Quadrant II – Notes

Programme: BSc. (Hons.) Agri.

Subject: Horticulture

Course Code: HORT-111

Course Title: Fundamentals of Horticulture

Module Name: Use of plant bio-regulators in horticulture

Module No: 15

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Notes :

Use of plant bio-regulators in horticulture

Phytohormones: organic substances naturally produced, synthesized in one part of plant and translocated to another parts, wherein very low concentration causes a physiological response

Plant growth regulators: natural or synthetic substances in small quality modifies, inhibits and promotes the physiological processes in plants

Growth regulating substances are:

a. Auxins
b. Gibberellins
c. Cytokinins
d. Ethylene
e. Abscisic acid

Synthesis of phytohormones

- Young leaves: IAA and GA3
- Roots: GA and Cytokinins

- Young leaves: cytokinins
- Old leaves: ethylene and ABA

Auxins

- Auxin is a **Greek word meaning to increase**
- It stimulate cell elongation
- Synthesised in shoot tip, expanding leaves, developing embryo and fruits
- Tryptophan is precursor
- Polar movement apex to downward
- Auxins: Indole acids: IAA, IBA; Naphthalene acids: NAA, Chlorophenoxy acid; Picolinic acid and derivatives

Role of auxin

- Stimulates **cell division and enlargement**
- **Shoot multiplications** in Tissue culture. IBA and BAP, callus growth (2, 4-D), root multiplication IAA and IBA (1-2 mg).
- **Breaking apical dormancy:** NAA
- **Shortening internodes:** Apple trees (NAA) dwarf branch fruit
- **Rooting of cutting**: (10-1000 ppm-NAA, IAA, Phenyl acetic acid)
- **Prevent lodging:** NAA develop woody and erect stem
- **Prevent abscission**: premature leaf, fruit and flower fall (NAA, IAA and 2,4-D).
- **Parthenocarpic fruit:** Grapes, Banana and Orange (IAA).
- **Flower initiations**: Pineapple uniform flowering and fruit ripening (NAA) and delay flowering (2, 4-D, 600 ppm NAA in guava
- **Weed eradication:** 2, 4-D.
- **Germination**
- **Fruit drop control:** 10ppm NAA in citrus, tomato

Gibberellins

- It was isolated from the soil borne fungus Gibberella fujikuroi
- Synthesis in young leaves, roots and immature shoots
- Move in all directions
- **Role**

1. **Synthesis** in leaf and induce shoot elongation (IAA + GA3), by effecting cell elongation or cell division or both
2. Enhance **metabolic activity**: promote growth and height,
3. **Shoot elongation**: GA3 spray increases height of seedlings
4. **Delay senescence:** Increase photosynthetic and protein synthesis so decrease abscission
5. **Increase cambial growth and differentiation:** Induction of flower and fruit set
6. **Dwarf** plant (genetically) to normal height
7. Promote **flowering** in Long Day Plants
8. Induction of **parthenocarpy**
9. **Breaking dormancy** and leaf expansion 25ppm in GA3
10. **Germination**: 1000ppm in ornamental plants, 200ppm in papaya
11. **Extending shelf life**: 100 ppm in guava fruits

Cytokinins

- ❑ First isolated from maize kernels named as **zeatin**
- ❑ Synthesised germinating seeds, roots, saps canals, developing fruits, tumour tissues
- ❑ **Kinetin, Benzyladenine and Ethoxy ethyladenine**
- ❑ **Role of cytokinin:**

- ➢ Cell division, elongation and enlargement in tissue culture
- ➢ Induction of flowering and fruit development
- ➢ Apical dominance overcoming

- Breaking dormancy: gladiolus
- Delay senescence
- Improves N2 metabolism
- Seed germination
- Organogenesis BA 5 ppm in tissue culture

Ethylene

- **Neljubow** identified the ethylene
- Ripening gas
- **Role of Ethylene**

- Breaking dormancy.
- Induce ripening of fruits. 50ppm ethephone in citrus, 500 ppm in banana
- Induce abscission of leaves.
- Inhibit elongation and lateral bud growth
- Geotropism in pea
- Inducing of flowering 25 ppm in pineapple

Abscisic acid

- Abscission of plant parts
- Inducing dormancy
- Seed development and delay germination
- Stomatal closing: inhibits potassium uptake by guard cells
- Stop elongation.
- Inhibit growth process

Growth Retardant

- Slows cell division and cell elongation of shoot tissues
- AMO 1618, Phosphon-D, CCC, Chloromequat and Alar
- **Inhibitors**: Phenolic inhibitors and synthetic inhibitors, Abscisic acid (ABA), Maleic hydrazide, Tri-Iodobenzoic acid (TIBA), SADH

- Phenolic inhibitors: E.g. Benzoic acid, Salicylic acid, Coumaric acid and Chlorogenic acid

Methods of Application

- **Spraying method:** prepare solution of ppm concentration dissolve in small quantity of solvent and make up with water
- **Lanolin paste:** prepare paste of ppm concentration dissolve in small quantity of solvent and make up in equal quantity of water
- Injection of solution into internal tissues
- Root feeding method
- Powder form
- Dipping of cuttings in solution
- Soaking in dilute aqueous solution

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