

Present Status of Insecticides Use for The Cultivation of Brinjal in Kushtia Region, Bangladesh

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Abstract: This study has been carried out to assess the present status of insecticides use for the cultivation of brinjal in Kushtia region. A total number of 240 brinjal growers were randomly selected and interviewed by structured questionnaires from December, 2014 to June, 2015. The data were collected with respect to their educational level, cultivating land, times and types of insecticides spray, and farmer's consciousness about the excessive use of insecticides. Out of the 240 brinjal growers, 155 (64.58%) were illiterate and there were no brinjal growers have the education Bachelor or more. Around (0.0-0.20) acre of land was used by 18 (7.5%) brinjal growers for cultivation followed by (0.21-0.50) acre of land by 32 (13.33%) brinjal growers, (0.51-1.00) acre of land by 60 (25%) brinjal growers and more than 1 acre of land by 130 (54.16%) brinjal growers. Sixteen insecticides under different trade names were most commonly sprayed. Maximum brinjal growers were sprayed this insecticides more than 40 times during the period of whole cultivation. Most importantly, about 165 (68.75%) brinjal growers have knowledge while 75 (31.25%) brinjal growers have no knowledge about the negative effects of using excessive amounts of insecticides. The brinjal growers are randomly using same insecticides under different brand name. As a result, they could not protect early dropping of brinjal. In addition 80 (33.33%) brinjal growers are little conscious about side effect of insecticides and 160 (66.66%) brinjal growers are not conscious about side effect of insecticides. Most of the brinjal growers do not wear extra cloth and glass during spray. The main goal of this study was to assess the insecticide residues and to identify the health hazard of insecticides. Therefore, necessary actions should be taken immediately keeping in mind not only to reduce the early fall out of brinjal but also to produce safe brinjal for consumption.

Keywords: Brinjal Cultivation, Brinjal Growers and Insecticides.

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I. Introduction

Brinjal (*Solanum melongena L.*) more commonly known as eggplant is one of the most important vegetables grown throughout the country for its purple, green or white pendulous fruit. It is a member of the Solanaceae family and closely related to tomato and potato. Eggplant is native to India [1, 2]. It has been cultivated in southern and eastern Asia. At present brinjal eggplant is the third, after potato and tomato.³ In Poland, like in many Central European countries, eggplant is still an exotic vegetable but in Asia and the Mediterranean it is an important and valuable nourishment component, the so-called 'the king of vegetables'[3]. There are almost 8 million brinjal farmers in the country, fulfilling the demand of about 160 million people [4]. Unlike other vegetable crops, brinjal requires extreme care to attain satisfactory yield. Brinjal is a primary source of cash income for resource-poor farmers in Bangladesh. However, attack by insects/pests is one of the most important hurdles in the massive production of brinjal. Insect pests and diseases not only reduce the yield but also sometimes account for a complete crop failure [5]. Brinjal is attacked by 17 species of insects and six types of different diseases in Bangladesh [6]. According to an estimate, annual loss of yield due to insect pest alone is 25% for vegetable [7]. Considering the above fact, toxic synthetic chemical pesticides have widely been used in Bangladesh to reduce the early fall out of brinjal and to increase the production yield. However, pesticides are often used indiscriminately and frequently at a very high concentration without knowing the actual purpose of the pesticide being applied.

Consequently, the surrounding environment is polluted which also has an adverse effect on human health. Moreover, pesticide adulteration by wholesalers and retailers is a growing concern of many brinjal growers who are unsure whether insects are becoming more insecticide resistant or insecticides are being adulterated to the point of ineffectiveness. In most cases, brinjal growers use pesticides in their fields based on recommendations and advice from their local pesticide dealers. However, the dealers in general are not expert personnel.

The control of insect attack and fungal diseases are the emerging issues to protect premature brinjal fall out not only in Kushtia district but also in all over the country. The insect attacks play a negative role for the low yield and poor quality brinjal production. Brinjal suffers regular and heavy losses from a very destructive insect-pest called the fruit and shoot borer (FSB) which conventional insecticides cannot control effectively. Attack by the Fruit and Shoot Borer (FSB) insect is an inevitable reality of Bangladeshi brinjal farmers. To protect their brinjal, farmers are compelled to spray pesticide for 80-100 times in a single cropping season [4]. However, during heavy infestation, farmers have no option except to attempt controlling it by applying insecticides. Therefore, the aim of the present research is to find present status of insecticides use for the cultivation of brinjal in Kushtia region from early dropping.

II. Materials And Methods

2.1 Study Area

The present study was conducted in seven (07) different unions: Harinarayanpur, Jhaudia, Ujangram, Battail, Shimulia, Ambaria, Poradaha in kushtia sadar upazilla of Kushtia district during the period of April-June, 2016.

2.2. Study Subjects

A total 240 brinjal growers were selected from the study area. Out of 157, 34 brinjal growers were selected from Harinarayanpur, 47 from Jhaudia, 39 from Ujangram, 35 from Battail, 22 from Shimulia, 28 from Ambaria and 35 from Poradaha.

2.3. Study procedure

The brinjal growers were asked face to face interview and structured questionnaire was used in this study. There was one survey team of two (02) members, who were assigned to visit the brinjal growers. It was also assigned that the survey team will not visit more than five brinjal growers per day to ensure quality of data to be collected and subsequent minimize of the possible error of the survey. At the end of day, the quality of interview and collected data were evaluated by the experts to ensure completeness and consistency. Incomplete and inconsistent data were corrected by re-visit and re-examine the relevant brinjal growers. Informed written consent was taken from every respondent (brinjal growers) explaining the objectives of this study and was confirmed that the personal information will be kept confidential and any time they can withdraw their opinion if they want. In addition, a prior permission was also taken from local government.

2.4. Status of Brinjal Growers

Brinjal growers were categorized into two groups. One is based on their level of education, which was further sub-divided into three groups such as illiterate, under HSC and higher educated. The other one is based on the land that used for brinjal cultivation, which was sub-divided into (0.0-0.20) acre, (0.21-0.50) acre, (0.51-1.00) acre and more than 1.00 acre.

2.5. Quantity of Insecticides Applied for Brinjal Cultivation

Brinjal growers usually applied different types of insecticides from the starting of flowering until harvesting. Therefore, it was very difficult to exact quantification of insecticides used during the whole period of cultivation. However, to simplify our study, we divided the whole duration of brinjal cultivation into three stages based on application of insecticides. These were- (i) during before flowering of brinjal; (ii) in brinjal flowering; and (iii) in mature stage. Growers were asked to answer, how many times they had sprayed insecticides in each stage, such as two, three, four, five or more than five times.

III. Results

3.1. Status of Education and Cultivated Land

In this study, brinjal growers were classified according their educational qualification and cultivable land. Table 1 shows that out of 240 brinjal growers, the maximum number of brinjal growers, 155 (64.58%) are illiterate. Only 13 (5.41%) have completed their Higher School Certificate (HSC), 72 (30%) have completed

their Secondary School Certificate (SSC) and there were no brinjal growers have the education Bachelor or more. In addition, the cultivable land used for brinjal cultivation for 240 brinjal growers were assessed. Although brinjal production depends on land fertility and fertilizers use in soil when the land is infertile. Nevertheless, this study assessed cultivable land to explore the capacity of tentative brinjal production. About 18 (7.5%) brinjal growers cultivate around (0.0-0.20) acre land, 32 (13.33%) brinjal growers cultivate (0.21-0.50) acre land , 60 (25%) brinjal growers cultivate (0.51-1.00) acre land and 130 (54.16%) brinjal growers cultivate above 1.00 acres. The data were illustrated in the Table 1.

Table-1. Educational qualification and cultivable land of the brinjal growers in the study area

1. Educational qualification	Number of respondents	Percentage (%)
(i) Illiterate	155	64.58
(ii) SSC	72	30
(iii) HSC	13	5.41
(iv) Higher	0	0
2. Cultivable land	Number of respondents	Percentage (%)
(i) 0.0-0.20 acre	18	7.5
(ii) 0.21-0.50 acre	32	13.33
(iii) 0.51-1.00 acre	60	25
(iv) More than 1 acre	130	54.16

3.2. Spray of Insecticides onto Brinjal Trees During Brinjal Growth

Brinjal is very vulnerable vegetables to be attacked by various insects. Therefore, recommended insecticides spray is necessary to control insect to get better production of brinjal. These insecticides spray started from before brinjal flower (bud) until brinjal harvest. The brinjal growers frequently spray insecticides in different stages of brinjal maturation without following any standard recommendations. As can be seen in Fig-1 at the stage of before brinjal flowering, 13 brinjal growers used 5 times, 30 brinjal growers used 10 times, 70 brinjal growers use 15 times and 127 brinjal growers used more than 15 times.

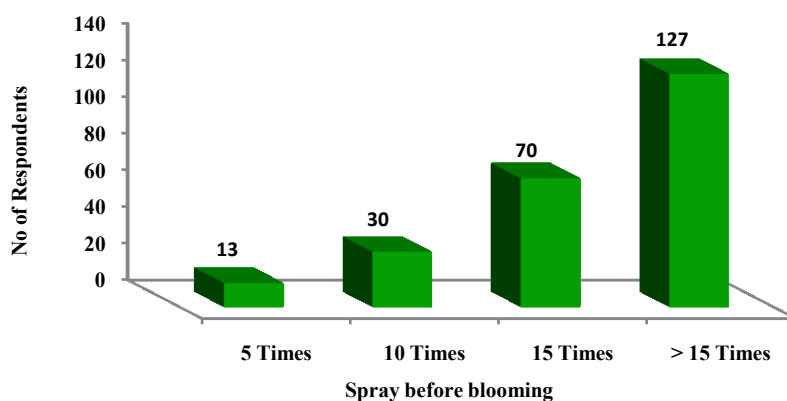


Fig-1: Number of spray of insecticides on brinjal tree just before blooming

At the stage of brinjal flowering, the insecticides sprays were sorted out into 4 groups. This study was found to be 10 brinjal growers sprayed insecticides for 2 times, 55 brinjal growers sprayed insecticides for 3 times, 60 brinjal growers sprayed insecticides for 4 times and 115 brinjal growers sprayed insecticides for more than 4 times. The numerical data was presented in the Fig-2.

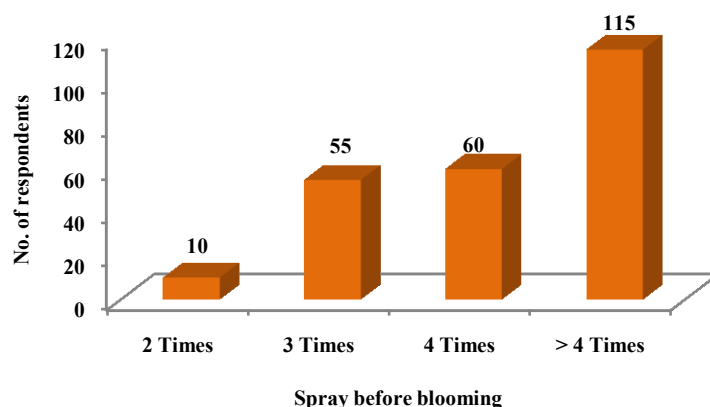


Fig-2: Number of spray of insecticides on brinjal flower

At the stage of immature brinjal until harvesting, this study was found to be 43 brinjal growers uses insecticides spray for (10-15) times, 37 brinjal growers used insecticides spray for (15-20) times and 160 brinjal growers used insecticides spray more than 20 times. The data was illustrated in the Fig-3.

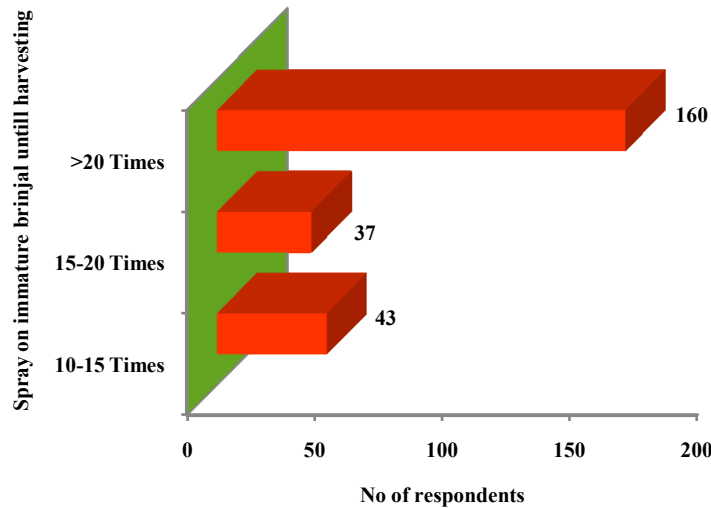


Fig-3: Number of spray of insecticides on immature brinjal until harvesting

3.3 Name and Use of Insecticides during Brinjal Growth

There are many insecticides used during brinjal cultivation in the study area. The brinjal growers are frequently used to Marshal 20 EC (Carbosulfan), Saham 5 SG (Emamectin Benzoate), Regent 50 SC (Fipronil), Licar 1.8 EC (Abamectin), Volium Flexi 300 SC (Thiamethoxam + Chloraniliprole), Choice 1.8 EC (Abamectin), Manik 20 SP (Acetamiprid), Surate 20 EC (Fenvalerate), Vetrimec 1.8 EC (Abamectin), Prize 20 SP (Acetamiprid), Proclaim 5 SG (Emamectin Benzoate), Alba 1.8 EC (Abamectin), Baizinin 10G (Baizinin), Autoben 5 SG (Emamectin Benzoate), Tundra 20 SP (Acetamiprid), Dtap 50 SP (Cartap). Before blooming, this study was found to be 47.13% respondents used Marshal, 3.81% used Saham, 22.29% used Regent, 33.75% used Licar, 20.38% used Volium, 34.39% used Choice, 20.38% used Manik, 4.45% used Surate, 8.91% used Vetrimec, 4.45% used Prize, 3.18% used Proclaims, 5.09% used Alba, 7.64% used Baizinin, 5.09% used Tundra and 2.54% used Dtap50. These data was stated in the Fig-4.

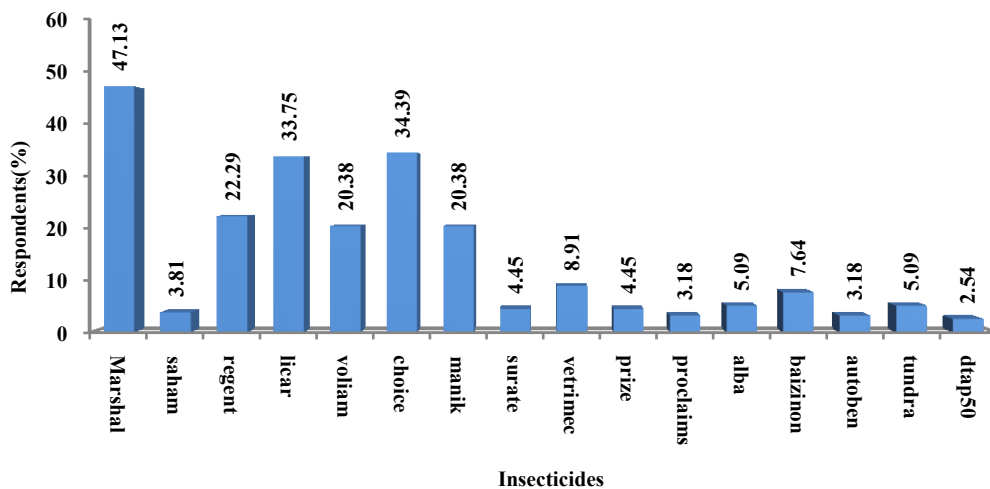


Fig-4: Insecticides used by the brinjal growers during before blooming

From blooming period, brinjal growers started using insecticides twice rate than before. This study was found to be 17.83% respondents used Marshal, 2.54% used Saham, 30.54% used Regent, 23.56% used Licar, 16.56% used Volium, 35.66% used Choice, 20.38% used Manik, 2.54% used Surate, 3.82% used Prize and 2.54% used Tundra. These data was designed in the following Fig.-5.

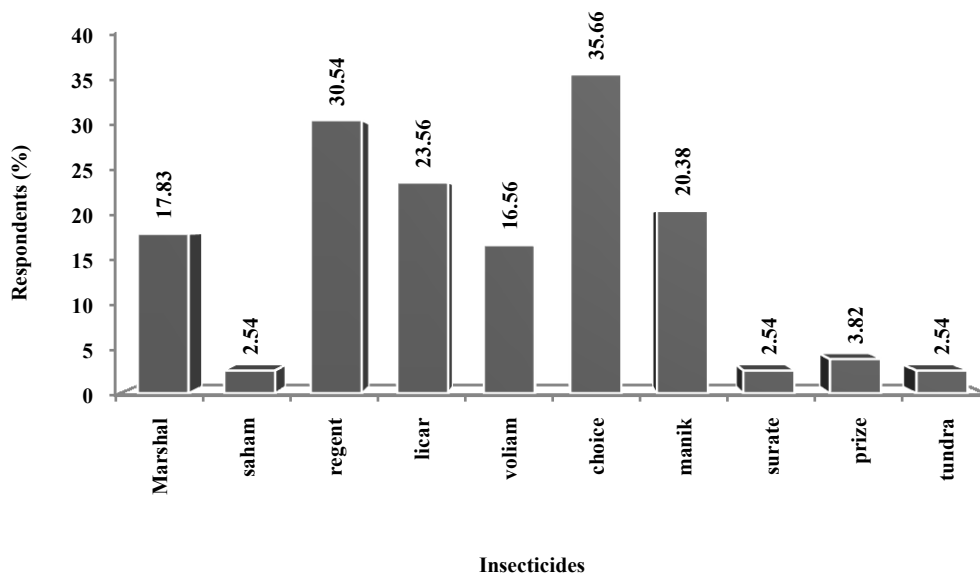


Fig-5: Insecticides used by the brinjal growers during blooming period

During the period of brinjal harvesting, approximately all brinjal growers used insecticides everyday and some used day after day. To get a good production, they used over rate insecticides without any recommendation. This study was found to be 21% respondents used Marshal, 2.54% used Saham, 23.56% used Regent, 31.21% used Licar, 18.47% used Volium, 23.56% used Choice, 20.38% used Manik, 2.54% used Surate, 13.37% used Prize and 1.91% used Tundra. These numerical data was illustrated in the following Fig-6.

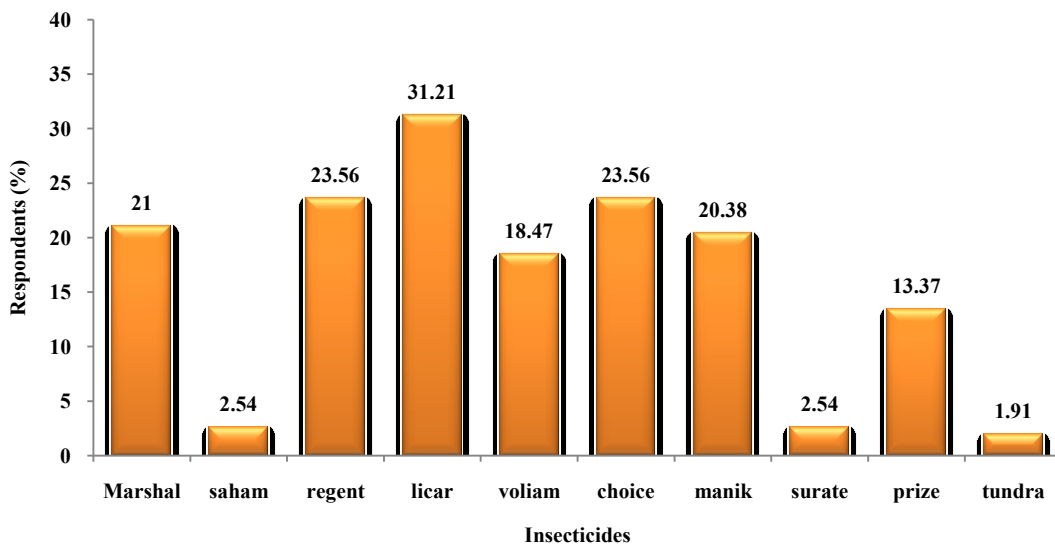


Fig-6: Insecticides used by the brinjal growers until harvesting

3.4 Knowledge and Consciousness About Side Effect of Insecticides of the Brinjal Growers

Every insecticide has its own safety instruction before spray. That's why, in this survey, consciousness about insecticides spray was also assessed for 240 mango growers in the study area. In the table-2 shows that about 165 (68.75%) brinjal growers have little knowledge on insecticides and 75 (31.25%) brinjal growers have no knowledge on insecticides. In addition 80 (33.33%) brinjal growers are little conscious about side effect of insecticides and 160 (66.66%) brinjal growers are not conscious about side effect of insecticides.

Table-2. Knowledge and consciousness of side Effect of formalin of brinjal growers, n=240

Parameters	Yes	No
Knowledge on insecticides	165 (68.75%)	75 (31.25%)
Consciousness about side effect of insecticides of the respondents	80 (33.33%)	160 (66.66%)

3.5 Taken Advice and Safety Measure of Insecticides of the Brinjal Growers

In this study, the targeted respondents were assessed on the basis of taking advice on health risk of pesticides. Only 10 (4.16%) brinjal growers were taken advice on health risk of pesticides and 230 (95.83%) growers did not take advice on health risk of insecticides. Furthermore, 240 brinjal growers were classified on the basis of wearing extra cloth and glass. Where 229 (95.41%) brinjal growers did not used extra cloth and glass but only 11 (4.4%) brinjal growers were used extra cloth and glass was presented in Table 3.

Table-3. Brinjal growers taken advice and safety instruction of insecticides, n=240

Parameters	Yes	No
Taking advices on health risk of insecticides	10 (4.16%)	230 (95.83%)
Wearing extra cloth & glass during spray	11 (4.4%)	229 (95.41%)

IV. Discussion

Brinjal is a primary source of cash income for resource-poor farmers in Bangladesh. However, attack by insects/pests is one of the most important hurdles in the massive production of brinjal. Insect pests and diseases not only reduce the yield but also sometimes account for a complete crop failure [8]. Education play important role for the detection of which on is correct and which on is wrong. However, the most of the brinjal growers in the study area are illiterate that strongly effect on insecticides use. This illiteracy of brinjal growers makes knowledge gap for proper selection and use of insecticides during brinjal cultivation. In addition, the most of the brinjal growers do not cultivate large land. They use land average from 0.0 acre to 1.00 acre.

A large brinjal production depends on fertile cultivated land at the root level. The fertile land links to more the production of brinjal. The brinjal growers are nursing their land and tree with great care. As a result, brinjal growers start spray in large-scale is being started from brinjal bud until harvesting of matured brinjal. In general, brinjal bud is too sensitive to attack by insects. Pest and disease control is very important on this stage. At the stage of before brinjal flowering, majority of the growers use more than above 15 times spray whereas 5 times spray by a few growers. During the brinjal flowering, maximum brinjal growers sprayed insecticides for more than 4 times and only 10 brinjal growers sprayed insecticides for 2 times.

At the stage of immature brinjal until harvesting, this study was found to be 43 brinjal growers uses insecticides spray for (10-15) times, 37 brinjal growers uses insecticides spray for (15-20) times and 160 brinjal growers uses insecticides spray more than 20 times. From this information, we can said that brinjal growers use insecticides every day during this stage. There is huge number of insecticides used during brinjal cultivation in this study area. The most important are Marshal 20 EC (Carbosulfan), Regent 50 SC (Fipronil), Licar 1.8 EC (Abamectin), Volium Flexi 300 SC (Thiamethoxam+Chloraniliprole), Choice 1.8 EC (Abamectin), Manik 20 SP (Acetamiprid), Vetrimec 1.8 EC (Abamectin), Prize 20 SP(Acetamiprid), Proclaim 5 SG (Emamectin Benzoate), Alba 1.8 EC (Abamectin). However, in the study area the brinjal growers do not follow any recommendation of pesticides spray. Interestingly, when brinjal growers do not get result by using Vetrimec 1.8 EC (Abamectin) then they use Alba 1.8 EC (Abamectin). They do not know both of these are contain same chemicals due to their ignorance. Not only that but also they use these chemicals more and more until control of pest attack. Most of the cases they do not get any result due to mistake of pesticides selection for target pest control.

Generally growers use a insecticides named voliam in their matured brinjal. The use of Voliam should be stopped before 14 days of harvesting recommended by Syngenta company. But the growers marketed the harvested brinjal in the same days or after 1 days of Voliam spraying. Those brinjal may cause harmful to health by occurring various critical disease. This is the consequence of their ignorance and knowledge gap about using insecticides. In developing world, pesticide poisoning causes more deaths than infectious diseases. Pesticide poisoning among farmers and occupational workers in developing countries is alarming [8]. WHO estimated approximately 20,000 workers die from exposure every year, the majority in developing countries [9, 10].

Attack by the Fruit and Shoot Borer (FSB) insect is an inevitable reality of Bangladeshi brinjal farmers. To protect their brinjal, farmers are compelled to spray pesticide for 80-100 times in a single cropping season. Almost half of eggplant production cost goes to pesticides, and more than 47% farmers misuse the pesticide; this can adversely affect the soil, water, environment and biodiversity. Due to the ignorance, the brinjal growers use huge amount of chemicals like insecticides and fungicides for control pests and diseases as well as to increase brinjal production. They use large amount of same pesticides by different trade name. This mistake is happening by private chemical company's representatives or agents and the companies did this only for their interest.

Furthermore, due to lack of knowledge of most of the brinjal grower in the study region, they are not aware about the side effect of pesticide. They spray huge amount of pesticide throughout the whole season of brinjal production without taking any kind of protective measures. These pesticides are very dangerous to human health. Pesticides may enter into the body through inhalation, ingestion and through the skin when it is spraying on the brinjal trees. Prolonged exposure of these pesticides may cause neurological, nephrological, dermal, intestinal and respiratory problem [11, 12]. But majority of the growers were not conscious about the side effect of pesticides. The brinjal growers expressed their opinion that they are suffered from headache, irritation of eye, fatigue and dermal disorder etc. after prolong exposure of pesticide during spray. On the other hand they even do not know the right time of harvesting brinjal after spraying the pesticides. They harvest and market their brinjal within same days after spraying the pesticide though it was advisable to harvest brinjal at least 10-14 days after spraying the pesticide. As a result, huge amount of pesticide residues are consumed by consumer throughout the country that can develop serious health problem. On contrary rest of the respondents although conscious about the side effects of pesticides but most of them do not practice the proper method for spraying the pesticide.

The study was conducted using 250 brinjal growers as sample from where most of the brinjal growers of this region are not aware about the side effects of pesticides they used. Due to their lack of knowledge they only know to use insecticides. But they don't know how to use it and also their effects. They use these pesticides in their own way locally. Even, they never feel to take advice from anywhere. During survey in the study area we found 15 growers taken advice and 235 are not. It also proclaimed that they are not conscious about health risk of pesticides. They spray huge amount of pesticides throughout the whole season of brinjal production without taking any kind of protective measures. They did not use extra cloths like apron, gloves, or glass during spray. Also they used to take food during and after spray without washing their hand properly. It is only happening due to their unconsciousness. During survey it was found that 13 growers used extra clothes and glass whereas, 237 growers were not. Similar result was conducted by Aparna A *et al.* in 2015 that showed that, about 87% of farmers do not use protective measures while spraying pesticide in the field [4].

V Conclusion

The southwestern region of Bangladesh with its diverse agro-ecology is very suitable for the production of high quality brinjal both for domestic and foreign markets. However, the regional average brinjal productivity is below the national average need. To improve this situation high yielding, better quality, disease resistant and pest control is necessary. In the study area, the brinjal growers abnormally using many pesticides and very high quantity without getting successful pest control result due to the ignorance of insecticides rules and knowledge gap for pesticides spray. They select wrong pesticide and it is continually happening by provoking locally untrained person. They are not aware about the importance of different agronomic and pest management practices. Thus, attempt should be taken immediately not only to reduce the early fall out of brinjal but also to produce safe mangoes for consumption and building awareness on brinjal pest management.

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