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SURVEY ON ARTHROPOD PEST OF CAPSICUM AND DIFFERENT PRACTICES USED BY THE CAPSICUM GROWERS AGAINST INFESTATION IN MAJOR GROWING AREAS OF BANGLADESH

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ABSTRACT

The study was conducted at Rajbari, Manikganj, Bogura, Sylhet and Kishoreganj district to study on farmers' practices for the management of capsicum insect pest in major capsicum growing areas of Bangladesh. Data were collected by the researcher during the period from 15 October to 15 November 2018. Among the respondent the maximum (87.2%) capsicum growers were cultivated capsicum in winter season and 12.8% capsicum growers were cultivated in summer season. The highest around 36.00% have low level infestation whereas only 4.80% were belongs to severe level insect pests' infestation under the study area. Capsicum growers practices (CGPs) related data were collected at two levels: directly from the sample farmers by administering pre-designed and pre-tested questionnaires. Total 11 capsicum varieties were recorded from the study area and the highest used capsicum varieties California wonder (17.21%), Omax hybrid (15.35%), BARI misti morich -2 (13.84%). BARI misti morich-1 (12.36%), Bell pepper (9.1/0%) and Marcuri rosso (7.23%). Total 10 insect pests of capsicum were recorded from the study area. Among the insect pests capsicum fruit borer and aphid were dominant and observed upto 100% respondent farmer's field. The capsicum growers practices (CGPs) for capsicum insect pest management were generally three broad types. Type I Non-chemical, bio-pesticide and untreated control practices; Type II was combination of chemicals with other management practices and Type III was combination of non-chemicals management practices comprising bio-pesticide, mechanical, cultural and mulching materials. Most of the respondents of capsicum growers (71.14%) practiced Type II, whereas, Type I was practiced by 23.08% and Type III was practiced by only 5.77% of respondents of capsicum growers of the respective districts. The BCR was maximum in CGP 8, CGP 9, CGP11, CGP 12 and CGP 10 (3.12-2.90) while it was minimum (2.06-2.15) in CGP 7 and CGP 15. Application of integrated pest control measures were more effective compared to single control measure for capsicum cultivation regarding insect pest management.

Key words: Capsicum, arthropod pests, infestation, practices.

Introduction

The genus Capsicum is the second most important vegetable crop of the family after tomato in the world. It is widely cultivated in almost all regions. The fruit is an excellent source of natural colours and antioxidant compounds whose intake is an important health protecting actor by prevention of widespread human diseases. Pepper fruit contain antioxidants and vitamins which increase its daily consumption worldwide. Rajbari, Manikganj, Bogura, Sylhet and Kishoreganj district are the major pepper growing area of Bangladesh. Recently farmers are facing a lot of problems to cultivate bell pepper. Major contributors to lower productivity are various insects and diseases. The typical damage in pepper known as "leaf curl syndrome" showing upward and downward curling is common due to infestation of different sucking insect pests (aphids, thrips and mites). Due to serious infestation economic yield loss may be 12-77% and 60-80% in respect of quantitatively and qualitatively (Ghosh *et al.*, 2009). Up to 50% yield loss may occur due to anthracnose disease caused by *Colletotrichum* sp. (Pakdeevaraporn *et al.*, 2005). Different sucking insect pests (mite, thrips, jassid, aphids) and caterpillars are the major problems for bumper pepper production. Now, *Spodoptera litura* is a burning issue and extremely serious pest for pepper fruits. For controlling this pest, farmers of Rajbari, Manikganj, Bogura, Sylhet and Kishoreganj districts are frequently spraying insecticides without any pre-harvest interval causing pest resistance, resurgence and environmental health hazard. Resistance to different insecticides (organophosphorus, carbamate, pyrethroids and some selected

new products) of *Spodoptera litura* caused sporadic out breaks of the pest and serious crop damage (Shad *et al.*, 2001). Different fungal, bacterial and viral diseases hamper pepper production. Considerable yield loss may occur due to major devastating fungal diseases such as damping off, choenaphora and anthracnose. Environment plays an important role for disease development. Inoculums of different soil-borne diseases grow rapidly in wet weather, high temperature and high humidity. Under ideal conditions fruit or leaf infection include water-soaked and necrotic lesions progress rapidly. Pepper production is hampered due to insects and diseases (Alam *et al.*, 2006). Integration of different practices can be helpful for controlling insect pests effectively, economically and in a most environment friendly manner. In order to promote the supply of safe green and bell pepper for both domestic and export market; major emphasis is urgently needed to find out the major insect pests and their management approaches through a survey study. Findings from the survey may provide important information for the management of insect pests in bell pepper. Quick dissemination of new IPM technologies and information generated through this study will help to motivate the pepper farmers for controlling major insect pests and to reduce the indiscriminate use of pesticides ensuring food security among the pepper farmers. Hence, the present survey study was conducted considering following objectives: i) To study the infestation intensity of insect pest of capsicum in intensive growing areas; ii) To study the control practices of growers including insecticide and other measures; iii) To survey the present attitude of farmers towards the impact of toxic insecticides on capsicum and iv) To study farmers income from capsicum cultivation and cost expenditure

Materials and Methods

The study was conducted at Rajbari, Manikganj, Bogura, Sylhet and Kishoreganj district (Table 1) to study on farmers' practices for the management of capsicum insect pest in major capsicum growing areas of Bangladesh.

Table 1: Locations of the study

District name	Upazilla name	Village name	Respondents of capsicum growers
Rajbari	Kalukhali	Pakshina	25
Manikganj	Singair	Hemayetpur	25
Bogura	Sibganj	Garidoho	25
Sylhet	Biswanath	Ramdhana	25
Kishoreganj	Bhairob	Adarshapara	25

Population and sample size of the study: An up-to-date list of the capsicum growers were selected upazila were prepared with the help of Agriculture Extension Officer in respective district. Therefore, in total there are 620 families in study area as a population and around 20% of the populations were randomly selected using random sampling method as the sample for the study. Thus, 125 farmers constituted the sample of the study.

The research instrument: An interview schedule was prepared the research instrument for collection of data. It was done keeping in new the objectives and variables of the study. Necessary corrections, additions, alterations, re-arrangement, and adjustments were made in the interview schedule based on pretest experience. Appropriate scales were developed to measure both independent and dependent variables. The interview schedule was then multiplied by printing in its final form.

Method of data collection: Data for the study were collected by following on interview procedure. While starting interview with any respondent, the researcher established appropriate rapport with her so that she did not feel hesitant to furnish proper responses to the questions and statements in the schedule. Farmers of the original list were not available for interview in spite of repeated attempts. Therefore, they were replaced by those from the reserve list. Excellent cooperation was obtained from all respondents during data collection. Data were collected by the researcher himself during the period from 15 October to 15 November, 2018.

Data processing, analysis and output generation: After completion of data collection the responses were coded, tabulated and analyzed according to the objectives of the study. Various statistical measures such as frequency count, percentage distribution, average and standard deviation were used in describing data. SPSS (version 26) computer program was used for analyzing the data. The mean values of all the characters were evaluated and analysis of variance (ANOVA) was performed by the 'F' (variance ratio) test using Statistix 10 program. The significance of the difference among the different combinations for different characters was estimated by the LSD Test at 5% level of probability (Gomez and Gomez, 1984).

Results and Discussion

Characteristics of the capsicum growers: Season of capsicum cultivation of the capsicum growers were classified into two categories as winter season capsicum growers and summer season capsicum growers (Table 1). Among the respondent the maximum (87.2%) capsicum growers were cultivated capsicum in winter season and 12.8% capsicum growers were cultivated in summer season. Age of the capsicum growers were classified into five categories as young, middle and old (Table 1). Among the respondent, the highest (55.20%) capsicum growers were middle aged, 28.00% were young and only 16.80% were in old aged category. Among the respondent, the highest (46.40%) capsicum growers have an education level at primary, 25.60% were secondary level educated, 17.60% were illiterate and only 10.40% in above secondary level educated under the study areas. The highest (48.80%) capsicum growers were medium size farmers, followed by small size farmers (30.40%), whereas the lowest (8.00%) capsicum growers were large size farmers followed by (12.80%) capsicum growers were in marginal size under the study.

Table 1. Profiles of capsicum growers

Parameters	Respondents		Mean	Standard deviation
	Number	Percent		
Growing season				
Winter season	109	87.2	1.128	0.335
Summer season	16	12.8		
Total	125	100	-	-
Age category				
Young aged (below 35 years)	35	28.00		
Middle aged (35-50 years)	69	55.20	1.888	0.663
Old aged (above 50 years)	21	16.80		
Total	125	100	-	-
Education				
Illiterate (0.5)	22	17.60		
Primary education (1-5)	58	46.40	2.288	0.878
Secondary education (6-10)	32	25.60		
Above secondary (above 10)	13	10.40		
Total	125	100	-	-
Farm size				
Marginal (upto 0.2 ha)	16	12.80		
Small (0.201-1.0 ha)	38	30.40	2.520	0.819
Medium (1.01 to 3.0 ha)	61	48.80		
Large (above 3.0 ha)	10	8.00		
Total	125	100	-	-

General practiced followed for capsicum cultivation: Duration of involvement in capsicum cultivation of the capsicum growers were classified into three categories as short-term involvement, mid-term involvement and long-term involvement (Table 2). Among the respondent the highest (76.80%) capsicum growers have short-term involvement with capsicum cultivation, 18.40% have mid-term involvement and only 4.80% have involvement for long-term in capsicum cultivation under study. Uses of mulching of the capsicum growers were classified into four categories as straw, compost, different polythene and water

hyacinth. Among the respondent, the highest (61.6%) capsicum growers were different polythene mulching user. The maximum (81.60%) numbers of insects were observed in morning time. In respect of infestation levels, the maximum levels were estimated as around 36.00%, whereas 5.60% for no level infestation. Among method of insect pest managements, the maximum (86.4%) capsicum growers were chemical insecticide user, followed by IPM (integrated pest management) user (7.20%), whereas the minimum (6.40%) capsicum growers were biological insecticide user under the study. Pest control training status of the capsicum growers were classified into two categories as received pest control training and didn't received pest control training (Table 2). The highest (52.00%) capsicum growers didn't received pest control training and (48.00%) received any training on pest control or management. In respect of contact with extension agents the highest (58.40%) capsicum growers have low level contact with extension agents and only (19.60%) have high level contact with extension agents.

Table 2. General practiced followed for capsicum cultivation

Followed practiced	Respondents		Mean	Standard deviation
	Number	Percent		
Farming experience				
Short term involvement (below 5 years)	96	76.80	1.280	0.548
Mid-term involvement (5-10 years)	23	18.40		
Long term involvement (above 10 years)	6	4.80		
Total	125	100	-	-
Mulching used				
Different polythene	77	61.6	1.628	1.115
Compost	12	9.60		
Straw	28	22.40		
Water hyacinth	8	6.40		
Total	125	100	-	-
Timing for insect observation				
Morning	102	81.60	1.344	0.742
Noon	3	2.40		
Afternoon	20	16.00		
Total	125	100	-	-
Infestation level				
No infestation (0% infestation)	7	5.60	3.089	1.276
Low infestation (1-4% infestation)	45	36.00		
Mild infestation (5-10% infestation)	27	21.60		
Moderate infestation (11-30% infestation)	28	22.40		
High infestation (31-50% infestation)	12	9.60		
Severe infestation (above 50% infestation)	6	4.80		
Total	125	100	-	-
Pest management practices				
IPM	9	7.20	1.992	0.370
Chemical	108	86.40		
Biological	8	6.40		
Total	125	100		
Training on pest control				
Received pest control training	60	48.00	1.520	0.502
Didn't received pest control training	65	52.00		
Total	125	100	-	-
Contact with extension agents				
Low contact (upto 4)	73	58.40	1.512	0.667
Medium contact (5-9)	40	32.00		
High contact (10-13)	12	9.60		
Total	125	100	-	-

Capsicum varieties of farmer's field under the selected study areas: Famers used different capsicum varieties in their field and total 11 capsicum varieties were recorded from the study area, where 2 varieties were BARI capsicum varieties (BARI misti morich-1 & BARI misti morich -2) and 9 were different type of exotic capsicum varieties (Table 3). Among these 11 different capsicum varieties were distributes as California wonder (17.21%), Omax hybrid (15.35%), BARI misti morich-2 (13.84%), BARI misti morich-1 (12.36%), Bell pepper (9.10%) and Marcuri rosso (7.23%) were observed as dominant as other variety in the study area.

Farmer's practices for the management of insect pests in capsicum: The capsicum growers practices (CGPs) for capsicum insect pest management were generally three broad types. Type I was Non-chemical, bio pesticide and untreated control practices; Type II was combination of chemicals with other management practices and Type III was combination of non-chemicals management practices comprising bio-pesticide, mechanical, cultural and mulching materials. Most of the respondents of capsicum growers (71.14%) practiced Type II, whereas, Type I was practiced by 23.08% and Type III was practiced by only 5.77% of respondents of capsicum growers of the respective districts (Table 3).

Table 3. List of farmers practices for capsicum fruit borer management

Type I. Non-chemical, biopesticide and untreated control	
CGP 1	Use of pheromone traps
CGP 2	Use of light traps
CGP 3	Use of neem seed solution (1kg broken seed/20 litre water)
CGP 4	Spraying of Neem leaf extract @ 3.0 ml/L of water at 7 days interval
CGP 5	Spraying of Neem oil @ 3.0 ml/L of water at 7 days interval
CGP 6	Use of bio-pesticide i.e., Spinosad-45 (4ml per litre of water)
CGP 7	Untreated control
Type II. Combination of chemical with other management practices	
CGP 8	Combination of chemicals, bio-pesticide, mechanical, cultural and mulching materials
CGP 9	Combination of chemicals, mechanical, and mulching materials
CGP 10	Combination of chemicals, cultural and mulching materials
CGP 11	Combination of chemicals, bio-pesticide and mulching materials
CGP 12	Combination of chemicals, bio-pesticide, cultural and mulching materials
Type III. Combination of non-chemicals management practices	
CGP 13	Combination of bio-pesticide, mechanical, cultural and mulching materials
CGP 14	Combination of mechanical, cultural and mulching materials
CGP 15	Combination of bio-pesticide, mechanical and cultural

Effect of capsicum grower's practices on yield and return in capsicum cultivation: Table 4 exposed that the highest number (21.10) of healthy fruit was recorded from CGP 8, which was followed by CGP 9, CGP 10, CGP 11, CGP 12, CGP 6 and CGP 3 (19.11-16.03), while it was the lowest in CGP 7, CGP 15 and CGP 14 (10.67-11.57). The highest number (24.38 ton/ha) of healthy fruit yield (tha^{-1}) was recorded from CGP, which was followed by CGP 9, CGP 10, CGP 11, CGP 12, CGP 1 and CGP 3 (23.87-19.14), while it was the lowest in CGP 7, CGP 15 and CGP 14 (12.37-14.81). For infested fruit yield (tha^{-1}) more or less opposite trend of result occurs. The BCR was maximum in CGP 8, CGP 9, CGP11, CGP 10 and CGP 3 (3.12-2.75) while it was minimum (2.06-2.19) in CGP 7, CGP 14 and CGP 15 followed by CGP 13, CGP 5, CGP 4 and CGP 6 (2.22-2.56). The maximum BCR in CGP 8, whereas the net return (12,42000 Tk./ha) because of the higher healthy fruit although the cost of production was the highest (5,86500 Tk./ha).

The above results indicated that among the different CGPs, the CGP 8 and other CGPs that included combination of all the control options included chemicals, mulching materials and mechanical control were more effective than the CGPs excluding chemical and mulching materials. Thus the effect of chemicals, mulching materials and mechanical was positively demonstrated in significantly reducing the insect pests' infestation. The mulching materials used in CGP 8 reduced the population of capsicum insect pest to some extent through mating disruption.

Table 4. Effect of capsicum grower's practices on yield and return in capsicum cultivation under sample districts

Farmers' practices	Healthy fruit (no. per plant)	Fruit yield (t ha^{-1})		Production cost (Tk. ha^{-1})	Net return (Tk. ha^{-1})	BCR
		Healthy	Infested			
CGP 1	16.10	19.35	2.88	530500	920750	2.74
CGP 2	15.67	19.11	2.91	525000	908250	2.73
CGP 3	16.03	19.14	3.02	522500	913000	2.75
CGP 4	15.47	17.49	3.43	520000	791750	2.52
CGP 5	14.78	17.18	3.51	515000	773500	2.50
CGP 6	16.08	18.11	3.81	530200	828050	2.56
CGP 7	10.67	12.37	5.25	450000	477750	2.06
CGP 8	21.10	24.38	1.27	586500	1242000	3.12
CGP 9	19.11	23.87	1.76	575000	1215250	3.11
CGP 10	18.39	22.36	2.14	578000	1099000	2.90
CGP 11	18.97	23.11	2.13	565500	1167750	3.06
CGP 12	17.81	21.94	2.38	560000	1085500	2.94
CGP 13	12.32	15.09	4.13	510000	621750	2.22
CGP 14	11.57	14.81	4.38	507500	603250	2.19
CGP 15	11.79	14.49	4.62	505000	581750	2.15

Market price of capsicum: @ Tk. 75,000/ton

All these ultimately contributed to the increased number of fruit set, higher number and quantity of healthy fruits harvest, higher healthy fruit yield and higher gross return and ultimately resulted the higher BCR. This result is similar with Karim (2001) who reported that IPM technique had given satisfactory result as compared with sprays of chemical insecticides alone for controlling capsicum fruit borer. Similarly, Alam *et al.* (2006) conducted IPM trials at Jessore and Noakhali in Bangladesh during summer 2002. They portrayed that the fruit infestation in IPM trials were very much less than the farmers field. But many researchers reported that collection and destruction of infested fruit along with application of insecticides were effective for capsicum fruit borer management (Alam *et al.*, 2006; FAO, 2015). Gahukar (2000) reported that IPM is compatible and has the potential to be adopted on a broad scale, together with other measures, to provide a low-cost management strategy.

References

Alam, S.N., Hossain, M. I., Rouf, F. M. A., Jhala, R. C., Patel, M. G., Rath, L. K., Sengupta, A., Baral, K., Shylesha, A. N., Satpathy, S., Shivalingaswamy, T. M., Cork, A. and Talekar, N. S. 2006. Implementation and promotion of an IPM strategy for control of eggplant fruit and shoot borer in South Asia. Technical Bulletin. AVRDC publication AVRDC-The World Vegetable Center, Shanhua, Taiwan. 06-672(36):74.

FAO. 2015. Report of a joint FAO/WHO workshop on fruit and vegetables for health. Food and Agricultural Organization. p.25.

Gahukar, R. T. 2000. Use of neem products pesticides in capsicum pest management. *Int. J. Pest Manage*., 46(1): 149-l60.

Ghosh, A, Chatterjee, M. L., Chakrabati, K. and Samanta, A. 2009. Field evaluation of insecticides against chillithrips. *Ann. Pl. Protec. Sci*., 17:69-71.

Gomez, K. A. and Gomez, A. A. 1984. Statistical Procedures for Agricultural Research. 2nd Edn., pp. 13-175.

Karim, K. N. S., Das, B.C. and Khalequzzaman, M. 2001. Population dynamics of *Aphis gossypii* Glover (Homoptera: Aphididae) at Rajshahi, Bangladesh. *Online J. Biological Sci.*, 1: 492-495.

Pakdeevaraporn, P., Wasee, P. W. J. and Mongkolporn, O. 2005. Inheritance of resistance to anthracnose caused by Colletotrichumcapsici in Capsicum. *Plant Breeding*, 124(2):206-208.

Shad, S. A., Sayyed, A. H., Fazal, S., Saleem, M. A., Zaka, S. M. and Ali, M. 2006. Field evolved resistance to carbamates, organophosphates, pyrethroids, and new chemistry insecticides in Spodoptera litura Fab.