Farmers' Knowledge of Using Plant Growth Regulators in Vegetable Production

Md. Riad Khan[1], Md. Faruq Hasan[2], Susmita Sarmin[3], and Atia Shahin[4]
[1]MS student, Department of Agricultural Extension, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh
[2]Professor, Department of Agricultural Extension, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh
[3&4]Lecturer, Department of Agricultural Extension, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh
*** Corresponding Author's Email Address: faruqhstu@gmail.com**

Abstract

PGRs regulates the physiological process of the crop plants like rooting, flowering, growth, sprouting, ripening, and the use of PGRs in vegetable production is found to be beneficial for yield and yield contributing characteristics of various vegetable crops. The main objectives of the present study were to determine farmers' knowledge of using plant growth regulators (PGRs) in vegetable production and to assess its relationships with farmers' selected socio-economic characteristics. Attempts were also made to assess the problems confronted by farmers in using PGRs. The study was conducted in two unions namely Chehelgaji and Fazilpur under Sadar upazila of Dinajpur district. One hundred one (101) farmers were interviewed using an interview schedule from 2 to 25 March 2020. To measure the farmers' knowledge of using PGRs, six levels of knowledge were considered following Bloom's taxonomy of cognitive domain. The finding of the study revealed that the majority (91.1 percent) of the farmers had "moderate knowledge", 5.9 percent had "inadequate knowledge" and only 3.0 percent had "adequate knowledge" of using PGRs. Moreover, the knowledge level of the farmers followed the hierarchical pyramid of Bloom's taxonomy of the cognitive domain. Among the ten selected characteristics of the farmers, age, vegetable farming experience, and problem confrontation showed negative significant relationships, while extension media contact showed a positive significant relationship with the knowledge of using PGRs. The top-ranked problem confronted by the farmers in using PGRs was 'poor knowledge about the proper application procedures of PGRs' (PCI=257). Different agricultural extension service providers should take necessary strategies for the development of the knowledge of the farmers in using PGRs.

Keywords: Knowledge, Bloom's taxonomy, Plant growth regulators, Vegetable, Extension services.

Introduction

Vegetables are very important to the human diet. They are the main sources of nutrients such as vitamins, minerals, folic acid, and dietary fiber and are low in fat and sodium. People are now becoming more interested in their health and to increase their quality of life, which has led to a rise in vegetable consumption in recent years [2]. In Bangladesh, vegetable cultivation occupies an area of 9,89,000 acres of land with a production of 37,29,000 M tons and per acre yield of 3,770 kg [3]. The present consumption of vegetables in Bangladesh is 112 g/day/capita (23-gram leafy vegetables, 89 gram nonleafy vegetables), which is far below the minimum average requirement of 400 gram/day/capita [8]. Therefore, there is a big gap between the requirement and the supply of vegetables in Bangladesh.

As vegetables occupy a vital place in a balanced diet, it is equally important that the area and production of vegetable crops should be increased. The use of high-yielding varieties and improved technologies can

increase production to meet our growing demand for vegetables [6]. Besides this, the application of plant growth regulators has become essential for increasing the productivity of vegetable crops. These chemicals are highly regulated because they are used on plants or their products which will be consumed [2].

Plant growth regulators (PGRs) have been used as an important component in agricultural production. PGRs are now used on over one million hectares worldwide for a diversity of crops each year [12]. However, most of these applications are confined to high-value horticultural crops. In the case of vegetables, growth regulators are used mainly to improve seed germination rate, increase yield, plants become resistant to diseases and unfavorable growth conditions ([9], [10], [13]).

Plant growth regulators considered a new generation of agrichemicals when added in small amounts, modify the growth of plants usually by stimulating or modifying one part of the natural growth regulatory system, thereby the yield is enhanced. Higher production through breeding is a continuous endeavor of mankind. But these methods are, however, not only time-consuming but also costly. The growth regulators have, therefore, been known to be one of the quick means of increasing production. Similarly, nutrients are inorganic substances necessary for the normal growth and development of plants and have an important role in various enzymatic processes, assimilation, oxidation, and reduction reactions and help in increasing biomass and yield [14]. Plant growth regulators provide an immediate impact on crop improvement programs. In Greece and other European countries, the PGRs are commonly used on food crops (melon, pepper, celery, etc.) in order to improve and accelerate plant productivity. In Bangladesh, it is comparatively a less used phenomenon. Moreover, Bangladesh is ranked 3rd in vegetable production in the world but the production is not sufficient to meet the demand of its growing population. Thus, the role of plant growth regulators becomes more vital in our country as well as in other countries. To get a full return out of the use of PGRs, it is very much needed for farmers to have adequate knowledge of using PGRs [14].

The major focus of the study is to assess the knowledge of the farmers in using PGRs. Vegetable cultivation has been found very needed for its nutritional and business prospect. The use of PGRs in vegetable cultivation can increase production meeting the dietary needs of the nation as well as it can be exported to meet foreign needs. For this reason, the use of PGRs in vegetable cultivation needs to be increased gradually day by day. From this, the nutrition of people can be met, and the country can earn huge foreign currencies by exporting vegetables if the commercial use of PGRs starts at the national level and farmers are motivated to PGRs use. Government and non-government organizations are currently putting effort and allocating resources for production-oriented research and also encouraging both rural and urban people to undertake the use of PGRs. So, the evaluation of the knowledge of the concerned farmers is necessary for the further development of the use of PGRs in Bangladesh. Considering the above fact, the researcher became interested to undertake this study to determine farmers' knowledge of using PGRs**.**

Specific Objectives of the Study

The overall objective of the study is to determine the extent of farmers' knowledge of using plant growth regulators. The specific objectives are:

1. To determine the extent of farmers' knowledge of using plant growth regulators (PGRs).
2. To determine some selected socio-economic characteristics of the farmers namely: age, educational qualification, family size, farm size, vegetable farming experience, training exposure, credit received, extension media contact, environmental stewardship, and problem confrontation.
3. To explore the relationships between farmers' selected characteristics with their knowledge of using plant growth regulators (PGRs) in vegetable production.
4. To determine the extent of the problems confronted by the vegetable farmers in using PGRs.

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Methodology

In any scientific research, methodology plays an important role. The appropriate methodology enables the researcher to collect valid and reliable information and to analyze the information properly in order to get the right conclusion. The methods and procedures followed in this study are described in this section.

Locale of the Study

The study was purposively conducted at Sadar upazila under Dinajpur district. A multistage random sampling technique was used for the selection of sample farmers. In the first stage, Sadar upazila was selected randomly out of 13 upazilas of Dinajpur district. There are ten unions under Sadar upazila. Two unions namely Chehelgaji and Fazilpur were randomly selected from these ten unions in the second stage. In the third stage, six villages from these two unions were randomly selected. All vegetable growers from these six villages constituted the population of the study. The selected villages were Nasipur, Karnai, Mohadebpur, Jhanjira, Raypur, and Raniganj. A map of Dinajpur district showing Sadar upazila is presented in Fig. 1 and a map of Sadar upazila showing the study areas is presented in Fig. 2.

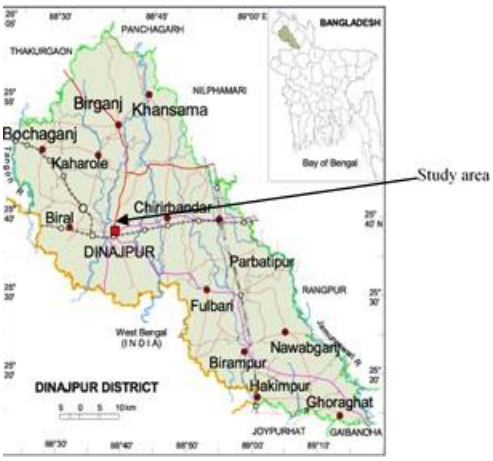

Fig. 1 Map of Dinajpur district showing Sadar Upazila (Bangladesh inset)

Fig. 2 Map of Sadar Upazila showing Chehelgaji and Fazilpur union

Population and Sampling

A list of vegetable farmers who are currently cultivating vegetables was prepared with the help of the

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Upazila Agriculture Officer and the field staff. The number of vegetable farmers in the selected six villages was 171 which constituted the population of the study. The sample was calculated following formula of [7]. The formula is:

Where, z=1.96 (Z-score at 95 percent confidence level), p=proportion of the population will be considered=0.2 (20 percent), e=margin of error=0.05 (5 percent), and N=population size=171.

Thus, the sample size, *101 is* considered for the data collection. Moreover, a reserved list of 11 vegetable farmers was prepared for use when the vegetable farmers under the sample were not available during the data collection.

Research Instrument

A structured interview schedule was prepared for the collection of relevant data. Both closed and open-form questions were included in the schedule. Simple and direct questions were included to ascertain the opinion of the farmers regarding a number of aspects. The draft interview schedule was prepared in accordance with the objectives of the study. The draft interview schedule was pre-tested with 10 farmers from the study area excluded from the sample. Necessary corrections, additions, and modifications were made to the interview schedule based on the pre-test results. The modified and corrected interview schedule was then printed in final form and multiplied as required.

Measurement of the Selected Characteristics of the Farmers

In total ten selected characteristics of the farmers were considered for the study. These were age, educational qualification, family size, farm size, vegetable farming experience, training exposure, credit received, extension media contact, environmental stewardship, and problem confrontation. The procedures followed for measuring each of the characteristics are presented in Table I.

Table I

Measurement techniques of the selected characteristics

Variables	Scoring method	Scale/score
Age	No. of year since birth	–
Educational Qualification	Year of schooling.	Each year of completion=1 Can sign name only=0.5 Cannot read and write=0
Family size	No. of members in the family.	–
Farm size	Hectare	–

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Vegetable farming experience	No. of years	–
Training exposure	No. of days	–
Credit received	Thousand BDT	–
Extension media contact	The score was computed on the basis of a respondent's extent of contact with 13 selected media. Possible extension media contact score could range from zero (0) to 39	Frequently=3 Occasionally=2 Rarely=1 Not at all=0
Environmental stewardship	A total of eight statements (4 positive and 4 negative) were used to measure the environmental stewardship. The five-point Likert type scale (Likert, 1932) was used for scoring. Environmental stewardship scores could range from 8 to 40.	Strongly agree=5 Agree=4 No opinion=3 Disagree=2 Strongly disagree=1
Problem confrontation	The score was computed on the basis of a respondent's extent of 10 selected problems. The possible problem confrontation score could vary from zero (0) to 30.	High=3 Medium=2 Low=1 Not at all=0

Measurement of Knowledge of Using PGRs

Farmers' knowledge of using plant growth regulators (PGRs) was the focus issue of the study. After thorough consultation with relevant experts and reviewing of related literature, eighteen questions regarding knowledge of the use of plant growth regulators (PGRs) were selected following Bloom's Taxonomy of the cognitive domain [5]. The questions were asked to the farmers to determine their extent of knowledge on the use of plant growth regulators (PGRs). Different scores were assigned against different levels of difficulty of the questions. The methodology of [17] was taken into consideration for setting the difficulty level of the questions. Answering a question correctly by individual could obtain a full score, the partial score was given to a partially correct answer and zero (0) was assigned for the wrong answer. Thus, the knowledge score of a

respondent could range from 0 to 65, where 0 indicates no knowledge and 65 indicates adequate knowledge.

Measurement of the Extent of Problem Confrontation in Using PGRs

The Problem Confrontation Index (PCI) was measured to determine the extent of problems faced by vegetable farmers in using PGRs for the selected ten problems using the following equation:

Problem Confrontation Index (PCI) = $(N_h \times 3) + (N_m \times 2) + (N_l \times 1) + (N_n \times 1)$

Where, N_h = Number of respondents with high problem confrontation

N_m = Percentage of respondents with medium problem confrontation

N_l = Percentage of respondents with low problem confrontation

N_n = Percentage of respondents with no problem confrontation

The Problem Confrontation Index (PCI) for any selected problem could range from 0 to 303, where 0 indicates no problem confronted for the specific problem and 303 indicates the highest severity of the problems confronted.

Data Collection

Data were collected personally by the researcher himself through face-to-face interviews. To familiarize with the study area and for getting local support, the researcher took help from the local leaders and the Sub Assistant Agriculture Officers of the Upazila Agriculture Office. The researcher made all possible efforts to explain the purpose of the study to the farmers. Rapport was established with the farmers prior to the interview and the objectives were clearly explained by using the local language as far as possible. After completion of the interview, it was checked, and editing was done as necessary. The researcher did not face any major problems in collecting data. Excellent cooperation and coordination were extended by the respondents and other concerned personnel at the time of data collection from 2 to 25 March 2020.

Data Processing and Analysis

Necessary coding, compilation, tabulation, and analysis of data were done in accordance with the objectives of the study. Various statistical measures such as range, mean, percentage, and standard deviation were used in categorizing and describing the variables. Pearson's Product Moment Coefficient of Correlation (r) was used to explore the relationships between the selected characteristics of the farmers and their knowledge of using PGRs. The SPSS (Statistical Package for Social Science) computer package (version 23) was used to perform data analysis.

Results and Discussion

Knowledge of Using Plant Growth Regulators (PGRs)

Farmers' knowledge of using PGRs scores could range from 0 to 65 with an observed range of 17 to 50, the mean is 35.96 and the standard deviation is 5.93. Based on the possible scores, the farmers were classified into three categories as "inadequate knowledge" (up to 22), "moderate knowledge" (23 to 44), and "adequate knowledge" (above 44). The categorization technique of [11] was followed in this case. The distribution of the farmers according to their knowledge level is shown in Table II.

Table II

Distribution of farmers according to their knowledge of using PGRs

Categories	Farmers		Mean	SD
	Frequency	Percent		
Inadequate (up to 22)	6	5.9	35.96	5.93
Moderate (23-44)	92	91.1		
Adequate (>44)	3	3.0		

The greatest proportion (97 percent) of the farmers had inadequate to moderate knowledge of using plant growth regulators (PGRs). Thus, there might be ample opportunity for the agricultural extension organizations to boost-up the knowledge level of the farmers regarding the judicial utilization of the PGRs in vegetable production. Arrangement of campaigns by the public extension organization (Department of Agricultural Extension) and the local level NGOs needed to be increased for improving farmers' knowledge concerning the use of PGRs. Organization of training programs as well as the conduction of result demonstration by the concerned agencies will be effective in diverting the mindset of the farmers towards the use of PGRs. Conduction of method demonstrations to show the easy way of applying PGRs into the plants could also be helpful in enhancing the knowledge of farmers.

1. *Dimension-wise Ranking of Farmers' Knowledge Levels*

Bloom's Taxonomy assists in determining the knowledge level at which individuals can work and develop clear objectives in their framework [5]. There are six levels that an individual possessed based on their level of difficulty and aid individuals in ascending the hierarchical scale. Reference [1] simplified the levels for evaluation of an individual's knowledge level which was considered in this study. The levels are remembering, understanding, application, analysis, evaluation, and creation. The level-wise mean score of the respondents is presented in Table III.

Table III

Distribution of the knowledge levels based on the mean values (n=101)

Knowledge levels	Mean score	Rank order
Remembering	2.28	1
Understanding	1.79	2
Application	1.72	3
Analysis	1.69	4
Evaluation	1.60	6
Creation	1.61	5

Results of Table III indicate that the respondents possessed the top-ranked mean score on the "remembering level" and least ranked mean score on the "evaluation level". Except for the ranking of "creation level" (5^{th} rather than 6^{th}) all the levels follow the pyramidal hierarchical distribution as suggested by [1] and [5].

Socio-economic Characteristics of the Farmers

Ten characteristics of the farmers were selected to describe and find out their relationships with farmers'

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knowledge of using plant growth regulators (PGRs) in vegetable production. The salient features of the ten characteristics of the respondents are presented in Table IV.

The age score of the farmers ranged from 24 to 65 with a mean of 36.29 and a standard deviation of 7.85. The respondents were classified into three categories on the basis of their age following Hossain *et al.*, (2011) and it was found that the overwhelming majority (94.1 percent) of the farmers belong to the young to middle age category. The young to middle-aged farmers are more energetic and dynamic in nature thus the extension agents can target those people in designing their extension activities. On the other hand, the educational qualification score of the respondents ranged from 0 to 13 with a mean of 6.79 and a standard deviation of 4.24. It is evident from Table IV that the majority of the respondents had institutional education. The educated respondents should be emphasized for designing any agricultural extension programs regarding efficient, effective, and judicial utilization of PGRs.

Moreover, the family size of the vegetable farmers ranged from 3 to 14 with a mean of 6.67 and a standard deviation of 2.11. According to family size, the farmers were classified into three categories, namely 'small', 'medium', and 'large' family. Results of Table IV indicate that the majority of the respondents had medium to large size families which might directly or indirectly contribute to family farm labor. Thus, the members of the families might be considered for efficient utilization of farm labor in vegetable production. However, the farm size of the vegetable farmers ranged from 0.16 to 6.72 hectares with a mean of 1.15 and a standard deviation of 1.02. As the majority of the respondents are small to medium farm holders, they might be targeted by the extension service providers for disseminating the idea of extensive farming in a small area of land especially with different vegetable varieties to ensure proper utilization of minimum land with maximum profit.

Table IV

Salient features of the selected characteristics of the farmers (n=101)

Characteristics	Scoring method	Range Possible (Observed)	Categories	Respondents		Mean (Std. dev.)
				No.	Percent	
Age	No. of year	Unknown (24-65)	Young (18-35)	55	54.5	36.29 (7.85)
			Middle-aged (36-50)	40	39.6	
			Old (>50)	6	5.9	
Educational qualification	Year of schooling	Unknow (0-13)	Can't read and write (0)	1	1.0	6.79 (4.24)
			Can sign only (0.5)	26	25.7	
			Primary level (1 to 5)	9	8.9	
			Secondary level (6 to 10)	50	49.5	
			Above secondary level (above 10)	15	14.9	

Family size	No. of Members	Unknow (3-14)	Small (up to 4)	12	11.9	6.67 (2.11)
			Medium (5-6)	39	38.6	
			Large (above 6)	50	49.5	
Farm size	Hectare	Unknown (0.16-6.72)	Marginal (0.021-0.200)	2	2.0	1.15 (1.02)
			Small (0.201-1.000)	58	57.4	
			Medium (1.001-3.000)	37	36.6	
			Large (above 3.0 ha)	4	4.0	
Vegetable farming experience	No. of year	Unknown (3-50)	One decade (up to 10)	51	50.5	13.56 (8.42)
			Two decades (11-20)	31	30.7	
			Three decades and above (above 20)	19	18.8	
Training exposure	No. of days	Unknown (0-25)	No training (0)	69	68.3	2.71 (5.91)
			Single-day training (1)	2	2.0	
			Weeklong training (2-7)	16	15.8	
			Monthlong (8-30)	14	13.9	
Credit received	'000' taka	Unknown (0-150)	No credit (0)	44	43.6	30.12 (35.32)
			Low (up to 50)	16	15.8	
			Medium (51-100)	37	36.6	
			High (>100)	4	4.0	
Extension media contact	Score	0-39 (6-28)	Low (up to 13)	40	39.6	15.52 (4.48)
			Medium (14-26)	57	56.4	
			High (>26)	4	4.0	
Environmental stewardship	Score	8-40 (18-33)	Low (8-19)	1	1.0	26.65 (2.66)
			Medium (20-30)	94	93.1	
			High (>30)	6	5.9	
Problem confrontation	Score	0-30 (9-27)	Low (1- 10)	4	4.0	15.05 (3.57)
			Medium (11-20)	93	92.1	
			High (>20)	4	3.9	

The vegetable farming experience of the farmers ranged from 3 to 50 years with a mean of 13.56 and a standard deviation of 8.42. The findings indicate that the farmers in the study area are more or less experienced in vegetable cultivation. Thus, different sophisticated and conventional learning techniques

(like result demonstration, method demonstration, etc.) might be more beneficial for enhancing the learning of the farmers regarding efficient and sensible utilization of PGRs. In this connection, the training exposure of the respondents is not at a satisfactory level as the majority had no training exposure, different training programs regarding the proper utilization of PGRs might be helpful for bringing their positive attitude towards the same. In addition, vegetable cultivation is a capital-intensive endeavor that might need adequate credit support at the farmers' end. Results of Table IV indicate that more than half of the respondents (59.4 percent) had no to low credit support for farming. Thus, different credit organizations should step forward to support the farmers in vegetable cultivation on soft terms and conditions.

The extension media contact score of the farmers ranged from 6 to 28 with a mean of 15.52 and a standard deviation of 4.48. An overwhelming majority of the respondents (96 percent) had low to medium contact with extension media which might be needed to be considered by the respective Upazila Agriculture Office for the betterment of the farmers. Although on average a sole field-level extension officer needs to serve more than 1200 farm families in Bangladesh, different group techniques might be emphasized to overcome this constraint and for reaching a large number of farmers. In addition, the environmental stewardship score of the farmers ranged from 18 to 33 with a mean of 26.65 and a standard deviation of 2.66. Environmental stewardship refers to the responsible use and protection of the natural environment through conservation and sustainable practices to enhance ecosystem resilience and human well-being [4]. Results of Table IV indicate that the majority of the farmers had their environmental stewardship from medium to a high level which might be a good sign for the judicial utilization of PGRs in vegetable production. Lastly, the problem confrontation score of the farmers ranged from 9 to 27 with a mean of 15.05 and a standard deviation of 3.57. As the respondents feel different extents of problems in vegetable production in the study area, these problems might be needed to be addressed by different agricultural extension programs with timely and comprehensive policy recommendations.

Relationships between the Selected Characteristics of the Farmers with Their Knowledge of Using Plant Growth Regulators

To explore the relationships between farmers' selected characteristics and their knowledge of using plant growth regulators, "Pearson's Product-Moment Correlation Co-efficient" (r) has been used. The results of the correlation analysis between each of the selected characteristics of the farmer and their knowledge are shown in Table V.

Results of Table V indicate that out of ten selected characteristics of the farmers' extension media contact showed a positive significant relationship, and three variables viz., age, vegetable farming experience, and problem confrontation showed negative significant relationships with farmers' knowledge of the use of plant growth regulators. Thus, it might be interpreted that by enhancing the extent of contact with different extension media, farmers' knowledge of using PGRs can be extended to a notable level. Different extension campaigns can generate awareness among the farmers concerning the health and environmental benefits of the judicial application of PGRs. Various extension media can enhance the knowledge of farmers through organizing different educational campaigns, arranging training, providing posters, and leaflets, create awareness on digital as well as analog platforms. On the other hand, it can be interpreted that, young farmers facing fewer problems regarding the use of PGRs would have better knowledge of using them. The younger generation of farmers can more easily meet the demands that society requires in the profession of farming, and those required by the regulations of the standard agricultural policy, especially in the case of prudent use of PGRs [15]. Moreover, they are more receptive to gathering and adapting innovative technologies and knowledge. Their paths to rendering knowledge would be more precise if they faced fewer problems in different farming activities.

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Table V

Relationships between the selected characteristics of the farmers and their knowledge of using plant growth regulators (d.f.= 99)

Selected characteristics	Correlation coefficient (r)	Tabulated value	
		0.05 level	0.01 level
Age	-0.233*	±0.196	±0.255
Educational qualification	0.135		
Family size	0.130		
Farm size	0.044		
Vegetable farming experience	-0.209*		
Training exposure	0.129		
Credit received	0.034		
Extension media contact	0.404**		
Environmental stewardship	-0.033		
Problem Confrontation	-0.303**		

Problem Confrontation Regarding the Use of PGRs

The problem confrontation index (PCI) for the selected ten problems was calculated to determine the extent of problem confrontation by the vegetable farmers in using PGRs. The rank order of the problems based on their PCIs is presented in Table VI.

Results of Table VI indicate that the top-ranked problems faced by the farmers was 'Poor knowledge about the proper application procedures of PGRs' (PCI=257) followed by 'Inadequate knowledge about selecting appropriate PGRs for specific plant growth functions' (PCI=238) and 'Lack of extension services for disseminating adequate information of PGRs' (PCI=200). It might be interpreted that, farmers lacked adequate knowledge about the appropriate application procedures of PGRs in plants due to lack of extension services providing timely and need-based information and knowledge support. If adequate awareness and information support is missing in the farming community, they wouldn't be adaptive in welcoming the idea of introducing new ideas, innovation, and technologies in their farming activities [16]. So, these problems should be addressed properly with effective solutions generated by experienced resource persons and suggestions from farmers themselves.

Table VI

The rank order of the problems confronted by the vegetable farmers as per their PCI values

Sl.	Problem	High	Medium	Low	Not at all	PCI	Rank
1.	Poor knowledge about the proper application procedures of PGRs	57	42	2	0	257	1
2.	Inadequate knowledge about selecting appropriate PGRs for specific plant growth functions	43	51	7	0	238	2

3.	Lack of knowledge about appropriate concentration of PGRs	9	52	32	8	163	5
4.	No knowledge about human health hazards associated with PGR residues	8	43	39	11	149	6
5.	Lack of extension services for disseminating adequate information of PGRs	19	65	13	4	200	3
6.	Lack of knowledge about banned synthetic PGRs	6	10	42	43	80	8
7.	Lack of educational and training campaigns	27	37	29	8	184	4
8.	No idea about the appropriate time of PGRs application	1	8	41	51	60	10
9.	Lack of Government agricultural policies on judicial use of PGRs	0	22	63	16	107	7
10.	Lack of experienced resource personnel in disseminating knowledge regarding PGRs	2	7	47	45	67	9

Conclusion

The findings of the study revealed that the vast majority of the farmers had inadequate to moderate knowledge of various aspects of plant growth regulators. So, it is strongly recommended that different technical support as well as different comprehensive agricultural extension programs like demonstrations, training programs, group discussions, etc. are needed to be undertaken by different agricultural extension organizations for boosting farmers' knowledge of judicial and effective utilization of PGRs. The knowledge levels also followed the hierarchy of Bloom's taxonomy except for the creation level which ranked slightly higher than the evaluation level, which is a good sign for the development of cognitive contents of the farmers. It is, therefore, can be recommended that farmers can take advantage of different printed materials i.e., books, booklets, leaflets, posters, newspapers, etc. so that they can get more knowledge on PGRs easily. Different arrangements should also be made by the concerned authorities to undertake more educational activities for increasing the education level of the farmers to increase the effectiveness of these printed materials. Moreover, farmers' knowledge of using PGRs had significant negative relationships with age, vegetable farming experience, and problem confrontation while extension media contact had a significant positive relationship. As the extension media contact is positive in relation to knowledge which demands that a media campaign should be launched involving all teaching methods in a balanced way to improve the knowledge of using plant growth regulators, especially for the young-aged vegetable farmers. However, vegetable farmers faced a considerable number of problems in using plant growth regulators. It is, therefore, recommended that concerned authorities should give due attention to the solution to the problems as soon as possible. Therefore, it may be concluded that it would be wise thinking to improve the overall situation by taking care of the factors related to the increase of knowledge among the farmers.

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