

Types of Training in Vegetables under Protected Cultivation

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SUMMARY

This study explores the significance of training methods in protected cultivation for horticulture, particularly focusing on tomato, capsicum, and cucumber crops. Protected cultivation involves controlling the microenvironment around the plant to maximize yield and resource efficiency. The primary objective of training methods is to shape the plants, reduce excess growth, minimize soil contact, and facilitate easier intercultural operations. By employing specific training methods, such as single stem training, two-stem training, three-stem training for tomatoes, two leader system, and four leader system for capsicum, and tree trellis system, umbrella system, and single stem training for cucumber, growers can enhance fruit quality and overall yield. This comprehensive investigation emphasizes the importance of training methods in protected cultivation and highlights how they contribute to increased productivity, better resource management, and improved market prices for horticultural crops. Adopting these specialized techniques enable growers to thrive even in extreme environmental conditions, making horticulture an indispensable aspect of sustainable agriculture.

INTRODUCTION

Horticulture today forms an important part of food, nutritional and economic security. Adoption of horticulture, both by small and marginal farmers has brought success in many regions of the country as India is gifted with a wide variety of agro-climatic conditions & enjoys a fortunate position in the horticulture map of the world. Inspire of its great importance, it facing a lot of constraints like photostress, moisture stress, temperature stress, weed growth, deficiencies in soil nutrients, excessive wind velocities and atmospheric carbon-dioxide. These constraints can be alleviated by adopting an exclusive, specialized hi-technology known as protected cultivation. The goal is to grow crops where the extreme conditions are existed and plant could not survive by modifying the natural environment. Protected cultivation of vegetable offers distinctive advantage of quality, productivity and good market price to the growers. It increases their income in off- season as compared to normal season (Nair & Barche, 2014).

In this context, training methods play a pivotal role in equipping conservation specialists with the expertise needed to safeguard these treasures. Architects, structural engineers, archaeologists, historians, and other experts undergo rigorous education and practical experiences to understand the unique challenges posed by historic buildings. Additionally, they familiarize themselves with traditional building techniques and modern conservation approaches, seeking a comprehensive understanding of the intricacies involved in preserving these delicate structures. In greenhouse the training methods are dependent on the crop and their growing method/ structures on which they are trained on. In this assignment tomato, capsicum and cucumber are discussed along with their various training methods followed.

What is protected cultivation?

Protected cultivation can be defined as a cropping technique where in the micro environment surrounding the plant body is controlled partially/fully as per plant need during their period of growth to maximize the yield and resource saving. (Parmar, 2020)

They are different type of protected structure

- Poly house
- Glass house
- Net house
- Plastic low tunnel

Objective of training

- Remove excess growth
- Force plants to give desired/certain shape
- Minimize direct contact with the soil
- Maximum use of resources
- Easy intercultural operations

Advances of training in protected cultivation

- Increased yield through optimized sunlight exposure.
- Efficient resource management (water, nutrients).
- Improved fruit quality and reduced disease risk.
- Year-round production and extended growing seasons.
- Protection from extreme weather events.
- Higher market prices in off-peak seasons.
- Easier crop management and intercultural operations.
- Diversification of crop varieties.
- Environmentally friendly practices.
- Enhanced profitability and economic sustainability.

Tomato: Single stem training, two stem training, three stem training

Capsicum: Two leader system, Four leader system

Cucumber: V-system, Umbrella system, single stem training

Tomato

Single stem training: The purpose of single stem training is to focus the plant's energy on a single main stem, leading to increased fruit production, improved air circulation, and ease of maintenance. Here's how you can perform single stem training in tomatoes

Seedling stage: When starting with tomato seedlings, select the healthiest and most robust stem to be the main stem. Remove any additional side shoots, also known as “suckers,” that may emerge from the leaf axils of the seedling.

Stake or trellis setup: Provide a sturdy stake or trellis system to support the single main stem as it grows. This will prevent the plant from sprawling on the ground and protect it from diseases and pests.

Pruning: As the tomato plant grows, monitor it regularly to identify any new suckers that develop along the main stem. Suckers are the small shoots that emerge between the main stem and the branches' junctions. These are often referred to as “axillary shoots.”

Training the main stem: As the plant grows taller, gently tie the main stem to the stake or trellis to support its upward growth. This will help the plant grow vertically and maximize exposure to sunlight.

Continued maintenance: Regularly check for new suckers and remove them promptly to maintain the single stem structure. This will promote efficient energy distribution and resource allocation for fruit production.

Two stem training: Two-stem training, also known as “double stem pruning” or “dual stem training,” is an alternative tomato training technique to single stem training. This method involves allowing two main stems to develop instead of just one. Two-stem training is often employed for indeterminate tomato varieties that have a vigorous growth habit and produce many fruit clusters along the main stem.

Three stem training: Three-stem training, also known as “triple stem pruning” or “multi-stem training,” is a variation of tomato training that involves allowing three main stems to develop instead of just one or two. This technique is typically employed for indeterminate tomato varieties that have a robust growth habit and produce numerous fruit clusters along the main stems. Three-stem training allows for even higher fruit production and can be particularly useful in high-density planting systems or greenhouse environments.

However, it's essential to be aware that three stem training demands more effort and management than single-stem or two-stem training. You need to regularly monitor and prune the plant to maintain only three main stems and provide sufficient support for the increased fruit load. Additionally, depending on the variety, three-stemmed plants may require more nutrients and water to support their enhanced growth and fruit production.

Capsicum

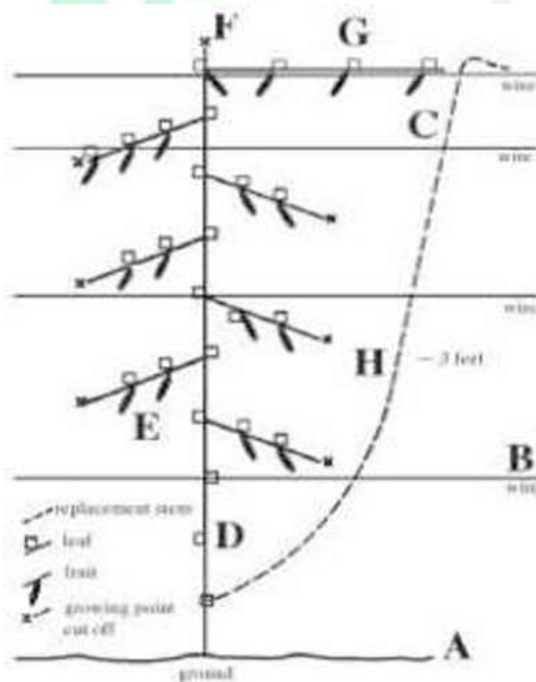
Two leader system and ii) Four leader system

The purpose of the Two Leader System is to manage the plant's growth, improve fruit quality, and increase overall yield. Each pepper plant is trained to hold onto just two or four stems. The plants must be pruned after 15 to 20 days after planting, with a 7 day gap between cuts, in order to sustain this. Pruning is done once every 10 days after 4 months. After 4 weeks of transplanting, the plants are trained along the plastic twines tied to the main stem.

Cucumber

Tree Trellis System

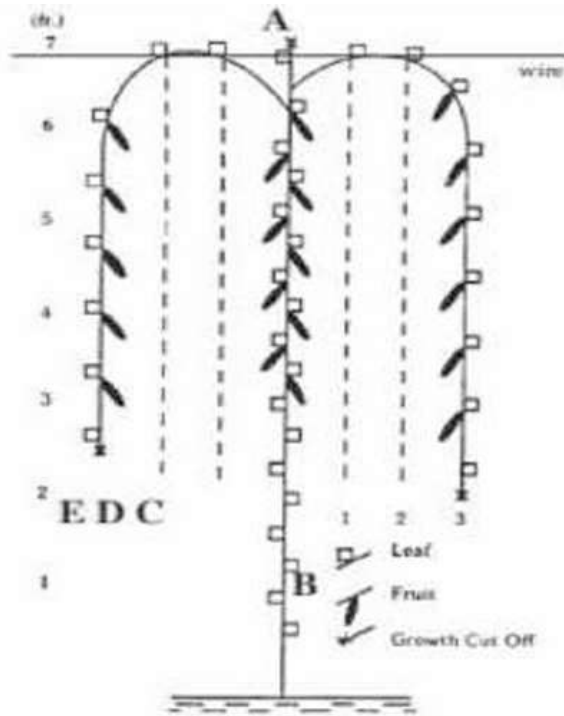
- Attach horizontal wires (B) spaced about two feet apart to the cucumber plants using ties. About 6 feet should separate the uppermost wire from the ground.
- Cut off all of the laterals and leaves on the plants' lowest 20 inches. (D)
- Tie the main stem and cut off the growing point after it has reached the top wire. (F)
- After the main stem's laterals at each leaf axis have grown two leaves, clip the growth point. (E)
- Train the top sprout that is growing a leaf axis to grow along the wire. (G)
- After the main stem has produced the majority of its fruit, allow a lateral to grow in its place and prune it in the same way as the main stem. (H)



A- Ground level, **B-** Wire, **C-** Support string
D- Leaves and Lateral removes,
E- Fruiting area
F- Tip nipped out, **G-** Lateral treated along top wire
H- Replacement lateral

Umbrella System: This system is straightforward, not too demanding in labor and easily understood.

- Tie the cucumber plant to a 7-foot-tall vertical wire (A). Remove the growing point at the top by pinching.
- Offer assistance to every fruit that forms on the lowest portion of the main stem.
- Cut off every lateral in the main stem's leaf axis. (B)
- It is best to train the top two laterals over the wire
- so that they hang down on either side of the main stem. Allow them to extend to about two-thirds of the main stem. (E)
- After the first laterals' fruits have been picked (C), those laterals should be cut back to a sturdy shoot to make way for the second laterals (D). Follow the same procedure for lateral (E).
- This technique for renewal.



A- Top wire
 B- Support
 C, D, F- Lateral
 fruiting stems

Single stem training: By cutting all lateral vines, just one main stem should grow. Throughout the duration of the crop, keep pulling out every lateral vine on the main stem.

CONCLUSION

In conclusion, protected cultivation with its various training methods proves to be a game changer in horticulture. By controlling the microenvironment and employing techniques like single stem, two-stem, and three-stem training, growers can achieve higher productivity, efficient resource management, and better market prices. The adoption of these specialized methods paves the way for sustainable agriculture and resilient farming practices, making horticulture an indispensable component of food security and economic growth.

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