

Subject: Botany (Major)

Course: DSE-2

Semester: 5th

Propagation on own root system (Part-1)

1. Cutting:

It is a part of a plant which eventually produce roots after placing it in soil media and produce a new plant, generally true to type of parent plant.

Types of cutting:

- A. Root cutting:** It is very simple and practiced in species which are difficult to propagate by other methods of cutting. Plants like apple, pear, cherry etc. Can be grown by root cutting. New shoots develop from adventitious buds at the proximal end and lateral roots develop from the old root part or from base of new shoots. Mostly root cutting made in early or late winter or in early spring when roots contain sufficient carbohydrate reserve. When plants are well developed, they can be transplanted in pots or nursery beds for growth. Thicker cuttings are mostly better than thin one and produce well developed root and shoot system. Periclinal chimera of bougainvillea with variegated leaves produce green foliage or single color flowers when propagated with root cutting.
- B. Stem cutting:** It is a widely used cutting type and classified into following subtypes.
- a. Herbaceous cutting:** It usually consists of terminal leafy portion of stem of herbaceous plants These are usually soft tender and succulent. Terminal portions of moderately vigorous shoots are considered most suitable. The cuttings are to be prepared just before they are placed in the rooting medium. Under favourable conditions cutting strike root within a short time. Auxin treatment is not essential. Examples of plants propagated by means of herbaceous cuttings are Dahlia, Carnation, Petunia, Sweet potato etc.
 - b. Softwood cutting:** The cuttings are made from soft succulent non lignified new growth of woody plants. Soft stem growth is produced continuously at the tip of the stem during the growing season. Such cuttings are usually low in carbohydrate and it is essential to retain some of the leaves during rooting. Softwood cuttings are extremely susceptible to water loss. Extremely fast growing, soft and tender shoots with immature leaves are not suitable. Slow growing, weak and thin shoots are also not suitable. Softwood cuttings are usually made 10 to 15 centimetre long keeping the terminal bud intact, leaves are removed from the lower nodes and the basal cut is made just below a node. If the upper leaves are very large they may be trimmed to some extent. Treatment with auxin is beneficial. Softwood cuttings which are to be stored for any length of time should be kept cool and moist by wrapping them in damp bags. The base of this cutting should be treated with powdered fungicide or pretreating with the IBA solution. These are liable to quick drying and placed in a mist propagating chamber or a polythene tent. The rate of root production depends on the temperature, the higher the temperature the faster the production of roots.

Optimum temperature is 21 to 24 degree centigrade. Cutting should be hardened and finally they are potted in compost or similar media in the nursery.

- c. **Green woodcutting:** green wood cuttings require same environmental conditions as soft woodcutting. The method of handling and care are also similar. In the green wood cutting the stem is slightly harder and woodier than the soft woodcutting.
- d. **Semi hardwood cutting:** Cuttings are taken from partially matured slightly woody shoots. These are also succulent and tender and usually taken from growing terminal shoots. They are thicker and harder than softwood cuttings. But still susceptible to the problem of water loss. These cuttings have relatively high levels of stored carbohydrate. Such cuttings are usually made 7.5 to 15 centimetre long with several leaves on the terminal end but leaves are removed from the basal portion. Some semi hardwood cuttings are preferably collected during the cooler part of the day. They can be wrapped in moist newspaper or moss and kept away from the sunlight. Treatment of these types of cutting with auxins before planting is beneficial. The cuttings are better rooted under relatively low temperature, partial shade and high humidity. Rooting is complete within 3 to 6 weeks and these are carefully lifted and transplanted in pots or in beds in the nursery.
- e. **Hardwood cutting:** These are made from a wide variety of plants such as conifers, deciduous species and broad leaved evergreens. These should be taken from healthy vigorous stock plants growing in full sunlight. Extremely vigorous or too weak shoots are not desirable. These cuttings from deciduous plants are taken during the dormant season. The optimum concentration of root promoting hormone vary from species to species.

Hardwood cuttings from broad leaved Evergreen plants collected and rooted in anytime during the year. These may be made 10 to 30 centimetres or even longer with diameter of one to 2.5 centimetre depending on the kind of plants. One year old wood is used but in some species 2 year old or older shoots are also preferred. A top cut of one or 2 centimetre above a node is given and basal cut is given below a node. Example: Mango, Citrus, Guava etc. These cuttings may be of 3 types that is straight or simple cutting heel cutting and mallet cutting.

- f. **Leaf cuttings:** Plants with thick and fleshy leaves are generally used. This is simple and efficient method of vegetative propagation. The success of this technique depends on environmental factors such as light, humidity, temperature etc. Either the whole leaf blade, leafblade section or the leaf with petiole is used. This should be made only from leaves that have recently expanded, fully immature leaves and very old leaves are not preferable. Leaf cuttings are basically propagated in a closed case polythene tent or any other similar structures. All the materials, containers, composts and leaves should be kept clean and sterile.
- g. **Leaf petiole cutting:** It is quite simple and reliable method. A complete leaf with its stalk is used as cutting material. African Violet and *Peperomia* are commonly propagated. Well matured leaves with petioles are separated at the base from the stock plant. These cuttings are to be placed in an environment with high humidity,

moderate temperature and sufficient light. In favourable conditions a mass of fine fibrous roots appear at the base of the petiole.

- h. Leaf bud cutting:** Such cuttings usually consist of one to 1.5 centimetre of stem portion bearing auxiliary buds. Deciduous plants are not suitable. Cutting consists of a leaf blade, petiole and a small piece of stem containing a dormant vegetative bud at the leaf axil. Well developed leaves from the current seasons growth are generally used.

Factors influencing rooting of cutting: A.

Internal factors:

- 1. Age of the stock plant:** Ability of cuttings to form adventitious roots decrease with the increase in the age of the plant from the seed. Juvenile plants of mango apple etc. rooted relatively easily but cuttings from mature plant is difficult to root.
- 2. Types of wood:** Cutting from lateral shoots root better than from terminal shoots. In hardwood cutting, rooting is more in the distal portion of the shoot than on the middle or top portion. In most plants better rooting is observed when cuttings are taken either before or after the flowering. Cutting made with heel or a mallet gives much better rooting.
- 3. Role of leaves and buds:** The role of buds on rooting may vary with the time of the year when the cutting is taken. The promoting effect of buds on rooting during the non dormant period is observed. In some cases rooting response of cutting is proportional to leaf area. In most species rooting decrease with the removal of leaves and buds.
- 4. Position of the basal cut:** with reference to the node in some species rooting is better when the cut is made above or below the node, in others better rooting is observed if the cut is made at the node and in some the place of cut is immaterial.
- 5. Physiological conditions of the stock plant:** In some species rooting of cuttings takes place easily irrespective of the time of taking of cuttings but in others a particular time of the year facilitate root formation. The content of starch in the cuttings coincide with strong and weak phases of rooting.
- 6. Wounding:** In some cases wound at the base improves the rooting. It promotes rooting in many ways. It helps in the absorption of more water, growth substances etc. from the rooting medium, hormones and carbohydrate accumulated in the wounded area and it's adjacent cells are stimulated to cell division and it also release ethylene which promotes the rooting.

B. External factors

- 1. Light:** Light plays vital role in the rooting of cutting. Weight of roots produced is nearly proportional to the amount of daily illumination. Photoperiod has also some effect on rooting.

2. **Temperature:** Generally 21 to 30 degrees centigrade day temperature and 15 to 16 degrees centigrade night temperature are optimum for the rooting in most species.
3. **Water:** High degree of humidity is to be maintained in the propagation chamber to prevent desiccation and death of cutting before the rooting. The use of mist maintain high humidity and reduces leaf temperature.
4. **Rooting medium:** It has 3 functions- to hold the cutting in place, to supply moisture during rooting and to supply oxygen to the base of the cutting. An ideal medium is well drained, retains sufficient moisture, porous and free from harmful organisms. Medium effects the percentage of cuttings rooted and the quality of roots produced. The pH and calcium content of the medium has influence in rooting of cutting.