

# Practical Manual

on

## Commercial Floriculture

HFL-221 2(1+1)

(For Undergraduate Horticulture students)

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**2019**

**RANI LAKSHMI BAI CENTRAL AGRICULTURAL  
UNIVERSITY, JHANSI-284003**

**Commercial Floriculture HFL-221 2(1+1)**

**Practical:** Study of garden equipments. Study of Graphic language, Use of drawing equipments, graphic symbols and notations in landscaping designing, Study and designing of different styles of gardens, Study and designing of gardens based on different themes, Designing gardens using Auto-cad/ archi-cad, Designing gardens for home, traffic islands, schools and colleges, public buildings, factories, railway stations, air ports, temples, churches, play grounds, corporate buildings/ malls. Designing and planting of avenues for state and National highways, Design and establishment of Japanese, English and Mughal gardens. Visit to public, institutional and botanical gardens.

**Name of Student** .....

**Roll No.** .....

**Batch** .....

**Session** .....

**Semester** .....

**Course Name :** .....

**Course No. :** .....

**Credit** .....

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in the year.....in the respective lab/field of College.

Date:

Course Teacher

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**Objective: To identify commercially important flower crop: Rose**

**Exercise:** Write distinguishing features of different classes of rose and various cultivars.

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

**Enlist the species of the rose reported to be wildy grown in India:**


**Describe the main classes of rose (rose classification) with examples:**

**Hybrid perpetuals:** .....

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**Hybrid teas (HT):** .....

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**Floribundas/hybrid polyanthas:** .....

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**Teas/ tea scented china roses:** .....

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**Grandifloras:** .....

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**Polyanthas:** .....

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**China rose:** .....

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**Miniatures:** .....

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**Damask rose:** .....

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**Bourbon roses:** .....

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**Cabbage roses:** .....

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**Moss rose:** .....

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**French/gallica roses:** .....

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**Albas:** .....

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**Musk roses:** .....

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**Noisette roses:** .....

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**Rugosas:** .....

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**Austrian briars:** .....

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**Ramblers:** .....

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**Sempervirens:** .....

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**Pimpinellifolia:** .....

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**Describe the Types of roses**

**Shrub/Bush rose:** .....

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**Standard rose:** .....

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**Climber and rambler:** .....

.....  
**Hedge and edge:** .....

.....  
**Pot plants:** .....

.....  
**Rockery:** .....

.....  
**Cut flowers:** .....

**Enlist some important varieties of following class of roses:**

<b>Class</b>	<b>Varieties</b>
Hybrid Teas	..... ..... ..... ..... .....
Floribundas	..... ..... ..... ..... .....
Miniature	..... ..... .....
Polyanthas	..... ..... ..... ..... .....
Climbers	..... ..... .....

**Enlist some of the popular varieties for cut flower trade based on colour:**

<b>Colour</b>	<b>Varieties</b>
Red	
White	
Yellow	
Pink	
Purple	
Orange	
Cream	

**Enlist important varieties released from IARI, New Delhi and IHR, Bengaluru**

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**Objective: To identify commercially important flower crop: Chrysanthemum**

**Exercise:** Write the distinguishing features of different types of Chrysanthemum and various cultivars.

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

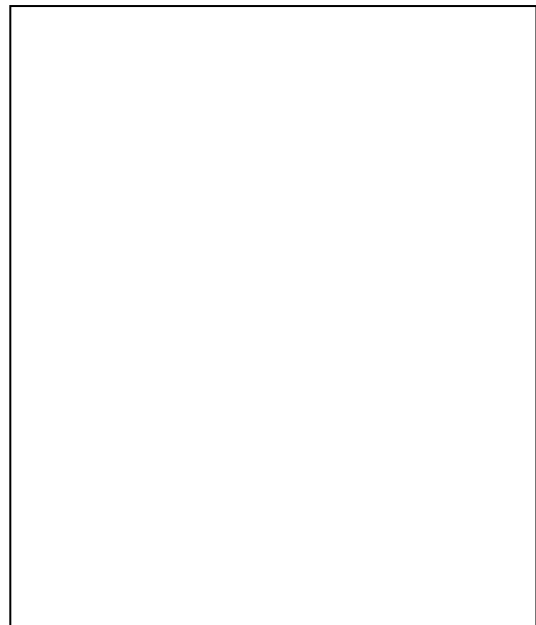
**Family:** .....

**Native:** .....

**Difference between spray and standard chrysanthemum**

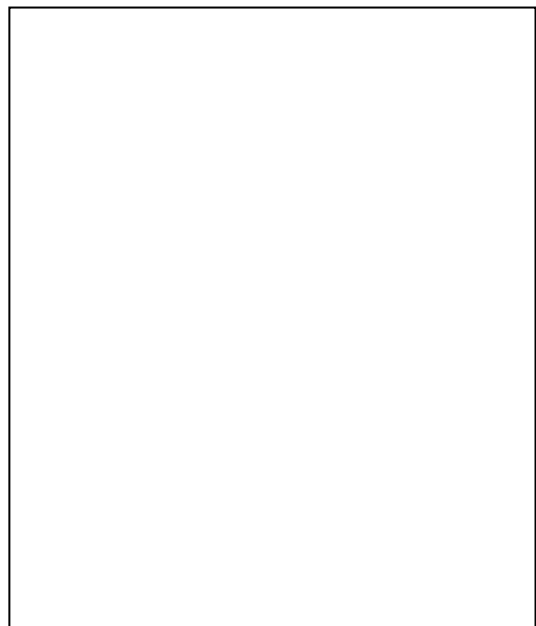
Spray chrysanthemum with diagram

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Standard chrysanthemum with diagram

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**Some important species of Chrysanthemum:**


**Classification of Chrysanthemum on the basis of arrangements of florets:**

**Single:** .....

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**Anemones:** .....

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**Pompons:** .....

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**Decorative:** .....

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**Irregular incurve:** .....

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**Regular incurve:** .....

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**Intermediate incurve:** .....

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**Reflex:** .....

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**Spoon:** .....

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Quill: .....  
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Spider: .....  
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Brush: .....  
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Semi double: .....  
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**Identification of some important varieties/cultivars:**

**Spray type:**

Colour	Varieties/cultivars

**Standard (large) type:**

Colour	Varieties/cultivars

**Small flowered:**

Colour	Varieties/cultivars
For Garland	

<b>For Pot cultivation</b>	
<b>For Cut flowers</b>	

**Varieties from different institutes**

<b>Important Varieties</b>	
IARI, New Delhi	
NBRI, Lucknow	
IIHR, Bengaluru	
PAU, Ludhiana	

**Objective: To identify commercially important flower crop: Marigold**

**Exercise:** Write the distinguishing features of types and varieties of marigold.

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** African Marigold: .....

French Marigold: .....

**Family:** .....

**Native:** .....

**Other important species:** .....

**Characters of *Tagetes erecta* (African marigold)**

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**Characters of *Tagetes patula* (French Marigold)**

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**Varieties from different institutes**

Important Varieties	Type
IARI, New Delhi	

IIHR, Bengaluru	
BCKV, Kalyani	
Others	

**Practical No. 4**

**Objective: To identify commercially important flower crop: Gladiolus**

**Exercise: Write the distinguishing features of different types of Gladiolus and various cultivars.**

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

**Native:** .....

**Classification of Modern types of gladioli:**

Types	Characters

**Classification on the basis of floret size:**

Class	Designation	Description
1		
2		
3		
4		
5		

**Cultivars on the basis of floret colour**

Colour	Variety

**Varieties from different institutes**

<b>Institutes/ Important Varieties</b>	
<b>IARI, New Delhi</b>	
<b>NBRI, Lucknow</b>	
<b>IIHR, Bengaluru</b>	
<b>PAU, Ludhiana</b>	
<b>Others</b>	

**Internationally important varieties:** .....

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**Objective: To identify commercially important flower crops: Gerbera and Crossandra**

**Exercise 1: Write the distinguishing features of varieties of Gerbera.**

**I. Gerbera**

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

**Native:** .....

**Cultivars on the basis of floret colour**

Colour	Variety

**Exercise 2: Write the distinguishing features of varieties of Crossandra.**

**II. Crossandra**

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

**Native:** .....

**Description of different species:**

**Important varieties:**

Varieties	Institution	Characters

**Objective: To identify commercially important flower crop: Carnation**

**Exercise:** Write the distinguishing features of different species, types and varieties of carnation.

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

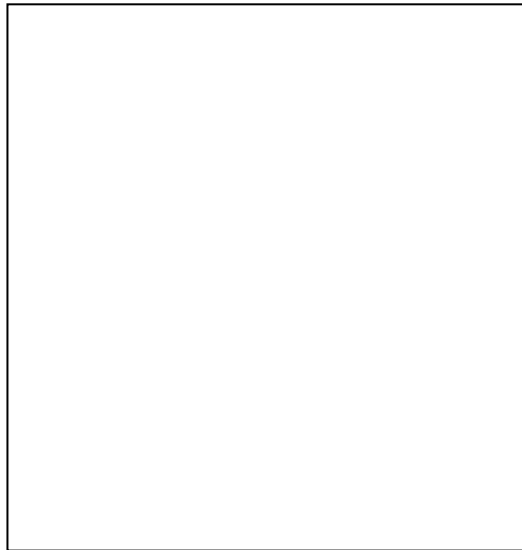
**Native:** .....

**Description of different species:**

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**Morphology:** .....

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**Cultivars on the basis of floret colour:**

Colour	Variety

**Objective: To identify commercially important flower crop: Dahlia**

**Exercise:** Write the distinguishing features of different species, types and varieties of Dahlia.

**Common Name:** .....

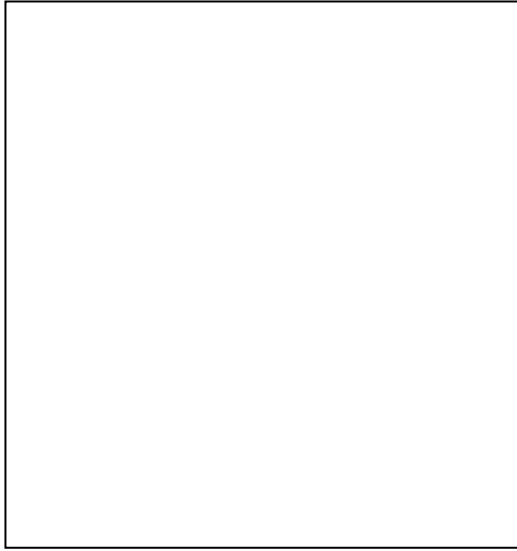
**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

**Morphology:** .....

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**Description of different species:**

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**Classification of Dahlia (According to the National Dahlia Society of England):**

Group Name	Description


**Important Varieties:**

Name of the variety/cultivar	Description (colour)

**Objective: To identify commercially important flower crop: Orchids**

**Exercise:** Write the distinguishing features of different types with diagram.

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

**Native:** .....

**Types of Orchids (Based on the growing habit)**

Type	Character
Terrestrial	
Epiphytic	
Lithophytic	
Subterranean	

**Description of plant morphology:**

Leaves	
Stems	Sympodial:
	Monopodial:
Roots	
Inflorescence	
Flowers	


**Draw a diagram of Orchid plant:**



**Different genera of orchid:** .....

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**Important varieties of genera**

<b>Genera</b>	<b>Varieties</b>

**Practical No. 9**

**Objective: To identify commercially important flower crop: Anthurium**

**Exercise:** Write the morphological description of Anthurium with diagram and describe about different species and varieties.

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

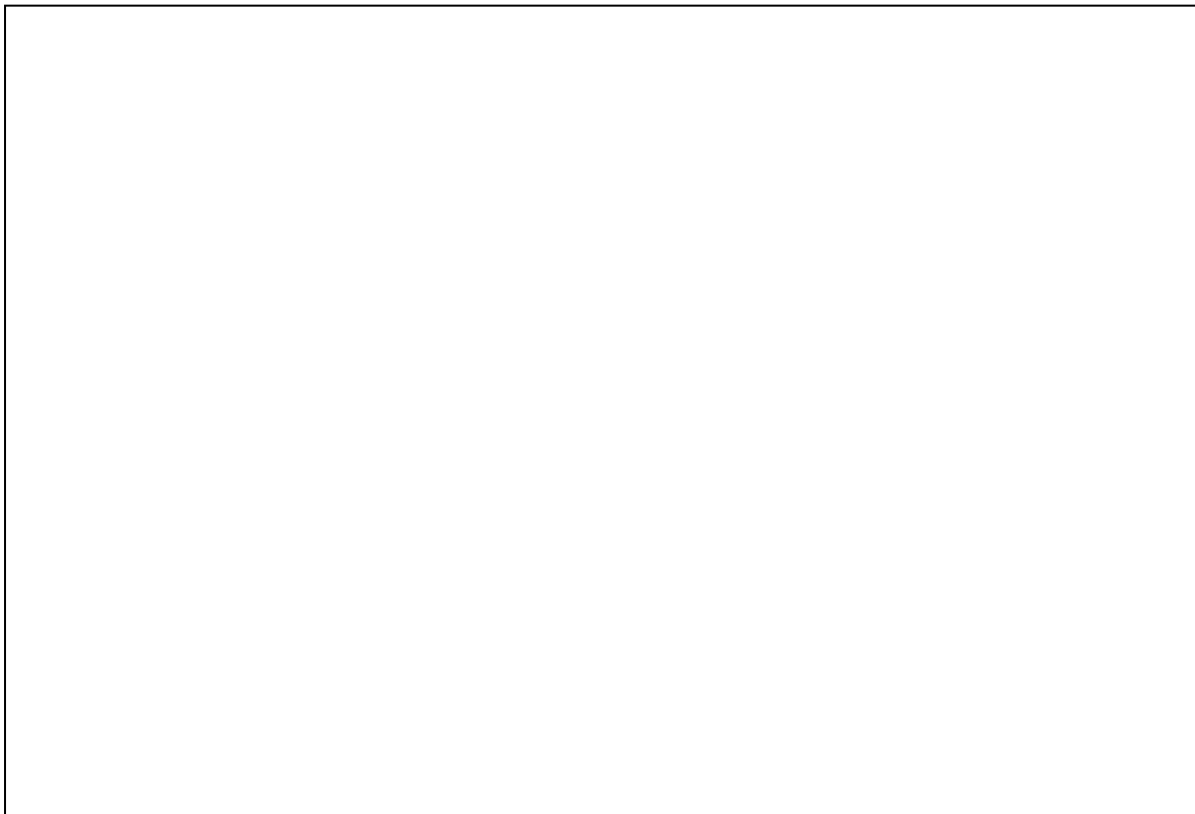
**Family:** .....

**Native:** .....

**Description of plant morphology:**

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**Draw a diagram showing spade and spadix in anthurium:**



**Description of different species:** .....

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**Important varieties:**

Varieties	Description



**Objective: To identify commercially important flower crop: Tuberose**

**Exercise:** Write the distinguishing features of different types of varieties and morphology of tuberose with diagram.

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

**Native:** .....

**Morphology of plant:**

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**Types:** .....

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**Description of important varieties:**

Varieties	Institute	Type

**Objective: To identify commercially important flower crop: Jasmine**

**Exercise:** Write the distinguishing features of different species of jasmine and its morphology with diagram.

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

**Native:** .....

**Morphology of plant:**

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**Species of jasmine:** .....

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**Description of important varieties:**

Varieties	Characters

**Objective: To identify commercially important flower crop: China aster**

**Exercise:** Give description of plant morphology of China aster and describe about its varieties.

**Common Name:** .....

**Hindi Name:** .....

**Botanical Name:** .....

**Family:** .....

**Native:** .....

**Description of plant morphology:** .....

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**Description of different species:** .....

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**Important varieties:** .....

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**Objective: To study propagation methods of chrysanthemum**

**Exercise: Write the methods of propagation of chrysanthemum and prepare cuttings of chrysanthemum.**

**Materials required:** .....

**Commercial methods & process of Propagation:**

**Suckers:** .....

**Cuttings:** .....

**Growing media/ substrate preparation:** .....

**Preparation of growing hormone solution and use:** .....

**Objective: To study nursery raising of annuals**

**Exercise:** Write the steps followed for raising of nursery of annuals and prepare a nursery bed for sowing seeds of annuals.

**Materials required:** .....  
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**Seed treatment:** .....  
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**Preparation & types of nursery beds:** .....  
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**Method of seed sowing:** .....

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**Weeding, irrigation and intercultural operations:** .....

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**Uplifting of seedling for transplanting:** .....

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**Objective: To study training and pruning in rose.**

**Exercise:** Write the technique of training and pruning in rose and describe different types of pruning methods followed.

**Materials required:** .....

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**Objectives of pruning:** .....

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**Time of pruning:** .....

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**Types and method of pruning based on intensity of pruning:**

Light pruning: .....

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Moderate pruning: .....

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Hard pruning: .....

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**Method of pruning in:**

Hybrid Tea Roses: .....

Floribundas: .....

Ramblers and Climbers: .....

Standard Roses: .....

**Wintering of Roses:** .....



**Objective: To study propagation methods in rose.**

**Exercise:** Write different propagation methods followed in rose and prepare cuttings of rose.

**Materials required:** .....

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**Cutting:** .....

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**Stem cuttings:** .....

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**Procedure of Cuttings:**

Hardwood cutting: .....

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Semi-hardwood cutting: .....

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Softwood cutting: .....

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Herbaceous cutting: .....

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Leaf cuttings: .....

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Root cuttings: .....

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**Methods of Budding:** .....

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**Give the technique/methods of budding in few important ornamental plants**

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**Objective: To study methods of layering and grafting in ornamental crops.**

**Exercise:** Write the technique of layering and grafting with diagram.

**Materials required:** .....

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**Layering:** .....

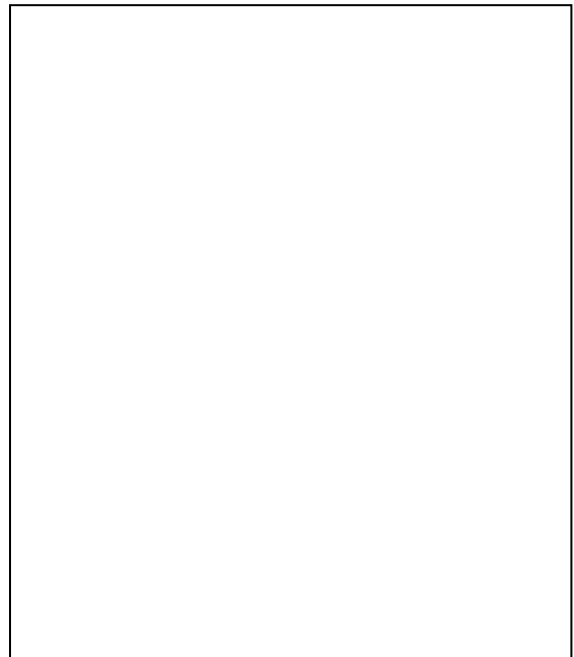
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**Types of layering:** .....

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**Explain with diagram the types of layering with examples from ornamental crops**

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**Grafting:** .....

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Raising of rootstock: .....

Selection of scion: .....

**Different types of grafting: .....**

**Explain the methods and procedures of grafting citing examples: .....**

**Objective: To study methods for prolonging shelf-life in cut flowers.**

**Exercise:** Write the different post-harvest handling methods followed in flowers.

**Factors Affecting Post Harvest Quality**

Flower Maturity (Harvesting indices) of important flower crops: .....

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Harvesting: .....

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Precooling: .....

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Pulsing: .....

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Packaging: .....

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Cold storage: .....  
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Holding: .....  
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**Chemicals used for increasing vase life of cut-flowers: .....**  
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**Objective: To study drying and preservation methods of flowers and arrangement of flowers**

**Exercise:** Write methods of drying and preservation of flowers

**Tips for collecting plant materials for drying:** .....

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**Methods of drying:**

**Press drying:** .....

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**Air drying:** .....

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**Sun drying:** .....

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**Oven drying:** .....  
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**Embedding method:** .....  
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**Microwave oven drying:** .....  
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**Glycerin drying (glycerining):** .....  
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**Freeze drying:** .....  
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**Exercise: Write different types of flower arrangement and make a flower arrangement of any type.**  
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**Container selection:** .....  
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**Selection of flowers and foliage:** .....  
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**Aids for arrangements:** .....  
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**Types of floral arrangements**

Circular: .....

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Triangular: .....

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Radiating: .....

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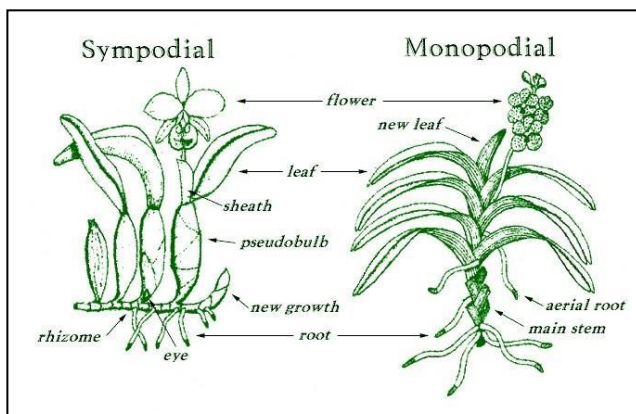
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## CLASSIFICATION OF ORCHIDS

**Monopodial:** These orchids grow from a single vegetative apex. These orchids have main stem which continues to grow year after year producing inflorescence from leaf axils. Monopodial orchids are *Aerides*, *Phalaenopsis* & *Vanda*.

**Sympodial:** These orchids have a rhizome, which grows horizontally producing new growth. These orchids have a main stem which terminates growth after each season or flowering. The new shoot (lead) then grows from the base forming its own bulbous stem called pseudobulb. A well-developed sympodial plant contains a clump of shoots of different sizes and age e.g. *Dendrobium*, *Cattleya*, *Oncidium*, *Cymbidium*



## PROPAGATION OF ROSE

**Material Required:** Mother plants of scion, budding knife, secateur, Cellophane tape (adhesive), and polythene sheet.

Roses are propagated by seeds (breeding of new varieties), cutting, layering, budding and grafting. Most commonly used method is by budding a desirable variety on a suitable rootstock.

In Northern plains of India, cuttings of rootstock are planted from January-March, which becomes ready for budding after 11-12 months' time. Best time for budding ranges from second fortnight of November to the end of February and in summer in the temperate regions of the hills. In the regions with mild climate like Bangalore, budding can be done almost all the year around.

In bush roses, T-shape cut is made 5-8 cm above the ground level with the help of budding knife. In this cut, bud taken from the desired scion variety, is inserted gently by lifting the bark. Then the cellophane adhesive tape or polythene sheet ribbon is wrapped over it leaving the bud exposed.

In standards and half standards, T-shape cut is made at a height 90 cm and 45 cm, respectively. The bud from the desirable variety is fixed as explained in bush roses. In standards and half standards *Rosa bourboniana* is mainly used as rootstock due to its erect growth habit.

Some vigorous types of climbing roses are propagated by hardwood cuttings. Some of the climbers and ramblers as well as Polyanthas respond quite well to this method. In the miniature roses this technique (cuttings) is preferred to budding, because budding tends to make the plants too large owing to the vigour of the rootstock.

**Seed propagation:** This method of propagation is generally adopted by breeders for developing new cultivars with desirable characters. Seedlings of rose species are also used as stock for grafting or budding. The rose fruits (hips) are harvested when fully ripe and thoroughly dried before extraction of seeds. In rose seed germination is very poor because most of the seeds when mature are in resting conditions requiring an after ripening period before germination. So stratification of seeds at 1.6-4.4°C for 6 weeks improves germination. Germination can also be improved with scarification with different chemicals like sulphuric acid for 1-2 hours.

**Cuttings:** Propagation of roses by cuttings is normally done to raise rootstocks for grafting or budding especially for greenhouse cultivation. Raising plants by stem cuttings is one of the least expensive and one of the easiest methods of rose multiplication. Hardwood cuttings are collected from healthy mother plants having 15-20 cm length and 3-4 nodes. Cuttings are treated with IBA @ 1000 ppm depending upon type of cutting. Cuttings are planted in mist chambers for easy and fast rooting. Temperature required for rooting of cuttings is around 24-28°C with relative humidity of 90-100%. Propagation through cuttings is generally done during winters i.e. Oct-Dec in plains and Feb-March in hilly areas.

**Budding:** roses are propagated through T-budding, it is the commercial method of propagation of rose. Rootstocks used for budding are *Rosa canina*, *R. multiflora*, *R. indica* var. *odorata*, *R. bourboniana*, Nishkanth (thornless rootstock developed at IHR, Bangalore), Natal Briar (used worldwide these days).

**Time of budding:** In North Indian plains during November – December and in hilly areas from February -March

**Stenting:** stenting is a rapid propagation method in which a cut rose is placed on an unrooted piece of rootstock. Rooting of the rootstock and fusion between graft and rootstock take place simultaneously. In the technique of stenting the base of the scion wood and the top of the rootstock are cut in 30° angle, both sections are fitted on one another and fixed with budding

tape. Rootstock used for stenting should be hardwood cutting and it is treated with IBA @ 1000 ppm and stent is placed in rooting medium (cocopeat or vermiculite or perlite). Temperature required for rooting of cuttings is around 24-28°C with relative humidity of 90-100 %. Stenting can be done throughout the year. However, best results are obtained from October onwards as high temperature during summers result in increased losses due to black rot.

### NURSERY RAISING OF ANNUALS

#### Steps in preparation of nursery beds and sowing of seeds

- Land is prepared by ploughing or digging up to 30 cm depth and exposed to sun for at least 15 days.
- Well rotten FYM at the rate of 5 kg/ m<sup>2</sup> should be thoroughly incorporated in the upper 10-15 cm soil of the beds at least 7 days before transplanting.
- Soil is levelled properly and stones are removed. Raised nursery beds up to 15 cm height should be prepared during rainy season.
- Lines of uniform depth are prepared at a distance of 5- 10 cm and seeds are placed in these lines.
- Seeds are then covered with a mixture of soil+ sand+ FYM (1:1:1, v/v).
- Beds are immediately watered with help of watering can using a fine hose.
- Beds are kept moist by sprinkling water as and when required.
- Seedlings of most annual flowers become ready for transplanting between 30 to 40 days of sowing.

### TECHNIQUES FOR DRYING OF FLOWERS:

**Natural Drying:** In this method ornamental plant parts are allowed to dry naturally on the plant itself. These are collected as and when completely dried during excursion trips to forests, countryside, gardens or cultivated fields.

The plants viz., *Aegle marmelos*, *Bambusa* spp., *Bauhinia retusa*, *Cassia fistula*, *Caesalpinia sepiaria*, *Clematis grata*, *Dioscorea deltooides*, *Mallotus philippensis*, *Rosa moschata*, *Lagerstroemia flos-reginae*, *Pinus roxburghii*, *Picea smithiana*, *Sapindus mukorossii*, etc. have beautiful fruiting shoots, whereas plants like *Abrus precatorius*, *Aesculus indica* and *Sapium sebiferum* have beautiful seeds.

**Vertical hanging drying in air:** This is the most common process for drying ornamentals. In this process only rope/ wire and newspaper/ blotting sheets are required. Plant material is simply kept hanging down under cover on racks or from rafters in dark or kept on newspaper/ blotting sheets. Drying in the sun result in discolouration and browning due to oxidation. Improved control over the rate of drying can be achieved by ensuring air movement around each and every stem and by lowering the relative humidity of the air. Good air circulation assists in sweeping away moisture vapours, thereby decreasing the thickness of the unstirred boundary layer of the water vapour with fresh plant material in surrounding. The entire process of air-drying depends upon the relative humidity, air velocity, pressure, moisture in plant material and type and shape of flowers. This is the most simple and cheap process of dehydration/drying. The main drawback is its weather dependence and petals/foilage shrinkage, thus lowering the aesthetic value of plant material. Hanging drying of small quantity of plant material with reasonable more success can be achieved by drying in microwave oven, hot air oven or solar dryer within short span in comparison to air-drying. Flowers with crisp texture viz., *Acroclinum*, *Anaphalis*, *Helichrysum*, *Delphinium*, Lemon mint, *Oregano*, *Limonium*, *Rumex*, *Holmskioldia*, etc. are more suitable for vertical hanging drying in microwave/ hot air oven/ solar dryer.

**Embedded Drying:** It is rather difficult to avoid shrinkage and changes in morphology of dehydrated ornamental plant material during vertical hanging drying in air/ microwave/hot air oven/ solar dryer, due to the loss of moisture/ water vapours from the cells. The petals/foilage generally droop- down and as a result aesthetic value of that material reduces. In embedding the drying medium/desiccant supports the flower/ foliage from all around and maintains perfectly the original shape.

**Characteristics of desiccants:** The material which removes the moisture quickly from the ornamental plant parts embedded without reacting with the water vapours released during drying or bleaching of petals and foliage, etc. The drying material/ desiccant should normally have the ideal size of 0.02-0.2mm or 20-200 mesh. It should be heavy so as to keep the plant parts perfectly in its original shape. It should not stick to the plant parts during drying. It should also not be very costly as the market value of most of the dried ornamental floral arrangements and craft is low.

**Different types of desiccants:** Silica gel (white and self-indicating blue), borax, boric acid, river sand, alum powder, aluminium sulfate, saw dust, corn granules are commonly used desiccants in purely single form or in combinations of two or more desiccants so as to be more effective and economical in drying ornamental plant parts.

**Process of embedding:** Various types of containers are used for embedding different ornamental plant parts which suits to the plant material and the process of drying in room, sun, solar dryer, hot air oven or microwave oven. The containers should uniformly get heated so that the material evenly dry out from all sides. Aluminium or tin containers are normally used which maybe cylinder or tray type. In microwave nonmetallic containers like glass, china clay, heat tolerant plastics are used.

Spread the layer of the desiccant on the bottom of the container. Arrange the plant parts according to type, well spaced and with no two items touching each other or the sides of the containers. Pour the desiccant gently, gradually and completely from all the sides until it forms a top layer for about 1.5 cm above the plant parts. In flowers where pedicels/ inflorescence are very delicate or hollow, insert a thin wire before embedding so as to maintain the original shape. After embedding the containers are left in the room for drying. But it takes longer time to dry. The containers for quick drying are kept in sun, solar dryer, hot air oven or microwave oven, in which drying is faster with superior quality of the dried plant parts. These are described as follows:

**Drying in Sun:** After embedding the plant material the containers are daily exposed to Sun, resulting in rapid dehydration. Containers are shifted under a room in the evening and again on the next morning these are kept in the Sun light. The efficiency of drying depends upon the prevailing weather in the region.

**Drying in Solar dryer:** The containers are kept in solar dryer in which movable tray at the bottom is fitted to regulate the temperature. This is quicker method of drying and drying is done without use of energy. The results are at par with hot air oven or microwave- oven thus is more economical method.

**Drying in Hot air oven:** The containers are kept in the hot air oven at 45 to 60°C for few hours to three days depending upon the moisture content in the plant material to be dried. Drying technology for number of cultivated ornamental plants has also been standardized at National Botanical Research Institute (NBRI) Lucknow.

**Drying in Microwave oven:** The plant material in microwave oven is dried with the help of electronically produced microwaves. Non-metallic containers in which various plant parts are embedded in desiccants are kept in microwave oven for 2-5 minutes. Then, these are kept in the room for 2-5 hours known as setting time before taking out from the desiccant. In microwave oven the mostly plant material is dried at a range of 300-700 Hz., which may be given once or in splits. The results in split drying are comparatively better.

**Vacuum drying:** The embedded plant material may be dried/ dehydrated under vacuum. The vacuum is created under thick-walled chamber fitted with a heating device, a vacuum pump and condenser. Low temperature is very effective and the quality of the product is excellent.

**Taking out embedded plant material:** The embedded plant material after drying/dehydration is taken out by gently tilting the container in order to remove the desiccant over and around the plant material. The dried material is either picked up with the help of fingers or tweezers. It is cleaned by inverting and tapping with fingers slowly and gently. Any remaining desiccant is finely removed with the help of a fine camel hair painting brush.

**Freeze drying:** Freeze-drying is now becoming a very popular although more expensive method of producing dried flowers and plant parts throughout the world. The worldwide market of freeze-dried products during 1997 was about \$18-20 million. The necessary equipment for freeze-drying is more expensive than vacuum drying, but the quality of the finished floral product is almost double and this process is relatively simple. The flowers are arranged in the specimen chamber. Then, these are frozen unto -35° C. Any frozen ice crystals on the flowers are sublimed or vaporized with the application of heat. After transforming into condensation, the vapour is captured into a separate chamber as ice. By eliminating the water, the flowers dry up with the life of freshness and retain better integrity and more durability. Thus, rapid dehydration particularly at low or ambient temperature tends to result in better-coloured products.

**Drying in water:** The flowers and foliage are kept in water and allowed to dry. Water drying, which usually seems to like a contradiction, but gives fairly good results with flowers like Hydrangea, Corn flower, baby's breath and fever few. In water drying first the lower leaves and flowers from the stem are stripped and are kept in standing cold water with about 5cm depth. The material is kept undisturbed in a dry, well-aerated room until both the holder and flowers are dried. This takes 6-7 days depending upon the water content in plant material and water taken in container/holder.

**Press drying:** The flowers and foliage are placed between the pages of a book or magazine or between the folds of newspapers or blotting sheets by giving some space between the flowers/foliage. These sheets are kept one above another and corrugated cardboard sheets of same size are placed between the folded sheets so as to allow the water vapours to escape. The whole bundle is then kept in the room. For quicker drying herbarium press is kept in hot air oven at 45° C for 12 to 24 hours depending upon the moisture in the flowers or foliage. Too much material should not be pressed simultaneously. Material of varied thickness should also be avoided in the same folders. When press drying is practiced in room, one must over-turn the flowers/foliage daily which will help in maintaining the original colour and prevent the plant material from discolouration. This method is laborious and time taken for drying is more than drying in solar dryer/ hot air oven.

The press-dried material is stored in cardboard boxes. These boxes are lined with blotting sheet, which keep flowers/foliage dry. These boxes are stored in herbarium vasculums fitted with cork sheet. The press-dried material is used for preparation of greeting cards, wedding cards, wall plates, sceneries, table- tops, interior scaping designs and other festive decorations.

## FLOWER ARRANGEMENT

**Materials required:** Flower vases, cut stems of flowers like rose, gerbera, gladiolus, tuberose, pin holders, fillers like leaves of ferns, Asparagus

### Procedure of making Ikebana flower arrangement:

- In any style of Ikebana flower arrangement there are 3 main lines i.e. *Shin* (Heaven), *Soe* (Man), *Hikae* (Earth) represented by cut flowers. In addition there are the Jushi stems or the fillers attached to the three main lines these associate.
- In any arrangement the shin should always be the tallest, followed in terms of height by Soe and Hikae.
- In a large vase the length of the Shin is equal to twice the combined measurement of the diameter and height of the vase i.e.  $2 \times (\text{Diameter} + \text{Height})$  while Soe should be  $\frac{3}{4}$ th of Shin and Hikae  $\frac{1}{2}$  of Soe.
- In a standard sized or a small sized vase the length of Shin will be  $1.5 \times (\text{Diameter} + \text{Height})$  of the vase and (Diameter + height) of the vase respectively.
- In both the above mentioned vase sizes the other main lines (Soe and Hikae) should be only  $\frac{3}{4}$ th of its predecessors.
- The arrangement is made on the frontal left side of the container.
- Shin is fixed at the rear end at an angle of  $10-15^\circ$ . Soe is arranged on left side of Shin at  $45^\circ$  and Hikae right side at  $75^\circ$ .

### Indian and other type of flower arrangements

1. **Garlands:** Made of different types of loose flowers such as marigold, rose, jasmine, tuberose, annual chrysanthemum, China aster, gaillardia etc.
2. **Gajra and Veni:** These are the floral arrangements used Indian Women to decorate hair. Flowers used are Crossandra, jasmine (Mogra, Juhi, Chameli), tuberose, barleria etc.
3. **Floral Rangoli:** It is the decoration of colourful flowers in different designs and patterns. Flowers and petals of marigold, rose, chrysanthemum, and bougainvillea are generally used for making floral *rangolis*.

**Bouquet:** Generally conical, round and flat bouquets are made. In flat type of bouquets generally spikes of gladiolus, tuberose, cut stems of rose, orchids, gerbera, and chrysanthemum are used. For filling the void space fillers like fern leaves, *Thuja* leaves, *Asparagus* and palm leaves are used. However, round and conical type of bouquets are mostly made from hybrid cut roses, gladiolus, carnation, liliun, orchids, gerbera, anthuriums, chrysanthemum in combination with foliage like palm leaves, *Nephrolepis* leaves, Solidago etc.