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DEVELOPMENT OF AN INSECTICIDE BASED MANAGEMENT PACKAGE AGAINST POD BORER, *EUCHRYSOPS CNEJUS* (F) ATTACKING YARD LONG BEAN

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Abstract

A study was conducted in the experimental field of Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur during February-August 2010 to evaluate the efficacy of some insecticide based management packages against pod borer, *Euchrysops cnejus* (F.) attacking yard long bean. Results indicated that management package comprising of mechanical control (hand picking) with 2 sprays of Ripcord10 EC (Cypermethrin) @ 1.0 ml/litre of water at 15 days interval starting from inflorescence infestation appeared to be the best option offering the lowest pest incidence (10.58%), lowest intensity of infestation, the highest yield (14.25 t/ha) and BCR (4.465) followed by sole use of Ripcord 10 EC (Cypermethrin) at the same rate compared to untreated control. Results obtained from the rest of the approaches were not encouraging.

Keywords: Management package, hand picking, cypermethrin, pod borer, yard long bean.

Introduction

Yard long bean is an important vegetable cum pulse crop grown everywhere in Bangladesh both in summer and winter seasons (Rashid, 1999). It has a long green or violet colored pod, rich in protein, vitamins A, B, C and calcium. The edible pods are rich in vitamin B and dry matter of green seeds contains 24.6% protein (Aykroiyd, 1974) with high amount of lysine (Ferry, 1981). Although the total cultivated area and production of yard long bean in Bangladesh has increased gradually over the last few years but the productivity is very low (Duttaet al. 2009). One of the major constraints for yard long bean production in our country is the attack of insect pests (Anon, 2009). Among the insect pests, pod borer, *Euchrysopscnejus* (F). (Lepidoptera: Lycaenidae) is considered as the major pests of yard long been in Bangladesh and elsewhere (Das, 1998; Ali, 2006; Dina, 1979 and Baker *et al.*, 1980. Butani and Jotwani (1984) found that the larvae of the pest causedamage by boring tender or mature pods. The borer is voracious, widely distributed and has a wide host

range. Pod borer make hole in flowers and tunnel in the pods (Ali, 2006 and Karim, 1993). The newly hatched larvae preferably feed on the contents of flower and buds. The damaged buds and flowers normally fall off. The mature larvae feed on the tender grains inside the pods preferably near the base by clinging half portion of its body downwards. In order to protect their crops from damages the farmers of Bangladesh often apply chemical insecticides without having sufficient field control of this pest. As the insect is an internal feeder and in most cases cultural, mechanical and biological management are not economically effective. So, insecticide based management package may be an effective means of suppressing the pod borer. Under these circumstances, insecticide application should be done at appropriate time and dose. At present, organophosphate and synthetic pyrethroids insecticides are being widely used to control the pod borer of yard long bean (Ali, 2006). Therefore, the present study was conducted to provide the farmers with an economic and suitable management package(s) to combat this pest.

Materials and Methods

The study was conducted at BSMRAUexperimental field, Gazipur during Kharif 2010 season. Yard long bean variety, Toky of East-West Seed Company was sown in the plot 3x3 m^2. The experiment was laid out in Randomized Complete Block Designwith 5 packages with an untreated control and replicated thrice. The recommended agronomic practices were followed to raise the crop. The packages were assigned as follows:

Package 1 (P_1) : Two sprayswith Ripcord10 EC (Cypermethrin) @ 1.0 ml/litre of water at 15 days interval

Package 2 (P_2) : Two sprays with Asataf 75 SP (Acephate) @ 2.0 g/litre of water at 15 days interval.

Package 3 (P_3) : Mechanical control (hand picking) & 2 sprayswithneem seed extract (NSE) @ 50g/litre of water at 15 days interval.

Package 4 (P_4) : Mechanical control (hand picking) & 2 sprayswith Ripcord 10 EC (Cypermethrin) @ 1.0 ml/litre of water at 15 days interval.

Package 5 (P_5) : Mechanical control (hand picking) & 2 sprayswith Asataf 75 SP (Acephate) @ 2.0 g/lire of water at 15 days intervaland an untreated control.

Data collection was started at flower initiation up to final harvest. The data were recorded on inflorescence infestation, flower shedding, pod infestation (by number and weight) and intensity of infestation by pod borer

larvae, yield (t/ha). Economic analysis of different packages was done by determining BCR (benefit cost ratio). All the data were analyzed systematically using MSTAT-C software and the means were separated using LSD test.

Results and Discussion

Effect of management packages in suppressing pod borer of yard long bean in terms of number and weight of pods per plot

Significant variation was observed by number and weight of healthy and infested podper plot in suppressingpod borer of yard long bean for different managementpackagespresented in Table 1.

Among different management packages in the study, the highest number of healthy pod per plot (425.3) was recorded in P_4 which was statistically identical to that of P_1 (405.7). On the other hand, the lowest number of healthy podper plot (208.7) was recorded in the untreated control plot which was statistically different to all other packages. P_2 (28.33), P_3 (275.7) and P_5 treated plotsshowed intermediate level of healthy pod which was statistically similar to each other (Table 1).

The highest number of infested podper plot (204.0) was recorded in untreated control plotwhich was statistically different from all other packages. On the other hand, the lowest number of infested podper plot (50.33) was recorded in P_4 which was statistically identical to that of P_1 (76.00) and P_5 (82.33). But P_3 (142.0) showed intermediate level of infested pods per plot and this was statistically identical to that of P_2 (Table 1).

Among the packages, the highest percentage of pod infestation (49.64) was recorded in the untreated control plotand the lowest percentage of pod infestation (10.58) was in the P_4 treated plot. The rate of pod infestation of P_1, P_2, P_3 and P_5 were 15.63, 24.02, 31.49 18.83, respectively (Table 1).

Among the packages, the highest percentage of pod infestation (47.52) was found in the untreated control plotand the lowest percentage of pod infestation (11.45) was recorded in the P_4 treated plot. Pod infestation percentage of P_1, P_2, P_3 and P_5 were 16.13, 25.55, 30.98, 18.87, respectively. Almost similar results were found in case of weight of healthy and infested podper plot (Table 1).

Table 1. Effect of different management packages in suppressing pod borer of yard long bean in terms of number of pods per plot (3x3 m^2)

Treatment	Pod per plot by number			Pod/plot by weight (kg)		
packages	Healthy	Infested	% infestation	Healthy	Infested	% infestation
P_1	405.7a	76.0cd	15.63	6.30ab	1.21bc	16.13
P_2	366.3b	115.3bc	24.02	5.30c	1.81ab	25.55
P_3	275.7c	142.0b	31.49	4.81c	2.16a	30.98
P_4	425.3a	50.33d	10.58	7.57a	0.97c	11.45
P_5	355.0b	82.33cd	18.83	6.07b	1.39bc	18.87
Untreated control	208.7d	204.0a	49.64	2.45d	2.22a	47.52
CV (%)	8.85	8.50	--	13.02	7.11	

Means within a column followed by same letter (s) do not differ significantly (P=0.05) according to least significant difference (LSD) test.

Package 1 (P_1) : Two sprays with Ripcord10 EC (Cypermethrin) @ 1.0 ml/litre of water at 15 days interval

Package 2 (P_2) : Two sprays with Asataf 75 SP (Acephate) @ 2.0 g/litre of water at 15 days interval.

Package 3 (P_3) : Mechanical control (hand picking) & 2 sprays with neem seed extract (NSE) @ 50g/litre of water at 15 days interval.

Package 4 (P_4) : Mechanical control (hand picking) & 2 sprays with Ripcord 10 EC (Cypermethrin) @ 1.0 ml/litre of water at 15 days interval.

Package 5 (P_5) : Mechanical control (hand picking) & 2 sprays with Asataf 75 SP (Acephate) @ 2.0 g/lire of water at 15 days interval and an untreated control.

Effect of management packages in suppressing pod borer attacking yard long bean in terms of intensity of infestation

The intensity of infestation per plot was expressed by counting the number of bores per pod for differentiating the effectiveness of the packages. Significant variation was observed in intensity of infestation per plot for different management packages including untreated controlpresented in Table 2.

Among different management packages in the study, the highest intensity of infestation per plot was recorded in untreated control plot (524.7 points) which was statistically different from all other packages. On the other hand, the lowest intensity of infestation podper plot (80.00 points) was recorded

in P_4 which was statistically identical to that of P_1 (119.0 points), P_5 (136.0 points) and P_2 (180.7 points). But P_3 (142.0 points) showed intermediate level of intensity which was statistically identical to P_2.

Among the packages, the highest percentage reduction of intensity of infestation over untreated control was calculated in the P_4 (84.75) and the lowest intensity of pod infestation was found in the P_3 (43.64). The reduction percentage over control of intensity of infestation of P_1, P_2 and P_5 were 77.32, 65.56, 84.75, respectively (Table 2).

Table 2. Effect of different management packages in suppressing pod borer attackingyard long bean in terms of intensity of infestation per plot (3 x3 m^2)

Treatment packages	Intensity of infestation/plot (points)	% Reduction over control
P_1	119.0c	77.32
P_2	180.7bc	65.56
P_3	295.7b	43.64
P_4	80.0c	84.75
P_5	136.0c	74.08
Untreated control	524.7a	--
CV (%)	11.46	--

Means within a column followed by same letter (s) do not differ significantly (P=0.05) according to least significant difference (LSD) test.

Note: For convenience of expression of intensity of infestation per plot, four scales corresponding to the number of bores per pod have been used such asScale-1: no bore in pod = 0 points, Scale-2: 1 bore per pod = 1 points, Scale-3: 2-3 bores per pod = 2 points and Scale-4: >3 bores per pod = 3 points. Then a total point in the plot was considered as the intensity of infestation of that plot.

Package 1 (P_1) : Two sprays with Ripcord10 EC (Cypermethrin) @ 1.0 ml/litre of water at 15 days interval

Package 2 (P_2) : Two sprays with Asataf 75 SP (Acephate) @ 2.0 g/litre of water at 15 days interval.

Package 3 (P_3) : Mechanical control (hand picking) & 2 sprays with neem seed extract (NSE) @ 50g/litre of water at 15 days interval.

Package 4 (P_4) : Mechanical control (hand picking) & 2 sprays with Ripcord 10 EC (Cypermethrin) @ 1.0 ml/litre of water at 15 days interval.

Package 5 (P_5) : Mechanical control (hand picking) & 2 sprays with Asataf 75 SP (Acephate) @ 2.0 g/lire of water at 15 days interval and an untreated control.

Effect of management packages on yield (t/ha) of yard long bean

Significant variation was observed in case of total yield (t/ha), healthy pod yield (t/ha) and infested pod yield (t/ha) among the management packages used in the present study (Table 3).

Among different management packages in the study, the highest yield of healthy pod (12.62 t/ha) was recorded in P_4which was statistically identical to that of P_1 (10.50 t/ha) treated plot. On the other hand, the lowest yield (4.079 t/ha) was recorded in untreated control plotwhich was statistically different from all other packages and was followed by P_3 (8.023 kg) and P_2 (8.840 kg). However, P_5 (10.01 t/ha) showed intermediate level of yield and was statistically identical to that of P_1treated plot.

Among different packages in the study, the highest yield of infested pod (3.70 t/ha) was recorded in untreated control plotwhich was statistically identical to that of P_3 (3.60 t/ha) and P_2 (3.033 t/ha). On the other hand, the lowest yield of infested pod (1.63 t/ha) was recorded in P_4treated plot which was statistically identical to that of P_1 (2.02 t/ha) and P_5 (2.32 t/ha). But the highest yield of infested pod of P_1, P_2 and P_5 were statistically comparable to each other.

Among the packages, the highest percentage yield increase over control (82.62) was found in the P_4 and the lowest percent yield increase over control (49.05) was found in the P_3 treated plot. The extent pod infestation of P_1, P_2 and P_5 were 60.45, 52.12, and 58.02, respectively.

The chemical used in the packages might significantly increase the yield byreducing the rate of infestation. Reduced rate of infestation ultimately contributed to the increased number of pod set, higher number and quality of healthy pod (Table 4), higher marketable yield and gross return and ultimately resulted in the higher BCR. Findings of the present study are comparable with the findings of different IPM packages studied by many other researchers (Alam *et al.*, 2005; Latif, 2007; Hossen 2008). Islam and Karim (1994) reported that IPM technique had given the satisfactory result as compared to spray of chemical insecticides alone for suppressingpod borer and aphid. Hand picking of infested plant parts was used as a component of IPM and it reduced the number of damaged fruits and ensured greater yield in plots with single picking than those with frequent picking in India (Verma, 1985). Gahukar (2006) reported that IPM is compatible and has potential to be adopted on a broad scale, together with other options to provide a low cost pest management strategy.

Table 3. Effect of different management packageson yield (t/ha) of yard long bean

Management packages	Yield (t/ha)			
	Healthy	Infested	Total	% yield increase over untreated control
P_1	10. 50ab	2. 020bc	12. 52b	60. 45
P_2	8. 840c	3. 033ab	11. 87b	52. 12
P_3	8. 023c	3. 603a	11. 63b	49. 05
P_4	12. 62a	1. 633c	14. 25a	82. 62
P_5	10. 01b	2. 327bc	12. 33b	58. 02
Untreated control	4. 097d	3. 707a	7. 80c	0. 00
CV (%)	13. 02	7. 11	11. 63	--

Means within a column followed by same letter (s) do not differ significantly (P=0. 05) according to least significant difference (LSD) test.

Package 1 (P1) : Two sprays with Ripcord10 EC (Cypermethrin) @ 1. 0ml/litre of water at 15 days interval

Package 2 (P2) : Two sprays with Asataf 75 SP (Acephate) @ 2. 0g/litre of water at 15 days interval.

Package 3 (P3) : Mechanical control (hand picking) & 2 sprays with neem seed extract (NSE) @ 50g/litre of water at 15 days interval.

Package 4 (P4) : Mechanical control (hand picking) & 2 sprays with Ripcord 10 EC (Cypermethrin) @ 1. 0ml/litre of water at 15 days interval.

Package 5 (P5) : Mechanical control (hand picking) & 2 sprays with Asataf 75 SP (Acephate) @ 2. 0g/lire of water at 15 days interval and an untreated control.

Economic analysis of different packages in suppressing pod borer of yard long bean

Economic analysis also reveals that Mechanical control (hand picking) & 2 sprayswith Ripcord 10 EC (Cypermethrin) @ 1. 0ml/litre of water at 15 days interval (P_4) had the best performance than any other management packages. It was observed that the highest gross return (142500. 00 Tk/ha), net return (130698. 00 Tk/ha), adjusted net return (52698. 00 Tk/ha) and highest Marginal Benefit Cost Ratio (MBCR) (4. 465) was obtained from that management package followed by P_1 (3. 503) and P_5 (2. 302) treated plot (Table 4). Barman, 2011 also found the highest BCR by using 3 sprays of Ripcord 10 EC (Cypermethrin) @ 1. 0ml/litre of water with mechanical control at 10 days interval in country bean which is almost similar to this study.

Table 4. Economic analysis of different management packages against pod borer of yard long bean.

Management packages	Cost of pest management (Tk/ha)	Gross return (Tk/ha)	Net return (Tk/ha)	Adjusted net return (Tk/ha)	Benefit cost ratio (BCR)
P_1	10482. 00	125200. 00	114718. 00	36718. 00	3. 503
P_2	12388. 00	118700. 00	106312. 00	28312. 00	2. 285
P_3	13700. 00	116300. 00	102600. 00	24600. 00	1. 796
P_4	11802. 00	142500. 00	130698. 00	52698. 00	4. 465
P_5	13718. 00	123300. 00	109582. 00	31582. 00	2. 302
Untreated control	0. 00	78000. 00	78000. 00	0. 00	--

Notes:Cost of Ripcord 10 EC/spray =4761 Tk/ha, Cost of Asataf 75 SP/spray =5714Tk/ha, Cost of NSE/spray =4750Tk/ha, cost in extraction of NSE =480 Tk/ha; 2 labors required for per ha spray; Cost of laborer: 150 Tk. Per labor/day for spraying; Sprayer rent/ spray= 30 Tk. /ha; 24 labors required for collection and destruction of larvae throughout the season;Cost of laborer: 130 Tk. Per labor/day for mechanical control (hand picking) ; Av. market price of edible pod:Tk. 10/Kg.

Package 1 (P1) : Two sprays with Ripcord10 EC (Cypermethrin) @ 1. 0ml/litre of water at 15 days interval

Package 2 (P2) : Two sprays with Asataf 75 SP (Acephate) @ 2. 0g/litre of water at 15 days interval.

Package 3 (P3) : Mechanical control (hand picking) & 2 sprays with neem seed extract (NSE) @ 50g/litre of water at 15 days interval.

Package 4 (P4) : Mechanical control (hand picking) & 2 sprays with Ripcord 10 EC (Cypermethrin) @ 1. 0ml/litre of water at 15 days interval.

Package 5 (P5) : Mechanical control (hand picking) & 2 sprays with Asataf 75 SP (Acephate) @ 2. 0g/lire of water at 15 days interval and an untreated control.

Relationship between pod borer infestation and yield (healthy pods) of yard long bean

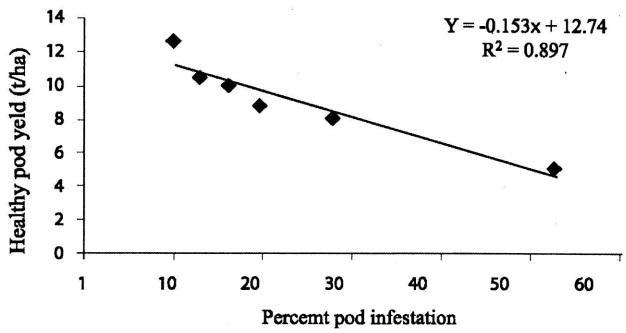

Figure 1. Relationship between percent pod infestation and yield of yard long bean.

Figure 1 showed the relationship between pod borer infestation and yield (healthy pods) of yard long bean. It is revealed that pod borer infestation is negatively correlated with yield of yard long bean. The relationship was significant and about 15% yield would be affected due to pod borer infestation. Barman, 2011 also found the pod borer infestation is negatively correlated with yield in country bean which is similar to the present study.

Conclusion

From the above study it could be concluded that in terms of lowest pod infestation (10. 58%), intensity of infestation (80 points), highest benefit cost ratio (BCR) (4. 465) and yield (14. 25 t/ha) may be achieved by the management package comprising of mechanical control (hand picking) & 2 sprayswithRipcord10 EC (Cypermethrin) @ 1. 0ml/litre of water at 15 days interval and may be chosen as the best package forsuppressing podborer in yard long bean field.

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