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Enhancing Cucumber Cultivation in Polyhouse Using Biochar Based Substrate

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Protected cultivation encompasses various structures such as greenhouses, naturally ventilated polyhouses, shade-net houses, insect-proof net houses, and plastic mulching systems (Jensen et al., 1995). Among these, polyhouse farming has gained considerable popularity due to its cost-effectiveness, ease of management, and ability to significantly improve crop yield and quality (Castilla, 2013). As climate variability continues to pose challenges to conventional farming, protected cultivation is increasingly recognized as a smart and sustainable agricultural practice that contributes to food security, efficient resource utilization, and enhanced farm profitability (Singh et al., 2018). Greenhouses are available in several designs, including lean-to, even-span, uneven-span, ridge-and-furrow, saw-tooth, and Quonset types. The choice of structure depends on climate, crop, and economic considerations (Tiwari et al., 2003).

Choice of Crops

Protected cultivation is highly suitable for vegetables belonging to the Solanaceae and Cucurbitaceae families, including tomato, capsicum, brinjal, cucumber, melon, watermelon, and summer squash. These crops adapt well to the controlled conditions inside greenhouses and have a long cultivation period, enabling continuous production(Singh & Sirohi,2006).

Crops Commonly Grown Under Protected Cultivation

Category	Examples
Vegetables	Tomato, Capsicum, Cucumber, Broccoli, Red cabbage, Leafy vegetables, Radish
Flowers	Gerbera, Chrysanthemum, Rose, Carnation, Lilium, Orchid, Gladiolus
Fruits	Strawberry
Seedlings and Nursery	Vegetable and flower seedlings, tissue culture plants, citrus, mango, pomegranate, guava, litchi and other grafts

Shade Net House

Shade-net houses are covered with polyethylene nets that permit adequate sunlight, air, and moisture while reducing excessive light intensity. By modifying the microclimate, they help meet the varying light requirements of different crops and are commonly referred to as net houses or shade-net houses. It allow farmers to create optimal microclimate for crops(Tiwari et al.,2003).

Tunnel Farming

Tunnel farming uses semi-circular polythene-covered structures to protect crops from rain, frost, pests, and other adverse conditions. High tunnels, walk-in tunnels, and low tunnels are widely used for crops such as cucumber, tomato, pepper, carrot, and lettuce.



Scope of Protected Cultivation

- Tamilnadu among the leading states in flower cultivation.
- Floriculture contributes to the export of horticultural products from India.
- The Government of India promotes protected cultivation through schemes at both central and state levels.
- Organizations such as NHB, NHM, MIDH, and RKVY provide awareness, technical guidance, and financial support for adopting protected farming.

Advantages

- Certain crops can be grown throughout the year.
- Crop yields are often much higher than in open-field cultivation.
- Produce Cultivation is possible under unfavourable agro-climatic conditions.
- quality improves considerably.
- Water and fertilizer use become more efficient.
- Pest, disease, and weed management are easier.
- Income per unit area increases.
- The technology offers opportunities for export-oriented production.
- Protected structures are suitable for producing improved hybrids and micro-propagated plants.

Limitations

- High initial investment is required.
- Skilled labour and technical knowledge are essential.
- Operations require precision and constant attention.
- Continuous supervision is necessary.
- Some invasive pests and soil-borne diseases are difficult to manage.
- Repair and maintenance can be expensive.
- Assured marketing is important for profitability.

Conclusion

Protected cultivation is transforming agriculture by creating a controlled environment where crops can grow successfully despite external weather conditions. With support from central and state horticulture departments and the availability of subsidy schemes, more farmers are adopting this technology. Its ability to increase productivity, improve quality, and reduce production risks makes protected cultivation an important component of sustainable and secure food production in the future.

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