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**Laveti Gowthami**

Ph.D. scholar- College of Horticulture, Dr. Y.S.R. Horticultural University, Anantharajupeta, Railway Kodur (Mandal), Kadapa, Andhra Pradesh, India

**Anindita Roy**

Assistant professor, Department of Horticulture, MS Swami Nathan School of Agriculture, Centurion University of Technology and Management, Paralakhemundi, Gajapati, Odisha, India

**V Vijaya Bhaskar**

Professor, College of Horticulture, Dr. Y.S.R. Horticultural University, Chinalataripi, Prakasam, Andhra Pradesh, India

**Corresponding Author:**

**Laveti Gowthami**

Ph.D. scholar- College of Horticulture, Dr. Y.S.R. Horticultural University, Anantharajupeta, Railway Kodur (Mandal), Kadapa, Andhra Pradesh, India

## Production details of cut foliages: A boon to farmers

Laveti Gowthami, Anindita Roy and V Vijaya Bhaskar

### Abstract

Floriculture is fast emerging money spinning component in agriculture sector, growing at a modest rate throughout world and has become the potential agricultural activity especially for the developing countries. With the fast changing trends and a constant urge for new innovative products in domestic and leading international flower markets, the flower growers have to respond rapidly. Cut flower production has the potential to increase income for both small and large farms. Varieties should be selected as per the vibrant color, sturdy stems, yield, quality, disease resistance, and vase life. Generally environmentally sound production techniques, increased farm diversification, and increased farm income are basic parts of sustainable farming systems. Specialty in cut flower production and marketing offers both small- and large-scale growers a way to increase the level of sustainability on their farms. The tremendous variety of plants that can be grown as cut flowers allows growers to choose those which are well-adapted to the farm site and grown without large offsite inputs. This variety also makes diversity in both production and marketing possible and the high value of cut flowers can increase farm income. Cut foliages are those which stay green for long time, retain their appearance and do not shed leaves or berries. Ferns and Asparagus are popularly used in flower arrangements because of its year-round availability and good vase life. The commercial cultivation of these cut foliage species helps in improving the livelihood of farmers.

**Keywords:** Cut foliages, profit, varieties, designs

### Introduction

Indian floriculture is now viewed as a high growth dynamic industry. The liberalization of industrial and trade policies paved the way for development of export oriented floriculture. Flower consumption growth raises up to 30 per cent per annum and numerous festivals, along with increasing modernization and per capita income make India a floral super power of the future. Imports and exports of floriculture products from all round the world are increasing year.

Cut foliage is a vegetation used in large quantities as a source of decoration on its own or in association with flowers in bouquets. Evergreen plants with green, silver or variegated leaves are usually used and species with berries are now also becoming popular. A recent statistics from Holland indicated that 25-30% of bouquets now consist of foliage compared to 5%, 15 years ago. This trend is set to increase further because of the green, healthy image presented by such products and because of the predicted increase in consumption of floral products. Floriculture is fast emerging money spinning component in agriculture sector, growing at a modest rate throughout world and has become the potential agricultural activity especially for the developing countries. With the fast changing trends and a constant urge for new innovative products in domestic and leading international flower markets, the flower growers have to respond rapidly. Cut flower production has the potential to increase income for both small and large farms. Varieties should be selected as per the vibrant color, sturdy stems, yield, quality, disease resistance, and vase life. Generally environmentally sound production techniques, increased farm diversification, and increased farm income are basic parts of sustainable farming systems. Specialty in cut flower production and marketing offers both small- and large-scale growers a way to increase the level of sustainability on their farms. The tremendous variety of plants that can be grown as cut flowers allows growers to choose those which are well-adapted to the farm site and grown without large offsite inputs. This variety also makes diversity in both production and marketing possible and the high value of cut flowers can increase farm income. Cut foliages are those which stay green for long time, retain their appearance and do not shed leaves or berries. Ferns and Asparagus are popularly used in flower arrangements because of its year-round availability and good vase life. The commercial cultivation of these cut foliage species helps in improving the livelihood of farmer.

### Definition of cut foliage

Cut foliages are generally attractive in form, color and freshness of leaves and/or stems, substantive in texture with well-furnished sprays, resistant to wilting and long lasting in flower arrangement and delightful in floral designs, bouquets and wreaths. Cut foliage also known as Cut greens or florist's green.

### Importance of cut foliage industry

Cut foliage industry is an integral part of the green industry, which goes hand-in-hand with the cut flower industry. Modern cut flower industry cannot survive without the cut foliage industry, which has emerged as a blooming industry in many countries. There is a great demand, particularly in Europe, USA and Japan for many different varieties of cut

foliage. Cut foliage has enough potential as an alternative for flowers, particularly during lean period. In the sphere of agro-exports, cut foliage trade is identified as an extreme focus segment for rejuvenating the stagnant-economy. India is endowed with various agro-climatic conditions suitable for growing a large variety of foliage plants. Such as abundant sunshine throughout the year, high amount of diversity in indigenous flora, a wide range of soil type, low labour and investment cost. There is relative nearness to the new emerging markets like Japan, Australia and the Middle East. Besides, during the peak demand period in November-March, the weather in India is very conducive for top quality production when the rest of Europe is at a handicap of not being able to grow tropical foliage plants.

### Classification of cut foliage plants

Category	Examples
Trees	Thuja, Eucalyptus
Shrubs	Acalypha, Cordyline, Aralina, Duranta
Creepers	Asparagus, Monstera, Scindaspus, Philodendron
Annuals	Coleus, Cosmos
Grasses	Emu grass, Fountain grass, Beargrass, Pampas grass
Herbaceous perennials	Golden rod, Anthurium, Areca
Palms	Christmas palm, Chinese fan palm
Ferns	Leather leaf fern, Sharon fern

The commercially cultivated cut foliage like that of cut flowers, can be classified into their geometric shapes and usage (line, mass, filler and form). This classification makes it easier to understand how the foliage from different crops can be used in floral designs. The floral designers often classify design elements into four categories as follows:

**Line (linear) materials:** Narrow elongate materials such as Aspidistra leaves, Ligustrum stems and Liatris flower spikes. Line materials often establish the frame work (size and shape) for a floral design.

**Mass materials:** Broad, round materials like individual croton (Codiaeum) leaves or football chrysanthemum flowers. Mass materials are used singly and in groups as focal points of arrangements and are frequently used towards the centre of a design.

**Filler material:** Generally inexpensive, many-branched materials. The various ornamental Asparagus species and baby's breath (Gypsophila) are examples of this group. Filler materials can be used to tie the other elements of a design together, to soften the appearance of an arrangement, to extend design lines and in many other ways.

**Form material:** Distinctive shapes or colouring characterize this group. Palm (Sereona) and croton leaves, and Catleya orchid flowers are commonly used form materials. Form materials are usually the focal points of arrangements and should not be crowded by other design elements.

**Desirable characters for cut foliages:** Consumer's preference for cut foliage depends on: fresh appearance, longer keeping quality, attractive color, shape, texture, stem length, freedom from pest and diseases, freedom from external damage, ability to withstand transport and handling conditions.

### Methods of propagation

**Seed:** Seed propagation is increasing in popularity because the costs are lower than vegetative methods of propagation, there is no need to maintain stock production areas. Examples: Araucaria, Brassia, Coffea, Dizygotheca, Podocarpus. Seeds of tropical foliage plants should be sown soon after harvest because the germination percentage decreases rapidly with increased time between harvest and seed sowing.

**Cuttings:** The most popular method. It includes tip, single or double eye leaf bud, and leaf and cane cuttings. Selection of cuttings depends on: plant form (upright, vine), availability of propagative material and healthy, turgid, disease and insect-free stock plants with no nutritional deficiencies. Maximum leaf surface should be left on cuttings for faster and best rooting response as leaves provide carbohydrates and hormones essential for root development.

- Tip cuttings:** Thorough this, plants are produced short period of time. Small cuttings usually root faster and require less space. Tip cuttings should be 10-15 cm long. Cuttings must be placed 3-5 cm deep. Aglaonema, Diffenbachia, Dracaena and Peperomia are examples.
- Leaf bud cuttings:** The vine-type foliage plants are propagated through leaf bud cuttings. Single eye leaf bud cuttings consists of a short stem section (2 to 4 cm) with an attached leaf. Leaf bud cutting does not produce as many saleable plants as quick as tip cutting, but their initial cost is much less. Scindapsus aureus and Epipremnum aureum are propagated by single and double eye leaf bud cuttings.
- Leaf cuttings:** In this method, the largest number of plants is produced from the least propagative stock material. Rex Begonia, Peperomia and species of Sansevieria are propagated from leaf cuttings that do not have chimeras.
- Stem cuttings:** The stem is usually cut with one eye per

section but stem sections of 30 to 120 cm are used for *Dracaena massangeana*. Foliage plant cuttings should be pressed in to the potting medium carefully until the stem is barely visible, with the eye facing up and out of the media. Aglaonema, Dieffenbachia and Philodendron are propagated from node cuttings.

- e) **Division:** Division is the only method of propagation of some cultivars of Sansevieria. Propagation of Calathea and Chlorophytum ferns and other genera are also obtained by division from parent plants. Healthy disease-free clean stock is especially important when division is used as a method of propagation as nematode diseases and insect related problems are transferred to the new plants.

**Air layering:** Layering is development of roots on the base of the cuttings while it is still attached to the mother plant. Air layering is highly labour intensive and has the problems of desiccation of the material covering the cut portion during dry periods and excess moisture during wet periods. Most air layering foliage plants are Codiaeum, Dracaenas, Ficus, Monstera, Philodendron, etc.

**Runners:** Chlorophytum and *Saxifraga sarmentosa* are propagated through runners.

**Spores:** Spores are commonly used to propagate a number of fern genera. Spores from mature ferns are placed in a rooting medium. Usually peat and misted or a moisture-tight cover is placed over the seed pan until the plants are large enough to pot. Fern production from spores can take one or two years before saleable plants are available.

**Tissue culture:** An important method of propagation for foliage plant production. Rapid multiplication of new cultivars is an important advantage of tissue culture. Aseptic culture of plant tissue, such as protoplasts, cells, meristems, stems, leaf, shoot tips, roots, embryo and ovules in a container containing microbe-free nutrient medium, under controlled environmental conditions suitable for plant development. Dieffenbachia, Philodendron, Spathiphyllum and Syngonium are most commonly propagated through tissue culture.

#### Production technology of cut foliage

**Climate:** Humid tropical and sub-tropical conditions best for cut foliage production. Neither high nor freezing temperatures are preferred. Optimum temperature range is from 25°C to 28°C day and 18°C during night. Most of the cut foliage crops grow well in 50-75% shade. Both high relative humidity and low temperature is important in reducing moisture loss from foliage.

**Light:** It is another important factor. Cut foliage crops grow well in bright light, but not under direct sun. It does best in partial shade. The foliage will turn yellow in deep shade. Most of the cut foliage crops grow well in 50-75% shade condition. Foliage size and shape vary considerably as light intensity changes. For example, Philodendron produces larger leaves and longer stem under 40% shade than under 80% shade. Select an intermediate light intensity to produce the required size and quality.

**Temperature:** The best general day/night temperature around 32°C and 21°C respectively. Temperature influences rate of photosynthesis and respiration. Growers must provide proper

temperature regimes to maximize starch synthesis during the day and control its consumption at night through lowered respiration so as to obtain maximum plant growth.

**Relative humidity:** Relative humidity plays very important role in cut foliage production. Relative humidity affects transpiration rate and water usage. The lower the relative humidity the more often watering will be required to keep water available and prevent water deficits. Commercial growers generally maintain relative humidity level of 50% or more in greenhouse. Cut foliage crops need regular watering, but allow the soil to dry out between watering. Both high relative humidity and low temperature are important in reducing moisture loss from foliage.

**Carbon dioxide:** A concentration of carbon dioxide up to 1,500 parts per million will increase plant growth and decrease the time required to propagate foliage plants.

**Soil:** Cut foliage plants are very sensitive to soil pH and a slightly acidic soil is preferred. A free draining soil is essential. Inadequate aeration will create a favorable soil environment for soil borne fungal diseases. The incident of such diseases is lower in light, sandy, free-draining soils. During rainy seasons effective drainage should be allowed.

**Potting mixture:** The potting medium used to grow foliage plants can range from 50-100% organic matter and 50% inorganic matter. The major factors to consider in the selection of potting media includes: aeration (capillary and non-capillary pore space), moisture retention (water -holding capacity), nutrient retention (cation exchange capacity), uniformity, availability, C:N ratio, pH, compaction, rate of decomposition, weight and cost.

#### Importance of pH

During foliage plant production, growers need to monitor pH of the growing medium in order to produce high quality foliage. A decrease in a pH of the medium in container grown foliage plants. The main cause of decreasing pH of the "soilless" growing media favored is related to that fact that these media are organic in nature. Decomposition of organic matter results in the formation of both organic and inorganic acids. These acids cause the basic ingredients of the potting medium, such as calcium, to dissolve and eventually leach out, which then results in lowered pH. Fungi, which utilize the organic components (carbon) of potting medium as their food source, also significantly contribute to acid formation. Often, another major source of acid is the fertilizers applied for plant growth, with different nutrient sources responsible for high or low acidity. Most fertilizers utilized in the foliage industry are acid forming and the higher the fertilizer application rate, more acidity created. Although most plants will grow within a wide pH range of 3.5 to 8.0, the suggested range of pH values for growth of good quality foliage plants is 5.5 to 6.5.

#### Planting

Foliage plants are generally planted in fields or in pots. Planting can require investment if done in the pots. Pots can be specially chosen to suit individual plants. Plastic and nonporous pots are available. Watering is needed less frequently in plastic pots than in clay pots. Potting methods fall in two categories: Hand potting, automatic planters.



**Hand potting**

The pots are filled with media and rooted cuttings. Planted pots are taken to the growing area. In the growing area, the plants are placed at 0 to 3 times the pot diameter. Plants grown in a container of 6-inch or more in size may take six months to two years to reach maturity. Plants are placed pot-to-pot until they become crowded and are then moved to their final spacing. Depending on growth of foliage plants, spacing varies from 1 to 6 times the container diameter. Pot spacing is important to foliage plant grower because spacing directly controls the final quality.

**Nutrition**

Fertilizer directly influences growth rate of foliage plants. Maximum growth rate of acclimatized foliage plants can be obtained with moderate levels of soluble, organic or slow-release fertilizer applied constantly or periodically. The fertilizer requirement of the foliage plants is related to light intensity. Slow release fertilizers are proven to be the best where as excessive nutrients destroy the root system. The fertilizer ratios of NPK for foliage plants will be approximately 3:1:1. Foliage quality is poor under outdoor conditions. Fertilizing treatments can improve the quality and would also increase foliage yield and vase life. Fertilize only when the plants are in active growth. It advisable to water plants before fertilizing them so that the fertilizers are absorbed more readily by the roots and do not burn them. Soluble fertilizers should not be applied in dry soil as it causes root burning and damage to the plant. Micronutrients are required in small amounts by foliage plants. The use of dolomite or other liming material to raise the pH above 6.0 will prevent the fluoride damage. Under low light intensities and high fertilization rates, plants are usually leggy with long weak stems and light green color of foliage.

**Irrigation**

Foliage plants are composed of 80% or more water. A water pH of 5.5 to 6.5 is most desirable for foliage plant growth. Soluble salt levels should be 500 ppm, but is also acceptable when watered heavily. Sodium and chlorine less than 20 ppm and 50 ppm, respectively. A zero level of fluorine is essential for foliage plant production. Water content low in calcium and other minerals is desirable. During winter, watering of foliage plants should be weekly intervals. But in spring or summer, daily irrigation is necessary. Plants grown in plastic pots must be watered less frequently than those in clay pots. The frequency of irrigation varies with the size of plants, container, soil potting mixtures, soil and air temperatures, solar radiation, humidity and movement of air. Watering should be done in potting medium without wetting the foliage, which is desirable because this reduces foliar diseases and residue problems. The excess irrigation in the field or pot causes poor aeration, waste of water and fertilizer, reduced plant growth and ultimately death of the plant. Leaves of the foliage plant should be wiped with wet cloth or sponge or sprayed with water to remove dust. The most common watering system is individual tubes to each foliage plant and capillary mats. Overhead application of water to foliage plants is most common but it is strongly affected by plant canopy.

**Weeding:** Weed control is usually practiced by mulching, herbicide application and hoeing the inter row spaces.

**Plant protection measures****Insects and mites**

Common pest of foliage plants are green flies, mealy bugs,

scale insects, red spider mites, thrips, snails and slugs. These can be controlled by spraying or dusting or soil drenching with insecticides. The factors that affect pest populations are temperature, humidity, potting medium, methods of irrigation. Temperature above 26°C in association with low humidity can cause rapid increases in mite populations. Cool temperature reduces pest problems in unheated production areas, where as in temperature-controlled greenhouses mites are present year round. Frequent and continued spraying of foliage crops is undesirable because it increases potential for phytotoxicity and leaves persistent residues on foliage. Use of high pressure sprayers and thorough coverage of both sides of the foliage provide best assurance of control.

**Diseases**

Foliage plants are less affected by diseases. Fungal and bacterial diseases are found when wet foliage is combined with high temperature and humidity. These diseases are most prevalent in tropical and subtropical regions with high rainfall. Soil-borne fungal diseases are more severe when poorer quality growing media, poor aeration and drainage, over watering, viral diseases are not commonly found on foliage plants. The most common diseases are grey mold, mildew, root rot and stem canker. These fungal diseases can be controlled by spraying or dusting with fungicides. Foliar fungal and bacterial disease can be controlled in Greenhouse by keeping the foliage dry. Soil drenching for most of the soil-borne diseases is fairly successful.

**Physiological disorders**

A large number of problems of foliage plants occur due to excessive or insufficient amounts of chemicals applied to plants or the potting media.

**Nutrient deficiency**

**Nitrogen deficiency** - Lower doses of nitrogen application results in light green foliage color, similar to that seen with high light intensity. Loss of lower foliage.

**Potassium deficiency** - a general marginal chlorosis occurs on the lower foliage, which may develop into necrosis.

**Magnesium deficiency** - chlorotic bands on each edge of older leaves.

**Iron deficiency** - a general chlorosis on the terminal leaves

**Copper deficiency** - cupped and dwarfed terminal foliage.

**Excessive nutrients:** Major nutrients - Soluble salts toxicity (marginal necrosis of foliage, dwarf plants and poor quality roots). Micronutrients - causes dwarf plants, chlorosis and necrosis.

**Spray material toxicity:** Symptoms - dwarfed plants, chlorosis, necrosis or both, of foliage, ring spots on foliage leaf drop and dull appearing foliage.

**Other problems:** Fluoride toxicity may causes severe damage to a number of foliage plants. The most common source of fluoride in fertilizer is *Superphosphate* (1 to 2% fluorine). Foliage plants developing foliar chlorosis, tip or marginal, or necrosis from fluorine include Calathea, Chlorophytum, Cordyline, Dracaena Mananta, Spathyphyllum and Yucca. The pH of the media should be maintained at 6 to 6.5 to tie up fluoride in the potting medium.

## Harvesting

Utmost care is needed to determine the right stage of development and time of harvest to secure prolonged vase life of the produce. Harvesting should be completed in cool conditions either early in the morning or late in the afternoon when carbohydrate reserves in the leaves are expected to be higher. Prevent bruises or damage and prevent the harvest of unwanted materials along with the fresh produce. Postharvest success begins with providing the best growing conditions possible and harvesting at optimum harvest stage. The optimum harvest stage varies with individual species and according to your market. The longest vase life for some flowers will be achieved if they are cut with color but not yet open.



**Fig 1:** Potted foliage plants

(A) Codiaeum, (B) Monstera, (C) Cordyline, (D) Tacca, (E) Nepenthea, (F) Dracaena, (G) Anthurium, (H) Alocasia, (I) Syngonium, (J) Vriesea, (K) Aglaonema, (L) Chlorophytum, (M) Calathea, (N) Spathiphyllum, (O) Guzmania, (P) Philodendron, (Q) Dieffenbachia, (R) Schefflera

## Remarks

Growing and marketing specialty cut foliage can be a profitable and rewarding business. Specialty in cut foliage production and marketing offers both small- and large-scale

growers a way to increase the level of sustainability on their farms. The tremendous variety of plants that can be grown as cut flowers/ foliage allows growers to choose those which are well-adapted to the farm site and grown without large offsite inputs. This variety also makes diversity in both production and marketing possible and the high value of cut flowers can increase farm income. With the fast changing trends and a constant urge for new innovative products in domestic and leading international flower markets, the flower growers have to respond rapidly. Cut flower production has the potential to increase income for both small and large farms. Varieties should be selected as per the vibrant color, sturdy stems, yield, quality, disease resistance, and vase life. Generally environmentally sound production techniques, increased farm diversification, and increased farm income are basic parts of sustainable farming systems.

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