

EFFICACY OF BIOPESTICIDES AGAINST BANANA SCARRING BEETLE, *Basilepta subcostatum* Jacoby

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Abstract : A field experiment was conducted during 2006-07 at Rajendra Agricultural University, Pusa, Bihar, India to test the efficacy of one entomopathogenic fungus (*Beauveria bassiana*) and three neem products against banana scarring beetle, *Basilepta subcostatum* Jacoby. Among the treatments tested, *B. bassiana* (5g/L) and azadirachtin (5ml/L) were highly effective and on par with carbaryl, which was used as check. The efficacy was measured in terms of fruit damage, beetle population, number of scars, pulp-skin ratio, TSS and benefit-cost ratio. The results suggested that an eco-friendly management strategy can be developed by including these products.

Keywords : Banana, *Basilepta subcostatum*, neem, scarring beetle

INTRODUCTION

About 19 insect pests have been found associated with banana in India from planting to harvesting (Padmanaban *et al.*, 2002). Of these, banana scarring beetle, *Basilepta subcostatum* Jacoby has been considered as the most serious one in different parts of the country. It causes extensive damage to leaves as well as fruits during summer and kharif season (Singh *et al.*, 1977). The extent of damage has been reported to be approximately 30 per cent of the banana bunches during rainy season in Bihar (Ahmad *et al.*, 2003; Mukherjee, 2004; Samui *et al.*, 2004 and Mukherjee, 2006) but no systematic efforts have been made to study the efficacy of insecticides and biopesticides applied through foliar and whorl application against this pest on banana in Bihar. Hence, the present investigations were undertaken to find out a suitable eco-friendly measure against this insect.

MATERIALS AND METHODS

A field trial was conducted in randomised block design at Research farm of Rajendra Agricultural University, Pusa (Bihar) during 2006-07 to find out the efficacy of biopesticides applied either as spray or whorl application against the scarring beetle, *Basilepta subcostatum* Jacoby. The banana cv. *Basrai* was plated on 20th July 2006 as test crop using healthy suckers maintaining plant to plant and row to row distance as 1.5 x 1.5 m. respectively. Each plot consisted of six plants. The crop was grown by following recommended package of practices for this region and no insecticide other than those included in the present experiment were applied either before or after planting. There were nine treatments including an untreated control and each treatment was replicated thrice. All the treatments (Table 1) were applied five times in two ways *viz.* spraying and pouring, at their respective doses at fortnightly intervals starting from 15th May, 2007 till the complete formation of fingers in bunch.

Table 1. Relative efficacy of biopesticides and neem products against scarring beetle (*Basilepta subcostatum*) on banana (cv. *Basrai*).

Treatment	No. of scarring beetles / plant	No. of scars/ 5 cm ² leaf surface	Mean fruit infestation (%)	Bunch weight (Kg/ plant)
Azadirachtin (0.15%) @ 5ml per litre of water spray	9.89	11.89	18.58	14.74
Azadirachtin (0.15%) @ 5ml per litre of water whorl application banana heart	10.64	13.56	21.49	14.33
Neem oil (2%) spray	10.44	13.31	21.01	15.54
Neem oil (2%) @ 20ml whorl application per banana heart	11.14	13.67	21.88	13.69
NSKE (5%) spray	12.35	14.81	23.33	13.63
NSKE (10%) spray	11.40	14.56	22.51	14.44
<i>Beauveria bassiana</i> 5g/litre spray	7.44	9.75	14.68	16.40
Carbaryl (0.3%) spray	5.48	7.65	9.71	17.42
Untreated control	19.01	21.21	78.67	12.14
SEm (±)	1.351	1.537	1.636	3.263
CD (<i>P</i> = 0.05)	4.05	4.60	4.90	9.782

Table 2. Influence of different eco-friendly measures on pulp: skin ratio, TSS (°B) and benefit ; cost ratio of banana

Treatment	Pulp-Skin ratio	TSS (°B)	Benefit-Cost ratio
Azadirachtin (0.15%) @ 5ml per litre of water spray	3.26	20.85	3.25
Azadirachtin (0.15%) @ 5ml per litre of water whorl application banana heart	3.22	20.15	3.13
Neem oil (2%) spray	3.24	20.21	3.48
Neem oil (2%) @ 20ml whorl application per banana heart	3.19	20.02	2.95
NSKE (5%) spray	3.17	19.74	2.93
NSKE (10%) spray	3.18	19.91	3.17
<i>Beauveria bassiana</i> 5g/litre	3.32	21.08	3.73
Carbaryl (0.3%) spray	3.42	22.11	4.02
Untreated control	3.06	19.56	2.50
S E m (±)	0.046	0.645	0.212
CD (<i>P</i> =0.05)	0.137	1.934	0.636

Population of the beetle was recorded two days after spraying by counting them on leaves including those hidden inside the crown leaves from the randomly selected plants. Similarly number of scars on leaves in treated and untreated plants was also recorded from 5 sq. cm. on youngest leaf at three different locations. Observations pertaining to the number of healthy and infested fingers / bunch data were used for computing the mean (%) finger infestation. The effect of different treatments was also recorded in terms of pulp-skin ratio, TSS (°B) and benefit-cost ratio. Overall performance of the treatment effect compared on the basis of bunch weight.

RESULTS AND DISCUSSION

The mean number of beetles on banana after treatment varied significantly in different treatments. All the treatments under test recorded significantly lower level of pest population compared to untreated control (Table 1). Among the different treatments, spraying with carbaryl (0.3%) and *Beauveria bassiana* (1.15%) were most effective in minimizing the pest population, recording 5.48 and 7.44 adults / plant, respectively as against untreated control (19.01 adults / plant). Again azadirachtin (0.15%), neem oil (2%) (Pouring and spray), neem seed kernel extract (NSKE) (5%) and NSKE (10%) spray were found effective in reducing the beetle population recording 9.89, 10.64, 10.44, 11.14, 12.35 and 11.40 / plant, respectively. All the neem products *viz.*, azadirachtin, neem oil, NSKE applied either as spray or poured at their test doses showed more or less similar effect recording between 9.89 to 12.35 / plant. The neem products proved statistically superior over untreated control and at par with each other.

More or less similar observations were recorded in case of number of scars / 5 sq. cm leaf surface area. The data presented in Table 1 reveal that all the treatments recorded significantly lower number of scars (7.75 to 14.81 / 5 sq. cm leaf surface) compared to untreated control (21.21).

Spray with carbaryl (0.3%) recorded significantly lower number of scars (7.75 / 5 sq. cm leaf surface) which was statistically at par with spraying *B. bassiana* (1.15%) recording 9.75 / 5 sq. cm leaf surface.

The per cent finger infestation was minimum in carbaryl (0.3%) sprayed plots and maximum in untreated control. Spraying of *B. bassiana* (1.15%) was found statistically at par with carbaryl spray recording 9.71 per cent finger infestation. The remaining treatments *viz.*, spraying and pouring of azadirachtin (0.15%) and neem oil (2%) were found equally effective in minimizing the finger infestation recording 18.58, 21.49, 21.01 and 21.88 per cent, respectively followed by spraying of NSKE (5%) and NSKE (10%) which recorded 23.33 and 22.51 per cent fruit infestation, respectively. All the neem products and *B. bassiana* were on par with carbaryl in reducing pest infestation but were superior to untreated control. It could be further seen that the bunch weight of banana varied significantly from 12.14 to 17.42 kg / plant under different treatments (Table 1). Among different treatments, carbaryl (0.3%) gave highest bunch weight (17.42 kg / plant) followed by *B. bassiana* (1.15%) spray, neem oil (2%) spray, azadirachtin (0.15%) spray, NSKE (10%) spray and azadirachtin (0.15%) pouring, recording 16.40, 15.54, 14.74, 14.44 and 14.33 kg plant, respectively. They were at par with chemical treatment. The results obtained in the present investigation are in conformity with the reports of Ahmad *et al.* (2003) and Mukherjee (2006).

Influence of various treatments on pulp-skin ratio, total soluble sugar (TSS) and benefit-cost ratio is presented in Table-2. The pulp-skin ratio in various treatments varied from 3.06:1 to 3.42:1 recording maximum pulp-skin ratio in carbaryl (0.3%) spray and minimum in untreated control. Spraying of *B. bassiana* was observed to be the second best treatment with pulp-skin ratio 3.32:1. All the neem products were superior over untreated control. Effect of different treatments

on TSS (⁰B) and benefit – cost ratio followed similar trend with carbaryl (0.3%) giving highest value (22.11 and 4.02:1) followed by *B. bassiana* (21.08 and 3.73:1, respectively). The neem products also gave higher TSS (⁰B) and benefit – cost ratio over untreated control. The present findings are in agreement with the results of Ahmad (2002), Mukherjee (2004) and Mukherjee (2006).

It may be concluded that use of eco- friendly pest management strategies including biopesticides and neem products are quite effective against *B. subcostatum* on banana and are comparable with chemical treatment. Further, the present study has given the possibilities of minimizing the frequency of application of synthetic insecticides and encouraging the use of bio-pesticides and phyto-products in IPM strategies in banana.

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