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Production Potentials of Tomato and Capsicum under Poly House Condition in Kerala

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Abstract: ***An experiment was conducted in Farming Systems Research Station, Sadanandapuram, Kottarakkara, Kerala to evaluate the performance of trailing tomato and capsicum with respect to vegetative and yield parameters under protected structures along with an open field (control). Highest yield was recorded in poly house structures than in open field for trailing tomato and capsicum. The increase in yield was to the tune of 82.84% and 90.85% for trailing tomato and capsicum respectively and shelf life better in poly house. Bacterial wilt affected trailing tomato and wilt and thrips in capsicum even in poly house structures. During second trial, grow bags (40×24×24 cm) was used for planting trailing tomato and capsicum in poly house and in open field. The bags are treated with Phytolan (2grams/lt) and Streptocyclin (0.2g/lt) for controlling bacterial wilt. The increase in yield was to the tune of 300% and 321% for trailing tomato and capsicum in poly house structures respectively compared to first trial. It was found that micro climatic parameters were varied between poly houses and outside. Solar radiation (PAR) inside the polyhouse was reduced by about 50% compared to the open field while air and soil temperatures were always remained higher. The relative humidity was less in poly house structure compared to outside the structure (5-8% increase in outside). The tallest plants, maximum number of branches/plant and higher leaf area expansion were found in the crops grown under poly house as compared to natural condition (i.e. open field).***

Keywords: trailing tomato; capsicum; poly house structure; yield; micro climatic parameters

1. Introduction

Protected structures are erected for protection of crops from adverse climatic conditions and for growing crops irrespective of their growing season.

Green house technology has potential to produce more produce per unit area with increased input use efficiency. Total production of vegetables in India is next to China, but per capita availability of vegetables is much lower than required. The production of vegetable crops is to be increased to meet the demand of the ever growing population otherwise per capita availability of vegetables will further go down. There is a lot of pressure on cultivable land caused due to industrialization, urbanization and expansion of the rural villages. Therefore, it is utmost necessary to improve the productivity of crops including vegetables by adopting hi-tech farming and ploy house cultivation. Besides productivity, the better quality of produce is also obtained under poly house cultivation. This technology can be adopted by the rural youth for more income per unit land. In Kerala this technology is being adopted by many of the farmers.

Protected cultivation is gaining importance in the recent past, owing to its perpetual demand throughout the year. Polyhouse production has already been proven as profitable and production under protection has attracted much attention in recent years [1].

In this study, vegetable crops such as trailing tomato and capsicum were tested under protected conditions inside the polyhouse and were compared with their performance under open conditions. Various microclimatic parameters and biometric observations and yield were recorded for performance evaluation.

2. Materials and Methods

Gable type poly house structures with double vent each having an area of 96 m^2 (width of structure -6m and length of structure- 16m) with natural ventilation have been constructed at FSRS farm. Gable shaped ploy house structure oriented in north-south direction has facility to provide natural ventilation (> 30% effective side ventilation and > 9% effective roof ventilation) is most suitable to Kerala conditions since it permits reduction of temperature and relative humidity and replacement of carbon dioxide deficiency.

Drip system with fertigation facility and fogger units were installed in each of the 2 structures. Drip irrigation along with fertigation helps in saving water and fertilizers and at the same time increases the quantity and quality of produce[2].Natural ventilation system combined with fogging (only during peak hours) can provide a good degree of environmental control.

Green house monitor with sensors for measuring micro climatic parameters such as air temperature at different heights, relative humidity, soil temperature at different depths, leaf temperature, solar radiation and outside climatic parameters have been installed.

The experiment was laid out in poly house (**Figure 1 & 2**) for trailing tomato and capsicum. The selected variety of trailing tomato was F_1hybrid Rakshita (Indo-American) and for capsicum the variety was F_1hybrid Indira (Syngenta).

Figure 1: Cultivation of trailing tomato in poly house structure

Figure 2: Cultivation of capsicum in poly house structure

Plant characteristics and micro climatic parameters are recorded. Two trials have been conducted. Fertilizers are applied as per Adhoc recommendation of Kerala Agricultural University, India. Water soluble fertilizers are used.

3. Results and Discussion

3.1 Performance Evaluation of trailing tomato

The yield per cent of trailing tomato is more in poly house structures than in open field. The increase in yield was to the tune of 233% over open condition.

Bacterial wilt affected trailing tomato in poly house structures as well as in open field. More than 90% of the plants were affected in the open field. Plants are also dried due to heavy sunlight in open field.

An observational trial was undertaken to control bacterial wilt in trailing tomato. A pot culture study was conducted. Five treatments are imposed. Each pot has been treated with following organic/inorganic chemicals.

T_1= Pseudomonas 20 grams/litre
T_2 = Trichoderma 20 grams/litre
T_3 = Phytolan 2grams/ litre
T_4 = Phytolan 2grams / litre + Streptocyclin 0.2 grams/litre
T_5 = Streptocyclin 0.2 grams/litre

The study showed that plants treated with Phytolan 2grams / litre + Streptocyclin 0.2 grams/litres were unaffected by bacterial wilt. No plants have been damaged.

During second trial, Grow bags (40×24×24 cm) was used for planting trailing tomato (**Figure 3**) in poly house and in open field. The bags are treated with Phytolan (2grams/lt) and Streptocyclin (0.2g/lt).

Figure 3: Cultivation of Trailing Tomato in Grow bags in poly house structure

The increase in yield was to the tune of 300% in poly house structures compared to first trial.

Highest yield was recorded in poly house structures than in open field. The increase in yield was to the tune of 82.24% over open field. The per plant yield of trailing tomato was 1.2 kg and 0.7 kg in poly house and in open field respectively.

Earlier flowering of the crops was observed in poly house structures and shelf life better in poly house.

3.2 Performance Evaluation of capsicum

Wilt disease and attack of Thrips was noticed in capsicum in poly house structures as well as in open field. Most of the crops have been affected in open field in first trial. Plants are also dried due to heavy sunlight in open field.

During second trial, Grow bags (40x24x24 cm) was used for planting capsicum (**Figure 4**) in poly house and in open field. The bags are treated with Phytolan (2grams/lt) and Streptocyclin (0.2g/lt).

Figure 4: Cultivation of Capsicum in poly house structure in grow bags

The increase in yield was to the tune of 321% in poly house structure compared to planting directly into the soil (first trial).

Highest yield was recorded in poly house structures than in open field. The increase in yield was to the tune of 90.85% over open field. Sucking pest (thrips) affected some of the plants in open field. Imidacloprid 17.8 SL (confidor) - 0.3

ml/ lt was applied to control the attack of thrips. The per plant yield of capsicum was 1.4 kg and 0.9 kg in poly house and in open field respectively.

Earlier flowering of the crops was observed in poly house structures. Shelf life is better in poly house than open field.

3.3 Evaluation of microclimatic parameters

Micro climatic parameters were varied between poly house and outside. The average solar radiation (PAR) was reduced to the tune of 50% in poly house structure when compared to open field (**Figure 5)** irrespective of the growing periods of the trailing tomato and capsicum. Soil temperature was increases with depth in poly house structure. The outside soil temperature was more compared to temperature inside the poly house (**Figure 6**). Soil under poly house always maintained a 2- 3ºC higher temperature as compared to the temperature at the outside soil at all growth stages of crop.

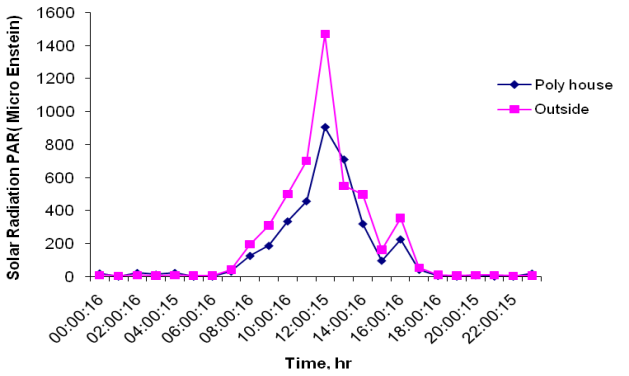

Figure 5: Variation of solar radiation in poly house and open field

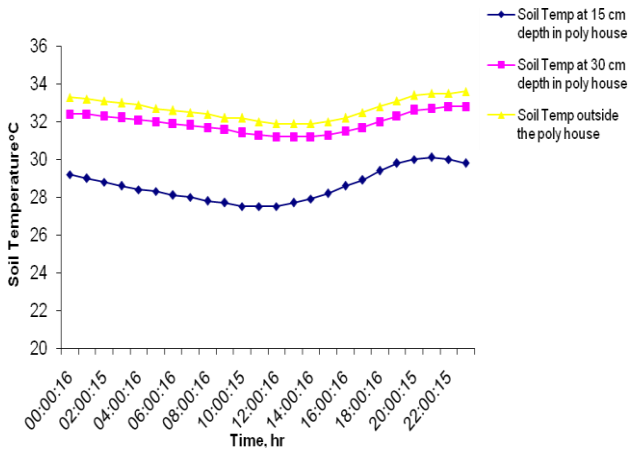

Figure 6: Variation of soil temperature in poly house and open field

The air temperature was high in poly house than in open field (**Figure 7**). However, the temperature differences between the polyhouse and the open field were small during the early or late hours of the day.

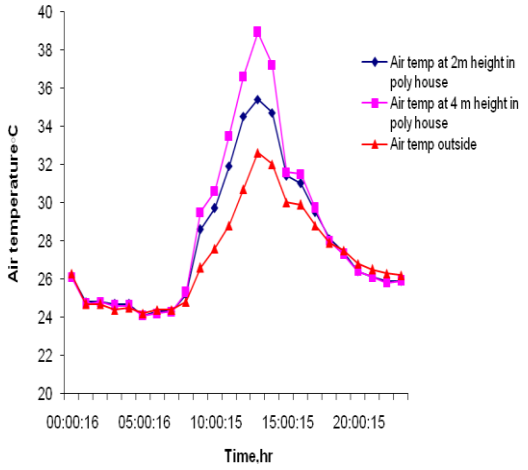

Figure 7: Variation of air temperature in poly house and open field

The relative humidity inside the poly house was less (**Figure 8**)compared to outside field. The relative humidity (RH) always followed a more or less opposite pattern of air temperature. The RH inside the polyhouse structure was always 5-8% lower than that of the nearby open field. The leaf temperature was high in open field than poly house.

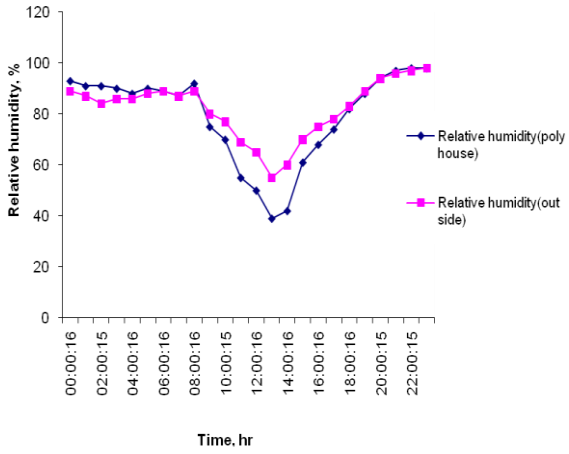

Figure 8: Variation of relative humidity in poly house and open field

4. Conclusion

Highest yield was recorded in poly house structures than in open field for trailing tomato and capsicum. The increase in yield was to the tune of 82.24% and 90.85% for trailing tomato and capsicum respectively. Grow bags treated with Phytolan (2grams/lt) and Streptocyclin (0.2g/lt) before planting controlled bacterial wilt in trailing tomato and wilt in capsicum. The tallest plants, maximum number of branches/plant and higher leaf area expansion rate were common in the plants grown under polyhouse as compared to natural condition (i.e. open field). Continuous monitoring of crops is needed inside the poly house.

References

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