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Low cost protected structures in horticultural crops: A way to mitigate climate change

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Abstract

Climate change is one of the major issue affecting agriculture worldwide. Cultivation under controlled or regulated conditions of temperature, light, humidity and other factors which influence crop yield and quality can be termed as protected cultivation. It is a way of mitigating the adversities on crop due to uncertain and varying climatic conditions as a result of climate change. Thus protected cultivation is a means of providing favourable conditions for better plant growth with the aim of enhanced yield of improved quality by creating favourable micro-climate around the plants. These favourable conditions of micro-climate can be achieved by means of polyhouse, shadenet houses, insect proof net houses, low plastic tunnels, plastic mulching etc. as these interventions have potential to enhance the crop productivity to many times which is difficult to achieve in normal open field conditions. However these interventions are undoubtedly are very beneficial for the farming community if used skillfully with proper marketing of produce but the point which goes against the majority of farming community is the higher initial cost associated with the adoption of these protective structures. Thus the introduction of low cost protected Structures between the small and Marginal farmers is a way for enabling the small and Marginal Farmers to take benefits associated with protected cultivation. The KVK Mahasamund has made a poly tunnels for nursery raising of Cabbage, Cauliflower, tomato, Brinjal in September. The erratic rainfall due to climate change during last week of September has damaged the nursery of vegetable crops of most of the farmers but the farmers under demonstration have succeeded in saving their vegetable nursery of above said crops. Also the cultivation of cole crops was also taken inside and outside the Low cost protected structure to study the impact of these protected structures. The marketable yield of cauliflower was found to be 5.47 kg/m² in protected conditions against of 4.42 kg/m² in open conditions while in case of cabbage marketable yield was found to be 8.55 kg/m² in protected conditions against of 6.70 kg/m² in open conditions. The response of small and marginal farmers towards adoption of low-cost structures for protected cultivation was encouraging as the technology adoption was feasible for them.

Keywords: Climate change, low cost protected structure, cole crops, protected cultivation

Introduction

Protected cultivation is described as a cropping strategy where a plant's growth and development are influenced by a regulated microclimate. Although agriculture has always been the foundation of India's economy, our experience over the past 50 years suggests a link between agricultural practices and economic well-being. It is no longer possible to ignore the growing urgency of the global issue of climate change. Anthropogenic factors, such as the unsustainable use of fossil fuels, the destruction of forests for industrial development, and the overcrowding of cities, are the fundamental underlying causes of these problems. The Climate Change has to be taken very seriously and every possible steps has been taken to mitigate the adverse effects of climate change. The vegetable growers will remain in difficult situation due to erratic rainfall, extreme cold, heat wave and so on. The low cost protected structures will be one of the way to mitigate adverse effects of Climate Change.

Characteristics of low cost Protected Structures

- It is made from bamboos or other such locally available material with minimum expenses.
- As these are low cost they are small in size having a short life-span.
- The size of the low technology poly houses is less than 3 meters in total height.
- Low technology poly houses generally provide suboptimal growing environment and little reduction in the incidence of pests and diseases.

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Material and Methods

The experiment was conducted in the farmers field of the village Dhansuli, adopted under National Innovations in Climate Resilient Agriculture (NICRA) project by KVK Mahasamund, Chhattisgarh during 2022-23 with a view to study the performance of cole crops both under protected environment and as well as in open field conditions. The micro climate under poly tunnel is different from open field environment as having higher Relative Humidity and Temperature. The seedlings of Cabbage and Cauliflower were transplanted both inside and outside the poly tunnel following all recommended practices for Application of fertilizers, plant protection measures and for other agro-techniques for successful cultivation of above mentioned crops.

Results and Discussion

The seedlings transplanted outside the poly house was late germinated at an early phase of their growth due to low temperature and chilling injury in winters. The yield of Cauliflower and Cabbage in Poly tunnel was higher (5.47kg/m² and 8.55 kg/m² respectively) then yield of above crops (4.42 kg/ m² and 6.70 kg/m², respectively) in open field. Due to favorable microclimate in poly tunnel crops are facilitated with early flowering. As the crops within protected environment has abundant amount of Carbon dioxide their vigorous vegetative growth was appeared. (Chandra *et al.*, 2000) [3]. The circumference of the curd for Cauliflower and Cabbage was found higher (49.65cm and 48.63cm respectively) and the same was found lower (44.60cm and 42.35cm respectively) in open field. Similarly average gross wt of Cauliflower and Cabbage was found higher (2240.26 g and 2123.16 g respectively) in poly tunnel while lower (1860.15 g and 1885.96 g) in open field. All the parameters were found to be superior in protected field as compared to open field condition, in both the Cole crops taken in this study.

Table 1: Performance of Cauliflower and Cabbage inside low cost poly tunnel and in open field condition.

Observations	Cauliflower		Cabbage	
	Protected field	Open field	Protected field	Open field
No. of leaves	18.20	15.42	11.20	10.25
Length of leaves (cm)	49.68	38.10	40.22	31.69
Width of leaves (cm)	28.75	24.62	32.17	29.26
Circumference of the curd (cm)	49.65	44.60	48.63	42.35
Avg. gross wt. of the plant (g)	2240.26	1860.15	2123.16	1885.96
Avg. curd wt. (g)	985.75	796.35	1540.25	1206.98
Yield (kg/m ²)	5.47	4.42	8.55	6.70

Conclusion

Crop cultivation in low cost protected structures cultivation may leads to 10-20 times higher yield than that of outdoor cultivation. The yield Component and desirable characters of the crops in low cost protected structures purely depends on type of protected structure, its design, control over prevailing environment, cropping system and crop type. The micro climate inside the low cost protected structures largely depends upon the prevailing environmental condition which varies from place to place.

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