Efficacy of some biopesticides against rice hispa, *Dicladispa armigera* (Olivier) (Coleoptera : Chrysomelidae)

Partha Pratim Bhattacharjee[1]* and D. C. Ray

ABSTRACT

Six commercial biopesticides like, dk-bioneem (0.1 and 0.2%,) multineem (0.01 and 0.03%), neem oil (0.5 and 1.0%), azacel (0.01 and 0.03%), calpaste (0.02 and 0.04%) and larvocel (0.05 & 0.1%) were evaluated against *Dicladispa armigera* in the field conditions. Five replications were followed for each treatment and each replication consists of four hills (25cm × 25cm area). Control (water spray) was also run against treatment. All the biopesticides showed effective reduction of the pest. However, highest mortality was obtained by Azacel (@0.03%) after 5 days of treatment but Larvocel (@0.1%) caused 86.36% reduction of hispa population after 10 days of treatment.

Key words : Biopesticides, *Dicladispa armigera*, crop pest, paddy

INTRODUCTION

Rice is the most important crop in Assam, India, grown about 70% of the total cultivated land (3.64 million hectares) in the state. In fact, about 70% of the rice grown area of the north-east Indian states is under Assam (Anonymous, 2003). Systematic surveys in different stages of the region have showed 13 major insect infestations in Assam (Barwal *et al*., 1994; Dutta and Hazarika, 1994). Out of the various insect pests of paddy, rice hispa, *Dicladispa armigera* (Olivier) (Coleoptera: Chrysomelidae) is a major pest of rice. This pest causes extensive damage to the vegetative stage of plant resulting 35-65% loss in yield throughout Assam (Rajek *et al*., 1986; Hazarika and Dutta, 1991; Dutta and Hazarika, 1992). The use of biopesticides has gained much importance mainly among the researchers because of their high bio-efficacy against many crop pests including *Dicladispa armigera* (Sarma and Rahman, 2010) and relatively safe to the environment as compared to the synthetic pesticides (Karim and Haque, 1999). In the present investigation, impact six commercial biopesticides on the *Dicladispa armigera* in the field conditions.

MATERIALS AND METHODS

The entire study area is having low plain lands and wet lands (locally called beels) with small hillocks (locally called tillah). Rainfall is moderate to high. The climate of the region is subtropical, warm and humid. Paddy is the dominant crop of this region and cultivated in the plain lands. Randomized Block Design (RBD) was followed to efficacy of biopesticides in terms of mortality of the pest. Bopesticides *viz.*, dk-bioneem, multineem, neem oil, azacel, Calpaste and larvocel were purchased from market and evaluated against *D. armigera* in the field conditions in two concentrations each. Five replications were followed for each treatment and each replication consists of four hills (25cm × 25cm area). Control (water spray) was also run against treatment. All agronomical practices followed for the preparation of treated as well as control plots. The percent reduction of hispa beetles were calculated at 1st, 5th, 10th and 15th day after treatment following the formula (Abbott, 1925).

RESULTS

Regarding the efficacy of six biopesticides, *viz.*, dk-bioneem, multineem, neem oil, Azacel, Calpaste larvocel; azacel @ 0.03% afforded maximum mortalities at 5 days after treatment (DATr.) followed by larvocel @ 0.1% at 10 DATr., where reduction was afforded 86.36%. dk-bioneem showed 37.50% reduction at 1DATr. and maximum reduction (52.38%) was found at 10 DATr. dk-bioneem in higher concentration caused 51.61% reduction and maximum was recorded at 10 DATr. Similar impact was observed in Multineem, Neem oil, and Azacel Calpaste (@ 0.02%) caused 31.33% reduction of the pest at 1 DATr. with maximum of 61.29% reduction at 5 DATr. A higher concentration showed 59.64% reduction at 1 DATr. and maximum (77.42%) reduction was obtained at 5 DATr. Use of Larvocel (@ 0.05%) gave 38.59% reduction at 1 DATr. whereas maximum was obtained at 10 DATr. In higher concentration, it afforded 67.74% reduction at 1 DATr. and (86.36%) reduction at 10 DATr. which was considered as a second highest mortality among all the concentrations (Table1).

Table 1. Efficacy of some Biopesticides against *D. armigera* during 2004 - 05.

Treatments	Concentartion (in %)	Percent reduction at days after treatments+			
		1DATr.	5DATr.	10DATr.	15DATr.
dk-bioneem	0.1	37.50 (37.61)	44.44 (41.35)	52.38 (46.09)	38.77 (38.34)e
	0.2	51.61 (45.30)	52.38 (46.09)	64.28 (53.15)	40.47 (39.10)e
Multineem	0.01	35.48 (36.20)	37.50 (37.61)	52.38 (46.09)	45.05 (42.08)de
	0.03	47.22 (42.90)	44.44 (41.35)	68.25 (55.15)	46.43 (42.86)d
Neem oil	0.5	47.37 (42.91)	64.91 (53.18)	67.74 (55.12)	43.87 (41.32)de
	1.0	73.56 (58.40)	78.16 (61.69)	71.43 (57.20)	42.86 (40.58)de
Azacel	0.01	35.71 (36.21)	68.0 (55.13)	68.75 (55.18)	65.93 (54.12)b
	0.03	50.79 (45.26)	96.43 (78.58)	72.22 (57.24)	67.03 (54.18)b
Calpaste	0.02	31.33 (33.43)	61.29 (51.29)	55.55 (47.78)	47.62 (43.63)cd
	0.04	59.64 (50.38)	77.42 (60.57)	66.66 (54.16)	49.99 (44.48)cd
Larvocel	0.05	38.59 (38.38)	43.83 (41.32)	77.78 (61.66)	54.76 (47.74)c
	0.1	67.74 (55.74)	56.25 (48.58)	86.36 (67.06)	78.57 (61.72)a
Control(water spray)	0.0	11.4 (19.32)	6.2 (13.94)	8.4 (16.32)	12.6 (20.52)f
CD ($p < 0.05$)		2.71 (NS)	2.97 (NS)	1.21 (NS)	4.38*

* Significant ($p < 0.05$), NS = Non Significant, DATr. = Date after treatments.

+ Based on 5 replications, each consists of 4 hills (25 cm. × 25 cm.).

Figures in the parenthesis are average of transformed values = Arc sin $\sqrt{\text{percentage}}$

In a column, means followed by a common letter are not significantly different ($p < 0.05$) by DMRT.

DISCUSSION

As regards the effectiveness of bio-pesticides among two concentrations of six each, it indicated that all the concentrations differ significantly from each other *i. e*., they belongs to the different groups. However, all treatments proved to be significantly different from control (water spray). Six biopesticides with lower and higher concentrations were used to study their effectiveness against hispa in the field. Lower concentrations were considered as per label recommendation dose. Among six bio-pesticides, dk-bioneem, multineem, neem oil and azacel are the products of neem and their main composition is Azadirachtin, where calpaste is the combination of Castor oil (25%), *Curcuma longa* (10%), Chitinase (15%), Jatropha oil (25%), neem oil (10%) and dissolving agent (15%). Larvocel is a biological insecticide which posses 1.5% *Beauveria bassiana* (Bals.) Vuill., a fungal spore affects for a long time because when spore contact with the hispa cuticle then they germinate and grow into their bodies that lead to formation of toxins and kill the pest eventually.

According to Baitha *et al*. (1993) different neem products *viz.*, neem cake, NSKE and neem oil were effective against *D. armigera* and reduced the leaf damage which supports our findings. Hazarika and Puzari (1997) reported that spraying of *Beauveria bassiana* and Neem-seed oil effectively controlled the pest population in the infected field that corroborates our observations. Chakraborti (1998, 2003) found that neem products singly and combined with chemical insecticides resulted significant reduction in pest population build up and consequently kept the damages by insect pests at significantly low levels. Bora and Hazarika (2001) observed that neem seed

oil proved to be effective antifeedant and anti-ovipositional compound against *D. armigera*. According to Reed *et al*. (1982) the suspension containing of azadirachtin was promising in reducing the population of striped cucumber beetle, *Acylamma vittatum*. Similarly Ramamurthy and Venugopal (1997) also found that neem oil and neem seed kernel extract were effective in controlling *Sitotroga cerealella*. Observations on the feeding deterency of neem insecticides proved effective against *Diacrisia oblique* Walker (Bhandari *et al*., 2003).

Evaluation of six biopesticides reveals that almost all the higher concentration afforded maximum mortality of beetle and residual action persists for 10 days after treatment where more than 50% reduction of population occurs. Although a highest mortality (96.43%) was obtained by Azacel after 5 days of treatment but Larvocel caused 86.36% reduction of hispa population after 10 days of treatment. Since Larvocel is a product which consists of fungal spore become active after get contact with the pest organism. The delay in response by the spore may take when get touched with the pest species body. Other products performances are also very promising since these are all bio products. However, the use of Larvocel may be recommended since this contains a fungal spore as one of the main constituent which is microbial product. The second dominant product Azacel which is a neem product may also be recommended for the management of rice hispa.

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Partha Pratim Bhattacharjee[1]* and D. C. Ray

Department of Ecology and Environmental Science, Assam University, Silchar-788011, Assam, India.

[1] Present address: Ecology & Biosystematics Laboratory, Department of Zoology, Tripura University, Suryamaninagar - 799130, Tripura, India, Phone number: 0381-2316937, *Corresponding author E-mali : bhattacharjee.pp1977@gmail.com

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