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Attitude of Farmers towards Chemical Pesticides Use in Vegetable Cultivation

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ABSTRACT

Farmers widely use chemical pesticides in vegetable field to control insect pests, although it is evident that chemical pesticides may cause adverse effects on health and environment. The present study was conducted to assess farmers' attitude towards the use of chemical pesticides in vegetable cultivation in the selected areas of Mymensingh district. A total of 100 farmers were selected from Mymensingh sadar upazila by using a simple random sampling technique. Data were collected through one-on-one interviews during May and June 2019 by using structured questionnaire. Both descriptive and inferential statistics were used to analyse data. Most of the farmers showed unfavourable attitude towards chemical pesticides use in vegetable cultivation. Correlation analysis shows that annual income and extension media contact were significantly and positively associated with attitude. On the contrary, the findings indicate that the farmers in the study area rely primarily on chemical pesticides for insect pest management. As recommendations, the extension service providers could provide training to the farmers on rational use of chemical pesticides; increase knowledge level of the farmers on insect pest management; and introduce alternative methods for insect pest management in the study area

Introduction

Due to its nature, vegetables are more susceptible to insect pests attack (Adeniji, 2008). Farmers in low income countries widely use chemical pesticides to prevent crop loss from insect pest attack (Rana *et al*., 2017; Schreinemachers *et al*., 2017; Pretty, 2005; Ecobichon, 2001), and as reported by Mahantesh and Singh (2009), pesticides contribute substantially to reduce pest attack and to increase production. Some previous studies of Hoi *et al*. (2013) and Yudelman *et al*. (1998) further confirm that pesticides have direct relation with increasing crop production significantly.

Vegetable farming has been an important enterprise in Bangladesh. A range of vegetable is grown by farmers throughout the year, either for subsistence or commercial purpose (Mannan and Rahman, 2017). However, like other developing countries, farmers of Bangladesh are highly dependent of chemical pesticides for insect pest management in vegetable cultivation (Gautam *et al*., 2017; Rana *et al*., 2017; Miah *et al*., 2014). For example, farmers spray chemical pesticides on eggplant nearly every day (Bentley, 2009; Rashid *et al*., 2003). This, in turn, poses serious environmental and health risks of farmers and consumers as well (Gautam *et al*., 2017; Jallow *et al*., 2017; Aktar *et al*., 2009; Dasgupta *et al*., 2005, 2007). Researchers (see for example Shammi *et al*., 2018; Schreinemachers *et al*., 2016) also documented that excessive use of chemical pesticides in vegetable cultivation had adverse effects on health and environment. As a result, existing studies urge for reducing chemical pesticide use in vegetable cultivation in Bangladesh (Gautam *et al*., 2017). A good number of literature further suggest reducing the use of chemical pesticides through the introduction of alternative methods of insect pest management, such as integrated pest management (IPM), in vegetable cultivation (Rahaman *et al*., 2018; Gautam *et al*., 2017; Pretty and Bharucha, 2015).

However, it is quite stressful to replace existing agricultural practice with pesticide-free agriculture overnight; instead, promotion of rational use of pesticides could be more beneficial. Change in attitude of the farmers through awareness campaign is first and foremost to reduce indiscriminate use of chemical pesticides (Sulaiman *et al*., 2019). Attitude influences an individual's choice option and responses to challenges, incentives and rewards (Business Dictionary, 2012). Thus, we endeavoured to assess farmers' attitude

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towards chemical pesticides use in vegetable cultivation. In the extant literature, a remarkable study was found in Bangladesh mostly on pesticides use by smallholders (Schreinemachers *et al*., 2016), pesticide exposures towards health and environmental hazard (Shammi *et al*., 2018; Aktar *et al*., 2009), and practices of pesticide use (Yeasmin *et al*., 2018). However, there is paucity of information concerning attitude of farmers towards the use of chemical pesticides in vegetable cultivation in the study area. Therefore, the present study was conducted to assess attitude of the vegetable farmers towards the use of chemical pesticides in vegetable cultivation.

Materials and Methods

The study was conducted in Mymensingh sadar upazila of Mymensingh district (Figure 1). The study area is particularly suitable for vegetable cultivation (Jahan and Khatun, 2016). Various vegetables such as brinjal, lady's finger, bottle gourd, potato, cucumber, chili and pointed gourd are grown well in the study area (Abdullah *et al*., 2007). Hence, diversification in vegetable cultivation, good communication facilities and researchers' perception about better cooperation from the farmers were some of the reasons to select the study area for investigation.

The farm households, which were involved in vegetable cultivation for both family consumption as well as marketing, were the target population of the study. The respondents were selected by using a simple random sampling technique from two *unions* (*Baira* and *Char Nilakshmia*) of Mymensingh sadar upazila. The *unions* were selected purposively through the consultation with Upazila Agriculture Officer (UAO) of the respective upazila. A list of farmers growing vegetables for family consumption and to some extent, for marketing was collected from agriculture office of Mymensingh sadar upazila, and around 600 farmers were found in the list. A total of 100 farmers (50 from each *union*) were selected for investigation by using Taro's formula (1967) (Equation 1).

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

Where, n = sample size, N = population size, and e = level of precision, which was set at 9%.

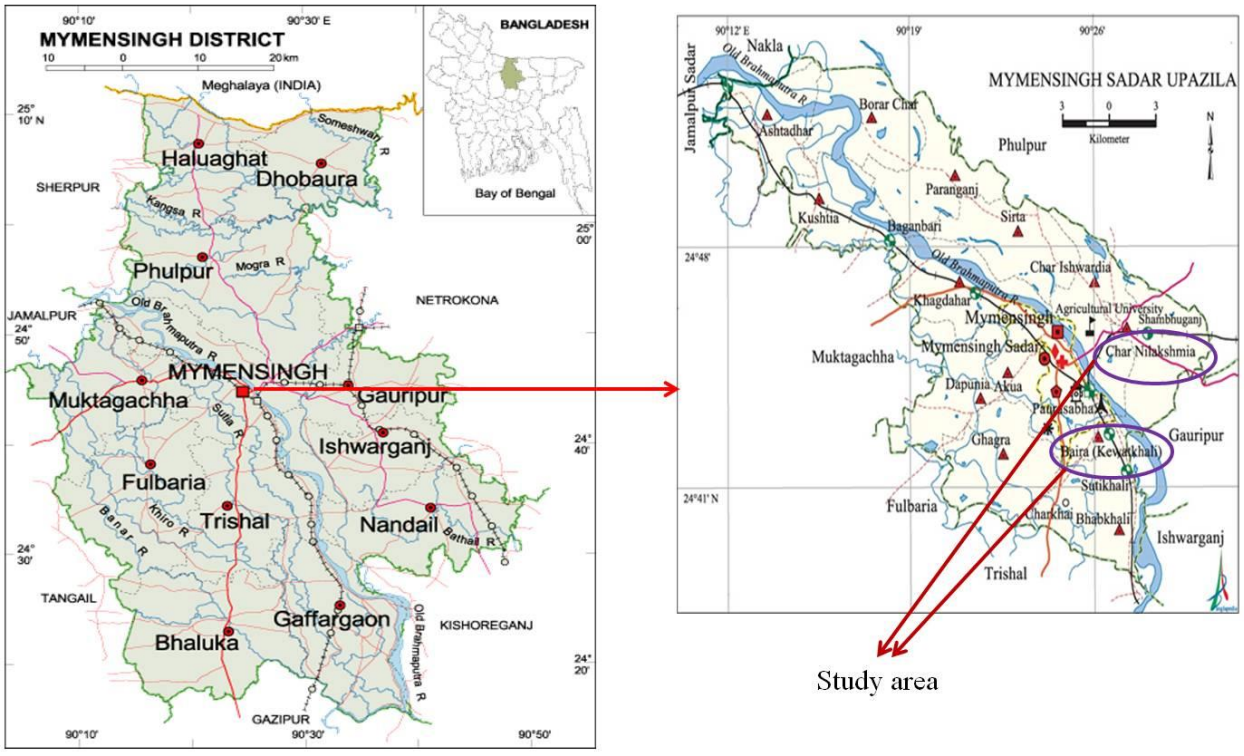

Figure 1. Map showing study area

The study employed a mixed methods approach including both qualitative and quantitative data collection methods. Qualitative methods included Focus Group Discussion (FGD) and Key Informant Interview (KII), whereas quantitative method included one-on-one interview, Two FGDs involving a total of 20 vegetable growers (10 from each *union*) were conducted using a checklist. Two KIIs were conducted with Upazila Agriculture Officer and Agriculture Extension officer of the respective upazila using open-ended questions. Outputs from FGDs and KIIs were used to design and modify the survey questionnaire as well as to interpret the findings of the study. The final data were collected from the respondents through one-on-one interview using a structured questionnaire during May and June, 2019. Before the final survey, the questionnaire was pre-tested with 15 farmers who did not participate in the final survey.

A Likert scale (Likert, 1932) was used to measure attitude of the farmers towards chemical pesticides use in vegetable cultivation. A total of 15 relevant statements (both positive and negative), identified in FGDs and KIIs, were adapted to the questionnaire. The statements were asked to the farmers against five possible responses, i.e. strongly agree, agree, undecided, disagree and strongly disagree with corresponding score of 5, 4, 3, 2, and 1, respectively or positive statements, with a reverse scoring for negative statements. Rana*et al*. (2017) and Ghosh and Hasan (2013) also used similar scale for measuring attitude in their respective study. The scale score ranged from 15 to 75, where 15 indicates highly unfavourable attitude and 75 indicates highly favourable attitude. Based on the scale score, the respondents were categorized into five groups.

The Statistical Package for Social Sciences (SPSS) ver. 22 and Microsoft Excel ver. 13 were used for data management. Descriptive statistics such as frequency, percentage, mean, standard deviation and inferential statistic such as Pearson's Correlation Coefficient was employed to find out the findings of the study.

Results and Discussion

Demographic characteristics of the farmers

The demographic characteristics of the farmers have been presented in Table 1. The majority of the respondents (43%) were in middle aged followed by old (30%). Most of the respondents (43%) had no formal schooling, whereas 33% of them had secondary level of education. Educational level is one of the important factors in determining respondents' attitude. It helps them to broaden their outlook and expands their horizon of knowledge. The household size ranged from 2 to 14 with a mean of 7.05, which was higher than that of the national average of 4.48 (BBS, 2015). Most of the households were large in size (45%) followed by medium size (43%). Table 1 further shows that the highest proportion of the respondents had small (36%) to marginal (27%) type farm.

The majority of the respondents (44%) had an annual income of 61-150 thousands Bangladeshi Taka (BDT) while 39% of them had an income of over 150 BDT per year. Over 68% of the respondents had low extension media contact; whereas 28% of them had low extension media contact and only 4% had high extension media contact. The findings also show that an overwhelming 70% of the respondents did not receive any training, while 18% of the respondents received training for 1 to 2 days. Table 1 further indicates that majority of the respondents (77%) had medium to low level of knowledge on insect pest management, whereas only 23% of them had high knowledge. A study by Nasrin *et al*. (2019) reported similarly that the majority of the farmers (80.7%) had medium to low knowledge on pesticide application in vegetable cultivation.

Attitude of farmers towards chemical pesticides use in vegetable cultivation

The overall attitude score of farmers varied from 16 to 56 against the possible score range of 15 to 75 with a mean of 38.01 and standard deviation 9.59. Based on the possible attitude scores, the respondents were classified into five categories as shown in Figure 2. It shows that over half of the respondents (56%) showed unfavourable attitude towards chemical pesticides use in vegetable cultivation and 19% showed highly unfavourable attitude. On the contrary, around 21% of the respondents showed favourable attitude and none of the respondents showed highly favourable attitude towards chemical pesticides use in vegetable cultivation.

The findings are consistent with Yeasmin *et al*. (2018). Several factors might influence the farmers for having unfavourable attitude towards chemical pesticides, for instances, awareness of farmers about the harmful effects of chemical pesticides, high prices, or resistances of insect pests to chemical pesticides. Our findings could be justified by the findings of Mohan and Helen (2014) who found that the majority of the farmers (86.7%) had a favourable attitude towards organic farming practices in India. Adebayo and Oladele (2013) and Oluwasusi (2014) reported positive attitude of the vegetable farmers towards organic agriculture Nigeria. However, our findings imply a good opportunity to initiate health and environment friendly methods for insect pest management, for example, organic agriculture and IPM in the study area.

Table 1. Demographic characteristics of the farmers (n=100)

Categories	Respondents (%)	Mean	SD
Age (year)			
Young (18-35)	27		
Middle Aged (36-50)	43	46.83	13.63
Old (>50)	30		
Education (year of schooling)			
No schooling (0)	43		
Primary (1-5)	20	4.1	3.98
Secondary (6-10)	33		
Higher secondary (>10)	4		
Household size (number)			
Up to 4	12		
5-6	43	7.05	3.19
Above 6	45		
Farm size (hectare)			
Marginal (0.02-.2)	27		
Small (0.21-1)	36	1.01	1.25
Medium (1.01-3.0)	24		
Large (>3.0)	13		
Annual income ('000'BDT)			
Up to 60	17		
61-150	44	153.90	115.73
Above 150	39		
Extension media contact (score)			
Low (up to13)	68		
Medium (14-26)	28	11.81	7.64
High (>26)	4		
Training received (days)			
Not received (0)	70		
1-2	18	0.80	1.72
3-4	9		
Above 4	3		
Knowledge on insect pest management (score)			
Low (up to 11)	37		
Medium (12-22)	40	16	7.71
High (>22)	23		

SD = Standard Deviation, BDT = Bangladesh Taka

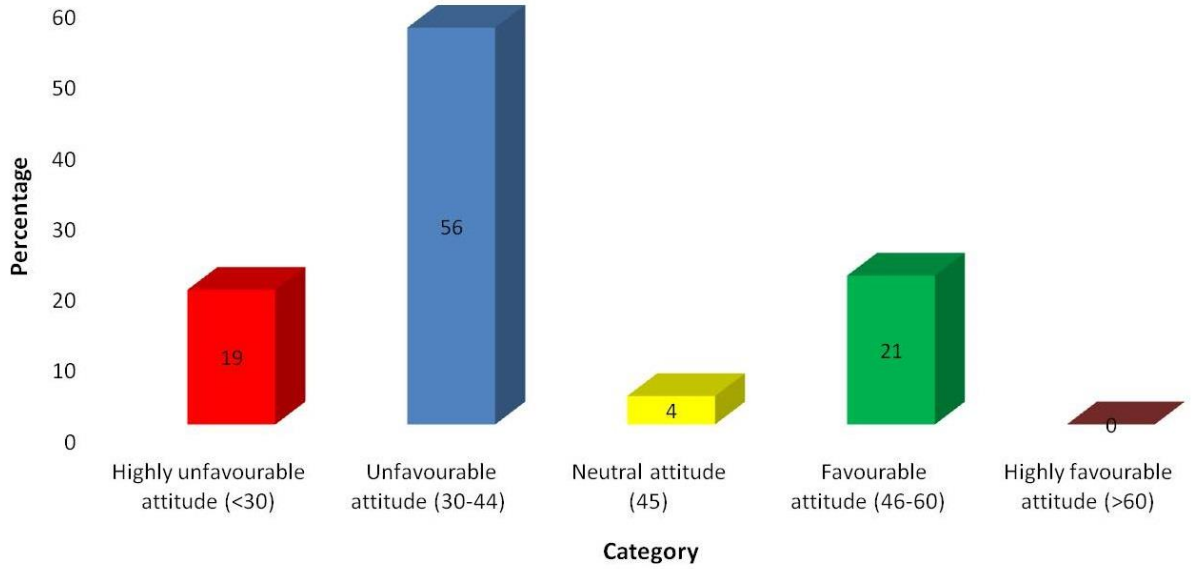

Figure 2. Attitude of farmers towards chemical pesticides in vegetable cultivation (n = 100)

To determine the extent of attitude of farmers towards individual statement regarding chemical pesticides use in vegetable cultivation, a rank order was developed by computing opinion scores (Table 2). Findings indicate that the farmers had the highest tendency to immediately apply chemical pesticides in case of pests incidence (mean score = 4.55). Farmers' perceived ease of pesticide application to control insect pest infestation might be the reason to apply chemical pesticides in vegetable cultivation. Similar finding was reported by Nguyen *et al*. (2018) in their study conducted in Vietnam.

Table 2. Extent of attitude towards individual statement regarding chemical pesticide use in vegetable cultivation (n = 100)

Statements	Mean score	Rank order
(+) Chemical pesticides is applied immediately after insect pests infestation	4.55	1
(-) Vegetables are harvested immediately after spraying chemical pesticides	4.30	2
(+) Use of chemical pesticides help farmers to get immediate benefits	4.20	3
(+) It is difficult to manage harmful insect pests without chemical pesticides	3.74	4
(-) Less or no use of chemical pesticides reduces crop production	3.70	5
(+) Consumption of pesticide-used vegetables can cause various fatal diseases	3.60	6
(+) Handling pesticides without safety measures can cause health hazards	3.40	7
(+) Chemical pesticide is more familiar to farmers than other methods of insect pests control	3.24	8
(-) Excessive use of chemical pesticides in vegetable cultivation causes rapid rotting	2.95	9
(-) Pesticide dealers can suggest appropriate chemical pesticides for insect pests control	2.90	10
(+) Pesticide containers should be buried or burned for safety	2.81	11
(+) Harmful insects can grow resistance due to excessive use of chemical pesticides	2.65	12
(-) Use of chemical pesticide is not harmful for beneficial organisms	2.57	13
(+) Lack of knowledge regarding safety measures of using pesticides can cause health problem	2.35	14
(+) Excessive use of chemical pesticides can cause environmental pollution	2.25	15

Harvesting vegetables immediately after chemical pesticide spray was found as the second highest tendency of the farmers (mean score = 4.30). This indicates a lack of knowledge of the farmers about harmful effects of chemical pesticides. Nguyen *et al*. (1999) reported that Vietnamese farmers were not likely to follow the withholding periods after pesticide spray. In addition, frequent use of chemical pesticides in order to get immediate benefits was the third highest tendency of the farmers (mean score = 4.20). Since, chemical pesticides are used as immediate measure for insect pest management, the farmers tend to use them in order to control insect pests and avoid crop loss. However, frequent use of chemical pesticides may be dangerous for farmers and consumers (Nguyen *et al*., 2018; Varela & Navarro, 1988). Moreover, environmental pollution resulting from excessive chemical pesticide use got the lowest attitude score (mean score = 2.25). The finding suggests that the farmers need to be aware of the harmful effects of chemical pesticides not only on human health but also on environment. Findings of Nguyen *et al*. (2018) support our study.

Correlation between demographic characteristics and attitude of farmers towards chemical pesticides use in vegetable cultivation

The outputs of the correlation analysis are presented in Table 3. The findings show that out of eight explanatory variables, two variables such as annual income (r=0.368) and extension media contact (0.366) were significantly associated with their attitude towards chemical pesticide use. The finding regarding annual income implies that with an increase in annual income, the respondents are likely to show positive attitude in using chemical pesticides in vegetable cultivation. These further hints that the market price might be one of the factors influencing farmers' attitude towards chemical pesticides use. A study by Saha *et al*. (1997) reported that use of pesticides are expensive and also cause damages to natural defenders. Mahantesh and Singh (2009) also reported the same. Ahaduzzaman (2003) found significant positive relationships between annual income and attitude of farmers towards modern *T. Aman* technologies. The finding regarding extension media contact implies that the farmers with frequent contact with extension media are more likely to use chemical pesticides in vegetable cultivation. The reason behind this might be farmers with high extension media contact take decisions and other activities about farming practices. On the other hand the farmers who had low extension media contact were unable to take decision and other activities about farming practices. Rana *et al*. (2017), Adebayo and Oladele (2013), Khan (2012) and Zakir (2010) found significant positive relationship between the extension media contact and the attitude of the farmers in their respective studies.

Table 3. Summary outputs of correlation analysis (n = 100)

Demographic characteristics	Co-efficient of correlation (r)
Age	0.013
Education	0.165
Household size	-0.042
Farm size	0.003
Annual income	0.368**
Extension media contact	0.366**
Training received	0.079
Knowledge on insect pest manag.	0.066

Degrees of freedom (df) = 98, **Significant at 0.01 level of probability (2-tailed)

Conclusions

The study concludes that the respondents in the study area showed unfavourable attitude towards the use of chemical pesticides in vegetable cultivation. Apparently, the findings could be considered as positive; however, the tendency of applying chemical pesticides in vegetable cultivation might be harmful, for example, farmers in the study area harvest vegetable without maintaining the withholding periods (Table 2). Some socio-economic characteristics, such as annual income and extension media contact, significantly influenced farmers' attitude. On the contrary, inadequate training and poor knowledge on insect pest management (Table 1) could be linked to the indiscriminate use of chemical pesticide in vegetable cultivation. The findings suggest that responsible authorities, for example, extension service providers could provide training to the farmers on rational use of chemical pesticides; increase knowledge and awareness level of the farmers on insect pest management; and introduce alternative methods for insect pest management in the study area.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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