Unit 3

Special Horticultural Practices in Protected Cultivation

Apart from general field operations, cut flowers need special practices for enhancing quality produce and its production. The special operations include bending, pinching, topping, thinning, disbudding, de-suckering, defoliation, etc. Growth regulators such as Auxins, Gibberellins, Cytokinin, Abscisic Acid, etc., are also used for enhancing the growth and quality of flower production. In this unit, these special horticultural practices in flower cultivation are discussed along with their application method.

Session 1: Special Horticultural Practices in Rose Cultivation

In protected cultivation, the special horticultural practices are:

Thinning

It is the removal of inward growth, weak stems, blind shoots and crowded growth, etc.

De-suckering

It is the removal of suckers from the rootstock. The shoots produced below the bud union on the rootstocks are called suckers and the process of removing them is known as de-suckering.

Pinching

It is done by removing the terminal growing portion of a stem. It is done to reduce the plant height and to promote auxiliary branching. Pinching of a blind shoot is beneficial to increase flowering.

Fig. 3.1: Disbudding in rose

Disbudding

It is the process of removing undesirable buds. Keeping only the central bud, by removing other buds, helps in the development of quality flowers. It is done in standard/HT roses to reduce the number of flowers.

Deshooting

It is the removal of unwanted lateral shoots arising on the terminal shoot. This process is generally followed in HT roses.

Defoliation

It is the removal of leaves from the rose plants. It has been reported that this increases the number of blind shoots. It is followed under special conditions. It forces the plants to produce growth and flowering during the desired period.

Use of Growth Substances

Growth substances like GA_3 and retardants like CCC are used to get more flowers of good quality. GA_3 @ 250 ppm has been found to reduce the number of blind shoots, increase the stalk length and flower size.

Removal of Faded Flowers

It refers to the process of removing old flowers. If opened blooms are not removed in time, there is a chance of developing fruit bearing seeds.

Bending

In bending, the mother-shoot is bent nearer to the crown region or on the second leaf. This happens when, after planting, two to three eye buds sprout on the main branch. These sprouts grow as branches and these branches form buds. The ground shoot or the first

bottom break starts coming from the base. The basic framework for production is done by these ground shoots. They should be cut at the fifth pair of leaves, and the medium ground shoots should be cut at second or third pair of leaves. This helps in the development of a good plant structure. Following this, only weak and blind shoots should be selected for bending. It is a continuous process, carried out throughout the life cycle. Bending helps in maintaining enough leaf area on the plant.

Bud Caps

These are generally placed on the buds when they attain pea size. This helps to increase the bud shape and size to meet the customer demand.

Fig.3.2: Rose bud capping

Practical Exercise

Activity 1

Demonstrate bending operation in roses.

Material required

Planting material, secateurs

Procedure

- Selection of plant
- Selection of shoot
- Bending at a desired length in a particular angle

Check Your Progress

A. Fill in the blanks

1. Removal of a part of a terminal growing portion of a stem is called _____.
2. Removal of unwanted buds is known as _____.
3. Removal of suckers from the rootstock is known as _____.

B. Multiple choice questions

1. Removal of leaves from plants is known as _____.
   (a) de-shooting
   (b) defoliation
   (c) disbudding
   (d) pinching
2. The process of removal of undesirable parts like inward growth, weak stems, blind shoot and crowded growth is known as _____.
   (a) thinning
   (b) de-suckering
   (c) disbudding
   (d) pinching
3. Growth regulator GA_3 helps to increase the _____.
   (a) stalk length
   (b) flower size
   (c) both (a) and (b)
   (d) none of the above

C. Subjective questions

1. Why should we go for bending in roses?

   _____

   _____

   _____

2. Make a list of different special field operations to be followed in rose cultivation and explain any one.

   _____

   _____

   _____

D. Match the columns

A	B
1. Bending	(a) Disorder
2. Blind shoot	(b) Removal of undesirable buds
3. Disbudding	(c) Mother shoot

Session 2: Special Horticultural Practices in Carnation Cultivation

Notes

Support Material

- Carnation crop needs support while growing because it has a tendency to bend due to its weak stem.
- The best material to give it support is a metallic wire woven with a nylon mesh.
- A metallic wire is tied around the bed along the length of the bed with supporting poles.
- Every two metres, the wire is supported with poles. The poles should be strong enough to provide support at the end of each bed.
- Optimum support can be achieved by increasing the width of the meshes, wherein the bottom net can be 7.5 × 7.5cm/10 × 10cm, two nets of 12.5 × 12.5cm and the upper most net of 15 × 15cm dimensions.
- The first layer (bottom net) should be laid before planting. Subsequently, the remaining layers should be spread when the plant grows.
- Before planting, 4–5 layers of nets should be laid for support.
- The wires should be supported with poles at every 2.5 to 3.0 m.
- The first net should be fixed at 12 cm above the soil.
- The remaining nets should be placed over the first net, 15 cm apart.

Pinching

- Pinching means removing the terminal stem and encouraging the growth of the side shoots.
- Pinching should be done of the first six pairs of the leaves.
- The first pinching should be done three to four weeks after planting. The pinched portion gives rise to 4–6 well grown laterals, which are to be allowed.

- Depending upon the need of the crop spread, it is classified into— single, one and a half, and double pinch.

Single pinch

- The ideal time for pinching is in the morning.
- The first pinch is given when the plant attains six nodes.
- An apical portion of 5–7 cm should be pinched off.
- This gives rise to 4–6 lateral shoots.

One and a half pinch

After single pinching, half of the re-arisen side shoots are pinched off again.

Double Pinch

- All the lateral shoots should be pinched off three to four weeks after the first pinch.
- The second pinching is done at four well-developed pairs of leaves.

Disbudding

Disbudding means removing unwanted buds.

For standards

These have a single large flower on an individual stem used as a cut flower.

- Remove lateral buds.
- A single main flower bud is left.

For sprays

Spray carnation is generally a bunch of flowers on short branches of a single stalk. The flowers are small and compact on each branch.

- To encourage more side shoots, terminal or main buds are removed.
- Disbudding should be done when the apical bud is 15 mm in diameter.

Practical Exercise

Activity 1

Visit a carnation cultivation greenhouse and observe the different special horticultural practices followed there.

Material required: Writing material

Procedure

- Visit a carnation greenhouse.
- See the supporting net provided for the crop.
- Draw sketches of the supporting system.
- Identify the buds that should be disbudded.

Check Your Progress

A. Fill in the blanks

1. In carnation, _____ is commonly used to support the plant.
2. The number of net layers laid in carnation is _____.
3. Pinching in carnation is done _____ weeks after planting.

B. Multiple choice questions

1. Disbudding of spray carnation should be done when the apical bud is _____ in diameter.
   (a) 5 mm
   (b) 10 mm
   (c) 15 mm
   (d) 20 mm
2. Which of the following operations is not related to carnation cultivation?
   (a) Pinching
   (b) Disbudding
   (c) Bending
   (d) Supporting

C. Subjective questions

1. Differentiate between single and double pinch in carnation.

   _____

   _____

   _____

NOTES

2. What is disbudding? How does it differ in types of carnation?

_____

_____

_____

3. How is supporting done for carnation plants?

_____

_____

_____

D. Match the columns

A	B
1. GI mesh or Nylon mesh	(a) Increase flower size
2. Disbudding	(b) Supporting
3. Pinching	(c) Increase yield

Session 3: Plant Growth Regulators, Types and their Role

The use of Plant Growth Regulators (PGRs) is well established. Some plant species cultivars or species are responsive to some PGRs, but not all.

A substance produced in one part of the organism and transferred to another part of the same organism, which affects a specific physiological function is known as hormone.

IAA — Indole-3-acetic acid
IBA — Indole-3-butyric acid
NAA — Naphtalene acetic acid
2, 4-D — 2,4-Dichlorophenoxyacetic acid
GA — Gibberellic acid

Types of PGRs

Auxins

Auxins are a group of organic chemicals other than nutrients, which in small quantities or concentrations have the capacity to induce cell division, enlargement, and elongation, root promotion, and flower initiation. They are naturally present in anthers, embryo, and the apical bud of the plant. IAA is a natural auxin and IBA, NAA and 2, 4-D are synthetic ones.

Gibberellins

Gibberellins are organic substances other than nutrients, which in small quantity, are characterised by

the capacity to induce cell elongation, sex modification, dormancy breaking, etc. There are more than 100 forms of GAs but the most common type is GA_3.

Cytokinins

Its natural occurrence is in the form of zeatin. Coconut water is a rich source of cytokinins. The synthetic form available is kinetin. Cytokinin promotes cell division (or cytokinesis) and elongation.

Ethylene

It is known as a ripening hormone. Ethylene triggers ripening but does not participate in the process. It also causes flower opening and leaf fall. Ripe fruits are good sources of ethylene. Ethrel or Ethephon is the synthetic form of ethylene.

Inhibitors

Plants contain many inhibitory substances, which inhibit processes such as seed germination, shoot growth, flower set, fruit set, seed set, etc. Abscisic Acid (ABA) is generally present in the matured and senescing or ageing tissues.

The role of PGRs in floriculture is:

- Plant propagation
- Plant morphological control
- Breaking or prolonging dormancy
- Regulation of flowering
- Improvement of spike and flower quality
- Weed control
- Increasing the yield of flowers, bulbs, corms and cormels
- Extending the vase life of flowers
- Senescence inhibition

PGRs can induce the above mentioned responses dramatically in very minute quantities. The response to PGRs, however, varies with the cultivar, age of the plant, light, temperature, availability of mineral nutrients, vigour of the plant and its endogenous hormonal content.

Practical Exercise

Activity 1

Prepare a list of PGRs (Plant Growth Regulators) and write their use in flower crops.

Material required: Writing material and a practical notebook.

Procedure

- Prepare a list of different PGRs used in flower crop cultivation.
- Write the trade name of different PGRs available in the market.
- Write down the use of PGRs in flower crop cultivation.

Check Your Progress

A. Fill in the blanks

1. A natural auxin is _____.
2. PGR _____ are responsible for cell elongation and sex modification.

B. Multiple choice questions

1. _____ is known as a ripening hormone.
   (a) Auxin
   (b) Gibberellins
   (c) Ethylene
   (d) Cytokinin
2. Abscisic acid is generally present in the _____ tissues.
   (a) newly grown
   (b) matured and ageing
   (c) primary root
   (d) None of these

C. Subjective questions

1. What are plant growth regulators? How can they help the farmers?

   _____

   _____

   _____

2. List the different types of plant growth regulators.

   _____

   _____

   _____

3. List the role of plant growth regulators in floriculture.

_____

_____

_____

D. Match the columns

A	B
1. Cytokinins	(a) Ethylene
2. Auxins	(b) GA_3
3. Ripening	(c) Zeatin
4. Gibberellins	(d) IBA

SESSION 4: METHOD OF APPLICATION OF GROWTH REGULATORS

Different methods of application of growth regulators have been discussed in this session. Among these methods, spraying technique is the most commonly used.

Lanolin Paste

Lanolin is a soft fat prepared from animal wool. It is by nature a good solvent for most of the growth regulators. The paste is prepared with fat and the growth regulator, which sticks firmly with the plant part so that the growth regulator used in the experiment does not dry out. Thus, the PGR used in treatment remains in touch with the plant organ for studying its effect.

Direct Immersion Method

Stock solutions may be prepared by dissolving growth regulators in a few ml of 95 per cent ethanol, methanol or any other alcoholic solvent. This solution is diluted as per requirement in requisite concentration. The cuttings or seeds are soaked for 10 to 24 hours in the diluted solution. If rapid action is required, then the concentration in which the cuttings are dipped is increased. The treatment is known as the direct dip or quick dip method, wherein cuttings are dipped for a few seconds only.

Spraying Method

This method is easy to apply since sprays conveniently cover a large area for any material of horticultural use. Diluted solution is sprayed on foliages. The efficiency of PGRs depends on the application of the method and its quantity. For satisfactory response, the specified concentration and spraying at the right stage is necessary. If properly done, a single spray may be sufficient. In some cases, two applications are necessary.

Growth regulators can also be injected into the plant parts with the help of a syringe, particularly for eliciting a local response from the specific target organ or systemic action.

Dust Method

In this method, the PGR is dissolved in absolute alcohol and mixed with a carrier substance like talc, chemical, or bentonite. This is also an easily applicable method for propagation of cuttings or for layering.

Aerosol and Vapour Method

In this method, the auxin solution is mixed with a solvent of low boiling point. It is done better in any cylinder with gas stored on pressure. Thereafter, this mixture of aerosols can be sprayed into the greenhouse through a spray nozzle in the form of mist. Aerosol mist hovers in the greenhouse for a couple of hours and induces requisite action. This method is more suitable for volatile compounds. The use of an electric fan to circulate the gas with aerosols is also effective. The greenhouse should be kept closed for the entire night by which time the auxins are absorbed by the plants. This treatment can be repeated for a few days to get effective results.

Soil Application

Growth regulators can be applied to the soil. Considerable success has been noticed in the effectiveness of auxins as herbicides.

Practical Exercise

Activity 1

Collect the trade names of growth regulators available in the market.

Material required: Writing material, Internet and practical file

Procedure

- Prepare a list of PGRs.
- List their dosages and roles.
- Make a list of their suppliers.

Activity 2

Prepare a stock solution of 1000 ppm concentration.
(Note: 1ppm=1mg dissolved in 1 litre distilled water)

Material required: Volumetric flask, glass container, growth hormone, weighing balance, and ethanol or solvent

Procedure

- Weigh a 100 mg PGR.
- Put it in a glass container.
- Add 3–5 ml of solvent.
- Mix thoroughly to dissolve properly.
- Bring to volume (100ml) with distilled water.

Check Your Progress

A. Fill in the blanks

1. The method of growth regulator application, most useful for propagation through cutting and layering is _____.
2. The most commonly used method of PGRs application is _____ technique.

B. Multiple choice questions

1. _____ is a popular method for promoting fruit setting in a greenhouse.
   (a) Soil application
   (b) Dust application
   (c) Vapour method
   (d) Lanolin paste
2. Stock solutions are made by dissolving growth regulators in a small volume of _____.
   (a) ethanol
   (b) alcohol
   (c) methanol
   (d) All of the above

C. Subjective Questions

1. List the different methods of growth regulator application and describe vapour method.

   _____

   _____

   _____

2. Why is spraying technique most commonly used for the application of growth regulators? How is it done?

   _____

   _____

   _____

D. Match the columns

	A	B
1.	PGR dissolved	(a) Animal wool
2.	Lanolin paste	(b) Direct immersion method
3.	Quick dip method	(c) Absolute alcohol
4.	Vapour method	(d) Volatile compound