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Methods of Pest Control and Direct Yield Loss Assessment of Country Bean (*Dolichos lablab*) at Farmers' Field Condition: A Survey Finding

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Abstract: A survey on farmers' pest control methods and direct yield loss assessment of country bean (*Dolichos lablab*) was done during September 2000 to February 2001 in North Edilpur and South Mohadebpur villages of Sitakundu under Chittagong district. Results revealed that farmers used Fanfan, Nogos, Ripcord, Malathion, Roxion and Sumithion as chemical methods and applying ash and handpicking of insect pests as non-chemical method to control insect pests. The frequency of insecticide application during flowering stage to harvest was 9 to 15 with waiting period of only 3 to 20 days and 6 to 12 with waiting period of 3 to 25 days in North Edilpur and South Mohadebpur, respectively. The pod infestation by pod borer and aphids varied from 2.29 to 5.12% and from 2.83 to 7.16% in North Edilpur and South Mohadebpur, respectively. Insect pests thus caused direct yield loss of 60.38-200.69 kg ha⁻¹ in North Edilpur and 92.63-345.80 kg ha⁻¹ in South Mohadebpur.

Key words: Pest management, country bean, *Dolichos lablab*, yield loss assessment

INTRODUCTION

Legume vegetable country bean (*Dolichos lablab*) is an important vegetable grown in all over Bangladesh. Country bean is cultivated commercially in a few areas of Bangladesh. Now a days country bean cultivation is seen significantly in Comilla, Noakhali, Sylhet, Dhaka, Kishoreganj, Tangail, Jessore and Dinajpur^[1]. In Chittagong the farmers follow intensive practices of country bean production as a commercial crop both in ails (border) of the plots or main plots^[2].

According to Alam^[3], nine different insect species and one species of mite attacked country bean. Four of these species have been considered as major pests and the rest of them as minor pest. However, not all the insects cause damage. The insects infesting the reproductive phase's i.e., flower and pods are of serious concern. As a result significant yield loss is commonly evident by these insects pest. So farmers are always worried about insect pests and try to control them at best of their level. The pod borer (*Maruca testulalis* G.) is the most serious pest causing economic losses in the field^[4]. The pod borers were found to cause 38.0% yield loss through flower and pod damage of pigeonpea in Bangladesh^[5]. Bean pod borer is considered as a major pest of legumes in Africa, Asia, South and Central America and Australia causing yield loss ranging between

20 and 60%. According to Karim^[6] the major insect and mite pests of hyacinth bean (country bean) in Bangladesh are hyacinth bean aphid (*Aphis craccivora*), pod borers (*Maruca testulalis* Geyer and *Helicoverpa armigera*) and red mite (*Tetranychus* sp.). Das^[7] reported the incidence of five major insects and mite pest of country bean in Bangladesh. These were aphid (*Aphis craccivora* Koch), flower bud and pod borer (*Maruca testulalis* G.), leaf miner (*Cosmopteryx* sp.) country bean leaf paster (*Hedylepta indicata* F.) and one mite (*Tetranychus* sp.). The bean aphids, *Aphis craccivora* Koch, is the most serious pest of bean plants from seedling to pod bearing stage, causing considerable yield losses^[8].

The available pest control techniques, chemical measures are vital and provide a rapid, cost-competitive and typically effective pest management tool^[9]. But farmers of our country usually use insecticide unconsciously and indiscriminately to control insect pests. Moreover, the Government's policy of giving 100% subsidy on pesticides i.e., giving the pesticides free of cost to the farmers had helped encourage and develop the habit of indiscriminate use of pesticides among the farmers^[10]. This is serious basic problem in achieving success in IPM programs. Kabir *et al.*^[11] found for hyacinth bean, farmer used a maximum of 15 kinds of insecticides of which Sumicidin and Nogos were most common. Farmers of Jessore region sprayed insecticides

at an interval of 5-7 days was common but in some location like Barobazar, Jhenaidha, Chowgacha, Baringar and Churamankati sprayed every or every alternate day in country bean. Farmers believe that insecticides are the only method to control insect pest. This mental make up has been created from their practice of using insecticides to control the insect pests attacking their crops over many years^[12]. Li *et al.*^[13] found that Dimethoate 40EC at a dilution of 1:500, Deltamethrin 20EC at 1:300 and Pirimicarb 50 WP at 1:3000 resulted in 96.71, 97.82 and 86.43% aphid control and 27.23, 26.01 and 23.90% yield increases, respectively in bean. Alam^[3] reported that the aphid (*A. craccivora*) can be controlled by spraying Malathion 57EC @ 0.56 l ha⁻¹. The insect may also be controlled with Diazinon 50EC @ 0.56 l ha⁻¹. Cruz^[25] recommended soil and foliar spray of insecticide for reducing damage by *A. craccivora* spraying with Diazinon 60 EC/Dimethoate 40 EC/Malathion 57 EC @ 2-2.5 ml l⁻¹ of water at every 10 days was recommended to control this pest in country bean^[14]. But when applied Methomyl flower damage was 6.2% and grain yield was 1240 kg ha⁻¹ as against 80.1% flower damage and 102 kg ha⁻¹ grain yield in control^[15].

Control of aphids by any measure is a difficult task, because of its rapid growth, mode of reproduction, polymorphic nature and wide adaptation. However, it is naturally controlled, to some extent, by its natural enemies^[16]. Aphids can be successfully controlled by spraying soap-water suspension at the rate of 25 ml liquid detergent per liter of water or spraying with the extract of the Neem (*Azadiracta indica*) seed kernel also give effective control of aphid^[12]. Another method with spraying of microbial insecticides *Bacillus thuringiensis* offers a good control of the insect^[12,17]. Neem oil, Neem oil emulsifiable concentrate, Neem oil slurry emulsifiable concentrate and 5% Neem oil emulsifiable concentrate from the seeds of the Neem plant, were tested against *Maruca testulalis* G. under laboratory condition^[18]. When Ddimethoate applied the highest (78%) flower damage by *M. testulalis* G. and grain yield of 684 kg ha⁻¹ was achieved. Application of Monocrotophos at 0.05% protected 176.72 kg ha⁻¹ of grain damage against pod borers but still a loss of 99.88 kg ha⁻¹ was observed^[19]. Dandale *et al.*^[20] reported the superiority of Cypermethrin, Fenvalerate and Endosulfan in reducing pod borer infestation in red gram. Begum^[21] found that the management of insect pests of country bean required 2-3 times spray with Malathion, Nogos and Sumithion. Ripcord 10 EC should be used @ 1% at flowering stages or when pod infestation exceeded 10% and aphid population exceeded 50 twig⁻¹ plant⁻¹. But the farmers, in general, do not follow such need-based practice. However, the exact situation of farmers' practice for

protecting the country bean against its pests is not known exactly. Nevertheless these information are quite necessary for fixing up the pest management strategy for any crop vis-à-vis country bean. The studies on the farmers' practices of country bean pest control or management in Bangladesh are rarely reported.

Under the above backdrop, a study of pest management practices of country bean in farmer's field condition was therefore under taken with the following objectives:

- to observe the incidence of insect pests of country bean at farmer's field
- to study the farmer's practices of pest management in country bean.
- to assess the direct yield loss of country bean in farmer's field.

MATERIALS AND METHODS

The study was conducted under farmer's field during rabi season, which covered 15 October 2000 to 15 February 2001. Two villages, namely North Edilpur and South Mohadebpur, located near the national highway under two agricultural extension blocks of Sitakundu upazilla in Chittagong district were selected as the locale of study. Sitakundu upazilla was selected based on the available statistics of country bean production from a BARC Contract Research Project report^[22].

Twenty farmers, 10 from each of two villages were selected based on their long time involvement in country bean cultivation, representative of the country bean farmers of the locality, consent for allowing data collection and their overall interest in the study. The farmers were selected well before the rabi season started so that all the pertinent information regarding cultivation starting right from land preparation to harvest could be properly recorded. The selected farmers following their traditional methods of cultivation, no intervention was made regarding the cultivation of the crop except field observation for recording the pertinent data. Data were collected directly by the researcher from the selected farmer's field by field observation as well as by interviewing the farmers by administering pre-designed and pre-tested questionnaires. The questionnaires consistent with the objectives of the study were prepared in English and then translated into Bengali for convenience in data collection.

For collecting data the selected farmer's fields were regularly visited at 15 days interval. In consistence with the study objectives both qualitative and quantitative data were collected on the parameters like land holding,

choice of variety, cultivation in main plot and in ail, incidence of insect pests, pest control practices, insecticides used, frequency of insecticide application, waiting period for harvest after insecticide application and healthy yield, infested yield and total yield.

Before actual data collection, rapport was established with the selected farmers as well as other farmers of the locality who were explained the objectives of the study. This helped in getting accurate data without any hindrance through out the study period. The BSs were also explained the procedures of data collection, so that they could also record the data in case of emergency. From each farmer eight harvests data were recorded for calculating yield loss assessment by using following formula.

$$\text{Percent pod infestation (\%)} = \frac{\text{Quantity of infested pod}}{\text{Total quantity of pod}} \times 100$$

RESULTS AND DISCUSSION

The average area under country bean cultivation in main land in North Edilpur was 0.07 ha per farmer and in South Mohadebpur was 0.19 ha (Table 1). Farmers were also found to cultivate country bean in the border of other croplands. The average area under country bean cultivation in borderland in North Edilpur was 0.10 ha per farmer while that in South Mohadebpur was 0.15 ha. Thus inclusive of borderland the total country bean cultivation per farmer per season was 0.17 and 0.34 ha in North Edilpur and South Mohadebpur, respectively. In both the villages, three varieties such as "Suri", "Bata" and "Puti" were found most common. According to descending rank order in terms of pest infestation and production, Suri was better than other two varieties. Farmers preferred Suri variety because of low infestation and high production. The susceptibility of country bean genotype to pod borer, *Maruca testulalis* G., was studied at the Regional Agricultural Research Station, Jamalpur. Out of 32 genotypes, the highest percentage of infestation was found in Bata (Mirsharai) (16.81±1.21%) and the lowest percentage of infestation in Suri (sword bean) (0.74±0.05%)^[24].

Insect pest incidence and farmers' pest management practices: Table 2 reveals that the incidence of insect pests in North Edilpur and South Mohadebpur was more or less same. In North Edilpur, 7 (seven) insect pests were found to infest country bean at different growth stages. They are listed in descending order of their incidence as aphid (*Aphis craccivora* Koch), pod borer (*Maruca testulalis* G.), leaf miner (*Cosmopteryx* sp.), leaf beetle

(*Madurasia obscurella* Jacoby), leaf eating caterpillars (*Amsacta albistriga* W.), mite (*Tetranychus* sp.) and hooded hopper (*Leptocentrus taurus* Fb.). On the other hand, the same in South Mohadebpur was found in the descending order of their incidence as aphid (*Aphis craccivora* Koch), pod borer (*Maruca testulalis* G.), leaf eating caterpillars (*Amsacta albistriga* W.), leaf beetle (*Madurasia obscurella* Jacoby), mite (*Tetranychus* sp.) and leaf miner (*Cosmopteryx* sp.). Thus aphid and pod borer were found to occupy the same status of incidence in both the villages. They were found to inflict severe infestation in country bean in farmers' field of both North Edilpur and South Mohadebpur.

Table 2 also shows pest management methods used by farmers include both chemical and non-chemical practices. The non-chemical methods comprised the use of ash and handpicking of insect pests, while the chemical methods included the use of Fanfan, Nogos, Ripcord, Malathion, Roxion and Sumithion. However, the preference of those methods to the farmers of North Edilpur was found in the order of ash, Fanfan, Nogos, Ripcord, Malathion, Roxion, hand picking and Sumithion, while the same to the farmers of South Mohadebpur was ash, Malathion, Ripcord, hand picking, Nogos, Roxion, Maladan and Changar. In Bangladesh, Malathion @ 2.5 ml l⁻¹ of water and Diazinon @ 0.04% are recommended against the bean aphid^[23] and have been found to be effective and standardized insecticides against aphid in Bangladesh.

Thus although the methods were almost same in both the villages, the order of their preference slightly differed in case of chemicals, while the order of non-chemical methods were the same. The farmers in both the villages preferred ash as an indigenous non-chemical method. Hand picking of insects also practices by the farmer's of both village.

The farmers of both the villages have reported to be very much concern about the pest attack, which is also evident from very frequent application of insecticides. The frequency of insecticide application in North Edilpur and South Mohadebpur was 9 to 15 and 6 to 12 during flowering stage to harvest, respectively. Moreover, the farmers were not that much cautious about the waiting period. The waiting period before harvesting of pods after insecticide application ranged from only 3 to 20 days and 3 to 25 days in North Edilpur and South Mohadebpur, respectively irrespective of the insecticides used.

Infestation, direct yield loss and yield: Table 3 revealed that the pod infestation by pod borer and aphids in North Edilpur and South Mohadebpur varied from 2.29 to 5.12% and from 2.83 to 7.16%, respectively. These pests caused

Table 1: Information on cultivation of country bean in North Edilpur and South Mohadebpur village

Village	Choice of variety by the farmers (according to ascending order of pest infestation and descending order of production)	Cultivation in main plot farmer ⁻¹ (ha)	Cultivation in ail (Borderland) farmer ⁻¹ (ha)	Total cultivation farmer ⁻¹ (ha)
North Edilpur	Suri > Bata > Puti	0.07	0.10	0.17
South Mohadebpur	Suri > Bata > Puti	0.19	0.15	0.34

Table 2: Information on pest management practices of country bean in North Edilpur and South Mohadebpur village

Village	Incidence of insect pests	Rank order (according to descending order of incidence)	Pest management practices	Rank order (according to descending order of use)	Waiting period (days) between insecticide	Frequency of insecticide application at harvest during flowering stage to
North Edilpur	Aphid	1	Ash	1	3-20	9-15
	Pod borer	2	Fanfan	2		
	Leaf miner	3	Nogos	2		
	Leaf beetle	4	Ripcord	3		
	Leaf eating-caterpillars	5	Malathion	4		
	Mite	5	Roxion	4		
South Mohadebpur	Hooded hopper	6	Hand picking	5	3-25	6-12
	Aphid	1	Sumithion	6		
	Pod borer	2	Ash	1		
	Leaf eating-caterpillars	3	Malathion	2		
	Leaf beetle	4	Ripcord	3		
	Mite	5	Hand picking	4		
	Leaf miner	6	Nogos	5		
			Roxion	6		
			Maladan	7		
			Changar	7		

Table 3: Information on direct yield loss and yield of country bean in North Edilpur and South Mohadebpur village

Information on yield	North Edilpur	South Mohadebpur
% Pod infestation	2.29-5.12	2.83-7.16
Direct yield loss due to aphids and pod borers (kg ha ⁻¹)	60.38-200.69	92.63-345.80
Yield (t ha ⁻¹)	2.15-5.81	1.73-5.55

direct yield loss of 60.38-200.69 kg ha⁻¹ in North Edilpur and 92.63-345.80 kg ha⁻¹ in South Mohadebpur. Exclusive of the direct yield loss caused by pod borers and aphids, the farmers obtained yield, on an average, 2.15 to 5.81 t ha⁻¹ in North Edilpur and 1.73 to 5.55 t ha⁻¹ in South Mohadebpur.

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