Principles of Propagation by Cuttings

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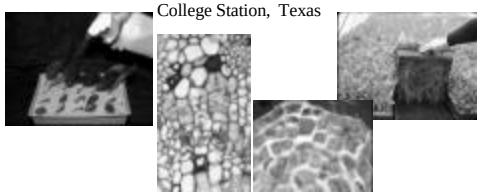
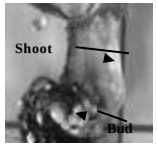


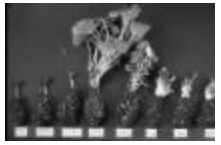
Cutting Propagation



- **Is the clonal multiplication of plants with propagules of stems, leaves or roots.**
- **Is the most important means for clonal regeneration of many horticultural crops: ornamentals, fruits, nuts, vegetables.**

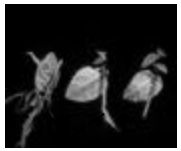
Adventitious Buds & Shoots





- **Arise from any plant part other than terminal, lateral or latent buds on stems.**
- **Form irregularly on older portions of a plant and not on the stem tips or in leaf axils.**
- **An adventitious bud is an embryonic shoot.**

Adventitious Roots



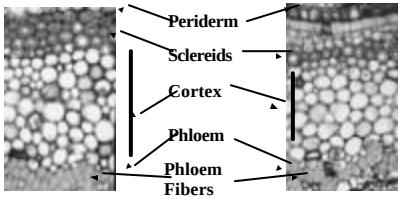
⇨ Arise from any plant part other than by normal development and ontogeny of the seedling root and its branches.

⇨ Adventitious Roots can also be regenerated from root-pruned seedlings.

Stem Anatomy

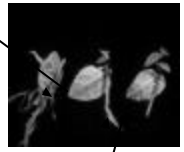
Ficus pumila

(Creeping Fig)



Adventitious Roots

⇨ Preformed Roots

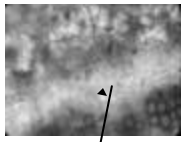


⇨ Wound-Induced; formed De Novo (a new)

De Novo Adventitious Root Formation

- ⇨ Dedifferentiation or remeristemation of parenchyma cells.
- ⇨ Initiation of slightly organized cell groups (root initials).
- ⇨ Root Primordia differentiation.
- ⇨ Elongation or extension of Root Primordia

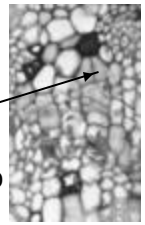
Dedifferentiation or remeristemation of parenchyma cells.



Increased Vascular Cambial Activity

1st Anticlinal division

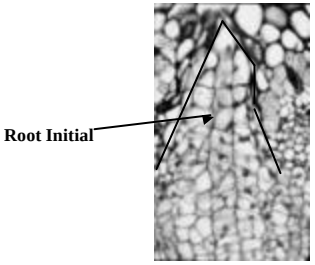
(phloem ray parenchyma cell)



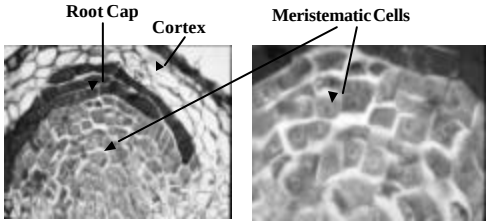
Phloem Ray Parenchyma Cells

- ⇨ All cells are initially parenchyma cells.
- ⇨ Totipotency.
- ⇨ Parenchyma cells can develope into other types of cells, i.e. initially revert to meristematic cells in de novo rooting
- ⇨ Phloem - "Loading zone" — rich in carbohydrates, other metabolites.
- ⇨ Auxin is translocated through phloem parenchyma cells.

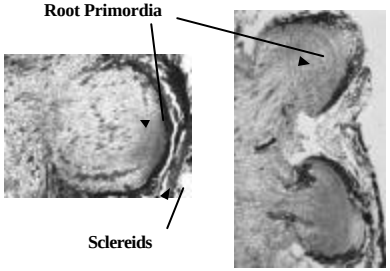
Initiation of Slightly Organized Cell Groups (Root Initials)



Root Primordia Development

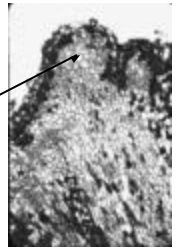


Elongation or Extension of Root Primordia



Origin of Wound-Induced De Novo Adventitious Roots

- Phloem ray parenchyma
- Cambial and phloem portions of vascular ray tissues
- Internal and external callus (irregularly arranged parenchymatous tissues).



Adventitious Root Formation in *Ficus pumila* (Creeping fig)

	Juvenile	Mature
First anticlinal cell divisions ray parenchyma	Day 4	Day 6
Primordia	Day 6	Day 10
First Rooting	Day 7	Day 20
Maximum Rooting	Day 14	Day 28

Auxins

- Powder (talc) formulations of auxins are still used to stimulate rooting of cuttings.

⇨ **Spray or quick-dip applications of 1 to 5 sec are the preferred methods to apply auxins**

Indolebutyric Acid (IBA) and Napthalene Acetic Acid (NAA) are auxins used singly or in combination in commercial propagation

Dip 'N Grow

Food Dye

Mass Dipping Cuttings

Hare's Rooting Powder

⇨ **Auxin (IBA)**

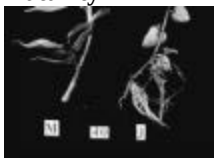
⇨ **Rooting Cofactors (PZI, FPZ)**

⇨ **Sugar (Sucrose)**

⇨ **Fungicide (Captan)**

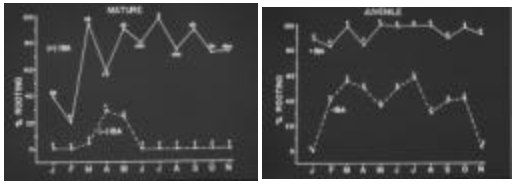
⇨ **Growth Retardants**

Juvenility and Maturity



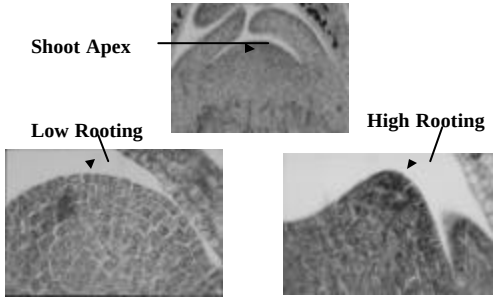
- ⇨ Auxins will only speed up and enhance rooting of cuttings.
- ⇨ Difficult-to-root species or cuttings taken from physiologically mature stock plants may not respond to auxin.
- ⇨ Plant biotechnology — genes responsible for making the plant tissue respond to auxin are more critical than genes producing auxin.

Seasonal Effect on Rooting



Mature Juvenile

Shoot RNA & Seasonal Effects

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