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SURVEY ON USAGE AND EFFECTIVENESS OF CHEMICALS FOR MANAGING POD BORER AND APHIDS OF YARD LONG BEAN IN BANGLADESH

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Abstract

The study was conducted in intensive yard long bean growing areas such as Jessore, Dhaka, Narsingdi, Comilla and Chittagong of Bangladesh to know the usage of effective chemicals in managing pod borer and aphids of yard long bean during March to October 2009 in the farmers' field. Farmers are used to apply more chemicals to minimize the damage done by insect pests of yard long bean. Sometimes they are applied as high as 12-15 times in the growing season. Insecticides used in different combinations were non selective, however, having different level of toxicity both to the pests and the natural enemies. Proclaim 5 SG (Emamectin benzoate) performed better as a singly applied insecticide where infested pod yield was the lowest (0.78 t/ha). Net return (123930 tk/ha) and BCR (1.36) were the lowest where malathion was applied singly. Spinosad performed better as a singly applied insecticide where net return (149090 tk/ha) and BCR (1.58) were the highest. Spinosad plus malathion performed better than carbosulfan plus dimethoate applied as a mixture where infested pod yield was the lowest (0.85 t/ha) and benefit Cost Ratio (BCR) was the highest (1.90).

Key words: Survey, Pod borer and aphids, chemicals, effectiveness, yard long bean.

Introduction

Yard long bean (*Vigna unguiculata* ssp. *sesquipedalis* (L.) Verdc) belongs to the Leguminosae family. Yard long bean is also known as asparagus bean, string bean, snake bean or vegetable cowpea (Purseglove, 1977). It is mostly grown in Chittagong, Chittagong Hill Tracts (CHTs), Faridpur, Noakhali, Comilla and Rangpur, but at present, it is extensively grown in Dhaka, Chittagong, Comilla, Narsingdi, and Jessore districts and also other districts of Bangladesh.

One of the major constraints for yard long bean production in Bangladesh is the attack of pod borer, *Euchrysops cnejus* (Dutta *et al.,* 2004). Pod borer larvae bore inside the flowers and tender pods. Aphids suck sap from flowers, buds, pods and tender branches of the plants and reduce the viability of plant (Thaker *et al.,* 1984). Available reports reveal that synthetic insecticides dominate the other means of control against pod borers in pulses, peas and beans (Lalasangi, 1988; Rahman and Rahman, 1988; Karim, 1995). The farmers mostly depend upon chemical insecticides to

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control the pest infesting yard long bean. The present survey was, therefore, conducted to study in details the usage and effectiveness of chemicals used for managing major insect pests of yard long bean in Bangladesh.

Materials and Methods

The survey was conducted in the farmers' field in five major growing areas of yard long bean such as Jessore (Jessoresadar), Dhaka (Savar), Narsingdi (Shibpur), Comilla (Chandina) and Chittagong (Mirshawrai) during March to October 2009. The study comprised survey of sample farmers and intensive field visit for field data collection and inspection.

Selection of survey locations and their features

Jessore sadar, Savar, Shibpur, Chandina and Mirshawrai are the intensive yard long bean cultivated upazillas of Jessore, Dhaka, Narsingdi, Comilla and Chittagong districts, respectively. From each upazilla one union and from each union one yard long bean field was randomly selected for the survey and field inspection. These fields from villages were -Natuapara under the upazilla Jessore sadar in Jessore district; Dayuin under the upazilla savar in Dhaka district; Ghasirdiah and Borokanda under the shibpur upazilla in Narsingdi district; Pihor under Chandina upazilla in Comilla district; East Gornia and north Uambaria under Mirshawrai upazilla in Chittagong district. The villages under Jessore, Dhaka, Narsingdi, Comilla, and Chittagong districts belong to Agro-ecological zone (AEZ) 11, AEZ 28, AEZ 28, AEZ 19 and AEZ 23, respectively.

For each location, 15 yard long bean farmers were randomly selected for the study. For this purpose, a list of yard-long bean growers of the randomly selected location was prepared with the help of the Sub Assistant Agricultural Officers (SAAOs) of the respective location. From the list of each location, 15 farmers were randomly selected by applying the statistical random chart.

Thus a total of 75 farmers were selected for interviews and their individual plots were visited for the survey (Table 1).

Methods of data collection

Data were collected directly from the sample farmers by administering predesigned and pretested questionnaires (Instrument 1) and recording of data in pre-formatted register (Instrument II) at 15 days interval from the

Table 1. Locations and number of farmers from each location.

District	Upazilla	Village	No. of surveyed farmers
Jessore	Jessore sadar	Natuapara	15
Dhaka	Shavar	Daywin	15
Narshingdi	Shibpur	Ghasirdiah	07
		Borokanda	08
Comilla	Chandina	Pihor	15
Chittagong	Mirshawrai	East Govnia	10
		North Umbaria	05

sample farmer's crop fields through field and crop observation.

In questionnaire survey, the researcher directly interviewed the sample farmers and collected data on insecticide usage and major pests infestation, pod borers and aphid. In this context, data were collected from randomly selected 7 (seven) yard long bean plants by using normal pace of 20 steps interval along the field avoiding boarder lines, on infested and healthy inflorescence and pod (in number and weight), and ultimately healthy and infested yield at harvest and sales of harvested produces. Such field data collection activities were assisted by the Sub Assistant Agricultural Officers (SAAOs) of Department of Agricultural Extension (DAE) of respective areas.

Data processing, analysis and output generation

All the collected data were coded, tabulated, checked and analyzed by using descriptive statistical methods including the computer-aided statistical package SPSS suitable for survey data analysis.

The data obtained for different characters were statistically analyzed to find out the significance of effects/impacts of the different chemicals either alone or in different combinations used by the farmers on yield contributing characters, yield and economic return of yard long bean.

The economic analysis of Benefit Cost Ratio (BCR) was analyzed on the basis of total expenditure of the respective treatment along with the total return from the particular treatment. Finally the benefit cost ratio was calculated by utilizing the formula:

$$\text{Benefit Cost Ratio (BCR)} = \frac{\text{Adjusted net return}}{\text{Total management cost}}$$

The mean values of different parameters were calculated from chemical (s) or group of chemicals used by the farmers and all the characters were evaluated, and analysis of variance (ANOVA) was performed by the 'F' (variance ratio) test using MSTATC program. The significance of the difference among the different combinations for different characters was estimated by the Duncan's Multiple Range Test (DMRT) at 5% level of probability.

Results and Discussion

Spray frequency, time and dosages

In relation to pests' control, 17.33% farmers did not spray any sort of chemical insecticides, 18.57% sprayed 2-5 times, 50.67% sprayed 6-10 times and 33.33% sprayed 12-15 times during a cropping season (Table 2).

The results indicate that majority of the farmers (50.67%) used to spray 6-10 times in a cropping season in the surveyed areas. Higher spray frequency is a common phenomenon to control yard long bean pests in commercially grown areas of Bangladesh as because they are not properly oriented to Integrated Pest Management (IPM) approach. Madamba *et al.,* (2006) also reported that chemical control of insects is common practice on yard long bean, but not on cowpea.

In case of spraying time, 9.33% farmers sprayed chemicals before noon and 90.67% farmers sprayed chemical insecticides in the afternoon. Among them, 10.67% farmers sprayed chemical insecticides before harvest of fresh pods, 68.00% farmers sprayed

Table 2. Spray frequency of chemical insecticides by the farmers of different growing areas of yard long bean in Bangladesh.

Location		Spray frequency by farmers (%) in a cropping season			
Districts	Upazilla	'0' spray	2-5 spray	6-10 spray	12-15 spray
Jessore	Jessore sadar	20.00	26.67	53.33	0.00
Dhaka	Savar	13.33	20.00	46.67	20.00
Narshingdi	Shibpur	20.00	33.33	40.00	6.67
Comilla	Chandina	20.00	0.00	66.67	13.33
Chittagong	Mirshawrai	13.33	13.33	46.67	26.67
Mean		17.33	18.67	50.67	13.33

insecticides after each harvest and 21.33 % farmers sprayed both before and after the harvest of fresh pods (Table 3).

The sample farmers applied the above insecticides in different dosages (Table 4). Among the sample farmers, 53.33% used proper dosage by following the specification given to the packaging label of pesticides while 46.67% used over doses of spray materials due to lack of awareness. They did not follow any basis for timing the application of the insecticides, which led to large number of application (15 times) in the crop growing season (Table 4).

In respect of effectiveness of pest control, 49.10% farmers opined that they were able to control 70-80% pests by spraying chemicals, 36.00% farmers succeeded in controlling 80-90% of the target pests and 14.67% farmers controlled 90% insect pests by spraying chemical insecticides comparing with the plots where farmers did not spray ('0' spray) any sort of chemical insecticides (Table 4).

Result from table 3 and table 4 reveal that farmers did not follow any appropriate time and dosages of spray chemical insecticides in their yard long bean field. Findings of the present study are comparable with the findings of Alam, S. N. (2001) who reported that in the rainy season most farmers harvested and marketed their eggplant on the same day they sprayed pesticides.

Chemical used and their effectiveness & impact

From the above results, it is revealed that the chemicals had played a vital role in managing major insect pests of yard long bean. But the chemicals used in different districts were not same and their effectiveness and impacts on infestation and yield were also variable.

Table 3. Time of spray of chemical insecticides any and harvesting of green pods of yard long bean by the farmers of different surveyed areas of Bangladesh.

Location		Spraying of chemical by farmers (%)				
Districts	Upazilla	before noon	after noon	before harvest	after harvest	both before and after
Jessore	Jessore sadar	0.00	100.0	0.00	66.67	33.33
Dhaka	Savar	33.33	66.67	20.00	53.33	26.67
Narshingdi	Shibpur	0.00	100.0	6.67	73.33	20.00
Comilla	Chandina	33.33	86.67	20.00	66.67	13.33
Chittagong	Mirshawrai	0.00	100.0	6.67	80.00	13.33
Mean		9.33	90.67	10.67	68.00	21.33

Table 4. Dosages of spray applied by the farmers and effectiveness (%) to control major insect pests of yard long bean at surveyed areas of Bangladesh.

Location		Farmers' response (%)				
Districts	Upazilla	proper dosages(%)	over dosages(%)	control pests 70-80%	control pests 80-90%	control pests>90%
Jessore	Jessore sadar	73.33	26.67	33.33	66.67	0.00
Dhaka	Savar	33.33	66.67	73.33	26.67	0.00
Narshingdi	Shibpur	86.67	13.33	0.00	26.67	73.33
Comilla	Chandina	46.67	53.33	86.67	13.33	0.00
Chittagong	Mirshawrai	26.67	73.33	53.33	46.67	0.00
Mean		53.33	46.67	49.10	36.00	14.67

Chemicals used

Total 14 active gradients, each having different brands, were used by the farmers of 5 sample districts. The brands were together grouped into 14 (fourteen) each active ingredients and named insecticides combinations (ICs) which were shown in Table 5.

As a general practice, the yard long bean growers applied single or combinations of insecticides. They adopted this practice for one or more reasons like unavailability of an insecticide at the time it is required, advice of the pesticide dealers or extension personnel and to substitute the poorly performed earlier insecticide. In India George *et al.* (2002) revealed that the majority of the farmers (63.3%) controlled the pest by blanket spraying of one or more insecticides.

Effectiveness of chemicals used

The effectiveness of the insecticides was measured comparing with the plots where farmers did not spray ('0' spray) any sort of chemical insecticides. It was analyzed in terms of some yield contributing factors related to pod borer and aphid management. These are presented below:

Inflorescence infestation

As shown in Table 6, the inflorescence infestation by pod borer and aphid was the lowest (8.18%) in IC # xii (Spinosad, Malathion) followed by IC # x (9.35%) and IC # viii (10.23%), which were statistically similar. On the other hand, the highest inflorescence infestation was recorded in IC # v (16.80%) followed by IC # iv (14.92%), IC # I (14.86%), IC # xi (14.78%), IC #xiii(13.96%) and IC # xiv (13.66%) and they were statistically similar.

Pod infestation

The lowest pod infestation was observed in IC # xii (9.07%) followed by IC # x (9.42%), IC # viii (10.77%) and IC # ix (11.79%) (Table 6), which were statistically similar but it is the highest in IC # v (17.45%) followed by IC # xi (14.88%), IC # ii (14.87%) and IC # iv (14.75%), which were statistically similar.

Table 5. Different brand chemicals in combination used by farmers in sample districts.

Common name	Insecticides combination No.(IC#)	Brand name of insecticides used in combinations
Cabaryl	(i)	Sevin 85 SP, Carbaryl 85 WP
Carbosulfan	(ii)	Amitage 20 EC, Marshal 20EC
Diazinon	(iii)	Diazinon 60 EC
Dimethoate	(iv)	Tafgor, Rogor, Starter
Malathion	(v)	Malaton 57 EC, Malataf 57 EC
Cypermethrin	(vi)	Limper 10 EC, Relothrin 10 EC, Ripcord 10 EC
Lambda cyhalothrin	(vii)	Reeva 2.5 EC, Karathrin 2.5 EC
Emamectin benzoate	(viii)	Proclaim 5 SG
Spinosad	(ix)	Tracer 45 SC
Emamectin benzoate	(x)	Rogor, Starter, Proclaim 5 SG
Diazinon, Cypermethrin	(xi)	Diazinon 60 EC
Spinosad, Malathion	(xii)	Tracer 45 SC, Malaton 57 EC, Malataf 57 EC
Dimethoate, Cypermethrin	(xiii)	Tafgor, Rogor, Ripcord 10 EC, Limper 10 EC,
Carbosulfan, Dimethoate	(xiv)	Marshal20EC, Rogor, Starter

As shown in Table 6, the highest number of farmers (15.73%) used the insecticide of Insecticides combination No. (IC#) x (Dimethoate, Emamection benzoate), which differed significantly from all other insecticides combinations, followed by IC # xii (Spinosad, Malathion), IC# vii (Lambda cyhalothrin), and IC# vi (Cypermethrin), IC# ix (Spinosad), IC# xi (Diazinon, Cypermethrin) and IC# xiii (Dimethoate, Cypermethrin), which were statistically similar while the lowest percent of farmers (4.29%) used IC# ii (carbosulfan) and IC# iv (Dimethoate) followed by IC# i (Carbaryl), IC# iii (Diazinon), IC# v (Malathron), IC# viii (Emameetin benzoate) and IC# xiv (Carbosulfan, Dimethoate), which were statistically identical.

Table 6.The effects of chemicals on yield contributing parameters of yard long bean in surveyed areas during kharif season 2009.

Chemical used			Practicing farmers (%)	Infloresc. infestation (%)	Pod infestation (%)
Common name	Insecticides combination No.(IC#)	Name of insecticides used in combinations			
Cabaryl	(i)	Sevin 85 SP, Carbaryl 85 WP	5.72c	14.86(3.85)c	13.18(3.63)b
Carbosulfan	(ii)	Amitage 20 EC, Marshal 20EC	4.29d	13.16(3.63)b	14.87(3.86)c
Diazinon	(iii)	Diazinon 60 EC	5.72c	13.04(3.61)b	13.68(3.70)b
Dimethoate	(iv)	Tafgor, Rogor, Starter	4.29d	14.92(3.86)c	14.75(3.84)c
Malathion	(v)	Malaton 57 EC, Malataf 57 EC	5.72c	16.80(4.10)d	17.45(4.18)d
Cypermethrin	(vi)	Limper 10 EC, Relothrin 10 EC, Ripcord 10 EC	7.15bc	11.93(3.45)b	12.78(3.57)b
Lambda cyhalothrin	(vii)	Reeva 2.5 EC, Karathrin 2.5 EC	8.57b	12.14(3.48)b	13.54(3.68)b
Emamectin benzoate	(viii)	Proclaim 5 SG	5.72c	10.23(3.20)a	10.77(3.28)a
Spinosad	(ix)	Tracer 45 SC	7.15bc	12.22(3.50)b	11.79(3.43)a
Dimethoate, Emamectin benzoate	(x)	Rogor, Starter, Proclaim 5 SG	15.73a	9.35(3.06)a	9.42(3.07)a
Diazinon, Cypermethrin	(xi)	Diazinon 60 EC Ripcord 10 EC,	7.15bc	14.78(3.84)c	14.88(3.86)c
Spinosad, Malathion	(xii)	Tracer 45 SC Malaton 57 EC, Malataf 57 EC	9.92b	8.18(2.86)a	9.07(3.01)a
Dimethoate, Cypermethrin	(xiii)	Tafgor, Rogor, Ripcord 10 EC, Limper 10 EC,	7.15bc	13.96(3.74)c	13.32(3.65)b
Carbosulfan, Dimethoate	(xiv)	Marshal 20 EC, Rogor, Starter	5.72c	13.66(3.70)c	13.59(3.69)b
CV (%)			8.74	10.38	12.57

*In a column the numeric data represent the mean value of 5 districts; data of each district are derived from the field

of 15 respondents.

*Appropriate transformation of data was done as per necessity. In a column, means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly at 0.05 level of probability.

The results in the combinations of different insecticide and most commonly used insecticides as presented in table 6, revealed different scenarios and inconsistencies in respect of any single parameter. However, based on the results, as a whole, insecticide combination # x, i.e., dimethoate plus emamectine benzoate applied as a mixture were practiced by the maximum farmers (15.73%) while carbosulfan and dimethoate as a singly applied insecticide was practiced by minimum farmers (4.29%). In case of inflorescence infestation, spinosad plus malathion applied as a mixture performed best than any other singly or as a mixture applied insecticides. In case of singly applied insecticides, emamectine benzoate performed best than any other insecticides. Comparable finding was also given by Alam, S.N., et al. (2003), who observed that even in several instances farmers were reported to use cocktails of 3 to 5 insecticides to control the eggplant shoot and fruit borers, which indicated the development of resistance, destruction of natural enemies, resurgence and harmful residues in edible fruits.

Infested pod yield

The infested pod yield was the lowest in IC # viii (0.78 t/ha), followed by IC # xiv (0.85 t/ha), IC # v and IC # ix (0.87 t/ha), which were statistically similar (Table 7). The moderate infested yield was followed by IC # xii (0.90 t/ha), IC # xiii (0.92 t/ha) and IC # x (0.93 t/ha) and they were statically identical. The highest infested yield was recorded in IC # i and IC # vi (1.22 t/ha) followed by IC # vii (1.17 t/ha), IC # ii (1.08 t/ha), IC # iii (1.07 t/ha), IC # xi (1.02 t/ha) and IC # iv (1.01 t/ha) and they were statistically comparable.

Healthy pod yield

As shown in Table 7, the highest healthy pod yield was obtained from IC # xii (15.55 t/ha) followed by IC # ix (14.91 t/ha), IC # iii (14.24 t/ha), IC # viii (13.97 t/ha) and IC # x (13.85 t/ha) while it was the lowest in IC # i (12.20 t/ha) followed by IC # ii and IC # vi (12.25 t/ha), IC # v (12.47 t/ha) and IC # xiii (12.51 t/ha), which were statistically similar.

From the table 7, in case of infested pod yield, results revealed that emamectine benzoate and spinosad performed better than any other insecticides. On the other hand, the highest healthy pod yield (14.91 t/ha) was obtained from spinosad, which was applied singly.

Total pod yield

The highest total pod yield was obtained from IC # xii (16.45 t/ha) followed by IC # ix (15.78 t/ha), IC # iii (15.31 t/ha), IC # vii (14.80 t/ha), IC # viii (14.75 t/ha) and IC # xi (14.66 t/ha)(Table 8). But it was the lowest and statistically comparable in IC# ii (13.33 t/ha), IC # v (13.34 t/ha), IC # i (13.42 t/ha), IC # xiii (13.43 t/ha) and IC # vi (13.47t/ha).

Table 8. The effects of chemicals on net return and benefit cost ratio (BCR) of yard

Table 7. The effects of chemicals on yield of yard long bean in surveyed areas during kharif season 2009.

Chemical used		Infested pod yield (t/ha)	Healthy pod yield (t/ha)
Common name	IC #		
Cabaryl	(i)	1.22c	12.20d
Carbosulfan	(ii)	1.08bc	12.25d
Diazinon	(iii)	1.07bc	14.24ab
Dimethoate	(iv)	1.01bc	13.27b
Malathion	(v)	0.87ab	12.47cd
Cypermethrin	(vi)	1.22c	12.25d
Lambda cyhalothrin	(vii)	1.17c	13.63b
Emamectin benzoate	(viii)	0.78a	13.97ab
Spinosad	(ix)	0.87ab	14.91a
Dimethoate, Emamectin benzoate	(x)	0.93b	13.85ab
Diazinon, Cypermethrin	(xi)	1.02bc	13.64b
Spinosad, Malathion	(xii)	0.90b	15.55a
Dimethoate, Cypermethrin	(xiii)	0.92b	12.51cd
Carbosulfan, Dimethoate	(xiv)	0.85ab	13.15b
CV (%)		10.56	8.73

*In a column the numeric data represent the mean value of 5 districts; data of each district are derived from the field of 15 respondents.

*In a column, means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly at 0.05 level of probability.

*[IC # i = Sevin 85 SP, Carbaryl 85 WP
IC # ii = Amitage 20 EC, Marshal 20 EC
IC # iii = Diaginon 60 EC
IC # iv = Tafgor, Rogor, Starter
IC # v = Malaton 57 EC, Malataf 57 EC
IC # vi = Limper 10 EC, Relothrin 10 EC, Ripcord 10 EC,
IC # vii = Reeva 2.5 EC, Karathrin 2.5 EC
IC # viii = Proclaim 5 SG
IC # ix = Tracer 45 SC
IC # x = Rogor, Starter, Proclaim 5 SG
IC # xi = Diaginon 60 EC
IC # xii = Tracer 45 SC, Malaton 57 EC, Malataf 57 EC
IC # xiii = Tafgor, Rogor, Ripcord 10 EC, Limper 10 EC,
IC # xiv = Marshal 20 EC, Rogor, Starter].

Benefit Cost Ratio (BCR)

The calculated BCR was the maximum in IC # xii (1.90) followed by IC # x (1.80), IC # ix (1.58), IC #xi (1.56), IC # iii (1.55), IC # iv (1.53) and IC # viii (1.49) while it was the maximum in IC # I (1.36) (Table 8). The healthy pod yield (t/ha), total yield (t/ha), net return and Benefit Cost Ratio (BCR) were the highest (15.55 t/ha, 16.45 t/ha, 1,59,550.00tk/ha and 1.90, respectively) in insecticide combination # xii, i.e., spinosad plus malathion applied as a mixture (Table 8).

long bean in surveyed areas during kharif season 2009.

Chemical used		Total yield(t/ ha)	Net return ('000' tk/ha)	BCR
Common name	IC#			
Cabaryl	(i)	13.42c	125.67d	1.36
Carbosulfan	(ii)	13.33c	133.07bc	1.46
Diazinon	(iii)	15.31a	141.80b	1.55
Dimethoate	(iv)	14.28b	138.45b	1.53
Malathion	(v)	13.34c	123.93d	1.36
Cypermethrin	(vi)	13.47c	124.5d	1.37
Lambda cyhalothrin	(vii)	14.80ab	130.41c	1.41
Emamectin benzoate	(viii)	14.75ab	135.55b	1.49
Spinosad	(ix)	15.78a	149.09ab	1.58
Dimethoate, Emamectin benzoate	**(x)**	14.78ab	159.55a	1.80
Diazinon, Cypermethrin	(xi)	14.66ab	145.11ab	1.56
Spinosad, Malathion	(xii)	16.45a	159.66a	1.90
Dimethoate, Cypermethrin	(xiii)	13.43c	137.88b	1.47
Carbosulfan, Dimethoate	(xiv)	14.00b	131.70bc	1.45
CV(%)		9.53	11.67	

*In a column the numeric data represent the mean value of 5 districts; data of each district are derived from the field of 15 respondents.

*In a column, means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly at 0.05 level of probability.

*[IC # i = Sevin 85 SP, Carbaryl 85 WP
IC # ii = Amitage 20 EC, Marshal 20 EC
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IC # iv = Tafgor, Rogor, Starter
IC # v = Malaton 57 EC, Malataf 57 EC
IC # vi = Limper 10 EC, Relothrin 10 EC, Ripcord 10 EC,
IC # vii = Reeva 2.5 EC, Karathrin 2.5 EC
IC # viii = Proclaim 5 SG
IC # ix = Tracer 45 SC
IC # x = Rogor, Starter, Proclaim 5 SG
IC # xi = Diaginon 60 EC
IC # xii = Tracer 45 SC, Malaton 57 EC, Malataf 57 EC
IC # xiii = Tafgor, Rogor, Ripcord 10 EC, Limper 10 EC,
IC # xiv = Marshal 20 EC, Rogor, Starter].

It was adjudged that proclaim 5 SG (Emamectin benzoate) performed better as a singly applied insecticide and spinosad plus malathion performed better when applied as a mixture. And these were the most effective, profitable and recommendable. These findings are more or less in conformity with the findings of an experiment, which was conducted at central farm of Bangladesh Agricultural Research Institute, Gazipur during kharif 2008 to evaluate the several management tactics against the pod borer, *Enchrysops cnejus* (F.)

attacking yard long bean where management package comprising of hand collection and destruction of larvae along with two sprays of Emamectin benzoate appeared to be the best method offering the lowest pest incidence (10.29 %) and the highest benefit cost ratio (BCR) (6.74). Results obtained from the rest of the techniques were not encouraging (Anon, 2009).

Conclusion

Pod borer and aphids are the key insect pests of yard long bean in surveyed areas. The farmers are used to apply different chemical insecticides to control these insect pests. Spinosad and emamectin benzoate are the most effective chemical insecticides to manage pod borer and aphid in yard long bean field and obtained the highest profit.

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