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Integrated management practices of hairy catterpillar of soybean

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Abstract: Management of hairy catterpillar of soybean (*Spilarctia obliqua* Walker) using zetpowder, neem kernel extract, neem oil and Ripcord 10EC alone and their integration was studied at Regional Agricultural Research Station, .Bangladesh Agricultural Research Institute, Rahmatpur, Barisal during rabi season of 2007-2008 and 2008-2009. The highest hairy catterpillar was 40 per plant observed in the last week of March in 2008, 2009. Among the treatments Ripcord 10EC reduced the highest Hairy catterpillar (99.17%) with the highest BCR (5.36) followed by Neem kernel extract + Zet powder (27.08%) and Neem oil + Zet powder (20.00%) and Neem kernel extract (16.67%) recorded at 15 days after spray over the pre-treatment count. Neem oil +Zet powder gave the second highest BCR (2.78) followed by Zetpowder (2.75), Neem kernel extract + Zetpowder (2.54) and Neem kernel extract (2.24).
Key words: Integrated, Management, Practices, Hairy catterpillar, Soybean.

Introduction

Bangladesh is principally an agricultural country and produces good number of oilseed crops like mustard, sesame, groundnut, linseed, niger, safflower, sunflower, soybean, castor, etc. Soybean (*Glycine max* L. Merr.) was one of the important crop which is grown for oil and protein in both the rabi and kharif season. Soybean has received a great deal of attention all over the world as important source of protein to alleviate the protein deficiency. It is comparatively cheaper than the animal sources of protein such as meat, fish, milk, egg, etc.

Soybean (*Glycine max* L. Merr.) has high potential both as a pulse and oil crop for Bangladesh (Anon, 1985). In Bangladesh soybean is not yet popular as a crop but soybean oil is very popular as cooking oil. However, recently the crop gained popularity in the poultry industry. Extraction of soybean oil from seed is not possible in normal expeller. Soybean oil is imported at the cost of huge foreign exchange and most of the soybean commercially produced in the country is used for making nutritious food items likes soyaflour, soyadal, soyakhechuri, soyamistry, soyaploao, soyamilk, soyasemai, soyachanachur soyacake, soybeabiscuits and soyabred etc. (Kaul and Das 1986). Soybean seeds contain 42-45% protein and 20-22% edible oil. Crushed seeds are used as important component of poultry feed as a source of protein. Soybean plant with help of Rhizobium bacteria in its root modules, is capable of utilizing atmospheric nitrogen for its growth, higher yield finally enrich the nitrogen fertilizer of the soil. Soybean is also intercropped with cotton and pigeonpea and with short duration pulse as well as mungbean and blckgram in some parts of India. The yield of this crop in Bangladesh is found much lower than the other countries due to low yield potential of local varieties and its poor management practices. Oil seed Research Centre (ORC) of BARI has developed some advanced promising varieties/line of soybean which possess the high yield potential and less pest susceptible But yield of soybean is very low due to poor management practices under field conditions, such as improper practices can increase the productivity of soybean up to a considerable extent. There is bright prospect for expansion of soybean cultivation because it can be grown in both rabi and kharif seasons. Each crop genotypes needs certain time for normal growth and development.

Thirty nine species of insect pests have been recorded at the different growth stages of soybean crop in Bangladesh. Of these eight species were recorded as the major pests and rests were of minor importance. The most damaging insects are hairy catterpillar, leaf roller, common cutworm, pod borer, stem flies, bugs and white fly those are found to damage during vegetative, flowering and pod formation stages of the crop. One of the major constraints of oilseed production is the attack of insects pests. One of the major constraints to the successful soybean production in Bangladesh is the damage caused due to insect pests. Practical experiences reveal that 15-20 percent of the total soybean productin is lost directly or indirectly by the attack of insect and mite pests every year. The insect pests of soybean in Bangladesh were recorded by several scientists (Kaul and Das, 1986; Begum, 1995).

This pest is also serious in India, Pakistan, USA and many other countries of the world. The larvae of the hairy catterpillar feed on shoots, pods and top of the leaves. They are vuretious types and make shot holes inthe leaves, pods and webs the growing points. About 90% soybean plants are infested by this pest inIndia (Singh, 1990). Although chemical insecticides are the effective control measures against these pests but the bad-effect of pesticides ugage. Farmers spray insecticides in their field indiscriminately. So it causes resistance of the pest, destruction of beneficial organisms and environmental pollution. So it is necessary to find ecologically sound and environmentally safe methods for pest control. Botanicals are comparatively less toxic, naturally available materials, less expensive, less hazardous, biodegradable and also safe for beneficial organisms. Ahmed (1984) listed 2121 plant species possessing pest control properties. Researchers isolated and identified several chemical compounds from leaves and seeds of many plants and screened and identified out for insect deterrents and growth inhibitors. Neem seed kernel extracts containing azadiractin, salanin and meliontriol have extensively been studied and demonstrated for insect pest control efficacy (Sexena *et al.* 1981; Haque and Islam, 1988). These neem products are distastefull or repelled to the insect and may reduce the insect infestation. Information using botanicals for the control of hairy catterpillar in Bangladesh is scantly. Therefore, the present study was undertaken to find out the most effective plant materials with their integration for the management of hairy catterpillar of soybean.

Materials and Methods

The experiment was carried out during the period from rabi season of 2007-2008 to 2008-2009 at the field of

Oilseed Research Centre, Regional Agricultural Research station, Bangladesh Agricultural Research Institute (BARI), Rahmatpur, Barisal, The experiment was laid out in a randomized complete block design (RCBD) with three replications. The unit plot size was 3 m X 4 m Fertilizers were applied at the rate of 25: 30: 60: 16: 2: 1 NPKSZnB kg/ha respectively as recommended for Bangladesh (Anon, 2004). Half of N (as urea) and all others fertilizers were applied during final land preparation and the rest of half N was applied at the initial stage of flowering. During land preparation, cowdung was applied at 10 ton/ha. The spacing maintained for soybean entries was 30 cm row to row and 10 cm seed to seed distances. The soybean variety BARI soybean-5 were sown in 30 December, 07 and 08. Intercultural operations, such as irrigation was given twice, weeding and mulching were done as and when necessary as per recommendation of Mondall and wahhab (2001). Six treatments namely, Zet powder @5g/l, Neem kernal extract(2.5%), neem kernal extract+ Zet powder, Neem oil 5ml/l +Zet powder, Ripcod 10EC@ 2ml/l and untreated control were evaluated against hairy catterpillar of soybean under field condition. Three hundred fifty gram (350g) neem seed kernal was crushed and added to 10 litre of water and kept over night and sieved with fine net. Then the solution was ready for spray. Four gram (4g) detergent powder (Zet powder) added to 1 litre of water stirring and sieved with fine net. Four (4) ml neem oil added to 1 litre of water with 4 g zet powder stirring and sieved then the solution was ready for spray. Botanicals and insecticide were applied on February 20, 2008, 2009 at the vegetative and pod formation stage of the crop with the help of knapsack sprayer. Randomly 10 plants were selected per plot for counting hairy catterpillar of soybean. Larvae of the hairy catterpillar were counted bellow the leaf, shoot and pod of the plant before 5, 10 and 15 days after spray in all the treatments. The crop was harvested on 20-04-08, 09. Seed yield of different treatments were recorded. Recorded data were compiled and analyzed in the computer package programmee MSTAT-C for Randomized Complete Block Design (RCBD) and mean value were separated by Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984). Benefit cost ratios (BCR) of different treatments were also calculated.

Results and Discussion

Initially hairy catterpillar apeared on the soybean crop in the 1st week of March at the vegetative, flowering and pod formation stage of the crop and continued their infestation up to 1st week of April at the maturity stage. Initially hairy catterpillar was low at the early part of March but it increased gradually up to last week of March in 2008 and 2009. The highest hairy catterpillar was 40 Larvae/plant observed in the last week of March in 2008 and 2009 and then declined gradually (Table 1). Almost similar information was made by Kaul and Das (1986) and Biswas and Das (2000) in this country.

Table 1. Incidence of hairy catterpillar in soybean 07-08 and 08-09 at Barisal

Duration (Date)	Hairy catterpillar/plant
1-7 March	5
8-14 March	10
15-21 March	15
22-28 March	40
29 March - 04 April	34
05-11 April	23

Table 2. Efficacy of some plant materials against hairy catterpillar (*Spilarctia obliqua* Walker) 2007-2008 and 2008-2009 at Barisal

Treatment	Hairy catterpillar/plant			
	Before spray	5 DAS	10DAS	15 DAS
Zetpowder 4g/1	22b	20 b	18c	17b
Neemkernel extract(2.5%)	28a	26 b	23b	21b
Neemkernel extract(2.5%)+Zet powder	32a	27 b	23c	20c
Neem oil+Zet powder	25b	23 c	20c	17c
Ripcord 10 EC 2ml/l	40a	1d	0d	0d
Untreated control	34a	42 a	45 a	46a

Data were recorded on average of 10 plants, Mean followed by the same letters in a column do not differ significantly at 5% level by DMRT, DAS= Days After Spray

Table 3. Efficacy of some plant materials against hairy catterpillar (*Spilarctia obliqua* Walker) 2007-2008 and 2008-2009 at Barisal

Entries	Percent population reduction over pretreated				
	5 DAS	10 DAS	15 DAS	Average	Yield (kg/ha)
Zetpowder 4g/1	9.09c	18.18b	22.72c	16.67	1900c
Neemkernel extract (2.5%)	7.14c	17.86b	25.00b	16.67	1920b
Neemkernel extract(2.5%)+Zet powder	15.63b	28.12b	37.5b	27.08	1990b
Neem oil+Zet powder	8.00b	20.00b	32.00b	20.00	1940b
Ripcord 10EC 2ml/l	97.50a	100.00a	100.00a	99.17	2366a
Untreated control	+23.53	+32.35	+35.29	+30.39	1650d

Data were recorded on average of 10 plants, (+) Percent increase in hairy caterpillar, Mean followed by the same letters in a column do not differ significantly at 5% level by DMRT.

Table 4. Economics of different plant materials spraying hairy catterpillar (*Spilarctia obliqua* Walker) 2007-2008 and 2008-2009 at Barisal.

Treatment	Yield (kg/ha)	Increased yield over untreated (kg/ha)	Cost of insecticides & spray (kg/ha)	Add. income (Tk./ha)	Net income (Tk./ha)	BCR
Zet powder 4g/l	1900c	250	2000	7500	5550	2.75
Neem kernel extract (2.5%)	1920b	270	2500	8100	5600	2.24
NKE+Zet powder	1990b	330	2800	9900	7100	2.54
Neem oil +Zet powder	1940b	340	2700	10200	7500	2.78
Ripcod 10EC 2ml/l	2366a	716	3375	21480	18105	5.36
Untreated control	1650d	-	-	-	-	-

Mean followed by the same letters in a column do not differ significantly at 5% level by DMRT, BCR= Net income/ Management cost, Price of soybean seed =30Tk./kg, cost of neem oil=200 Tk./litre, Cost of neem seed kernel= 50Tk./Kg, cost of Ripcod, 10EC=450Tk./litre, Cost of labour=120Tk./labour day. Three labours and 1litre of Ripcod 10EC @ 2ml/l being required for 1hectare of crop field spryed in one time. One machine spray volume= 10 litre required 200 sqm field spraying in one time. Other variable costs were same in all the treatment.

Before spray, the mean hairy catterpillar per plant ranged 22 to 40. These variations in hairy catterpillar were not significant indicating homogenous distribution of population. After spray the number of hairy catterpillar decreased in the treated plots while in significantly increased in untreated plot. Untreated plot had the highest hairy catterpillar (46 hairy catterpillar/plant) (Table 2).

Neem products and Zetpowder significantly reduced the hairy catterpillar (16.67-27.08%) after 15 days of spray and then reappeared. But in Ripcord 10 EC treated plot hairy catterpillar did not reappeared up to 15 days after spray. As expected, Ripcord 10 EC gave the highest reduction of hairy catterpillar (99.17%) followed by Neem kernel extract + Zetpowder(27.08) (Table 2). The significantly highest yield (2366 kg/ha) was obtained on the Ripcord 10EC treated plots followed by Neem kernel extract + Zetpowder treated plots (1990 kg/ha).The significantly lowest seed yield (1650 kg/ha) was obtained from untreated plots (Table 3). The highest BCR (5.36) was obtained from Ripcord 10 EC treated plot followed by Neem oil +Zet Powder treated plot (2.78) (Table 4).

This result revealed that neem formations and Zetpowder are effective in checking the hairy catterpillar in soybean only up to 10-15 days after spray. Their performance was inferior to Ripcord 10 EC treated plots. Morde and Blackwell (1993) reported that antifeedant and insect growth regulatory effect are present in azadirachtin and neem product which can be used for insect management. Islam et al. (2006) reported that about 50% mortality of *Spilarctia oblique* occurred in jute plant when applied 5% concentration of neem oil in Bangladesh. Result revealed that although botanicals fail to reduce 100% hairy catterpillar but it safe for natural enemies and also safe for environmental pollution.

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