Micropropagation of Orchids

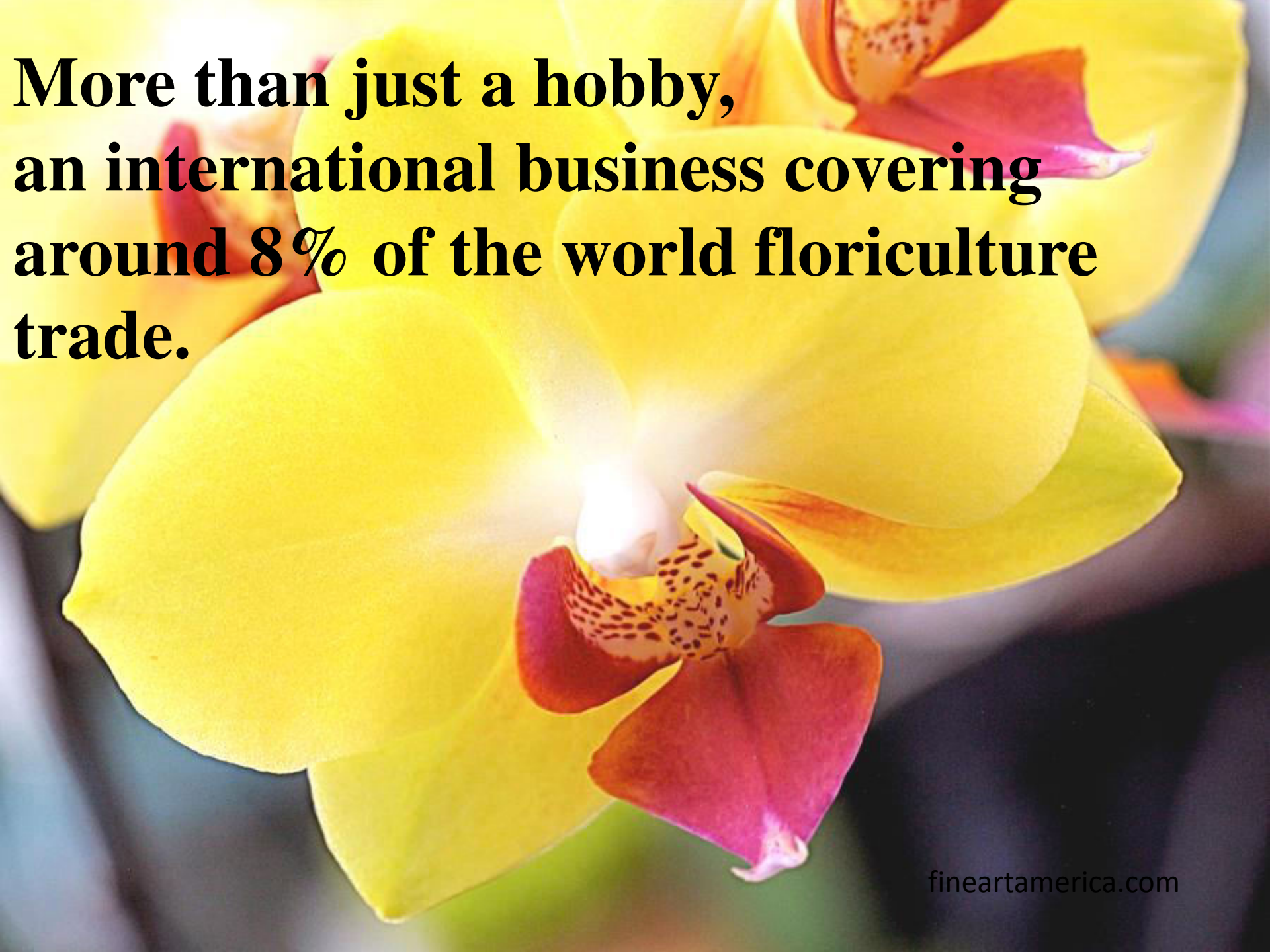
Assist. Prof. Melekşen Akın


Over 800 genera
and
25 000 species
orchidcarelady.com

Long lasting flowers incredible range of diversity in size, shape and color

As ornamentals, herbal medicines and food (Arditti, 1992).

marionkay.com


More than just a hobby,
an international business covering
around 8% of the world floriculture
trade.
fineartamerica.com

Orchids are marketed both as cut flowers and potted plants.

Largest exporters Taiwan, Thailand, UK, Italy, Japan, New Zealand and Brazil.

Largest importer United States.

Tissue culture techniques has helped orchids occupy a position as one of the top ten cut flowers.

Advantages of clonal propagation

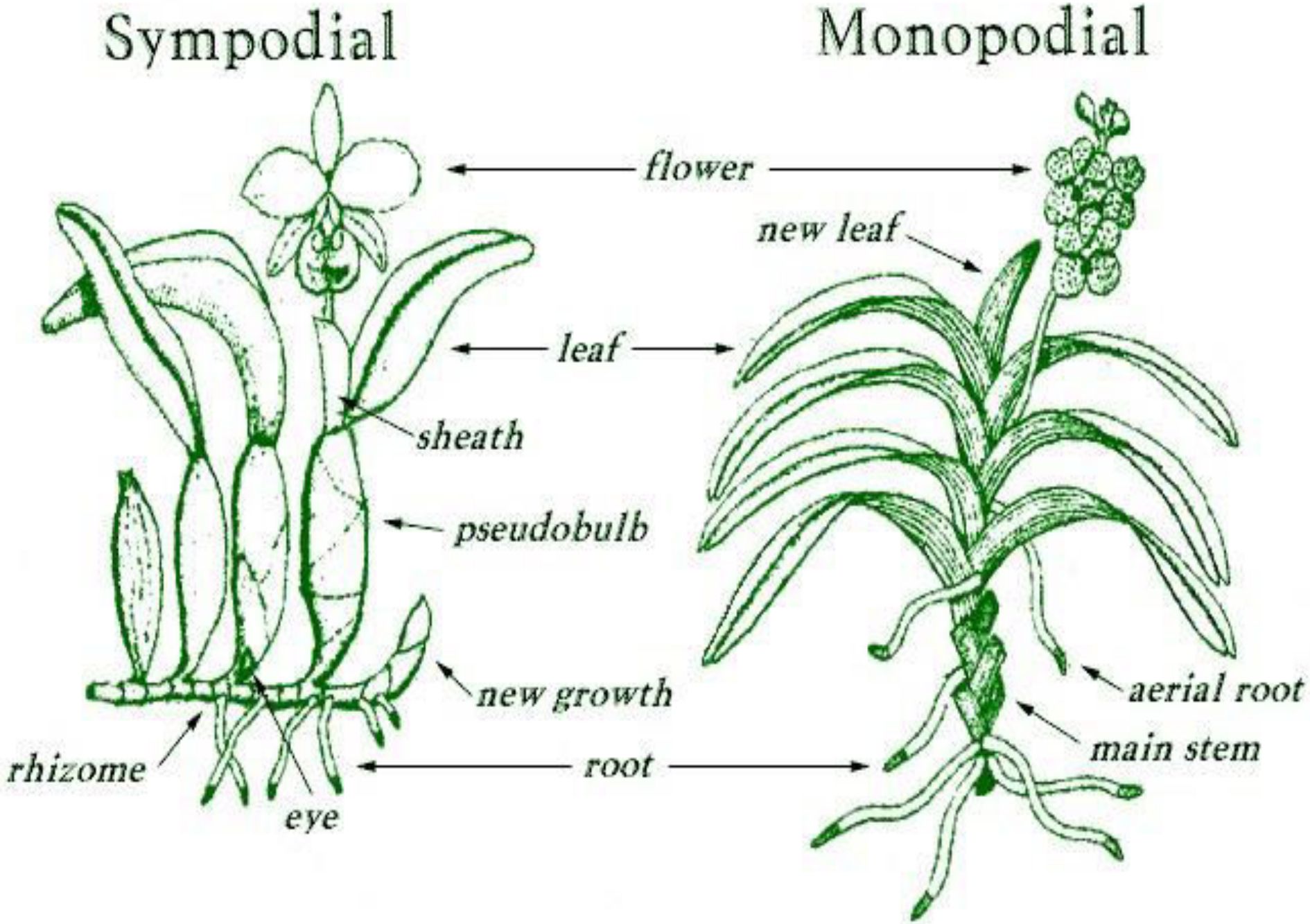
- Seeds leads to the production of heterozygous plants.
- More than two years to reach the flowering stage.
- Plantlets identical to their parents.
- Uniform blossoms during predictable periods to meet market demands.

Micropropagation

"… the *art* and science of multiplying plants *in vitro*."

Explants

- Shoot tip
- Leaf segment
- Flower bud
- Rhizome segment
- Root segment


Sympodial
Monopodial
flower
new leaf
leaf
sheath
pseudobulb
new growth
aerial root
main stem
rhizome
root
eye

Micropropagation pathway

1) Explant
2) Protocorm like bodies (PLB's)
3) Proliferation of PLB's
4) Plantlets with well developed shoots

Basal media

- **KC** medium (1946)
- **VW** medium (1949)
- **MS** medium (1962)
- **N69** medium (1969)
- **MPR** medium (1976)

Plant growth regulators and adjuncts

- **BAP:** 6-Benzyl Amino Purine
- **NAA:** 1-Naphthalene Acetic Acid
- **IAA:** Indole Acetic Acid
- **IBA:** Indole Butyric Acid
- **CW:** Coconut Water
- **AC:** Activated Charcoal

Shoot tip culture

First detailed protocol for *in vitro* production of *Cymbidium* orchid using meristem culture (Wimber 1963).

en.wikipedia.org

MS + 1 mg/l BAP + 150 mg/l CW

for

Vanilla orchid

From a single explant
100,000 plants in about 15 subcultures.

Not appropriate for the monopodial orchids.
Leads to the growth arrest of mother plant.

Better for **sympodial** orchids like *Dendrobium* and *Cymbidium.*

Leaf segment culture

First well-documented report on production of PLBs
from *Cymbidium* leaves (Wimber, 1965).


a
Leaf explant


b
PLB's


c
6 month old plant

- **MPR +66.6 µM BAP + 28.5 µM IAA** *(Vanda spathulata)*
- **½ MS + 0.3-3 mg/l TDZ** *(Oncidium)*

- medium nutrient composition
- plant growth regulators
- source of the leaf (*in vitro*/*in vivo*)
- part of the leaf taken
- the age of the leaf

- Mass scale cultivation of commercially important orchid species is restricted because of the time and costs involved in standardizing the mentioned factors.

Inflorescence axis and flower bud culture

Effective donor organs for micropropagating orchids

Mass propagation of the monopodial orchid *Phalaenopsis*

zgallerie.com

Media composition

- MS +0.5 mg/l NAA + 1 mg/l TDZ
- MS + 4.52µM 2.4-D +2.22 µM BAP
- MPR + 2 mg/l BAP
- VW liquid media + 20% coconut water

Problems

Exudation of phenolics

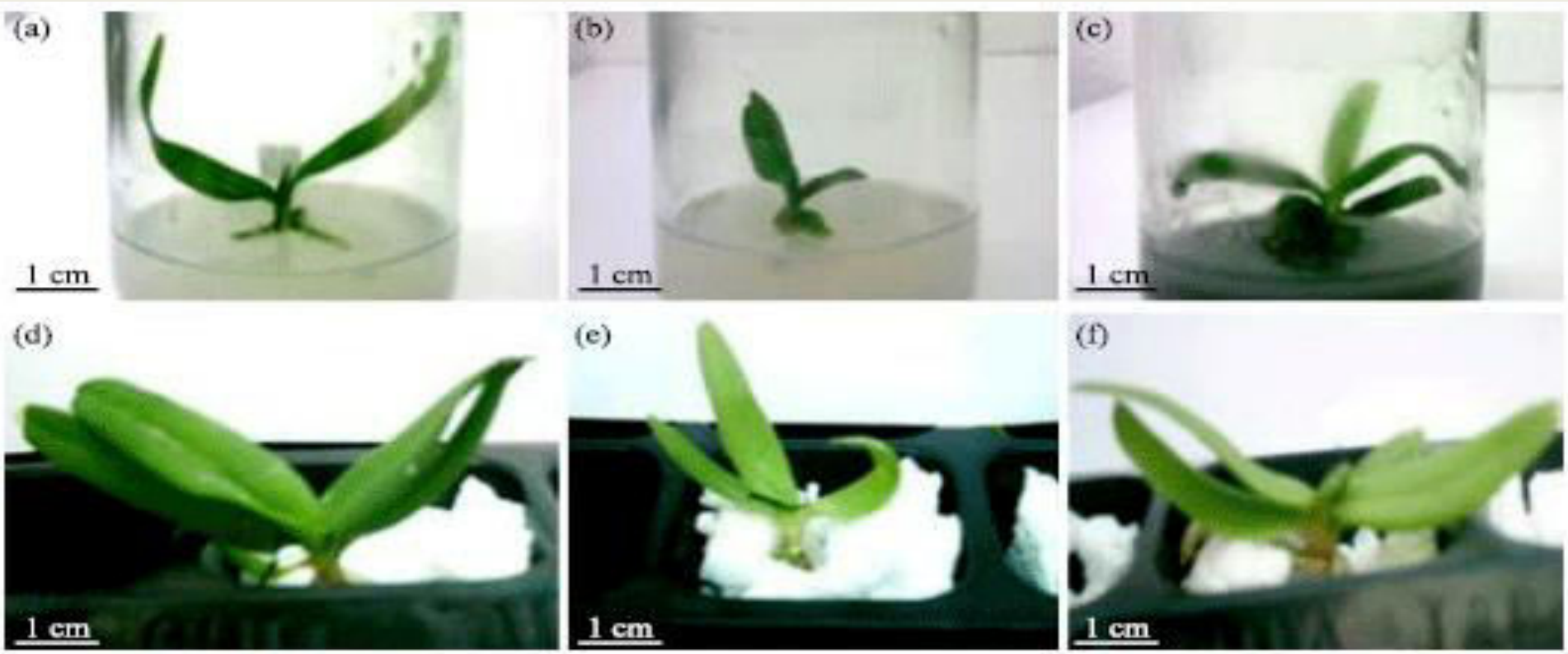
Remedy:

Activated charcoal,

ascorbic acid

(Arditti and Ernst, 1993)

- Low survival rate at transplantation

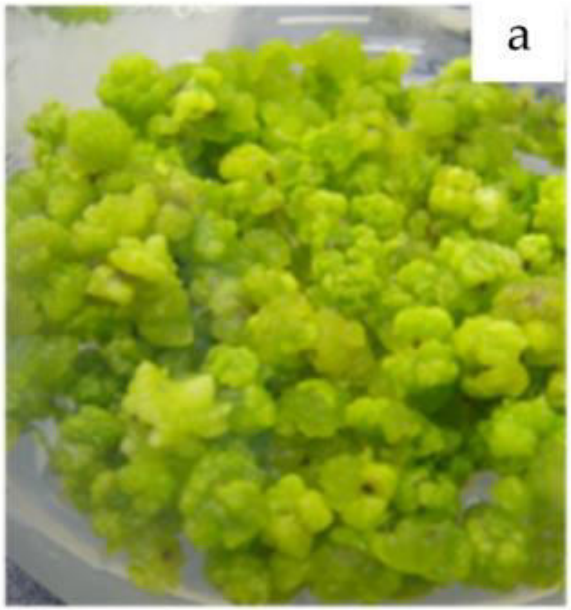


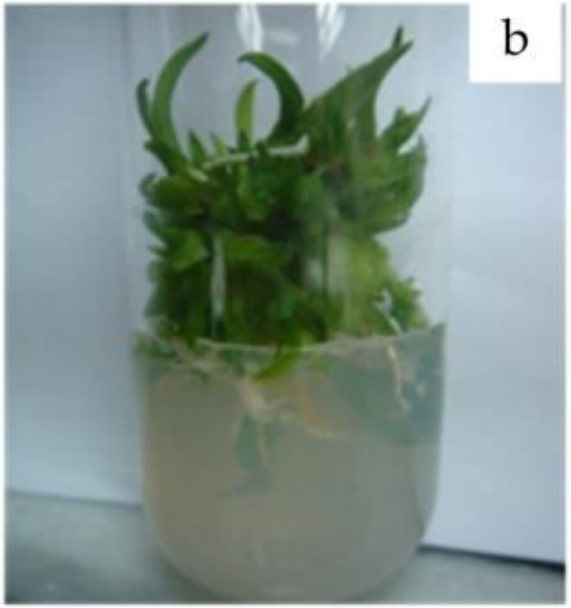
Remedy:

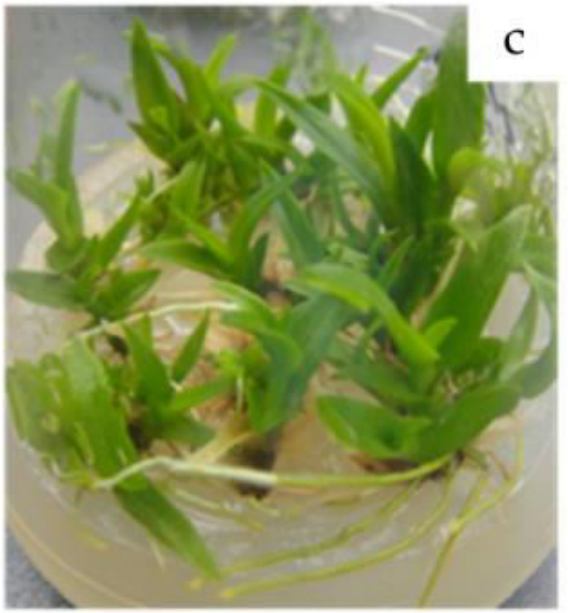
- Acclimatization (gradually decrease humidity)
- Applying ABA (decrease transpiration)
- Increasing CO_2 concentration (Hazarika, 2003)

Somaclonal variation:

- plant growth regulators
- long periods of culture







sites.psu.edu

- Decreasing concentration of plant growth regulators

- Using shoot tips

Conclusion

- Produces high quality plant materials.
- Explant propagated and not seed propagated.
- Cost efficient protocols for mass propagation.

References

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