

Protected Cultivation- An Emerging Technology in Fruit Production

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SUMMARY

Protected cultivation is one of the alternative system in fruit crops for production of high value crops with good quality to meet the growing demand of fruits. After the era of green revolution, more emphasis is given for quality and quantity of production. The demand for quality produce can be met when the environment for the plant growth is suitably controlled. The need to protect the crops against unfavorable environmental conditions, decrease in land holdings, increasing pressure on natural resources and biotic stress led to the development of protected cultivation. Our country is self-dependent on food grain production but to fulfill the nutritional security, the gap between increasing demand of horticultural produce has to be filled. This gap cannot be filled by the traditional horticulture system which requires large area under horticulture to increase the production for the ever growing population. In view of changing climate and sensitivity of fruit crops to natural scenarios, protected cultivation of fruits is gaining significance.

INTRODUCTION

Protected cultivation is a cropping technique where the micro climate surrounding the plant is controlled partially or fully as per the requirement of crops during their period of growth. It includes various technologies like drip irrigation, fertigation, mulching, use of tunnels, net house, shade house, greenhouse, mist chambers, high tunnels and earth tube heat exchanger etc. Greenhouses are framed structures covered with a transparent material in which crops are grown under partially or fully controlled environment conditions. Greenhouse cultivation as well as other modes of controlled environment cultivation creates favorable micro-climates, which helps the crop production throughout the year or part of the year as required. The primary environmental parameter controlled is temperature, usually providing heat to overcome extreme cold conditions. However, environmental control can also include cooling to mitigate excessive temperatures, light control either shading or adding supplemental light, carbon dioxide levels, relative humidity, water, plant nutrients and pest control.

Need of protected cultivation

- Protected cultivation helps in creating congenial microclimatic as per the requirement of crop for better performance.
- Main emphasis was to produce high quality fruits along with higher productivity by efficient utilization of available resources.
- The crops can be grown throughout the year including off season.
- It also provides employment opportunity and checks the crop loss caused by natural calamities like heavy rain, high wind, frost etc.

Advantages of protected cultivation

- Nurseries constructed using shade nets is good to propagate and produce quality planting material with better rooting of cuttings, grafts and buddlings.
- The protected structures can also be used for hardening of tissue cultured plants, seedlings, production of bud woods and hybrids.
- These provides year round cultivation including off-season production. The crops can be grown with high quality, minimum incidence of pest, diseases and physiological disorders. These structures promotes newer technologies like concept of high density planting, hydroponics and aeroponics etc.

Constrains in protected cultivation

Even though they are economical, farmers are facing the problem of high initial establishment costs, lack of suitable varieties, lower light interception, nutrient depletion and lack of knowledge on training, pruning and advanced technologies etc.

To overcome these constraints farmers are facilitating with subsidies from the government for establishment of these structures and more works has to be conducted to develop new hybrids and varieties which are suitable for cultivation under protected structures.

Characters of fruit crops suitable for protected cultivation

- Rapid growers: Papaya, Banana, Strawberries.
- Dwarf nature: Pineapple, strawberry and dwarf varieties of other crops.
- Response for training and pruning.
- Single stem fruit crops: Papaya, Banana.
- Regular bearer with high yield.

Effect of protected cultivation on fruit crops

1) On Growing Environment

a) Mango (Medany *et al.*, 2009)

- Max. temperature tend to be lower under the nets (2°C)
- Min. temperature tend to be lower in the open field by 1°C
- RH increased by 4-8 % in nets compared with open field

b) Grapes

The plastic covering above the grapevine rows increased the air circulation and decreased the photosynthetic radiation and wind speed the covering inferred with quality of incoming radiation influences the microclimate inside the greenhouse (Jiang *et al.*, 2013).

2) On Vegetative Growth

a) Mango

Vegetative growth (plant height, number of leaves, and stem diameter) under the greenhouse is higher than open field (Medany *et al.*, 2009)

b) Banana

The mean pseudostem height, pseudostem circumference and no. of leaves per plant at flowering was higher in protected but the total no. of leaves produced before flowering is higher in open field (Gubbuk and Pekmezci, 2004).

c) Grape

Based on the means of two years, the shoot elongation of plants in protected cultivation was greater than that of plants grown in open fields (Kamiloglu *et al.*, 2011).

3. On Flowering

a) Banana

- Period from shooting to harvest was 41.4 days shorter in protected cultivation (Gubbuk and Pekmezci, 2004).
- Planting to flowering
 - Protected : 6.9-7.0 months
 - Open : 9.2-10.10 months
- Flowering to harvest
 - Protected : 5.3-6.5 months
 - Open : 4.4-5.3 months

b) Grapes

- Bud break 9 days early under cover
- Full bloom 14 days early
- Veraison 16 days early and
- Maturity 17 days early (Kamiloglu *et al.*, 2011)

4. On Yield

a) Mango

Higher yield in white net in comparison with open field condition (Medany *et al.*, 2009)

b) Banana

- A yield increase of 53 % in protected condition
- Number of hands/bunch was 12.9 in protected cultivation against 10.6 in open-field condition (Gubbuk and Pekmezci, 2004).

5. On Quality parameters**a) Grape (Vool *et al.*, 2013)**

- Total soluble solids- Protected : 24.1 - 25.4 °brix
- Open condition : 17.9-21.8 °brix,
- Titratable acidity- Protected : 1.2 g/100g
- Open condition : 1.5-1.6 g/100g

6. On Pests and Diseases**a) Grape**

Leaf disease and fruit diseases like downy mildew on grape leaves, anthracnose and white rot in grape berries were lower in rain shelters cultivation than open condition (Jiang *et al.*, 2013).

CONCLUSION

Protected cultivation is beneficial for producing fruits of good quality. It offers great scope to produce organic fruit, minimize insect pest incidence, avoid fruit cracking and prevent frost injury, hardening of tissue culture as well as cuttings, buddlings and grafted plants. There are many advantages in protected cultivation compared to open-field cultivation in subtropical conditions *viz.*, reduction of life cycle from planting to harvest, reduction in water consumption, extended duration of temperatures, higher rate of photosynthesis, protection against wind and other weather conditions (e.g., sunburn and hail) and increased productivity.

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