Plant Hormones in Plant Propagation

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Plant Hormones = Phytohormones

- **Organically produced.**
- **Synthesized and Translocated to site of action**
- **Active in small concentrations (mmol, ppm)**
- **Signal transduction — a molecule that acts as a signal to regulate plant growth & development**

Hormone (i.e. auxin)

Hormone Receptor

Signal Transduction

Gene Expression

Plant Growth & Development Response (i.e. rooting)

Plant Growth Regulators

- ⇨ Synthetically produced
- ⇨ Organically produced (phytohormones)

Five Classes of Plant Growth Regulators

1. Auxins
2. Cytokinins
3. Gibberellins (GA)
4. Ethylene
5. Abscisic Acid (ABA)

- ⇨ Ancillary Compounds
- ⇨ New Potential Phytohormones

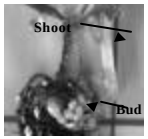
Auxins

- ⇨ Compounds: 2,4-D, NAA, IBA , IAA,
- ⇨ Enhance Adventitious Root Formation
- ⇨ Most cuttings 1000-3000 ppm;
- ⇨ Maximum 10,000 ppm

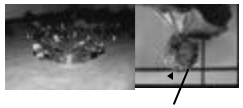
Cytokinins

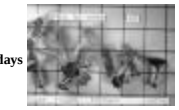
- Compounds: TDZ (thidiazuron), PBA, BA, Kinetin, Zeatin, 2iP
- Enhance Adventitious Bud and Shoot Formation in leaf and root cuttings
- Used in tissue culture systems in Stage II - Shoot Proliferation
- High Cytokinin : Low Auxin ratio stimulates adventitious bud formation & overcomes apical dominance

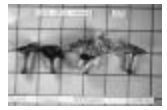
Cytokinins & Leaf Cuttings



Cytokinins & Leaf Cuttings (con.)







Gibberellins

- GA_3, $GA_{4/7}$, + 90-plus GA compounds
- Foolish seedling disease with rice seedlings
- Generally inhibit bud, shoot and root formation, so not used in vegetative propagation
- Sometimes used in tissue culture systems
- Important in breaking seed dormancy

Ethylene

- Gas $H_2C=H_2C$
- Compounds: Ethylene gas, Ethrel, Florel
- Can stimulate adventitious root formation; may be an indirect effect; rooting generally occurs with intact plants, not cuttings.
- Wounding and auxin can trigger ethylene production

Abscisic Acid (ABA)

- Compound: ABA
- Acts antagonistically with gibberellic acid (GA); both share the same chemical pathway (Mevalonic Acid pathway)
- Inhibitor; occurs during drought stress.
- Generally not used in propagation; can increase adventitious bud formation in leaf cuttings
- Inhibitors used in Hare's Rooting powder — "cocktail" with auxin & other compounds.

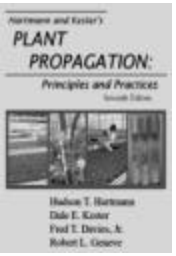
Ancillary Compounds

- **Compounds: Some are Growth Retardants/Inhibitors**
- **Alar (B-9), CCC, Arest, Sumagic -- antagonistic with GA**
- **Polyamines**
- **Phenolics -- "Rooting Cofactors"**
  di-phenolics--inhibit IAA oxidase

New Potential Phytohormones

- **Spermidine (polyamine)**

IPPS

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