

**Plant Propagation
Structures****The Scientific Agriculture**
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The structures which facilitate propagation of plants are called propagation structures. Propagation structures are required for propagating plants by seed, cuttings and grafting. Propagation structures are of two types; i) The first type a structure with temperature control and ample light, such as a green house, modified Quonset house, or hotbed-where seeds can be germinated or cuttings are rooted or tissues culture micro-plants are rooted and acclimatized and the ii) The unit is structure into which the younger, tender plants can be moved for hardening, preparatory to transplanting out-of-doors. Cold frames, low polyethylene tunnels or sun tunnels covered by *saran* cloth and lath-houses are useful for this purpose.

Greenhouses

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 or building, including other greenhouse. Some shelter, however, from north to northeast winds is desirable. These glasshouses may be plastic polyethylene covered or made from fiberglass. Modern greenhouses are well equipped with elaborate structures and have precise control on temperature, light intensity and humidity.

The size and type of greenhouses, primarily depends upon the need of the plant propagator. Glass covered greenhouses are expensive but they have long life. However, for shorter benefits, plastic covered greenhouses can also be made. Two types of plastics are available for the construction, polyethylene and fiberglass. Both are lightweight and in expensive as compared to glass. Plastic covered greenhouses are lighter than glass cover edones but there is very high increase in humidity is such houses, especially in winters, which results undesirable water drops on the plants. It can however be overcome by making adequate ventilation. Polyvinyl chloride (PVC) has also been used in construction of greenhouses but it tends to darken pre-maturely in sunlight. In India, construction of temporarily low-cost poly-houses is in fashion for raising nursery of fruit plant in off season. Such low cost greenhouses are constructed either on wood or metal framework and are covered with polyethylene sheet of 0.10 to 0.15mm thickness, which is resistant to ultra-violet rays. These houses are equipped with thermostat, cooler or an air conditioner or humidifier etc for rigid control on temperature and humidity. Greenhouses made from fibreless sheet are more durable than the polythene houses, but are quite expensive. In greenhouses, two types of beds are used for raising goring seedlings. In greenhouses, the beds may either be prepared on ground itself or raised beds or bench type

beds are used. Greenhouse structures vary from elementary home constructed to elaborate commercial installations. Commercial greenhouses are usually independent structures of even span, gable-roof construction, well proportioned so that the space is well utilized for convenient walk ways and propagating benches. On commercial scale several greenhouses units are often attached side-by-side for eliminating the cost of conversing the adjoining walls with glass or polyethylene. The heating and cooling equipment is more economical to install and operate, as large area can be shared by the same equipment. Greenhouse construction begins with a metal framework, to which metal rash bars are fastened to support panels of glass or some type of plastic materials. Now a day's metal prefabricated green house with pre-bolted trusses are available from several manufacturers. The two most common structural materials for green houses are steel and aluminum. Most greenhouses are made from galvanized steel, which is cheaper, stronger and lighter.

Lath houses

Lath (lath – thin strip of wood) or shade houses provide outdoor shade and protect container-grown plants from high summer temperature and high light irradiance. They reduce moisture stress and reduce the moisture requirement of plants. Lath houses have many uses in propagation, particularly in conjunction with the hardening off

and acclimatization of liner plants prior to transplanting and for maintenance of shade requiring plants. In mild climates, they are used for propagation, along with a mist facility and can be used as overwintering structures for liner plants. However, snow load can cause problems in higher latitude regions. Lath house may be constructed with many kind of materials, although aluminium prefabricated lath house are available, but may be more costly than wooden structure. Most lath houses are covered with high density, woven plastic material such as *saran*, polypropylene fabric and UV-treated polyethylene shade cloth, which come in varying shade percentage and colors. These materials are available in different densities, thus allowing lower irradiance of light, such as 50 percent sunlight, to the plants. They are light weight and can be fastened to supporting posts.

Net house

Net houses are widely used as propagation structures in tropical areas, where artificial heating is not required and artificial cooling is expensive. In these areas, net houses may be constructed with roofs covered with glass or plastic film and its sides are covered with wire net. It provides necessary ventilation and maintains an ideal temperature for germination of seeds and subsequent growth of the seedlings. The roof of net house may be covered with gunny cloth or even with live plant creeper to cut off the solar radiant energy and

to keep the house cool. Net house can be constructed as per the need of the propagator and therefore its size varies with the requirements of the nurserymen.

Bottom heat box

It is a simple box for promoting rooting of cutting in difficult-to-root fruit plants Like mango and guava. It consists of two chambers made from galvanized iron sheets. The outer chamber has a height of 70cm with 46 cm width and the inner chamber has a height of 68cm and width of 44cm. The space between the two chambers is filled with glass wool for heat insulation.

Another chamber is fitted inside the inner chamber with the height of 35cm fitted with two electric bulbs at the bottom for providing heat to the cutting. The innermost chamber is filled with soil mixture or any other propagation medium and the cuttings are inserted in it. Two electric bulbs of 100-watt capacity are fitted at the bottom of the chamber to provide heat and light to the cuttings. Similarly, the temperature in the box is maintained and controlled automatically by a thermostat fitted at the bottom of the chamber. The most ideal temperature to be maintained in the box is $30 \pm 20^{\circ}\text{C}$ because at this temperature, cuttings of mango, walnut, olive and guava root easily and profusely. The initiation of rooting in cutting varies from species-to-species but in general, it takes 1-2 months for proper development of the roots.