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Original Research Paper

Information needs of farmers on cultivation of salad cucumber *Cucumis sativus* under polyhouse

Poornima C.P.* and Husain A.S.
Kerala Agricultural University, Vellanikkara, Thrissur - 680656, Kerala, India
*Corresponding author Email : poornima.balachandran@gmail.com

ABSTRACT

The conventional practice of crop production is now giving its way to hi-tech farming practices. Salad cucumber (*Cucumis sativus*), is a relatively new crop in Kerala and has proven yield benefit under polyhouse conditions. The study intended to assess the information needs of farmers regarding various technical and cultivation aspects of salad cucumber production under polyhouse. Kendall's coefficient of concordance (W) and mean values were used to identify the information needs. Most of the cultivation aspects fell under either the 'highly essential' or 'moderately needed' information category. The technical aspects of construction, maintenance and repair of polyhouse were the most critical information need of farmers along with the specifics of fertilizers for polyhouse and fertigation system. Pests, diseases and nutrient deficiency problems were also the main concerns of farmers. Weed management and pollination, with low mean scores were among the least felt information need. Hence, these aspects are also found to be among essential needs. The study elucidated that an efficient information delivery system through appropriate channels is required to boost polyhouse cultivation of vegetables in Kerala.

Keywords : Hi-tech farming, information need assessment, polyhouse cultivation, salad cucumber

INTRODUCTION

Cultivation of vegetables under polyhouse has been gaining importance and popularity in the Indian farming system since two and a half decades. It lessens farmers' dependency on climate and makes the optimum use of natural resources for crop production. Compared to traditional farming, the modern technique of polyhouse farming promises a better income (Rabbi et al., 2019). Farmers can also minimise the adverse effects of weather or pest attacks on their crops. Thus, polyhouse farming can help the farmer to generate returns round the year by raising multiple crops (Franco et al., 2018).

The research and extension system in developing countries like India is gradually becoming knowledge-centred. As agriculture systems become more multifaceted, it is the need of the hour to ensure that farmers can access reliable, timely, and relevant information sources. The information must be need-based, packed, user-friendly, and disseminated in a way that is ideal for the farmer and market (Babu & Glendening, 2019).

Polyhouse is relatively a new practice in Kerala. Appraisal of the sustainability of polyhouse system after a span of time, has indicated that farmers are gradually discontinuing the cultivation under polyhouse. One of the main constraints observed was the lack of adequate knowledge regarding the protected cultivation of vegetables under polyhouse (Hena, 2017). Therefore, to provide a knowledge base to the farmers who adopted and going to adopt polyhouse in future, it was found essential to investigate the information needs of the experienced farmers.

Salad cucumber is one of the most suitable crops and popularly grown vegetable to be best cultivated under polyhouse (Lakshmi et al., 2017). An attempt was made to study the information needs of farmers in Kerala regarding salad cucumber cultivation under polyhouse.

MATERIALS AND METHODS

Based on number of polyhouses, two districts each from the north (Kozhikode, Malappuram), central (Thrissur, Ernakulam) and south (Alappuzha, Thiruvananthapuram) of Kerala were selected. A total of 371 farmers are cultivating/has already cultivated four most popular and successful crops (salad cucumber, yard long bean, amaranthus and chilli) in polyhouses of these districts. Thus, a representative

sample of 60 polyhouse farmers (10 farmers from each district) cultivating/has already cultivated salad cucumber were selected randomly for the study.

After an extensive literature review and discussion with experts (scientists and professors from Kerala Agricultural University, officers from the Department of Agriculture and Farmers' Welfare, Kerala and 30 non-sample farmers from Palakkad district), 71 critical aspects which requires specialised knowledge regarding the cultivation of salad cucumber under polyhouse were identified. These aspects, from the construction of polyhouse to the marketing of the produce, were categorised into 16 sections to formulate the interview schedule. The selected farmers were asked to rate the items on a five-point scale from zero to four, where zero representing 'not needed' and four representing 'highly essential' information on polyhouse cultivation.

Kendall's coefficient of concordance (W) and mean values were calculated and used to identify the agreement among farmers regarding the information needs. The W-value indicates the degree of agreement among scores assigned by the respondents on different attributes (Kendall et al., 1939; Kendall & Gibbon, 1990; Hardesty & Bearden, 2004). W-values were calculated as follows.

$$W = \frac{12S}{m^2(N)(N^2-1)}; \quad 0 \leq W \leq 1$$

where,

$S : \sum d_i^2$

$d_i : R_i - \bar{A}$, where R_i is the sum of ranks assigned to item i by m respondents

m : Number of respondents

N : Number of attributes

W value close to one indicates good agreement among all the respondents. The item-wise mean scores of information needs of farmers were also assessed. Mean scores were used to determine the most important to least important information needs of farmers.

RESULTS AND DISCUSSION

The W-value closer to one indicates higher agreement among the respondents regarding that specific cultivation practice, while, a value closer to zero indicated lesser agreement. The results are presented in Table 1.

Table 1 : W values of items under each category

Items	W value
Design and construction of polyhouse	0.073**
Hi-tech seedling procurement and production	0.055*
Crop layout and design	0.177*
Disinfection of polyhouse	0.046
Micro-irrigation system	0.302**
Fertigation system	0.005
Cooling system	0.094**
Maintenance and repair of polyhouse	0.011
Pest and disease management	0.091**
Nutrient management	0.151**
Weed management	0.084**
Pollination	0.303**
Training and pruning	0.022
Harvesting of crop	0.087**
Marketing of produce	0.445**
Financial assistance	NA#

**significant at 0.01 level; *significant at 0.05 level; # not applicable as only one item was included under the category

Table 1 indicates that the category-wise W values of 11 out of 16 practices showed significant agreement among the polyhouse farmers regarding their information needs. Coefficient of concordance value of nine categories (design and construction of polyhouse, micro irrigation system, cooling system, pest and disease management, nutrient management, weed management, pollination, harvesting and marketing of produce) showed significant concordance at 1% level, whereas, cultivation practices like hi-tech seedling procurement and seedling production, crop layout and design were significant at 5% level. The significance of these categories indicates that the agreement on the information needs among the farmers was fair enough to arrange the statements (Table 2) according to their mean score. The W value of variables such as disinfection of polyhouse, fertigation system, maintenance and repair, training and pruning were non-significant at 1% as well as at 5% levels of significance. This points out that the needs of farmers differed with each other. Under the section 'financial assistance', since only one item was included, the W-value was inestimable.

The item-wise mean scores obtained was used to select the most important information needed by farmers. The mean scores were arranged in descending order under each category in order to organise the items according to the need of farmers.

Table 2 : Mean scores of different cultivation aspects

Items	Mean (M)
Design and construction of polyhouse	
Orientation of polyhouse	3.48
Selection of site for polyhouse construction	3.47
Selection of materials for construction of polyhouse	3.33
Ridge height	3.27
Gutter height	3.27
Cladding material	3.17
Hi-tech seedling procurement and production	
Crop varieties suitable for hi-tech vegetable cultivation	3.98
Source of seeds	3.95
Quality seedling production	3.88
Transplantation of seedlings	3.78
Crop layout and design	
Training of the crops	3.97
Bed preparation	3.65
Spacing of the seedlings	3.48
Planting in growbags and potting mixture	3.18
Soil analysis	3.12
Disinfection of polyhouse	
Disinfection of polyhouse	3.72
Soil sterilization	3.60
Fumigation	3.47
Micro irrigation system	
Maintenance and repair of the irrigation system	3.88
Operation of the irrigation system	3.77
Drip irrigation	3.35
Installation of irrigation system	3.20
Fertigation system	
Fertilizers suitable for fertigation	3.77
Calculation of fertilizer doses	3.75
Maintenance of soil parameters	3.73
Maintenance and repair of fertigation system	3.72
Operation of fertigation unit	3.72
Cooling system	
Maintenance and repair of fogger	1.95
Operation of fogger	1.85
Installation of fogger	1.72
Maintenance and repair of polyhouse	
Maintaining weather parameters inside polyhouse	3.77
Cleaning of cladding material of polyhouse	3.73
Changing the cladding material of polyhouse	3.67

Pest and disease management	
Identification of infestation of diseases and pests and their symptoms	3.88
Biocontrol agents against pest and diseases	3.70
Method of application of biocontrol agents	3.48
Traps used for pest control	3.40
Plant protection chemicals	3.38
Dosage of the chemicals	3.25
Soil application of chemicals	3.15
Foliar spray of the plant protection chemicals	3.13
Nutrient management	
Identifying nutrient deficiency symptoms	3.88
Toxicity symptoms	3.78
Stage and time of application of fertilizers	3.73
Rate of application of fertilizers	3.63
Bio fertilizers to be applied	3.57
Soil application of fertilizers	3.57
Type and quantity of chemical fertilizers to be applied	3.53
Foliar application of chemicals	3.38
Composting	3.07
Weed management	
Stage of weeding	2.03
Weed flora found in polyhouses	1.80
Mechanical weeding	1.73
Chemical weeding	1.48
Pollination	
Knowledge about assisted pollination	2.03
Beekeeping	0.97
Maintenance of bee hives	0.87
Stage of keeping hives	0.85
Training and pruning	
Training methods	3.43
Pruning methods	3.35
Time of training / pruning	3.33
Stage of training / pruning	3.33
Harvesting of crop	
Method of harvesting	2.68
Stage of harvesting	2.48
Harvesting time	2.35
Marketing of produce	
Market rate of vegetable	3.62
Storage	2.52
Packing	2.52
Grading	2.48
Financial Assistance	3.55

The data highlights that the most essential information needed by farmers regarding the design and construction was the orientation of the polyhouse (M = 3.48). Farmers positioned selection of site for polyhouse construction in the next place under design and construction (M=3.47). Information about the right construction materials and their sources are very important as far as polyhouse construction is concerned. Due to this, they placed it as the next most important item under design and construction aspects with a mean value 3.33. The farmers considered the information regarding the cladding material which includes the quality and other specifications is also very important with a calculated mean score of 3.17 out of four.

Farmers opined that the information on hi-tech seedling production or procurement of good quality seedlings as essential. As self-pollinated and hybrid seeds were not commonly available to most of the farmers and were not aware of the availability, they marked the item 'seed source' as an important information requirement (M=3.95). Even some of the experienced farmers were unfamiliar with the practice of transplantation in a crop like salad cucumber in the polyhouse. They found it as an important and basic need. Hence score of 3.78 out of four.

The most important information under crop layout and design was on training of the crops, as farmers realised the need of specialised structures to grow salad/sweet/ English cucumber under a polyhouse (M=3.97) 3.65. Most of the farmers who had less experience in salad cucumber cultivation required information on bed preparation and spacing of seedlings and thus, they assigned it with a mean score of 3.65 and 3.48, respectively. Method of cultivating the crop in growbags was also placed as an important information requirement among crop layout and design with the mean score 3.18. The data from farmers indicate that the information regarding soil analysis was essential for farmers (scores 3.12).

Farmers experienced that the micro atmosphere in polyhouses is in such a way that, the pests and disease control is difficult if proper care is not taken (Choudhary et al., 2022). Therefore, they felt the information on disinfection of polyhouse is very essential and they placed disinfection, soil sterilisation and fumigation at high ranks (scores of 3.72, 3.60 and 3.47 respectively).

Micro-irrigation is an inevitable part in crop cultivation under greenhouse (Rathod & Shaikh, 2023). The information on maintenance and repair and operation of irrigation system was very essential for farmers and they have placed it in the first two positions (mean scores of 3.88 and 3.77, respectively). The mean scores indicated that farmers found the information a much needed one (M=3.20). Some of the farmers were aware of the general information on drip irrigation and remaining farmers needed the information (score 3.35).

Most of the farmers were not familiar with operation and maintenance of the fertigation unit (score above 3.70). Farmers required information about fertilizers suitable for fertigation followed by calculation of fertilizer doses (scores 3.77 and 3.75, respectively). Maintenance of soil parameters was positioned next with mean score 3.73. Operation, maintenance, and repair of the fertigation unit were found equally important to farmers (M=3.72).

Majority of farmers did not feel the need of fogger or any cooling equipment inside polyhouse (score less than two), which indicated that the information was least important for the farmers. The items under this were installation, operation, and maintenance and repair of the fogger with M values were 1.72, 1.85 and 1.95, respectively.

The knowledge regarding the maintenance and repair of polyhouse was very crucial according to the opinion of farmers. Algal growth resulting in the restriction of availability of sunlight to plants, leading to yield reduction is a major problem reported by polyhouse farmers in Kerala. The adverse climatic conditions such as heavy rainfall, wind, and high humidity result in damage of the polyhouse besides creating difficulties in maintaining weather parameters inside polyhouse. So, the farmers felt the importance of proper cleaning and maintenance of polyhouse. The items listed under the category were maintenance of weather parameters inside the polyhouse, cleaning of cladding material, and frequency of changing of the cladding material (scores 3.77, 3.73 and 3.67, respectively).

According to the farmers, in protected cultivation, the closed atmosphere and microclimate make pest and disease management a difficult task compared to that of open cultivation (Choudhary et al., 2022). The priority was given to items like symptoms of disease and pest infestation (M=3.88) as early diagnosis was

the most important factor to ward off the spread of pests and diseases. Many of the farmers had initially practiced organic methods of pest control. So, they were interested to know about different biocontrol agents (M=3.70) and the methods to apply them (M=3.48). Therefore, the polyhouse farmers marked items such as chemicals used, dosage of pesticides, soil, and foliar application of chemicals as highly crucial information (scores 3.38, 3.25, 3.15 and 3.13, respectively).

Under the aspects regarding nutrient management, polyhouse farmers needed more information on identifying the symptoms of nutrient deficiency and toxicity (mean value 3.88 and 3.78, respectively). They needed more insight on the stage and time of application as well as rate of application of fertilizers (scores 3.73 and 3.63, respectively). It was also reflected from the scores that, soil application and foliar application of chemicals were much needed information (scores 3.57 and 3.38, respectively). The items, composting and biofertilizer application had high mean scores (3.07 and 3.57, respectively).

As per the response from most of the polyhouse farmers, weed management was one of the least needed information by the polyhouse farmers. They opined that the weed control was possible without much difficulty and was not different from weeding in open fields and hence, very few farmers pointed it as a needed information (M=1.80). A few more farmers needed the information on the stage of weeding (M=2.03). Being in a confined area, farmers felt manual weed control is easier in polyhouses when compared to open cultivation.

It is observed that, majority of the farmers used self-pollinated vegetable varieties inside polyhouse. Only a very few farmers reported the requirement of information on the natural pollination aided by honeybees and other insects (values less than one). A slightly higher number of farmers needed information on hand pollination and other artificial crossing methods which can be possible under greenhouse (M=2.03).

The farmers said that training and pruning are critical aspects while cultivating salad cucumber under protected conditions. The respective mean scores of training methods, pruning methods, time of training and pruning and correct stage of training and pruning were 3.43, 3.35, 3.33 and 3.33, respectively. Skill trainings are absolutely essential to take advantage of right stage and methods of training and pruning.

Generally, it is observed that farmers under the study were familiar with harvesting procedures. But in protected cultivation, vertical growth of the plant makes the procedure a bit difficult. Hence, some farmers opined that, the process will be easier if they get more information on harvesting methods (M=2.68). Salad cucumber cultivation is comparatively a new practice in Kerala according to the farmers' opinion, and hence, some of the farmers were unaware of the correct stage of harvesting (M=2.48). Some farmers who were new to vegetable farming, required information on the time and method of harvest of salad cucumber under polyhouse (M=2.35).

Another key aspect regarding the cultivation of salad cucumber is about its market price. The main information farmers required regarding the marketing was about the market rate of salad cucumber (value 3.62). Apart from this, all aspects of marketing such as storage, grading, packing and transportation was moderately required for polyhouse farmers as they were familiar with these practices.

Initial investment to construct polyhouse is so high and most of the farmers reported that they cannot afford that. They pointed out that without any subsidies, loans or government schemes, polyhouse construction was impossible for them. So, they mentioned that the updated information on financial assistance should be made available by the concerned authorities, without which polyhouse cultivation is not economically feasible (high score 3.55), indicate that the need is very essential.

CONCLUSION

The study analysed the information needs of farmers about salad cucumber cultivation under polyhouse in Kerala. As the farmers are novice and facing many constraints on crop production through this technology, it can be observed from the results that the farmers pointed out their high information needs on almost all the aspects related to the crop cultivation. They found the information regarding design and layout, training of the crop, disinfection and maintenance of the polyhouse, marketing of the crop, pest and disease management, and financial assistance as most essential among all (high score >3.0).

It is concluded from the study that there is a felt need of providing accurate, reliable and need based information among the polyhouse farmers in Kerala. An elaborate study on the constraints faced by the polyhouse farmers has to be conducted to understand the field level problems faced by the farmers and to bridge the gap between farmers and technology. As the number of active polyhouses are declining in the state of Kerala, the needs of the farmers should be a serious concern. Proper measures should be taken to disseminate required information through trainings, media and tools most suitable for the situation and can be easily disseminated within least time in order to encourage polyhouse cultivation in the region.

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