

Poly Tunnels: Advantages, Present Status and Future Prospects– Review Study

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ABSTRACT

Protected Cultivation practices are cropping technique to maximize the plant yield by controlling the micro environment around the plant either partially or fully during the time period of plant growth. Commonly used protected cultivation practices are greenhouse (forced and naturally ventilated), shade net house, polythene tunnel and mulching, raised beds and drip irrigation. Inside the greenhouses, micro controlled climate is maintained by changing the humidity, temperature and ventilation to facilitate healthy growth of the plant. These innovations needs careful planning, mindfulness and data about course of events of creation and also, gather time to correspond with high market costs, selection of assortments embraced for the slow time of year conditions. Nursery is a counterfeit structure takes a shot at the wonder which is known as nursery impact. Poly tunnel has all in all two essential parts, initial one is framework and second one is creation innovation of harvests. Foundation includes different designing parts of secured structure improvement. The second part creation innovation of harvests includes logical examinations to build up the assortments appropriate for ensured development, picking the kind of yields and normalizing the creation conventions. Polytunnels can be used to provide a higher temperature and/or humidity than that which is available in the environment but can also protect crops from intense heat, bright sunlight, winds, hailstones, and cold waves. This allows fruits and vegetables to be grown at times usually considered off season; market gardeners commonly use polytunnels for season extension. Legislature of India is additionally furnishing half appropriation on all out use with a most extreme slice off limit up to 4000 m² for each recipient for reception and introducing nurseries under National Horticulture Mission.

KEY WORDS: PROTECTED CULTIVATION, POLY TUNNEL.

INTRODUCTION

The impact of abiotic and biotic stresses under the present changing climate dictates the crop production and quality. The foremost constraints in horticultural crop production in North Indian condition are the extremes of temperature, sunlight, water, relative humidity,

weeds, nutrient deficiency, wind velocity, carbon dioxide concentration and diseases and insect pest incidence. Protected cultivation means to grow with improved quality out of season under protected structures, thereby increasing the profitability for the farmer especially in hostile climatic conditions. This technology has a potential to cater for supply of high quality vegetables, flowers and fruits in the peri-urban areas by reducing the transportation time and delivering fresh produce. For Indian ranchers, this innovation can help in making worthwhile gets back from different high worth yields and will grant enough gauges to contend at International level (Nair et al 2014). The greenhouses had the second largest share in terms of the installation cost.

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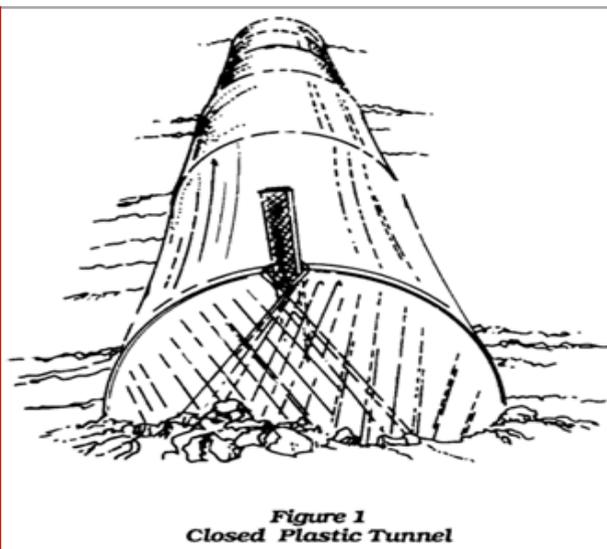
A polytunnel is a passage normally produced using steel and canvassed in polyethylene, generally semi-round, square or extended fit as a fiddle. The inside warms up in light of the fact that approaching sunlight based radiation from the sun warms plants, soil, and different things inside the structure quicker than warmth can get away from the structure. Air warmed by the warmth from hot inside surfaces is held in the structure by the rooftop and divider. Temperature, mugginess and ventilation can be constrained by gear fixed in the polytunnel or by manual opening and shutting of vents. Polytunnels are for the most part utilized in calm areas in comparative manners to glass nurseries and column covers. Other than the latent sun based warming that each polytunnel gives, each variety of helper warming (from nursery warming through negligible warming to unheated houses) is spoken to in current practice. The settling of column covers and low passages inside high passages is additionally normal.

Polytunnels can be utilized to give a higher temperature as well as moistness than that which is accessible in nature however can likewise shield crops from serious heat, brilliant daylight, winds, hailstones, and cold waves. This permits products of the soil to be developed on occasion generally viewed as slow time of year; market planters regularly use polytunnels for season expansion. Past season expansion, polytunnels are likewise used to permit cold-solid yields to overwinter in areas where their strength isn't exactly sufficient for them to endure outside. Temperature increments of just 5 to 15 °C (9 to 27 °F) above outside surrounding, combined with assurance from the drying impact of wind, are sufficient to let chosen plant assortments develop gradually yet soundly as opposed to biting the dust (Del Amor 2007).

Plastic tunnels are small greenhouse-like structures, covering the plants along the row. These tunnels are 18" high by roughly 30" wide at the base and are erected with wire hoops and covered with clear plastic. The tunnels promote early growth by warming the air surrounding the plants, using heat from the sun. The tunnels also protect plants from frost that can destroy or damage them. Greater overall crop yields are obtained when the plants come into earlier production and continue to bear throughout the season. This combination of earliness and greater yields can significantly increase profits for the growers (Figure 1).

Crops should be grown under poly tunnel: The determination of the sorts of yields to develop under tunnels is a significant choice and ought to be made cautiously. The decision ought to incorporate the thought of the harvests most appropriate for burrow development, extended costs over the market time frame for the foreseen market, and expected yield on a for each section of land premise. Harel et al 2014 conducted a study on high value vegetables like tomato, cherry tomato, shaded capsicum, parthenocarpic cucumbers, french beans (pole type), winter watermelon, muskmelon and strawberries can be become effectively unavailable under poly-tunnels

in Northern India. The innovation has likewise been demonstrated important to deliver joined natural product plants all year. Through experimentation, producers may discover different yields that might be developed effectively on their homestead under tunnels.



1.2.1 Points to be considered while constructing poly tunnel:

- The poly tunnel should be constructed on the north and the west face to protect from winds, whereas it should remain open on east and south sides for better sunlight and ventilation.
- Before constructing the green house, a plan of required beds and paths on the ground are to be prepared.
- A proper selection of polyethylene film and shape of roof slope.
- Appropriate controlled climatic conditions to be provided.
- Area size and material of construction of greenhouse.
- Precautionary measures for plant protection.

1.2.2 Advantages of poly tunnels

- It supplies vegetables and flowers throughout the year.
- By adapting different protected cultivation practices, horticulture produce can withstand even unfavourable climatic conditions.
- Environmental factors such as water scarcity, arid land and irregular monsoon etc doesn't affect protected cultivation and thus it is lucrative to farmers.
- It is possible for cropping multiple times on the same piece of land.
- Growers yield better returns during off season
- High quality and healthy seedlings of horticultural crops can be grown.
- It improves the profitability per unit of land, better utilization of water, work and energy.
- It makes cultivation possible at high altitudes and deserts.

- It makes vertical development possible for horticultural crops using technologies like aeroponics, hydroponics etc and use of vertical beds for production.
- It facilitates the seed production of disease-free costly vegetables
- In this controlled environment, it is easy to manage and control of insect-pests, diseases and weeds.

1.2.3 Limitations of poly tunnels

- High cost of introductory framework (capital expense).
- Less-accessibility of talented skilled labour and their substitution locally.
- Lack of specialized information on developing yields under secured structures.
- It also needs a close supervision and observing.
- A couple of soil-borne microbes are troublesome to oversee.
- Repair and support are significant obstacles.
- Requires guaranteed showcasing, since the speculation of assets like time, exertion and funds, is expected to be high.

1.2.4 Crops grown under poly tunnel

Vegetable	Tomato, Cucumber, capsicum (coloured), red cabbage, raddish, spinach, leafy vegetable
Flower	Gerbera, Gladiolous, rose, Chrysanthemum, Carnation
Fruits	Sapota, Strawberry

Secured development includes a complex arrangement of practices and innovations which require expound arranging, manufacture, the executives and value of horticultural crop yields (Adhikary et al 2020) to take bit of advantages of season, request and decision of market. It gives open doors for the development of horticultural crops in a pioneering structure for the up markets in metropolitan and semi-metropolitan territories, other than enabling youth, and innovation drove customary methods of yield development to such present day techniques.

1.3 Effect of low tunnel technology on yield of vegetables: Saini and Singh (2001) conducted a research study on growth and yield of chilly crop under low tunnel polyhouse, at research farm of Soil and Water Engineering Department at Punjab Agricultural University (PAU), Ludhiana-India. They found that there was no significant effect on the yield of chili due to variation in perforations on polythene cover. Drip irrigation system with IW/CPE ratio of 0.50 and 30 cm low tunnel polythene cover gave the best yield and water saving. Helbacka (2002) conducted a study on row covers for vegetable gardens. It was re-ported that many cucurbits (squash, cucumber, and melons) respond well under row covers with increased yield of as much as 25%. Joublan and Vergara (2003) conducted a study on

vegetative and productive development of strawberry (*Fragaria X ananassa* Duch.), using row cover of spun-bonded polyester with different densities.

Row covers were placed directly over the plants as a tunnel without any support structure. Treatments were comprised of a control treatment (without row covers), row covers of 20 g/m² and row covers of 30 g/m². Fruit production started 4.8 and 2.2 days earlier under 20 and 30 g/m² row covers, respectively, than under the control treatment. The use of row covers also increased the number of fruit and weight, yield per plant and sugar concentration compared to the control treatment. The best results were obtained with 30 g/m² row covers. Henandez et al. (2004) was conducted studies on row covers for quality improvement of Chinese cabbage for three years in the area of Granada, Spain, under a Mediterranean continental temperate climate, on 55-day cycles with transplanting in mid-march.

The mean commercial yield for the 3-years was 1 1.9 kg/m² under row cover compared to only 2.1 kg/m² in open air, owing primarily to important number of non-commercial cabbages. Vishnuvardhana et al. (2004) conducted a study on the economics on the propagation of cashew grafts in a mist chamber, naturally ventilated green house, low tunnel and shade net during the summer, monsoon and winter season. The initial investment for the establishment of the propagation structure (100 mi) reached Rs. 8,500 for the shade net, Rs. 300,000 for mist chamber, Rs. 36,400 for naturally ventilated green house and Rs. 21,000 for the low tunnel. The highest net profit was obtained with propagation in low tunnels, followed by propagation in a naturally ventilated green house, mist chamber and shade net.

2. Present Status of Protected Cultivation in India and in the world: In various parts of the world the viability of this innovation has been demonstrated. The zone under ensured development has increased exponentially in different parts of the globe by adopting practices like plastic mulching, polythene low tunnels, polythene walls, plastic-covered high tunnels, polythene-covered walk-in tunnels, temporary and permanent bug verification net houses and other different types of greenhouses etc. Protected Cultivation which has risen up from Northern India (Gyan et al 2010) invigorated its improvement in different pieces of the world including Northern America, Africa, Asia, Mediterranean region and Oceania with changing paces of progress.

Right now in secured development China is driving on the planet with a zone of around 3.5 million hectares out of which almost 96% is just being utilized for business development of vegetables and crossover seed creation of vegetables. A concurrent development has additionally been seen in different nations like India and African sub-mainland yet the achievement rate changed fundamentally. Singh et al 2019 suggested that this was a direct result of helpless arrangement between the predominant agro-climatic states of the

locales and plans of secured structures. Later on, it was understood that the ensured agriculture technological methods and strategies to be received and lined up with the nearby agro-climatic and financial conditions. This was accomplished through innovative work, expansion and preparing. In India secured cultivating of vegetables and other high-esteemed plant produce began through Indo-Israeli venture on greenhouse development started at Indian Agricultural Research Institute (IARI) in 1998. In 2003 Israeli specialists left India and IARI kept on keeping up the office by calling it as Centre for Protected Cultivation Technology (CPCT).

Centre for Research in Rural and Industrial Development (CRRID) conducted a survey which shows vegetable or flower yields under protected cultivation are 5-10 times higher than the open cultivation depending on the crop. In India, agriculture plays a vital role in the country's economy with over 58% of the rural households depending on farming and contributing around 17-18% to India's GDP. In the last two and half decades, India having diversified agro-climatic conditions shown an overall growth of around 75,000 hectares area under protected cultivation. Depending upon the prevailing conditions of various regions and seasons in India, the success rate varied significantly. Protected cultivation technologies faced a tough challenge in North Indian plains due to its harsh climatic conditions whereas other regions with mild climatic conditions like Pune, Bangalore and some parts in North-Eastern states has achieved high success rate.

To advance development of secured development innovation in India, Government presents various strategies as far as appropriations and dispatches different plans with different State Governments like TM (Technology Mission), MIDH (recently known as NHM), RKVY, NHB and so on. Through noteworthy adjustments in specialized plans of different secured structures appropriate to the district's particular needs under winning climatic states of India, prompted development in the zone and creation under ensured development. This was accomplished through ideal work completed by different public sector in situations in innovative work territory as a team with created nations. In order to raise the farmer's income and improve their availability for extended period, National Horticulture Board (NHB),

Ministry of Agriculture, Government of India considered greenhouse technology potential in producing high quality of wide range horticultural products. Through various schemes, NHB extended support growing and processing of horticultural crops (vegetables, fruits, plantation crops, ornamental and spices etc) in the country (Singh 2015). Department of Agriculture and Cooperation has been actively encouraging capital investment in protected cultivation by extending capital investment subsidies extending from 25% to 50% of normative capital cost. Under other schemes of Central and State Governments, sizable financial assistance is also available for horticulture crops. Under various Government schemes, the norms for subsidy varies with

the type of infrastructure such as cooling and heating purpose, naturally ventilated and fan and pad system; low, medium and high cost (Bamboo) poly houses etc;

3. Future prospects: The new age farming technique "Protected Cultivation" plays a critical role in the roadmap of actualizing Honourable Prime Minister's vision of 'Doubling Farmers income by 2022'.

Various opportunities exist for nursery men, business crop producers, seed makers and analysts in using greenhouse for their advantage. In mild and subtropical zones secured cultivating can without much of a stretch be utilized for bringing vegetable nursery up in late winters which could be relocated in late-winter. This can propel the editing by coordinated and half month and along these lines, may give profitable cost to the ranchers. In fields green house might be used for all year engendering of numerous tropical and subtropical natural products which could demonstrate an aid for nursery men.

All year round cultivation of vegetable crops, for example, tomato, capsicum and cucumber is conceivable under secured climate with single/multi crop in a year, which gets slow time of year more exorbitant cost with quality produce and furthermore with lower cost of development and longer length of yield (Issac 2015). There is appeal of hued capsicum, parthenocarpic cucumber and cherry tomato in the inn business and fare market all through year at exceptionally alluring business sector cost of the produce. India has an immense degree for trading cut - blossoms, for example, Gerbera, Carnation, Lilium and so on developed under secured climate.

CONCLUSION

The secured development of high value vegetables and flowers production has gotten indispensable both from economic and climate perspectives. It offers a few preferences to develop high value yields with improved quality considerably under ominous and negligible conditions. Though because of high preparing needs of the poly tunnel cultivators and some low quality produce with pesticide deposits has involved extraordinary concern. These issues can without much of a stretch be tended to by coordinating different creation what's more; security works on including area explicit planning and development of the polyhouses for effective info use. Making mindfulness among the greenhouse cultivators for sensible utilization of pesticides for safe creation can be instrumental in giving quality items without contaminating the climate.

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