 50%wp@2gm/lit and azadiractin 1500 ppm@1ml+cow urine 50ml/lit+vermiwash 20ml/lit of water was done on the appearance of insect at the field of 8 farmers of Nalanda district of Bihar. Results revealed that the hopper incidence was lower in the field which was treated with azadiractin 1500ppm + cow urine + vermi wash (2.74) followed by cartap hydrochloride 50 % wp (7.55/hill) and higher in farmer practice (14/hill) as well as yield also higher from the field was treated with azadiractin 1500ppm+cow urine+vermi wash (42.37 q/ha) followed by cartap hydrochloride 50% wp (35.51q/ha) and lowest in farmer practices (22.33q/ha). The cost benefit ratio (BC ratio) was higher in the field treated with azadiractin 1500 ppm+cowurine+vermiwash (1:2.60) followed by cartap hydrochloride 50% wp (1:2.30) and lowest in farmer practices (1:1.3).
Key words: Nilaparvata lugens, paddy and biopesticides.

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INTRODUCTION

The brown plant hopper (BPH), *Nilaparvata lugens* stal (Hemiptera: Delphacidae) is a major pest of rice (*Oryza sativa* L.) in India. It is a monophagous herbivore and affects the rice crop through direct feeding causing nutrient depletion in the plant. The causes more circle effects that leads to "Hopper burn" which is characterized by visible circle patch, wilting and browing of the affected crops. BPH is also an efficient vector for various rice viruses. Including ragged rice stunt and grassy stunt virus. These combines causes significant losses to rice crops, upto 60% yield losses in susceptible cultivars [3]. Insecticide indeed resurgence is thought to be a , important factor, causing *Nilaparvata lugens* to become a major pest of rice in the last decade. It is rather widely distributed in India. It damages the rice plant by directly feeding on it and by transmitting the grassy stunt disease [1].

There is an urgent need to enhance the productivity of irrigated paddy fields to increase the rice production that meets population growth. The focus of this study is to investigate the effectiveness of biopesticides in enhancing the paddy growth for yield improvement after controlling the pest and rice diseases. It is very difficult to control this pest due to its high fecundity and its long distance migratory behavior as well as adapting to resistant varieties rapidly [9,16]. In the presence of effective natural enemies and their production methods, control of BPH has became easier with the combination of biopesticides. It acts as a anti-feedent and repellent the insect and environmentally safe. Chemical pesticides developed the resurgence and resistant in the Brown plant hopper. Rice pests already developing resistance to even newly introduced agrochemicals leading to synthetic chemicals being registered at a slower rate than in the past. In the era of environment awareness, more emphasis is given to the natural insecticides, as they are biodegradable and less harmful to environment. Considering the economic importance of the pest and to reduce the poisonous effect of chemical insecticides to natural enemies, Azadiractin, vermiwash and cow urine were tried for its efficacy against the brown plant hopper (BPH).

This situation has helped to reopen the market for a new generation of biopesticides. With fast paced changes in development of effective delivery systems and possibility of identifying newer potential biomolecules. Resistance has affected many of the major classes of insecticides including organophosphate, carbamates, synthetic pyrethroid, neonicotionoids and phenylpyrazoles [4,7 and 8]. In this context, the present on farm trials was undertaken to manage the brown plant hopper (BPH), *Nilaparvata lugens* using Biopesticides at Nalanda district of Bihar.

MATERIAL AND METHODS

The present study was done among 8 different farmers field of Nalanda district of Bihar, during 2013-14 and 2014-15. The treatments of Azadiractin 1500 ppm@3-4ml/lit, cartap hydrochloride 50% wp@2gm/lit, Azadiractin 1500ppm@1ml + cow urine@50-60ml+vermiwash 20-30 ml/lit and profenophos 50EC@1ml/lit on the appearance of *N. Lugens*. The local varieties were transplanted. The randomized block design (RBD) was applied with 8 replication and 4 treatments. The nymph/adult population of brown plant hopper was observed one day before and 5 days after application of each technological option. To find out the economic impact of technological options on brown plant hoppers incidence and paddy yield, the cost benefit ratio were calculated.

RESULTS AND DISCUSSION

Results revealed that the incidence of the brown plant hopper (BPH), *Nilaparvata lugens* was lower in the field sprayed by azadiractin 1500 ppm +cow urine+ vermi wash (2.74/hill) followed by cartap hydrochloride (7.55/hill) and higher at farmer practices (14.00/hill) as well as yield also higher in the field sprayed by azadiractin 1500ppm+cow Urine+vermi wash (41.40q/ha) which was followed by cartap hydrochloride 5% wp (35.80q/ha) and lowest in the farmer practices (21.00q/ha). The cost benefit ratio (BC ratio) was higher in the field sprayed by azadiractin 1500ppm+cow urine+ vermi wash (1:2.6) followed by cartap hydrochloride (1:2.3) and lowest in farmer practices (1:1.3). Whereas during cropping season 2014-15 the hopper incidence was lowest in the field sprayed by azadiractin 1500 ppm+cow urine +vermiwash (2.18/hill) followed by cartap hydrochloride 50% wp(8.01/hill) and higher at farmer practices (12.06/hill) as well as yield also higher from the field sprayed by azadiractin 1500ppm+cow urine+vermiwash (42.37q/ha) followed by cartap hydrochloride 50% wp (35.51q/ha) and lowest in farmer practices (22.33q/ha). The cost benefit ratio was higher in the field sprayed by azadiractin 1500ppm+cow urine+vermi wash (1:2.5) followed by cartap hydrochloride 5o% wp(1:2.1) and lowest in the farmer practices (1:1.2). Therefore, it was concluded that the azadiractin 1500ppm+cow urine+vermiwash and cartap hydrochloride can be recommended to manage the hopper incidence in paddy field.

The alternative application of azadiractin 1500ppm+cow urine+ vermi wash and cartap hydrochloride maintained efficacy for longer duration, rapid effective and efficient controls on brown plant hopper in paddy and also delayed drug resistance of insects (17).Hasan*et el*., [5] revealed that the hopper incidence was lower in the field sprayed by fipronil (3.0 /hill) followed by Imidacloprid (3.06 /hill) and higher at farmer practices (28.71 /hill) as well as yield also higher from the field sprayed by fipronil (46.92 q/ha) followed by Imidacloprid (44.90 q/ha) and lowest in farmer practices (36.14 q/ha). The cost benefit ratio (BC Ratio) was higher in field sprayed by fipronil (1:2.49) followed by Imidacloprid (1:2.39) and lowest in farmer practices (1:2.00).

Neem formulations as spray also adversely affected the survival of BPH through toxic effects. The oil based neem formulations were more effective in oviposition deterrency than solvent based neem formulations as sprays. The studies have revealed that constituents other than Azadirachtin also play a role in exercising toxic effect against BPH. Some neem formulations with high azadirachtin content like Neem Azal T/S have exhibited some systemic activity when given as a seedling root dip adversely affecting the growth and development of BPH and GLH nymphs when confined to treated plants [6]. Saikia and Parameswaran [12] also reported more than fifty per cent mortality of leaf folder larvae after direct exposure to neem azal –F 5% treatment. In deep water rice also, integrated treatments with neem components plus one or two synthetic chemical applications were found very effective in controlling the pest population build up as compared to chemical control [2].Increase in the effectiveness of neem products when combined with insecticides has also been reported (15).

Table 1. Effect of Biopesticides on population of the brown plant hopper (BPH), *Nilaparvata lugens*

Treatments	Hopper incidence (population/hill)		Hopper incidence (Population/hill)		Yield (q/ha)	
	2013-14		2014-15			
	DBS %	5DAS%	DBS%	5DAS%	2013-14	2014-15
Profenophos 50 EC@1ml/lit	54.4%	14.00%	45.08	12.06	21.0	22.33
Aza 1500ppm @3-4 ml/lit	53.0%	10.22%	53.12	10.90	31.0	31.89
Cartaphydrochaloride 50 SP @ 2gm/lit	53.7%	7.55%	53.47	8.01	35.8	35.51
Aza1500ppm @ 1ml+Cow Urine @50ml +Vermiwash 25 ml/lit	49.0%	2.74%	46.21	2.18	41.4	42.37
DBS= Day Before Spray, DAS= Days After Spray						

Table 2. Economic Impact during cropping season 2013-14

Treatments	AV yield	% increase	Cost of Cultivation	Gross Return	Net Return	Cost Benefit ratio
Profenophos 50 EC@1ml/lit	21.00	-	19000	25200	6200	1.3
Aza 1500ppm @3-4 ml/lit	31.00	48%	16000	37200	21,200	2.3
Cartaphydrochaloride 50 SP @ 2gm/lit	35.80	70%	18000	42960	24960	2.3
Aza1500ppm @ 1ml+Cow Urine @50ml +Vermiwash 25 ml/lit	41.40	97%	18500	49680	31180	2.6

Table-3 Economic Impact during cropping season 2014-15

Treatments	AV yield	% increase	Cost of Cultivation	Gross Return	Net Return	Cost Benefit ratio
Profenophos 50 EC@1ml/lit	22.33	-	19500	24563	5063	1.2
Aza 1500ppm @3-4 ml/lit	31.89	43%	16800	35079	18279	2.0
Cartaphydrochaloride 50 SP @ 2gm/lit	35.51	59%	18500	39061	20561	2.1
Aza1500ppm @ 1ml+Cow Urine @50ml +Vermiwash 25 ml/lit	42.37	90%	18600	466.7	28007	2.5

CONCLUSION

Insect pests are continuing to challenging rice production. The reduction in chemical pesticide use associated with ecofriendly control measures is increasing the abundance of some beneficial insects as well improving the natural control. It is concluded that the azadiractin 1500ppm+cow urine+vermiwash and cartap hydrochloride can be recommended to manage the hopper incidence in paddy field.

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