GREEN HOUSE

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Greenhouse has been used long back by horticulturists as a mean of forcing rapid growth of plants and extending the growing season particularly in colder areas. These are being used for whole sale production and propagation of floricultural plants, nursery stock of fruit crops and vegetable crops. A greenhouse greatly extends the variety and scope of propagation. Many kinds of green houses are used for propagation but the most suitable type is the one that admits the maximum amount of light. This is important, particularly where most of the propagation is done in late winter and early spring. Good light conditions are essential for the study growth of the seedlings. Experiments have shown that a greenhouse that runs from east-to-west is best for better light penetration in winter and early spring, and consequently preferable for raising seedlings at this time of the year. Moreover, it is important that the green houses should be well away from any kind of shade such as a tree of building, including other greenhouse. Some shelter, however, from north to northeast winds is desirable. These glasshouses may be plastic polyethylene covered or made form fiberglass. Modern greenhouses are well equipped with elaborate structures and have precise control on temperature, light intensity and humidity.

Heating and cooling system in greenhouses:

Ventilation, to provide air movement and air exchange with the outside, is necessary in all green houses to aid in controlling temperature and humidity. The attempt of sloppy green houses near the mud houses in Ladak is an attempt in these

directions. The heat can be conserved by proving sealed polyethylene sheeting outside green houses, glass or fibre glasses.

Environmental control: Greenhouses can be cooled mechanically in the summer by use of large evaporative cooling units. The ―pad and fan‖ system is installed at one side of a greenhouse with large exhaust fans at the other end. Fog or sprinklers can be used to cool greenhouses and maintain humidity but it is costlier than pad fan cooling. A maximum night temperature of 13 to 15.50 C and a day temperature of 24^0C are generally set to start the heaters and fans; respectively. Spraying of green house with whitewash in summer and opening and cooling side and ridge vents with a crank to control temperature and by turning on steam valves at night, whereas humidity is increased by spraying the walls and benches by hand at least once a day.

i) Analog control: In this system proportioning thermostats or electric sensors are used to gather temperature information. Analog controls are costlier than thermostats, but offer better performance.

ii) Computerized environment control: The amplifiers and logic circuit analogs have now been replaced by computerized environmental system, which involves microprocessor, which gathers information on a variety of sensors like temperature, humidity, light intensity, wind directions etc. to provide more precision. Although more costly than thermostats oranalogs but computer controls offer significant energy and labour saving and increases production efficiency in propagation. The deviations from the present levels of temperature and humidity can trigger alarms by the computer.

Green house covering materials: The covering materials used for construction of greenhouses include glass, polyethylene, UV-stabilized polythene, acrylic, polycarbonate and fibreglass. The glass covered greenhouses are expensive but for a permanent long-term installation under low light winter conditions because glass has superior light transmitting properties and less expensive relative humidity problems. Polyethylene materials are light weight and relatively less expensive compared to glass. Being light in weight, permits a less expensive supportive frame work than is required for glass. Polyethylene has relatively short life than glass. The UV-stabilized sheets can last for 3-4 years. Polyethylene having a thickness of 100-200 micron is generally used. The acrylic is highly weather resistant and does not yellow with age, has excellent light transmission properties and retains twice the heat of glass, but it is more costly and brittle.

Polycarbonate: It is probably, the most widely used structures sheet material today. This material is similar to acrylic in heat retention properties, with 90% light transmission of lass. It is light in weight 1/6th of glass and easy to install. It is resistant to impact. Polycarbonate textured surface diffuses light and reduces condensation drip. For providing rigid panels fiberglass is used widely for construction of greenhouse. It transmits 80-90% of light. New materials are continuously coming onto the market, for constructing better glass houses.

Hot frames (Hot beds)

A **hotbed** is a bed of soil enclosed in a glass or plastic **frame**. A hotbed is a bed of soil enclosed in a glass or plastic frame. It is heated by manure, electricity, steam, or hot water pipes. Hotbeds are used for forcing plants or for raising early seedlings. Instead of relying on outside sources of supply for seedlings, you can grow vegetables and flowers best suited to your own garden. Seeds may be started in a heated bed weeks or months before they can be sown out of doors. At the proper time the hotbeds can be converted into a cold frame for hardening. Hot beds are small low structures, used for propagation of nursery plants under controlled conditions. Hot beds can be used throughout the years, except in areas with severe winters, where their use can be restricted to spring, summer and fall. Another form of a hotbed is a heated, low polythene tunnels or sun tunnels that is made from hooped metal tubing or bent PVC pipe, which is covered with polyethylene. The standard size of hot frame is 0.9by 1.8 m. If polyethylene is used as the covering, any convenient dimensions can be used. Plastic and PVC tubing with recirculation of hot water are quite satisfactory for providing bottom heat in hot beds. Seedlings can be started and leafy cutting rooted in hotbeds early in the season. For small propagation operations, hot beds structures are suitable for producing many thousands of nursery plants, without the higher construction expenditure for larger, propagation houses.

Propagation frames

Sometimes in a greenhouse, the humidity is not enough to allow satisfactory rooting in the leaf cuttings. In such cases, enclosed frames covered with glass or plastic material may be used for rooting of cutting. These frames are useful only on grafted plants as these retain high humidity during the process of healing. Large inverted glass can also be kept over a container having cuttings. Though, high humidity is required is such frames but ventilation and shading are necessary after the rooting process has started in the cutting. Warm and humid conditions inside these structures provide excellent environment for growth of pathogenic organisms, which may infect the propagation

material. It is therefore, necessary to maintain cleanliness and proper sanitation in such structures.

Cold frames

A cold frame is a bottomless box with a removable top. It is used to protect small plants from wind and low temperatures. No artificial heat or manure is used inside a true cold frame but many gardeners experiment with a variety of soil conditions. They utilize the sun's heat. The soil inside the box is heated during the day and gives off its heat at night to keep the plant swarm. The frame may be banked with straw or strawy manure to insulate it from the outside air and to retain heat. Cold frames include not only low polyethylene-covered wood frames or

unheated sun tunnels that people cannot walk within, but also low-cost, poly-covered hoop houses. The covered frames should fit tightly in order to retain heat and obtain high humidity. Cold frames should be placed in locations protected from wind. The primary use of cold frames is in conditioning or hardening of rooted cuttings or young seedlings prior to field, nursery row or container planting. Cold frames can be used for starting new plants in late spring. Low-cost cold frame construction is the same as for hot beds, except that no provision is made for supplying bottom heat .In these structures, only the heat of the sun is retained by the transparent or opaque, white polyethylene covering. When young, tender plants are first placed in a cold frame, the coverings are generally kept tightly closed to maintain a high humidity but as the plants become adjusted, the sash frames are gradually raised or ends of the hoop house to permit more ventilation and drier conditions. The installation of mist line or irrigation provision in cold frame is essential to maintain humid conditions. During sunny days, high temperature condition can be controlled by providing ventilation and shading.