Practical Manual

on

Commercial Production of Loose Flowers
HFL-504, 3(2+1)

Dr. Gaurav Sharma

Associate Professor

Dr. Priyanka Sharma

Assistant Professor

2023

Department of Floriculture and Landscaping

College of Horticulture & Forestry

RANI LAKSHMI BAI CENTRAL AGRICULTURAL UNIVERSITY, Jhansi-284003

Syllabus:

Identification of species and varieties, Propagation and nursery management, Training and pruning techniques, Fertigation, foliar nutrition, growth regulator application, Crop protection, Pinching, disbudding, staking, harvesting techniques, Post-harvest handling, storage and cold chain, Project preparation for regionally important commercial loose flowers. crop specific guidelines for project financing (NHB guidelines), Cost Economics, Exposure Visits to fields

Name of Student .....

Roll No. .....

Batch .....

Session .....

Semester .....

Course Name: .....

Course No. : .....

Credit .....

Published: 2023

No. of copies: ……..

Price: Rs.

CERTIFICATE

This is to certify that Shri./Km: ……ID No..... has completed the practical of course .....course No.:……..per the syllabus of M.Sc. (Horticulture) Floriculture and Landscaping. . . . . semester in theyear in the respective lab/field of College.

Date: Course Teacher

INDEX

Exercise: 1

Objective: Identification and description of commercially important flower crop: Marigold

Family: Compositae

Species

Tagetes erecta *(*African marigold)

- Hardy annual 90 cm tall, erect & branched
- Leaves pinnate & leaflets lanceolate, serrated
- Flowers single to fully double
- Flowers large sized of globular heads
- Colour varies from lemon yellow to orang

Tagetes patula (French Marigold)

- Hardy annual -30 cm tall
- Widely branched,dense little shrubby
- Stems often veined in dark violet or reddish brown
- Flowers solitary,terminal
- Unopened buds swollen & grooved,2.5" long
- Single flowered forms are popular
- Colour varies from yellow to mahogony red

Tagetes tenuifolia *(Tagetes signata)*

- Bushy type (less than 30 cm)
- Much branched ,bushy compact plants
- Flowers single,5 rays, roundish, obavate
- Bright yellow & small but numerous
- Pumila cv is tenuifolia type

Tagetes lucida (Sweet scented Marigold)

- Tender & perennial
- Stem erect straight, bushy plants
- Leaves entirely dentate, produce agreeable fragrant
- Flowers borne in dense terminal corymbs, scented
- Var. floridus is widely cultivated with large flowers

Tagetes lacera (Californian Marigold)

- Discovered in california
- Height is upto 120-150 cm
- Flower profusely with agreeable flavour
- Flowers are yellow in colour

Tagetes lemmonii

- Grows upto 60 -70cm
- Leaves slender, opposite
- Flowers showy
- 2-3 cm diameter

Tagetes sarmentosa

- Sarmentosa means 'climbing'
- Mystery marigold
- Annual, possibly a form of T. lacera
- Grows upto one-foot, late flowering
- Single, solitary bloom
- Foliage is aromatic

Other spp.,
T. minuta, T. pusila, T. corymbosa, T. argentina.

Types

Tagetes erecta – African Marigold

- Carnation flowered
- Chrysanthemum flowered
  - Tall double chrysantahemum flowered – Luxor series
  - Dwarf double chrysantahemum flowered – Rexor series
- Tall F_1 hybrids (F1 gold coin series and F1 climax series)
- Dwarf F_1 hybrids (Inca series, Space age series, Galore series)
- F_1 triploid

Tagetes patula – French Marigold

- Dwarf double – (20-30 cm)
- Dwarf double – Scabious flowered (flowers with crested centre)
- Dwarf double – Petite (15-20 cm)
- French Dwarf single – (20-35 cm)

Varieties
***Tagetes erecta*– African Marigold**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Tagetes patula - **French Marigold**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Tagetes tenuifolia

.....

.....

.....

.....

.....

.....

.....

.....

.....

Exercise: 2

Objective: Identification and description of commercially important flower crop: Chrysanthemum

Family: Compositae
Short day plant – 'Photo sensitive'

Identify the species

Remarks	Species
Grown in temperate regions. Insecticide 'Pyrethrum' is made from this	
Tri colour chrysanthemum , flowers 5 cm in dia., winter season annual	
Garland chrysanthemum, winter season annual. Flowers are yellow or white.	
Small shrub, 60-90 cm tall, bearing white and soft yellow flowers. Popularly grown as pot plants.	
Most widely grown cut flower type. Perennial and bearing white and yellow flowers.	
Bears yellow flowers, supposed to be involved in the evolution of florists' chrysanthemum	
Found growing in the pacific coastal region of Japan and is widely used as an ornamental plant	
Native of china and bears blooms of white ray florets.	

Classification:

Based on kind and arrangements of florets (National Chrysanthemum Society, England):

Type	Characters
Single	
Anemones	
Pompons	

Decorative	
Large flowered	
(a) Incurved double	
(b) Reflexed double	
(c) Tubular ray floret	1. Spider-
	2. Fuji-
	3. Quill-
	4. Spoon-

Classification based on temperature requirement for flowering (Cathey 1954):

- Thermo zero cultivar:
  Varieties which flower at any temperature between 10-27ºC but most constantly at 16ºC night temperature.
- Thermo positive cultivars:
  A minimum of 16ºC required for initiation and at 27ºC there will be rapid initiation but delayed flowering.
- Thermo negative cultivars:
  Bud initiation occur at low or high temperature between 10ºC and 27ºC but continuous high temperature delay bud development.

Cultivars

Large flowered:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Small flowered (pot cultivation):

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Small flowered (cut flowers):

.....

.....

.....

.....

.....

.....

.....

.....

.....

Small flowered (garlands):

.....

.....

.....

.....

.....

.....

.....

.....

.....

Important varieties from Institutes

Institute/University	Variety
IIHR, Bangalore	
NBRI, Lucknow	
PAU, Ludhiana	
TNAU, Coimbatore	

Exercise: 3

Objective: Identification of commercially important flower crops: Tuberose

Botanical Name: *Polianthes tuberosa* L.

Family: Amaryllidaceae

Native:

Description of tuberose plant:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Types of Tuberose

- Single: With one whorl of corolla and are highly scented which are chiefly used for concrete extraction. Concrete content has been observed to be 0.08 to 0.11 per cent. Loose flowers are used for making floral ornaments. Single, Kalyani Single, Shringar, Prajwal, Rajat Rekha, Hyderabad Single, Culcutta Single are main varieties
- Semi-double: Bearing two to three whorls of petals, used for concrete extraction as well as cut flower
- Double: This group comprises of varieties with more than three whorls. They are mainly used for cut flower and bouquet purpose. The main varieties are Double, Kalyani Double, Swarn Rekha, Hyderabad Double, Culcutta Double, Vaibhav & Suvasini.

Description of important varieties:

Varieties	Characters

Exercise: 4

Objective: Identification of commercially important flower crops: Rose

Genus: Rosa
Family: Rosaceae

Some species of Rose

- *Rosa brunonii (Himalayan musk rose)*
- *R. moschata (Musk rose)*
- *R. grandiflora*
- *R. chinensis*
- *R. multiflora*
- *R. bourboniana*
- *R. sericea*
- *R. foetida*
- *R. gigantea*
- *R. involcrata*
- *R. macrophylla*
- *R. webbiana*

Classification

Type	Remarks
Hybrid perpetuals	
Hybrid teas	
Floribundas	
Grandifloras	
Polyanthas	
Miniatures	
Ramblers	

Others:
China rose:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Damask rose:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Bourbon roses:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Cabbage roses:

.....

.....

.....

.....

.....

.....

.....

.....

Moss rose:

.....

.....

.....

.....

.....

.....

.....

.....

French/gallica roses:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Musk roses:

.....

.....

.....

.....

.....

Rugosas:

.....

.....

.....

.....

.....

.....

.....

.....

Austrian briars:

.....

.....

.....

.....

.....

arieties

Class	Indian varieties
Hybrid Teas	
Floribundas	
Miniature	
Polyanthas	
Climbers	

Varieties for protected cultivation:

.....

.....

.....

.....

.....

.....

.....

.....

.....

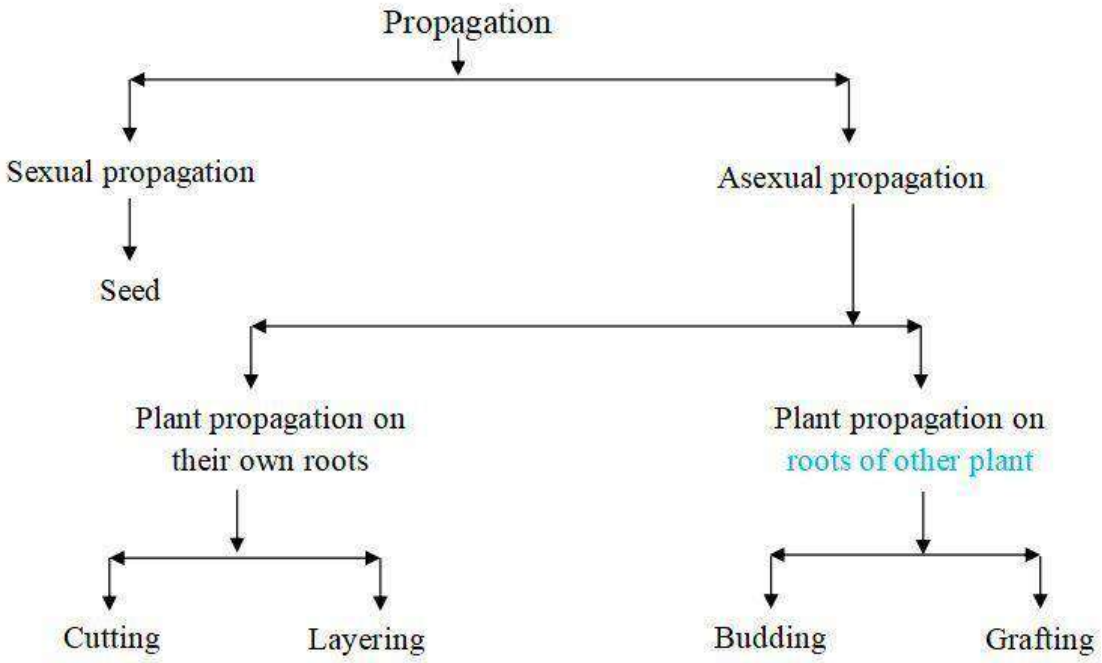
.....

.....

Exercise: 5

Objective: To study propagation methods in loose flowers

Materials required:
Sharp knife, stone pieces or hooks or pegs, polythene bags, Secateur, Pruning knife, grafting knife and grafting tape Bordeaux paste, rooting hormones



Commercial methods & process of Propagation:

Cuttings:

.....

.....

.....

.....

.....

.....

.....

.....

Stem cuttings:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Procedure of Hardwood cutting

.....

.....

.....

.....

.....

.....

.....

.....

.....

Semi-hardwood cutting

.....

.....

.....

.....

.....

.....

.....

.....

.....

Softwood cutting

.....

.....

.....

.....

.....

.....

.....

.....

.....

Herbaceous cutting

.....

.....

.....

.....

.....

.....

.....

.....

.....

Leaf cuttings

.....

.....

.....

.....

.....

.....

.....

.....

.....

Root cuttings:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Budding and its methods

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

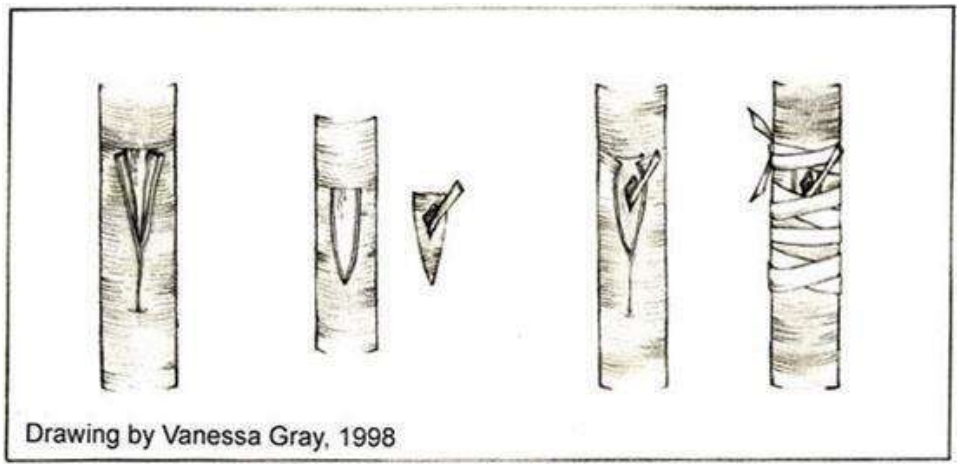
.....

.....

.....

.....

.....



T-Budding in Rose

Layering and its types

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Grafting:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Raising of rootstock

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Selection of scion

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Types of grafting

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Propagation methods and plants:

Propagation material	Crops
Corm	
Bulb	
Sucker	
Tuberous roots	

Exercise no. 6

Objective: To study the nursery management of annuals

Materials required:

Seeds of annuals, soil, sand, FYM/Vermicompost, fungicide.

Seed treatment:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Preparation & types of nursery beds

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Method of seed sowing

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Weeding, irrigation and intercultural operations

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Uplifting of seedling for transplanting

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Exercise: 7

Objective: To study training and pruning in ornamental plants

Training refers to the judicious removal of plant part / parts to develop proper shape of a plant capable of bearing a heavy crop load.

Objectives of trainings

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Methods of Training

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

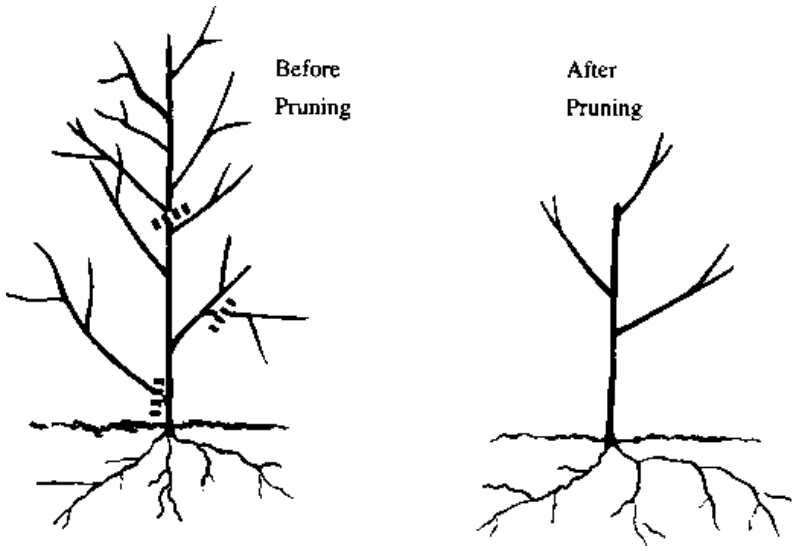
.....

.....

.....

Pruning

Pruning, on the other hand, is a planned removal of plants branches, leaves, twigs, limbs, shoots or roots.



Objectives of pruning:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Time of pruning:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Types and method of pruning based on intensity of pruning:

Light pruning:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Moderate pruning:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Hard pruning:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Differentiate between thinning and heading

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Exercise: 8

Objective: To study fertigation and foliar application in flower crops

Fertigation:

.....

.....

.....

.....

.....

Advantages of fertigation:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

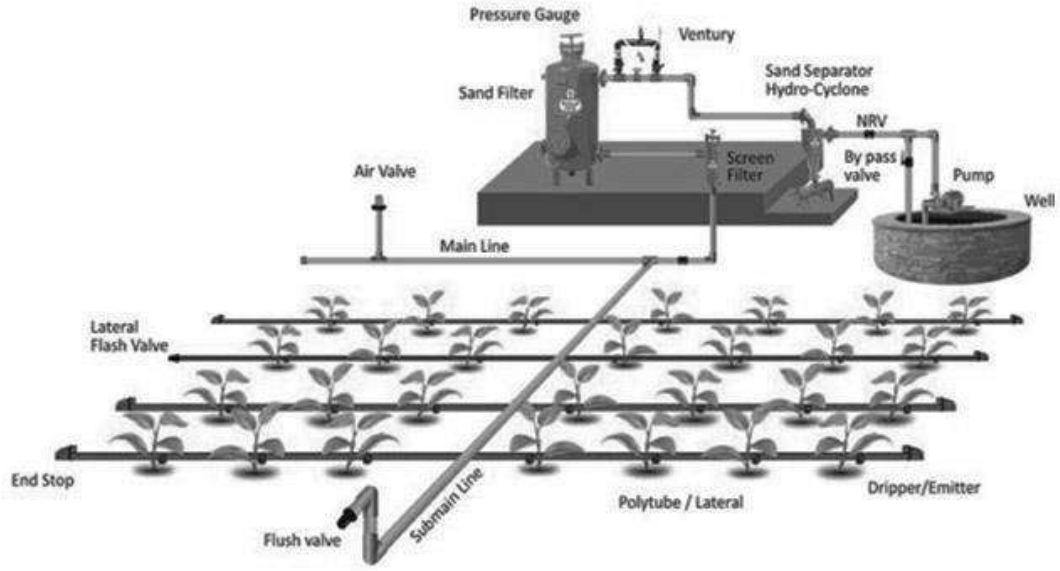
.....

.....

.....

.....

Components of fertigation unit:



Fertigation unit

Source-https://greengrownutrients.com/mode-of-application-fertigation

Fertigation schedule of some commercially important loose flowers:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Foliar application

- It refers to the spraying of fertilizer solutions containing one or more nutrients on the foliage of growing plants.
- Several nutrient elements are readily absorbed by leaves when they are dissolved in water and sprayed on them.
- The concentration of the spray solution has to be controlled; otherwise, serious damage may result due to scorching of the leaves.
- Foliar application is effective for the application of minor nutrients like iron, copper, boron, zinc and manganese. Sometimes insecticides are also applied along with fertilizers.

Exercise: 9

Objective: Use of plant growth regulators in flower crops

Plant growth regulators

A hormone (plant growth regulator) is a substance or chemical produced in one part of an organism (source) and transported to another part of the organism (target) where it causes specific physiological effects. Some plant hormones are inhibitory rather than stimulatory therefore, plant hormones are often referred to as plant growth regulators rather than hormones.

Hormones regulate various physiological processes such as seed germination, plant growth and cell division, responses to stresses, fruit development, and controlled tissue death (senescence).

Classification of growth hormones

Auxins

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Cytokinins

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Ethylene

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Abscisic Acid (ABA)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Gibberellins (GA, gibberellic acid)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Procedure for preparation of growth regulator solution:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Growth regulators and their uses in floriculture

Crop	Growth regulator	Dose	Used for

Exercise: 10

Objective: Study of special horticultural practices in ornamental plants

Pinching

.....

.....

.....

.....

.....

.....

.....

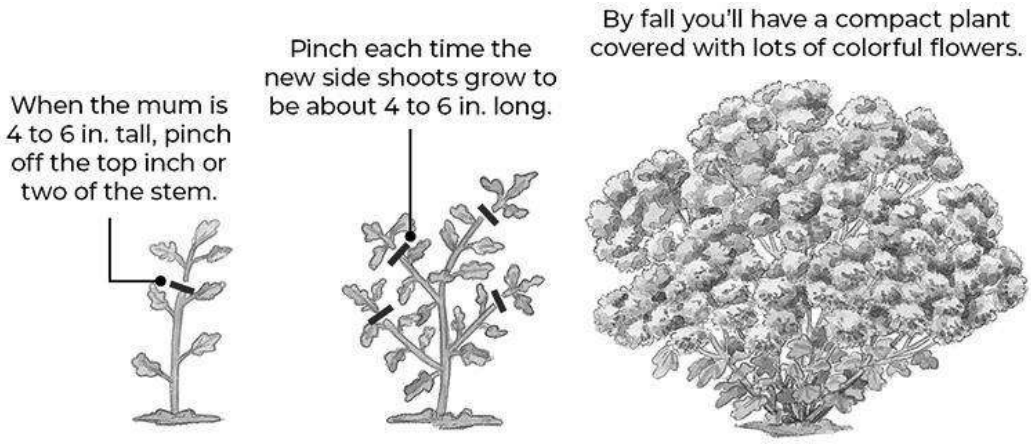
.....

.....

Types of pinching

In chrysanthemum

Soft pinching: The top soft tips of the shoot along with 2-3 open leaves are removed
Hard pinching: It means removing a longer portion upto hard shoot.



Source-https://www.gardengatemagazine.com

In Carnation

Single pinch

- When the plant attains 6 nodes, the first pinch is given.
- 5 -7 cm of apical portion has to be pinched off.
- This gives rise to 4-6 lateral shoots.

One and half pinch

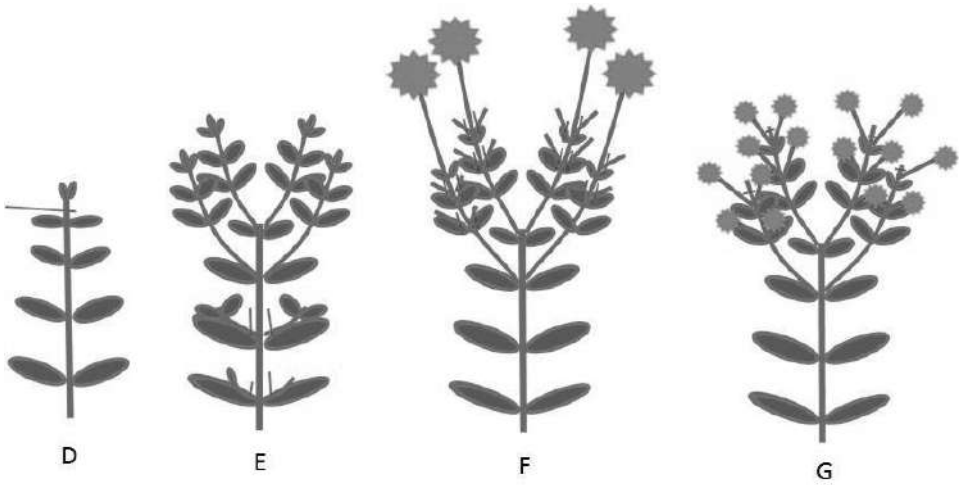
- After single pinched shoots flower, half of side shoots are pinched off.

- 2-3 of these lateral shoots are pinched again.

Double pinch

- All the lateral shoots are pinched off after first pinch (after 3-4 weeks)
- Pinching is done at 4 well developed pairs of leaves

Disbudding



Source-https://haddersm.files.wordpress.com

Staking

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Harvesting

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Exercise: 11

Objective: Identification and management of diseases in Rose

Materials required: Secateurs, Forceps, Lense, microscope

Black Spot (*Diplocarpon rosae* syn. *Marssonina rosae*)

Symptoms

- The spots, which may be as much as 12mm across, are generally circular and have an irregular edge often with a yellow halo.
- Leaves frequently turn yellow and fall early.
- Continual defoliation will cause weakness, die-back or death of the plant

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Powdery Mildew (*Podosphaera pannosa*)

- The fungus produces a very fine, powdery coating on the surface of buds and leaves.
- Attacks on young leaves and buds will cause deformity with retardation of growth. Infected buds fail to open.
- The disease is likely in hot, humid weather, with fungal spores overwintering on the stems and fallen leaves.

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Downy mildew (*Peronospora sparsa*)

- It causes purple-red to dark-brown spots on the leaves with irregular margins and often angular.
- Stems, petioles and flower stalks can split and spotted with purple marks.
- New growth may be deformed.

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Rust (*Phragmidium mucronatum*)

- Rust appears as yellow patches on the surface of leaves, with orange pustules of spores underneath the leaf.
- Affected leaves fall prior to healthy ones and plants may be defoliated in serious infections.

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Anthracnose (*Sphaceloma rosarum*)

- Spots caused by this fungus originate from a point where leaves are water soaked, they turn black with a very distinct defined edge.
- As the spots enlarge the center becomes gray and may fall out resulting in a shot-hole appearance.

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Grey mould (*Botrytis cinerea*)

- Grey mould occurs on the flowers and buds, leaves are infrequently attacked.
- Infected buds rot on the stem and infection may progress down the stem.
- On petals it produces pink rings.

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Exercise: 12

Objective: Identification and management of diseases of Chrysanthemum

Materials required: Secateurs, Forceps, Lense, microscope

Wilt (*Fusarium oxysporum f.sp. chrysanthemi*)

- Initial symptoms are in the form of yellowing and browning of leaves.
- Affected leaves die from the base of the plant upward.
- Infected plants are stunted and often fail to produce flower. Wilting may cause rotting of root or the base of the stem.
- The fungus is soil borne. The disease spreads through cuttings.

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

White rust of Chrysanthemum (*Puccinia horiana*)

- Pale-green to yellow spots, up to 5 mm diameter, develop on the upper surface.
- The centres of these spots become brown and necrotic with ageing.
- On the corresponding lower surface, raised, buff or pinkish, waxy pustules are found.
- The spots on the upper surface become sunken and the pustules become prominent and turn whitish.
- Telia are occasionally found on the upper leaf surface.
- Severely attacked leaves wilt, hang down the stem and gradually dry up completely.

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Brown Rust (*Puccinia chrysanthemi*)

- The symptoms are in the form of brown blister-like swellings, which appear on the under-sides of leaves
- These burst open releasing masses of brown, powdery spores
- Severely infected plants become very weak and fail to bloom properly
- Produces dark brown pustules on the undersurface of the leaf, often in concentric circles

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Septoria Leaf Spot (*Sepotria chrysanthemella*)

- Leaf spots occur during cool-wet periods of the rainy season.
- Serious infection may result in premature withering of the leaves
- When flowering starts, the infection occurs on flower buds, which rot completely.

Management

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Exercise: 13

Objective: To study post-harvest handling, storage and cold chain

Factors Affecting Post Harvest Quality

Flower Maturity (Harvesting indices) of important flower crops:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Harvesting:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Precooling:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Pulsing:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Packaging

.....

.....

.....

.....

.....

.....

.....

.....

.....

Cold storage:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Holding:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Cold Chain:

.....

.....

.....

.....

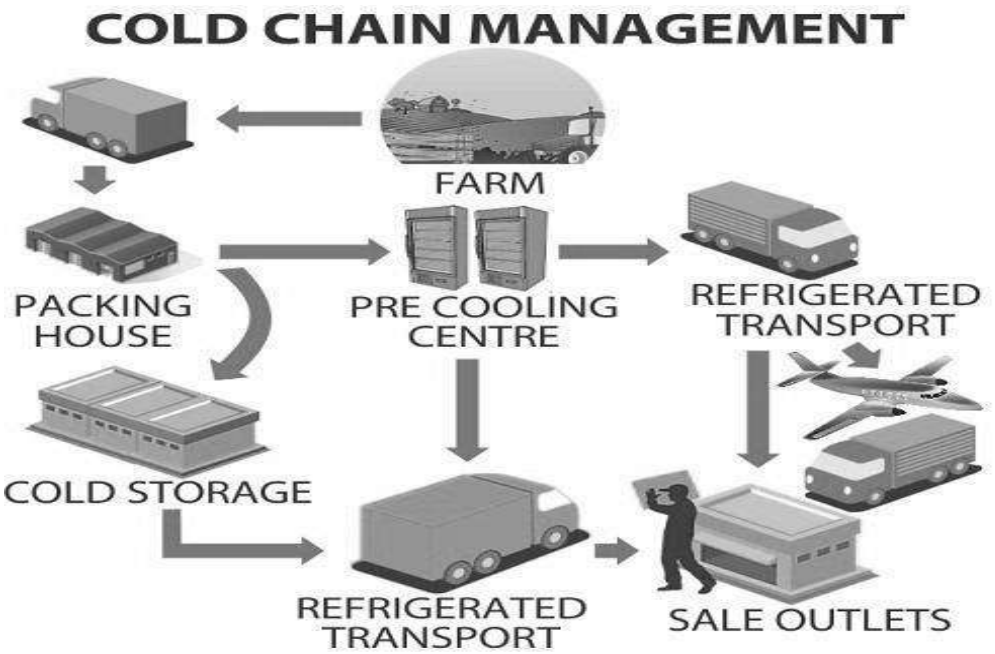
.....

.....

.....

.....

.....



Source-https://tsfps.telangana.gov.in/cold-chain/

Chemicals used for increasing vase life of cut-flowers:

.....

.....

.....

Exercise: 14

Objective: National Horticulture Board guidelines for scheme financing

National Horticulture Board (NHB) was set up by the Government of India in 1984 as an autonomous society under the Societies Registration Act 1860 with a mandate to promote integrated development of horticulture, to help in coordinating, stimulating and sustaining the production and processing of fruits and vegetables and to establish a sound infrastructure in the field of production, processing and marketing with a focus on post-harvest management and cold chain to reduce losses.

Objectives of NHB

The broad objectives are to:

- Develop high quality horticulrural farms in identified belts and make such areas vibrant with horticultural activity which in turn :will act as hubs for developing commercial horticulture
- Develop post-harvest management infrastructure
- Strengthen Market Information System and horticulture database
- Assist R&D programmes to develop products suited for specific varieties with improved methods and horticulture technology
- Provide training and education to farmers and processing industry personnel for improving agronomic practices and new technologies
- Promote consumption of fruits/vegetables in fresh and processed form etc

Programmes /Schemes of NHB

- Development of Commercial Horticulture through production and Post-Harvest Management.
- Capital Investment Subsidy for Construction, Modernization and Expansion of Cold Storage and Storages for Horticulture Produce.
- Technology Development and Transfer for Promotion of Horticulture.
- Market Information Service for Horticulture Crops.
- Horticulture Promotion Services
- Strengthening Capabilities of NHB

Pattern of assistance for NHB schemes

.....

.....

.....

.....

.....

.....

.....

.....

Exercise: 15

Objective: To work out economics of production

I. Variable Cost

1. Nursery management =

2. Land preparation

a) Ploughing =

b) Harrowing =

c) Preparation of beds and channels =

3. Transplanting =

4. Manures and fertilizers application =

5. Interculture operations =

6. Irrigation =

7. Plant protection =

8. Harvesting

a) Picking =

b) Grading =

c) Packing =

d) Transportation =

9. Seed =

10. Manures and fertilizers =

11. Plant Protection =

12. Miscellaneous =

13. Interest on working capital =

II. Fixed Cost

Land revenue, Rental value of land, Management cost, Risk margin, Depreciation cost, Plough, Harrow, Ridges, Buckets, Pump, Sprayer, Total Fixed Capital, Interest on Fixed Capital

Total Fixed Cost =

Therefore,

1. **Total cost of cultivation =**Total variable cost +Total fixed cost

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

2. Total income = Yield (kg) × Market price of the produce (Rs./kg)

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

.....

.....

3. Net Profit = Total Income - Total cost of cultivation

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4. Benefit cost Ratio = Cost of total benefit / Cost of production

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Exercise: 16

Objective: Exposure Visits to fields

Report of the visit:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....