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8. Importance of Protected Cultivation in Horticultural Crops

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Abstract:

The Indian economy is mainly affected by agribusiness and associated activities. After the Green Revolution, a few new biotic and abiotic stresses have arisen as an incredible challenge. Protected cultivation advances effective asset usage, including water and fertilizers, and minimizes weed infestation. It empowers the all-year and slow time-of-year creation of plant crops, guaranteeing a predictable and dependable inventory of new produce. Also, it works with the propagation of healthy planting material, further improving germination rates and disease resistance. The act of protected cultivation has emerged as a basic part of current cultivation, offering a scope of advantages and tending to different difficulties in crop creation. This paper explores the meaning of protected cultivation in horticultural crops. Protected cultivation includes growing crops in controlled conditions like greenhouses, polyhouses, and shade net houses, permitting exact guidelines for elements like temperature, humidity, and light. This technique plays a vital role in safeguarding plants from unfriendly weather conditions, pests, and diseases, subsequently improving yield efficiency and quality. However, the adaptation of protected cultivation also presents challenges, including the high initial capital costs, the requirement for skilled labor, and maintenance requirements. Ensuring a secure market for the produce is essential, given the significant investment of resources.

Keywords:

Protected cultivation, Greenhouse, polyhouses, controlled environment, horticultural crops, etc.

8.1 Introduction:

Protected cultivation is a method for cultivating crops in a controlled environment in agriculture (Jensen, 2002). This means that factors such as temperature, humidity, and light can be adjusted to meet the crop's specific needs. This approach promotes healthier and more abundant crop yields.

Emphasize the importance of controlled environments in sustainable farming practices Sojitra et al. (2023). There are several techniques for protected cultivation, including forced-ventilated greenhouses, naturally-ventilated poly houses, insect-proof net houses, shade net houses, plastic tunnels, and the use of mulching, raised beds, trellising, and drip irrigation (Ayas et al., 2011). These techniques can be employed individually or in combination to create an optimal environment that protects plants from adverse weather conditions and extends the cultivation season, enabling off-season crop production (Santosh et al. 2017, Pahuja et al. 2013). Adopting drip irrigation in conjunction with raised beds covered with mulch films not only suppresses weed growth but also retains soil moisture for an extended period, reducing evaporation losses (Iqbal et al., 2020).

8.2 Protected Cultivation:

- It is a process of growing crops in a controlled environment which means that the temperature, humidity, light, and other factors can be regulated as per the requirement of the crop.
- This assists in a healthier and larger production.
- It offers a massive potential to shorten and optimize farm-to-plate supply chains by making food available closer to the consumer and which can go a long way to improving the nation's GDP and reducing import dependency.
- It gives opportunities for the cultivation of horticultural crops in an entrepreneurial form for the markets in urban and semi-urban areas.
- At present in India, small and medium farmers have started flower and vegetable cultivation under different types of modular protected structures depending upon their investment capacity and the availability of markets in their area.

8.2.1 Status of Protected Cultivation: World

- An expected 405,000 ha of greenhouses spread over every one of the nations.
- There are more than 55 nations now in the reality where the cultivation of crops is embraced on a commercial scale, and it is ceaselessly developing at a quick rate universally.
- In developed nations viz., Japan, Holland, Russia, Joined Realm, China, and others, it is around two centuries old, but in India, greenhouse cultivation for commercial production is hardly thirty years old.
- In China protected cultivation started in the 1990s and today the area under greenhouse is more than 2.5 MHA and about 90% area is under vegetables

Israel is one country that enjoys taking huge benefit of this innovation by assembling quality organic fruits, vegetables, flowers, and so forth in a water deficit desert region. Numerous thousands of sections of land of square measure as of now under glass in the US and similarly monster spaces in Britain and the Kingdom of The Netherlands, place gardening underneath glass was practiced over a century ago. A few crops and various phases of plants might be very productive under various kinds of greenhouse cultivation. With the high reception of greenhouse cultivation in Asia, there's a consistent new advancement in horticulture crop analysis production and development within the associated ventures (Kang et al., 2013)

8.2.2 Status of Protected Cultivation: India

- The Indo-Israel project on protected cultivation started at the New Delhi-based Indian Agricultural Research Institute (IARI)in 1998.
- Be that as it may, the Israeli experts left India in 2003 toward the finish of a five-year project, IARI kept on keeping up with the facility, calling it the Middle for Centre for Protected Cultivation Technology (CPCT).
- The area under protected cultivation revealed toward the end of the twentieth century was around 110 ha in India and the world more than 275,000 hectares
- During the last ten years, this region probably expanded by 10% while perhaps not more.
- Presently, the total area covered under greenhouse cultivation in our country is about 30000 ha.
- The main state areas under greenhouse cultivation are Maharashtra, Himachal Pradesh, and North-East states, Tamil Nadu, and Punjab.
- The major crops grown in the protected cultivation are tomato, strawberry, capsicum, chilies, cucumber, melons, brinjal, rose, gerbera, carnation, orchids, and chrysanthemum

8.2.3 Objectives of Protected Cultivation:

- Protecting plants from environmental stressors, including extreme temperatures, water fluctuations, and pest or disease pressures.
- Optimal water management to minimize weed growth and maximize efficiency. Maximizing crop yield within confined spaces to enhance productivity.
- Reducing reliance on pesticides for crop cultivation.
- Encouraging the growth of high-value, top-quality horticultural produce.
- Improving the propagation of planting materials for better germination rates, uniformity, disease resistance, and resilience.
- Facilitating year-round and out-of-season production of flowers, vegetables, or fruits.
- Generating disease-resistant and genetically superior seedlings for transplantation

8.2.4 Limitations of Protected Cultivation:

- Significant upfront infrastructure costs pose a hurdle in terms of initial investment.
- A lack of skilled labor and limited local replacements present challenges.
- Inadequate technical knowledge in cultivating crops within sheltered settings.
- Labour-intensive operations demanding sustained dedication.
- Requires meticulous oversight and continuous vigilant monitoring.
- Control of specific pests and soil-borne pathogens poses challenges.
- Overcoming obstacles related to repairs and maintenance.
- Necessitates a secure market guarantee due to substantial investment of resources, including time, effort, and finances.

Greenhouse cultivation: it can be defined as a cropping technique wherein the micro-climate surrounding the plant body is controlled partially or fully as per the requirement of crop/species grown during their period of growth.

It ensures

- Conservation the soil moisture
- Efficient use of solar energy

8.3 Protected Cultivation: Importance

Environmental change is turning into an inexorably critical worldwide issue that can at this point not be disregarded. The basic reason is anthropogenic, i.e., impractical utilization of petroleum derivatives, backwoods debasement for industrialization, and quick urbanization with overpopulation (Mukherjee et al., 2016)

- The protection of crops from wind, storm, cold, rain, hail, and frost.
- Because of controlled conditions, there is better germination, plant growth, and development and crops mature faster.
- Worked on quality and quantity of produce with longer shelf life.
- The utilization of water is improved and there is a decrease in its utilization by 40-50 percent.
- Successful use of sources of inputs.
- Attacking of disease furthermore, pests is diminished.
- Year-round crops are cultivated
- Best innovation for commercial production of high-esteem crops like Medicinal plants, flowering plants, and so forth.
- Can be utilized for solar drying of farm produce.
- The association of the labor force can be decreased.
- Crop cultivation under severe climatic circumstances.
- Certain crops are cultivated year-round to fulfill the market needs.
- High-worth and superior quality, even organic, crops grown for trade markets.
- Income from little land possessions expanded a few overlaps.
- Fruitful nurseries from seeds or by vegetative proliferation arranged as and when important.
- More self-employment opportunities open doors for instructed youth on the homestead
- Control of microclimate and insect-resistant elements of the nursery for plant reproducing and, the production of new assortments and creation of seeds

8.3.1 Schemes for Greenhouse Cultivation:

The government of India executes different schemes for protected cultivation at the central and state levels to promote these hi-tech plant-growing techniques. National agencies through their leading schemes viz. National Horticulture Board (NHB), National Agriculture Mission (NHM), Mission for Integrated Development of Horticulture (MIDH)

Rashtriya Krishi Vikas Yojana (RKVY) create awareness and provide financial support to the farmers so that protected cultivation for high-worth horticultural crops can be embraced without any problem

Table 8.1: Various Crops Cultivated Under Protected Structure

Type of crops	Crops name
Fruits	Strawberry, Melons, Figs, Grapes, Papayas, Berries, Passion fruit
Vegetables	Broccoli, Cabbage, Cauliflower, Tomato, Capsicum, Cucumber, Lettuces etc.
Flowers	Roses, Orchids, Gerberas, Tulips, Chrysanthemum, Snapdragon, Carnation, Lilium, Gladiolus, etc.
Nursery	Cuttings and Grafted fruit plants, Vegetables, Flowers, Tissue Culture raised plants, Clonal for Forest plants

8.4 Protected Cultivation: Scope

A. **Cultivation in Problematic Agro-Climate:** in India, most of the crude space is underneath hazardous circumstances like barren, uncultivated lands and deserts. Indeed, even a small part of this space brought under greenhouse cultivation could yield significant returns for the local inhabitants.

B. Greenhouse Enormous Urban Areas:

- The significant interest continues for ongoing vegetables and ornamentals round the year in gigantic urban areas.
- Interest in off-season and excessive-cost crops also exists in enormous urban areas. In this manner, greenhouse cultivation is elevated to satisfy the metropolitan necessities.

C. Export of Horticultural Produce:

- There are fair global demands for farming produce, mainly cut flowers
- Advancements in greenhouse cultivation of commodity export homeward crops are going to be of distinct facilitating towards trade advancement.

D. Greenhouse for Plant Propagation

- Greenhouse cultivation innovation is by and is currently a day's considered a suitable methodology for the raising of seedlings, cuttings and grafted plants.
- Greenhouse offices could build the ability and nature of assembling the stuff.

E. Greenhouse Technology for Biotechnology: Materials developed through the tissue culture area unit will be proliferated up to speed. Hydroponics is likewise expected to control environmental conditions for raising and developing plants.

F. Greenhouse for The Cultivation of Endangered and Medicinal Plants: India has a great many energizing spices and endangered plant species like orchids that are known for huge-scope cultivation. The greenhouse could offer the appropriate style of environmental conditions for the intensive cultivation of those plants.

8.5 Conclusion:

Protected cultivation is a vital technique in horticulture that offers numerous advantages, from enhanced crop protection to improved yield and quality. Its continued adoption and innovation are essential for sustainable and efficient horticultural production in a changing agricultural landscape. Greenhouses are by and large monetarily utilized for the production of exotic and off-season vegetables, export of quality cut flowers, and raising quality seedlings. Economic returns from high-esteem agricultural produce can be expanded significantly when grown under greenhouse conditions.

8.6 References:

1. Ayas S, Orta H and Yazgan S. 2011 Deficit irrigation effects on broccoli (*Brassica oleracea* L.) var. Monet yield in unheated greenhouse conditions. *Bulgarian Journal of Agriculture Science,* 17: 551-559.
2. Iqbal R, Raza MAS, Valipour M, Saleem MF, Zaheer MS, Ahmad S and Nazar MA. 2020. Potential agricultural and environmental benefits of mulches- a review. *Bullet. of the National Research Centre,* 44(1): 1-16.
3. Jensen MH. 2002. Controlled environment agriculture in deserts tropics and temperate regions-A world review. *Acta Horticulture,* 578: 19-25.
4. Pahuja R, Verma HK and Uddin M. 2013. A wireless sensor network for greenhouse climate control. *IEEE Pervasive Computing,* 12(2): 49-58.
5. Santosh DT, Tiwari KN, Kumar V, Singh R and Reddy GA. 2017. Microclimate control in greenhouse. *International Journal of Current Microbiology and Applied Science,* 6(3): 1730-1742.
6. Sojitra MA, Patel ML and Satasiya RM. 2023. Importance of Protected Cultivation in Horticulture Crops. *Agri-India Today,* 4(1):56-62.
7. Kang Y, Chang YCA, Choi, H. S. and Gu, M. 2013. Current and future status of protected cultivation techniques in Asia, *Acta Horticulture, ISSN*: 0567-7572.
8. Mukherjee A, Rakshit S, Nag A, Ray M, Kharbikar HL, Shubha K and Burman, RR. 2016. Climate change risk perception, adaptation and mitigation strategy: An extension outlook in mountain Himalaya. In *Conservation Agriculture* Springer, Singapore, 257-292.