

Production technology for healthy planting material of major cut flowers

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Production of healthy and disease free planting material is difficult task and required lot of experience, planning and management. Since quality planting material (seed/saplings/bulbs etc.) is the basic requirement for successful flower (cut/loose) production for market or exhibition. Generally, plants are produced by two methods i.e. sexual and asexual or vegetative. In India sexual method is followed mostly in flowering annuals (seasonal flowers) and most of the shade, flowering or ornamental trees. Some annual creepers viz., *Clitoria ternatea*, *Cobaea seandens*, *Lethyrus odoratus*, *Ipomea spp* and *Thunbergia alata* are also produced from seeds. The other types of plants which are also commonly propagated in our country from seeds are palms, different cacti and succulents. There are several ornamentals which are not normally propagated from seeds but bred by breeders through seed to get new hybrids. Some of these plants are rose, chrysanthemum, gladiolus, carnation, orchid, dahlia, bougainvillea and hibiscus etc.

Large number of ornamental plants are also produced through vegetative means like cutting, layering, buddings and asexual organs like corm, bulb and tubers. Therefore, the vegetative production technology of major cut flowers is discussed below in order to facilitate the production of quality planting material.

Chrysanthemum

Plants are propagated by rooting terminal cuttings. These vegetative cuttings are removed from stock plants maintained under long day conditions to inhibit flower bud formation. The terminal cuttings of 8-10 cm long that are removed from stock plants can be placed directly in to the rooting medium. To enhance development of roots, basal ends of the cuttings are dipped in a talk powder containing 0.1-0.2% IBA (Rootadex A or No.1 or Seradex). The greenhouse temperature should be between 15-18⁰C and rooting medium temperature between 18 and 21⁰C. 500-600 cuttings are planted per square meter of medium, depending on size of the lower leaf of the cultivar. Until rooting is accomplished fine misting is done intermittently on the cuttings during day light hours. The mist is usually turned off a day or two before cuttings are removed for hardening. Cuttings are well rooted in 10-20 days depending on cultivation and season. Cuttings with roots 1.5-2.0 cm long are desirable since longer roots makes planting difficult.

Any porous mixture that is not toxic can be used as a rooting medium. Perlite plus sphagnum peat moss is perhaps the most common medium. Vermiculite, sand and a sandy soil mixture have also been used as rooting media. Total salts below 15 m eq./lit for mist system not affect rooting. However magnesium should not exceed 70 per cent and high percentage of sodium (more than 67%) will cause “red root” while calcium is necessary for good rooting. Application of gypsum or ground lime stone @ 20-30 kg/100m² can be broadcasted over the surface of the medium prior to the planting of the cuttings.

Carnation

A typical carnation cutting of 10-15 cm long with 4-5 visible pair of leaves weighing about 10 gm should be planted at 5 cm spacing in rooting medium. The rooting medium consists of one part of peat moss and two part of perlite+ sufficient calcium carbonate to bring pH near 7.0. The stem cutting should be broken from stock mother plant to avoid spreading of disease through wound (as with knife). A rooting hormone e should also be used. The cuttings normally are fully rooted in 21 days at rooting temperature of 15⁰C. Maintaining bottom heat at a constant 21⁰C reduce the rooting time to 15 days. The cuttings are watered through intermittent mist on bright warm days at an interval of 10 seconds out of every 4-6 minutes. Full sunlight is preferred for carnation rooting with proper misting.

Sanitation is important in propagation and rooting medium should be steam pasteurized for every successive group of cuttings. The dipping of cuttings in fungicide solution should be avoided, since bacterial wilt disease can be spread with dips. The drenching of cutting over bench is idle for applying of fungicides. Usually applying of nutrients during rooting is not necessary if adequate nutrient status maintained in the stock plants. Foliar fertilization of cuttings can be done.

The propagation from their own plants from vegetative lateral shoots of the flowering plants should be avoided. Since the disease are easily perpetuated and declining plant vigour and productivity occurs. In order to produce disease free plants, stock plants should be grown on raised benches in pasteurized media. These plants should be kept in vigorous and vegetative conditions and maintained by drip irrigation to keep foliage dry. Plant should be sprayed frequently to prevent foliage disease and insect damage. Stock plants should be used only for one season of cutting production.

Rose

Roses can be propagated by seeds, cuttings, grafting and buddings. Seed propagation is used by rose breeder for the development of new varieties whereas the T-budding is used for commercial production of the plants. The budding is done over the rooted root stock of *Rosa odorata*, the most commonly used root stock in Northern India. Some times *Rosa indica*, *R. multiflora* is used for the production of rooted root stock and further budding while *R. multiflora* is popular in South India.

Production of under stock

The 25-30 cm long semi-hard wood cuttings are planted in well developed bed during December to February from mother plant root stock. The cuttings are planted at 45° with the spacing of 30X15 cm. The cuttings are tipped from the bases in Rootadex No.2/B. The field are irrigated as soon as the cuttings are in place to settle the soil around the base. After 20-30 days of planting the under stock sprout and through the growth. During this period adequate soil moisture should be maintained. The moisture stress can cause the wilting among the cuttings. Proper care is practiced in field beds up to June.

Lifting of under stock (rooted cutting)

The rooted cuttings are lifted during 15th July to 30th July and planted in budding block/ polythene bags for budding. The rooted under stock are pruned up to the height of 30-45 cm and one to two shoots are retained. The plants are placed in the 15-20 cm deep pit and press firmly to avoid the air space. The planted under stock sprout 20-30 days later and produce newer shoots from base which further utilized for budding.

Budding of under stock

The budding procedure consist of making a vertical and horizontal cut in the under stock to form a “T”. The T is placed well below the shoot that arise from the under stock. Cuts are made only to the depth of cambium layer. An eye is removed from the marked cultivar making a shallow slicing cut from a shield like piece as backing for the bud. It is inserted between the flaps formed by the bark on either side of the T. A budding tape is wrapped around the shank of the under stock above and below the eye to hold it in place. The budding operations are completed by 15th February.

Three to four weeks after budding under stock is cut approximately one-third of the way through directly above the inserted bud and top is broken over. This places the bud in an apical position on the shank of the under stock, where it begin to grow. Three weeks after the top are broken over they are removed entirely from the plant. Top removal is done in two stages to prevent the complete

defoliation at any time. The digging of the budded plants is begun in mid of October and completed by the end of January.

Orchid

Orchids may be propagated either sexually or asexually. Since, most orchids do not come true from seed, once a hybrid or clonal selection has been made, then all further propagation is done asexual means to be some off-spring will be true to type.

Seed germination technique

Orchid seeds are very small, usually 80-130 μm wide and 470-560 μm long. If put end to end it would take 50 seeds to make a line of 2.5 cm long. The seeds are not only small but also lack of endosperm and hence are difficult to germinate. In their native habitats, germination takes place only when certain fungi are present which supply sugars to germinating seeds until such time as the seedling has sufficient chlorophyll to produce its own sugar and sustain itself.

Vegetative propagation

Cutting: Most monopodial orchids (*Vanda*, *Arachnis*) can be propagated by tip cuttings. *Vanda* tip cuttings are usually 30-37 cm tall and bear up to 12 leaves and usually few aerial roots. Cuttings can be potted and will grow without being put in a propagation bed. *Arachnis* cuttings are usually 45-60 cm in length. They, too will have aerial roots and can be potted directly.

Some monopodial and sympodial orchids produce off-sets. Those genera such as *Dendrobium* and *Epidendrum* produce off-sets in leaf axil. The 3-4 root off-sets can be snapped off and potted up.

Division: *Cattleya* and other *sympodial* orchids are propagated by division of the parent clump. This is usually accomplished on plants that have six or more pseudo-bulbs. The rhizome is cut between the third and forth pseudo-bulbs and both sections are potted up as individual plants. Since, most *cattleya* plants produce only one new leaf per year, most plants are divided every three years. Genera such as *Paphiopedilum* and *Cymbidium* can be divided more frequently, as a division containing only one fan of leaves or one pseudo-bulb is all that is necessary to increase these plants.

Gladiolus

Cormel production: Gladiolus corms are propagated from cormels which grow in clusters on out growth (stolons) between mother and daughter corms. Cormels are usually graded into three sizes: large ≥ 1.0 cm diameter; medium ≥ 0.6 cm and < 1.0 cm; and small < 0.6 cm. Mostly the large size of cormels are used for planting stock production. Carmel stocks should be chosen carefully to prevent the spread of disease into developing corms and preferably should only be from healthy, disease free

and roughed block. The cormel should be treated in hot water (53-55⁰C) to eradicate latent fungus, insects and nematodes for 30 minutes. The hot water treatment can be combined with fungicides like benomyl (0.10 kg/100 litres water), captan (0.18 kg/100 litres) or thiram (0.18 kg/100 litres) to compliment the action of hot water. Two days prior to treatment, cormel should be covered with warm water (32⁰C) to soften the husk. The treated cormels should be air-dried in thin layers in sterilized trays and thus placed in cold storage (2-4⁰C) until planted. Dormancy of large cormels is usually broken within four months of treatment. Root bud swellings indicate that cormels are ready to be planted. It is a good practice to soak cormels in water for 2 days just prior to planting to ensure uniform sprouting.

The soil pH should be 5.8-6.5 and chemical fertilizers 280 kg/ha of a 10:4.4:8.3 (NPK) should be mixed. The moist cormels are planted in single row in 10-13 cm wide furrow spaced 60-75 cm apart. Cormels should be carried with about 8 cm of soil, which should be leveled and compressed. The field should be maintained free from weeds during proper operation. About 130 large cormels are planted/m of row or 1.5 million litre/ha. The soil must be kept moist initially to obtain good germination and later good growth of the crop. The small corms are dug up with a modified potato digger. Yield of around 100 corms larger than 1.3 cm diameter can be harvested per meter of row when large cormels are used. Corms from 1.3 to 2.5 cm diameter are called “planting stock” and are used for the production of flowering size corms.

Planting stock production

Planting stock treatment is similar to the treatment of cormels except the temperature of the fungicide suspension is decreased to about 43⁰C and the time of submerged is limited to 15 minutes. Small corms <2.5 cm diameter are planted in one or two rows per bed at a depth of 6-8 cm. 50-80 number of corm is planted per meter of rows, depending upon the size of corms. The soil should contain adequate moisture and nutrition for good growth. Irrigation should be stopped prior to harvest to prevent rotting of corms in the field and to facilitate the cleaning of the new corms.

Removal of flower spikes improves corm size but many producers allow the first flower open to observe purity of the stock and allowing rouging of off type plants. Corms should be cleaned and dipped in a fungicide solution within two days of digging to obtain maximum effect of fungicide. The corm produced in warm region are dormant and require 3-4 months of cold storage (2-4⁰C) to break this dormancy.

Tuberose

Tuberose is multiplied through bulbs which is planted from February to May and bulbs of 1.5 cm and above diameters are selected for planting. The 8-10 bulbs per metre of rows are spaced in row 30 cm while row spacing is also maintained 30 cm. The bulbs are placed 5 to 8 cm depth over a ridge or in a flat bed. Good amount of potassium fertilizers especially potassium sulphate is applied as a basal dose. The bulbs sprout 10-15 days after the planting, depending upon the temperature. Timely irrigation, weeding and broadcasting of nitrogenous fertilizer is practiced to maintain good growth. The bulbs are lifted in the month of October and November. The bulbs are snapped off from the clump and kept in shade for two to three days. The soil is removed from the bulbs and bulbs are subjected for storage in normal ventilated conditions. The multiplication of bulbs is range from 1:10-15 times.