

REPORT ON GREENHOUSE



Central University of Himachal Pradesh

[Established under the Central Universities Act 2009]

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Executive Summary

Green house is a frame structure which covered with transparent material like glass, polyethylene and poly carbonate etc. The greenhouses are being used for growing high value vegetables, Flowers, nursery of different crops, ornamental and medicinal plants in Hilly region such as in Himachal Pradesh. The advantages of greenhouses are high productivity per unit area as the genetic potentiality of the crop can be fully exploited, off-season vegetables and nursery can be grown which fetch high prices in the market, good quality produce and it is easy to protect the crops against pests, diseases and extreme climatic conditions.

Green house will help research scholars, undergraduate and postgraduate students for smooth running of the plant-based experiments. In Central University Himachal Pradesh, Dharamshala, green houses are potential used to carry out the research experiments in different locations. Presently two Ph.D. scholars have conducted their experiment on Brussels sprout (*Brassica oleracea* var. *gemmifera*) at Krishi Vigyan Kendra, Kangra and another student conducting experiment at Choudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur on *Petroselinum crispum* (Parsley).

Greenhouse

Introduction

A Greenhouse is a structure with walls and roof made chiefly of transparent material, such as polyethylene, polycarbonates, green fabric cover in which suitable controlled climatic conditions are created and maintained for growing off-season crops and other endangered species of plants. These structures range in size from small sheds to industrial-sized buildings. The purpose of a greenhouse is to shield crops from excess cold or heat and unwanted pests. Certain types of economically important plants are cultivated inside greenhouse. A greenhouse works by converting light energy into heat energy. The shading cloth and polyacrylic sheet covering the greenhouse help in absorbing the sunlight and keep the environment warm in extreme winters. The greenhouse offers protection to the plants during adverse conditions. It also protects plants from harmful pests and predators that may severely damage the crop. Greenhouse will provide the ideal environment to learn about variety of plant species including herbal, medicinal, succulents and xerophytes.

Objectives

The objective of protected cultivation provides the ideal environment to cultivate variety of plants including vegetable crops, flowers, herbal, medicinal, succulents, xerophytes etc. It will also help researchers to study enormous plant diversity and different plant kingdoms. Students of Department of Life Sciences and Environmental Sciences will be benefitted, as it will provide plant lab material for the related experiments.

It is an established fact that the protected cultivation increases the yield manifold along with better quality produce by achieving higher water and nutrient use efficiencies, increasing photosynthetic efficiency and reducing transpiration losses. In hilly region such as in Himachal Pradesh which is situated in North Western Himalaya experiencing low productivity due to varying problems like scattered and small land holdings, difficult terrain, fluctuating and unpredictable weather, prevalence of low temperature during autumn winter and spring and large variation in seasonal and diurnal temperature in open environment cultivation .

Importance of Greenhouse

- One of the main advantages of Greenhouse is that it offers a longer growing season. Temperatures don't vary as much within a greenhouse, since the sun's radiation is trapped in the enclosure, retaining the heat within the structure. Growing seasons can be extended, even in cold climates. Greenhouse protects the plants from outside rain and keep environment dry.
- Another advantage of greenhouse is that it protects plant from pest and pathogens. Pests and predators including squirrels can be easily kept out. Smaller pests, like certain rodents, can be kept out as the sealing of the green cover creates a boundary that blocks pest entry in the greenhouse.
- Bad weather like high winds, dust storms, thunder storms and blizzards can all cause damage to the naturally grown crops, however, a greenhouse offers plants a layer of protection from these elements.

Hydroponics

Hydroponics is a technique of soil-less culture. Hydroponics is a technique in which plants are growing without soil using some mineral nutrient solutions in water. The land plants are grown with their roots suspended in the mineral nutrient's solution like gravel, mineral wool, or perlite. In soil-less conditions, in a hydroponics system, the roots are immersed in the nutrient solution. For vegetable production nowadays about 3.5% of the international area cultured under tunnels and greenhouse uses soilless agriculture techniques based upon hydroponics solutions. The hydroponics technique face many environment challenges and it also helps out in the management of production system for better use of natural resources and lowering the malnutrition. Undoubtedly this process on the field scale signified the appearance of many benefits such as production and the use of mineral recourses which including water in a well organised way. Hydroponics is the very fastest-growing technique in the field of agriculture. It would be very useful for food production in the future. Due to population is increasing day by day and fertile land decline due to poor management, people shift their focus on new technology like Hydroponics and Aeroponics to feed the nation. Changes in climatic factors and natural misadventure like drought and

floods etc are some of the reasons to switch to new technology, which undertaking food productions safely.

Importance of Hydroponics

- Methods of hydroponic produce healthy crops with high yield and there is no possibility of any soil-borne insects and pests' diseases.
- Soilless culture (hydroponic) provides organic food and there is no use of pesticides and harmful toxins too.
- Hydroponic needs less space in consumption to soil garden as a plant with little root can be grown very close to each other.
- Crops grow two times faster in hydroponics which doubled the yield and from same land spaces higher production is obtained.
- In this technique there is no wastage of water and water is reused and recycle. It only required 20th part of water to as compare to conventional agriculture.
- The less labour is required as compared to traditional farming and many other traditional farming methods are neglected like spraying, weeding, watering and tilling.
- No problems about changing in climates crops can be grown all year round.
- Hydroponics is an abiotic stressless free farming technique and eco-friendly practice of course no harm to nature.

Brussels sprout

Classification-

Kingdom-Plantae

Phylum-Spermatophyta

Class-Dicotyledonae

Order- Capparales

Family-Brassicaceae

Genus-*Brassica*

Species- *oleracea* var. *gemmifera*



Habitat –

- Brussels sprout is a delicious cold-climate winter vegetable that has been grown in Brussels (capital of Belgium) since the 13th century. It took 500 years to reach English gardeners but now it is a very popular crop in North-West Europe and the California state of USA. In other parts of the world, it is grown on a very limited scale.
- Sandy and silt loam soils are most suited for Brussels sprouts. It grows well in drained upland soil. Soils must-have the capability for retention of good moisture. Soil pH should be 5.8 to 7.2 for better growth. Brussels sprout requires a cool climate.
- The suitable temperature for seed germination optimum growth is 16- 20°C.

Special Characteristics –

- The sprouts resemble miniature cabbages and are borne in the axils of leaves along and around the main stock progressively from the bottom upwards.
- The stem of the crop makes normal longitudinal growth. Buds in the axil of petiolate leaves develop into the swollen small head like structure about 5-8cm in diameter.

Importance –

- Brussels sprouts, as with broccoli and other brassicas, contains sulphoraphane, a chemical believed to have potent anti-cancer properties.
- Brussels sprouts and other brassicas are also a source of indole-3-carbinol, a chemical which boosts DNA repair in cells and appears to block the growth of cancer cells.
- The sprouts are usually cooked and also pickled. This is a very nutritious winter season crop of temperate regions
- Sprouts after cutting vertically into two halves or fried with besan (gram flour) and paste can be used for the preparation of pakoras (fritters)
- Like cabbage head, boiled sprouts can also be consumed after adding salt, butter, and black pepper powder depending upon your taste



Greenhouse in Krishi Vigyan Kendra, Kangra



Seed beds for Brussels sprout

Parsley

Plant Name- *Petroselinum crispum* (Parsley)

Classification

Kingdom-Plantae

Phylum- Tracheobionta

Class- Magnoliopsida

Order- Apiales

Family- Apiaceae

Genus- *Petroselinum*

Species- *crispum*



Habitat –It is native to Mediterranean region and West Asia.

Temperature range- Optimum temperature for germination is 20°C with growing temperatures of 7 °C to 25 °C. Parsley is a shallow rooted crop requiring uniform soil moisture levels.

Direct / Indirect sunlight – Bright, indirect sunlight is ideal for parsley.

Humidity – They need a habitat of high humidity.

pH--It grows well in soils with a pH ranging from 6.0 to 7.0 and an optimum pH of 6.5. Parsley has deep roots and a high water requirement.

Special Characteristics

- It is a Biennial plant. Good source of vitamin A, B, C and phenolic compounds. Parsley is rich in mineral. Seed germination within 3-4 week with good moisture.
- After 5-6 weeks parsley plant is harvesting.
- Multiple time harvesting like chive. Parsley has 20-40% greater aromatic oil compared with conventional field with better quality.

Medicinal use:

- The use of both parsley seed powder and parsley juice have been reported for the stimulation of hair growth when used to massage the scalp, and also for the treatment and prevention of insect bites.
- Parsley infusions were used to treat and regulate menstrual pain.
- Apigenin was demonstrated to be the main compound responsible for this activity *Petroselinum crispum*.
- *Petroselinum crispum* leaves demonstrated antimicrobial activity.
- The latex can be applied on warts and corns to heal them. The dry and raw figs can be very beneficial for constipation.
- It is also grown as an ornamental plant or a house plant.

Additional Feature:

- Major flavonol constituents is Kaempferol, Myristicin and Quercetin.
- The volatile oil of Parsley contain Glycoside called Apiin.
- It is an essential ingredient in cooking



(A)



(B)

Hi-Tech Green House System (A-B)

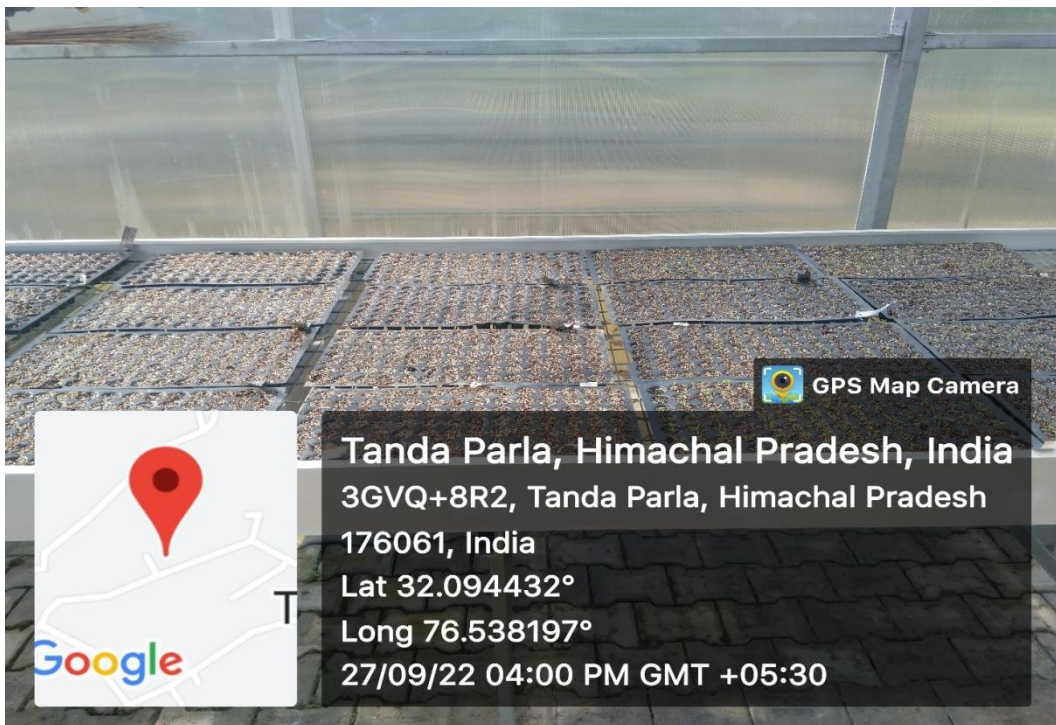


Hydroponic System (DFT)



Tanda Parla, Himachal Pradesh, India
3GVR+M2G, Holta, Tanda Parla,
Himachal Pradesh 176062, India
Lat 32.094491°
Long 76.538528°
27/09/22 03:57 PM GMT +05:30

Hydroponic System (NFT)



Tanda Parla, Himachal Pradesh, India
3GVQ+8R2, Tanda Parla, Himachal Pradesh
176061, India
Lat 32.094432°
Long 76.538197°
27/09/22 04:00 PM GMT +05:30

(A)



(B)

Pro-tray technique to grow Parsley seed (A-B)