A NOTES ON
PLANT ORGANOGENESIS

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PLANT ORGANOGENESIS

SYNOPSIS

- INTRODUTION
- DEFINITION
- HISTORY
- STEPS OF ORGANOGENESIS –

1. STERILIZATION
2. GERMINATION
3. REGENERATION
4. ORGANOGENESIS

   DIRECT METHOD

   INDIRECT METHOD

- IMPORTANCE OF ORGANOGENESIS IN PLANT TISSUE CULTURE
- SUMMARY
- CONCLUSION
- REFERECES

INTRODUCTION

PLANT ORGANOGENESIS

- **TISSUE CULTURE –** is the culture and maintenance of plant cells and organs.
- **PLANT TISSUE CULTURE -** is refers to *in vitro* cultivation of plant seeds. And various parts of the body (organs, embryo, tissues, single cell, protoplasts.)

- **IMPORTANT PARAMETERS FOR PLANT TISSUE CULTURE –**

- Type of explants: leaf, stem, embryo, root, petiole, etc.

- Medium:

Macro nutrient and Micronutrients

Vitamins

pH

- Hormones:

Cytokinin – TDZ (Thi dia zuron), BAP (Benzyl amino purine)

Auxin – NAA (Naphthalene acetic acid)

- Photoperiod

- Aseptic technique

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DEFINITIONS

- **Organogenesis**
  - Relies on the production of organs either directly from an explant or callus structure.
- **Somatic Embryogenesis**
  - Embryo-like structures which can develop into whole plants in a way that is similar to zygotic embryos are formed from somatic cells.
- **Existing Meristems**
  - Uses meristematic cells to regenerate whole plant.

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HISTORY

- F. Skoog (1994) first indication that *in vitro* organogenesis could be chemically regulated to some extent.
- He found that the addition of the auxin to the culture medium serves to stimulate root formation whereas shoot induction was inhibited.
- Organogenesis is controlled balance between cytokinin and auxin.
- C. Tusi (1948) they found that adenine sulfate was active in promoting shoot induction and this chemical reversed inhibitory effect of auxin.

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STEPS OF ORGANOGENESIS

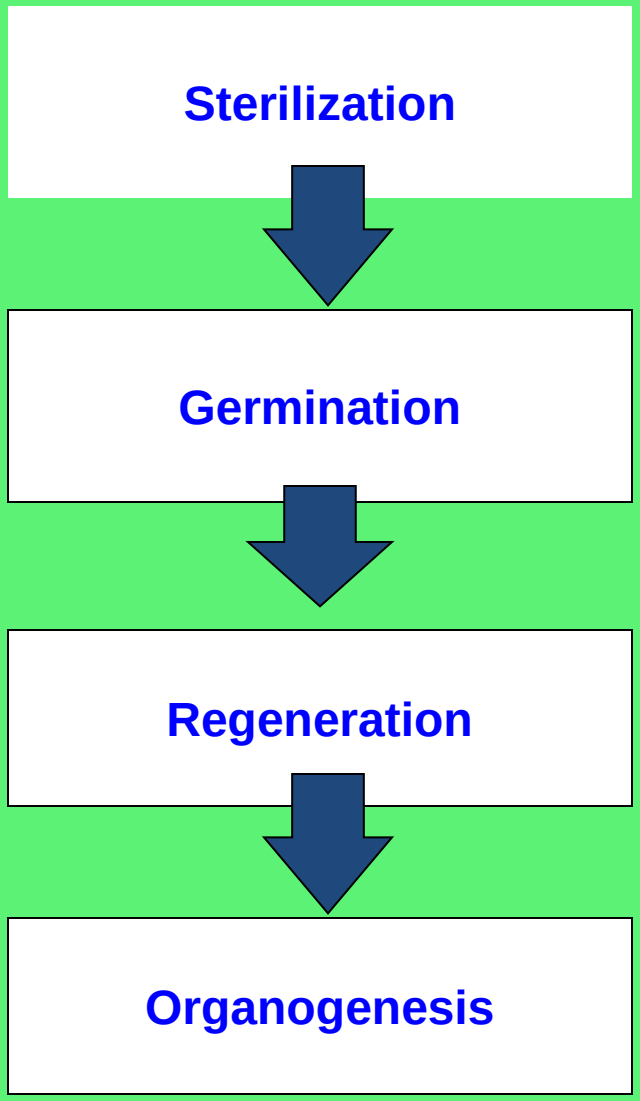

FIG NO – 1. Flow Diagram for plant Organogenesis

PLANT ORGANOGENESIS

STERILIZATION

Protocol for Sterilization

- Rinse with sterile water
- Soak seeds in sterile water (1 hour)
- Soak again and leave overnight
- Rinse with sterile water.
- Sterilized with teepol solution for 1 min.
- Then washed with ethanol for 30 sec.

FIG NO. – 2 ARACHIS HYPOGEA

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GERMINATION

Protocol for Germination

•Sterilize hands with 70% Iso-propanol.

•Remove seed , split each down the center to reveal the embryo.

•Use knife to cut embryo away from endosperm.

•Collect embryos and proceed to culture .

•Then inoculate the embryo on the medium.

•Use 10 embryos per plate.

•Then leave the plates for regeneration.

FIG NO. – 3

FIG NO. – 4 INOCULATION

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BAP (Benzyl amino purine)

TDZ (Thi dia zuron)

HA (Humic Acid)

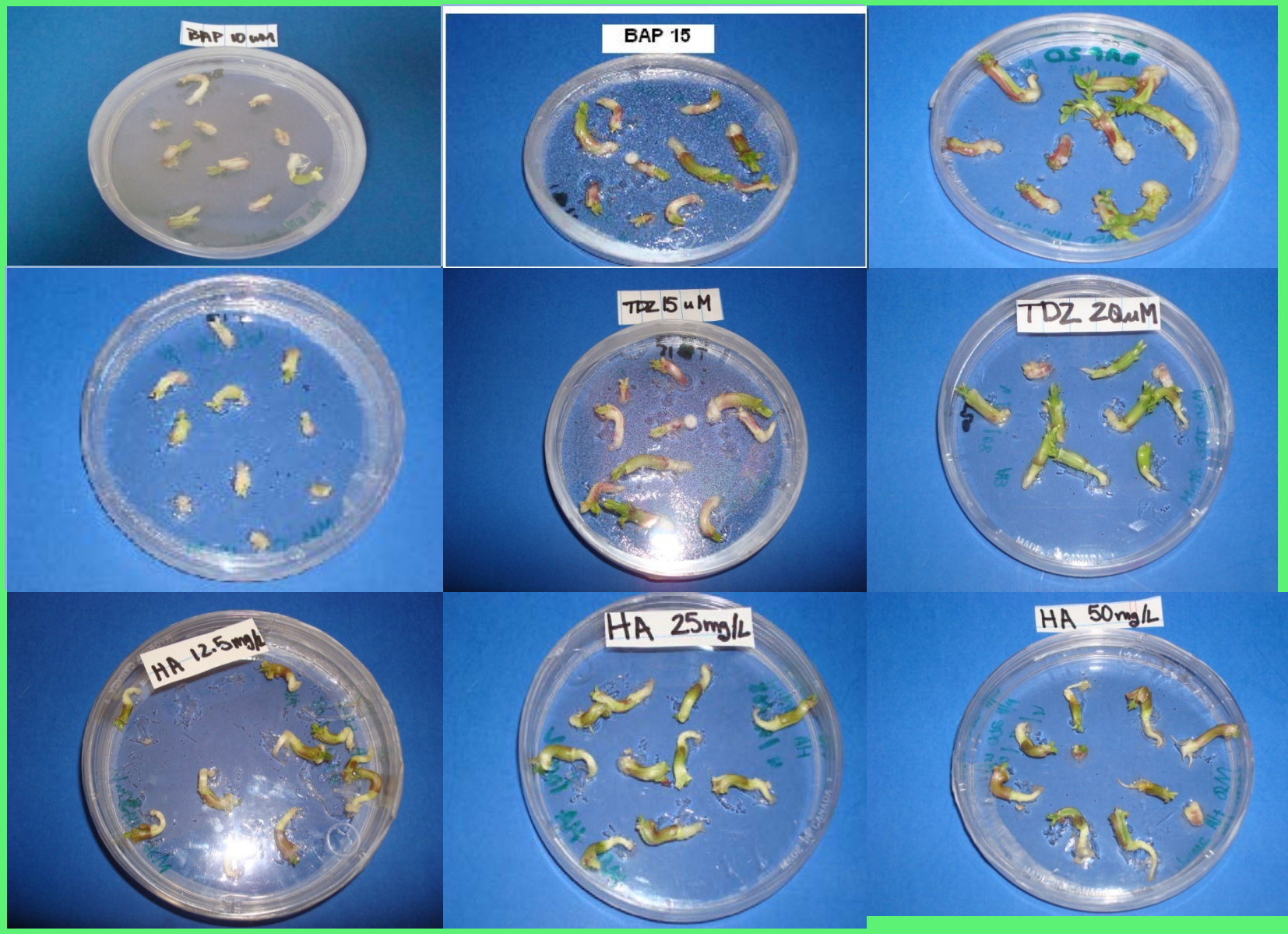
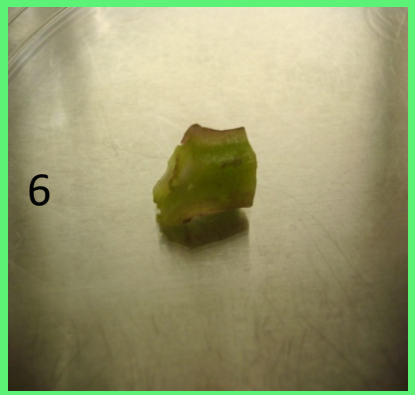


FIG NO.- 5. Germination using 3 different hormones at 3 different concentrations

PLANT ORGANOGENESIS

REGENERATION



1. **Embryo in culture**
2. **Germinating embryo**
3. **Elongating shoot**
4. **Well elongated shoot**
5. **Single well elongated shoot**
6. **Hypocotyl explants**
7. **Contaminated plate**

Fig. 6 .Steps in peanut regeneration

PLANT ORGANOGENESIS

REGENERATION

FIG NO. -7. Contaminated plate

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REGENERATION

All 3 hormones bring about germination.

On an average HA gave the best results for germination.

Change in concentration of the hormones did not necessarily change the germination success.

For both root and shoot germination HA gave the best results of the 3 hormones used.

FIG NO. – 8

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REGENERATION

Regeneration refer to the development of organized structure like root, shoots, flower buds, somatic embryogenesis, etc. from culture cell/ tissues ; it is also termed as “organogenesis”.

- The embryo regenerates the shoot and root.
- Then regenerate the complete plantlet.

FIG NO. 9. Regenerated Explant

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ORGANOGENESIS

FIG NO.10. Cut hypocotyl and reculture in same hormone concentration.

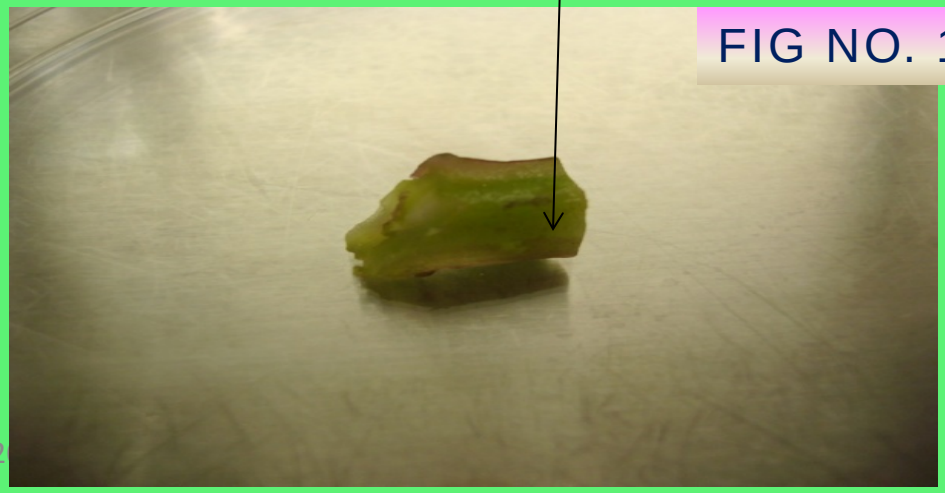

FIG NO. 11.Explant for organogenesis

METHODS OF ORGANOGENESIS

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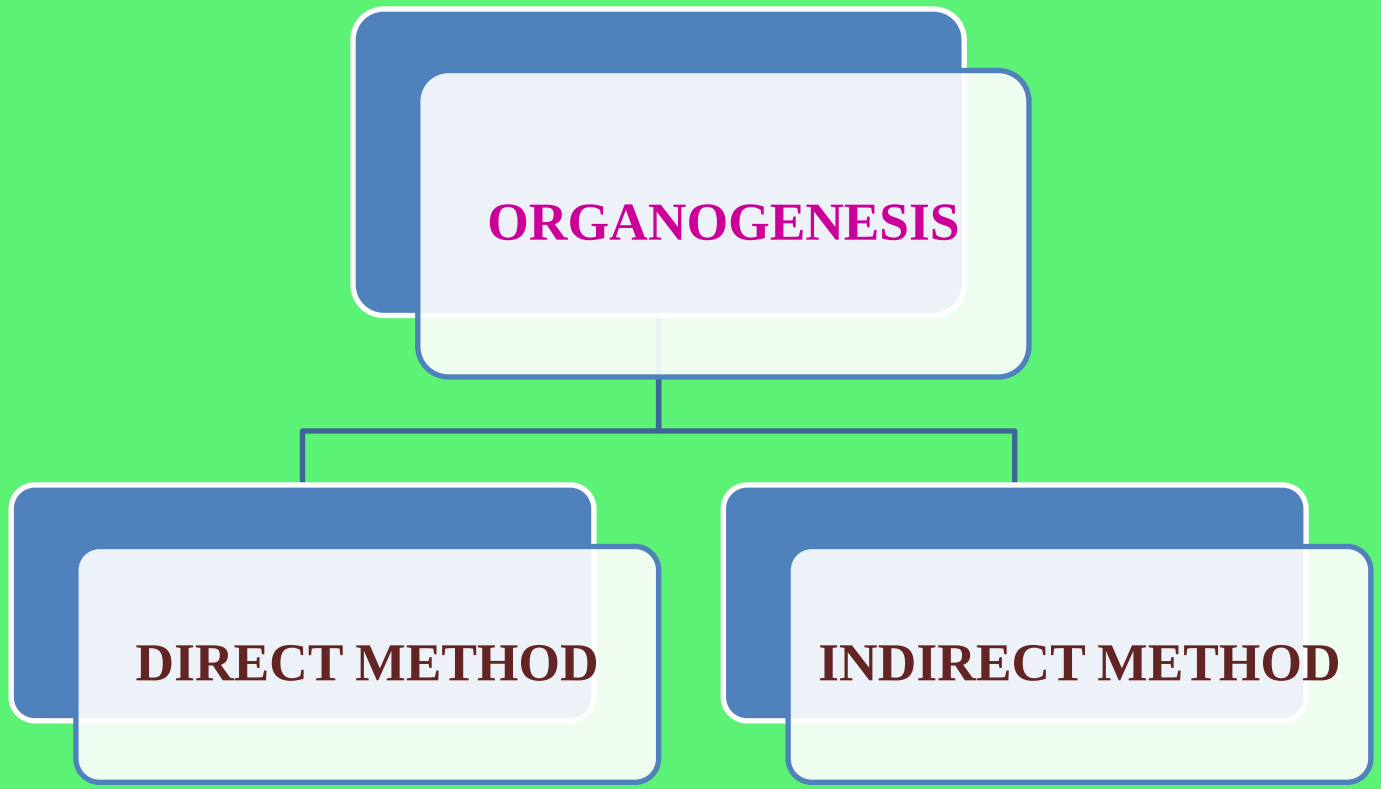
•Cut hypocotyl and reculture in same hormone concentration.

•The hypocotyl is further regenerates and produce plant organ by organogenesis.



TECHNIQUES OF ORGANOGENESIS

PLANT ORGANOGENESIS

DIRECT METHOD

Take a plant.

Then isolate an organ from plant (leaf, shoot or root.)

Inoculate on media and add the growth regulators auxin and cytokinin.

Then formation of shoot occurs simultaneously.

Then rooting occurs.

Finally from that explant a complete plant is regeneranated.

TECHNIQUES OF ORGANOGENESIS

PLANT ORGANOGENESIS

INDIRECT METHOD

Take a plant.

⇩

Then isolate an organ from plant (leaf, shoot or root etc.)

⇩

Inoculate on media and add the growth regulators auxin and cytokinin.

⇩

Then formation of callus occurs from the explant.

⇩

Then formation of shoot occurs simultaneously.

⇩

Then rooting occurs.

⇩

Finally from that explant a complete plant is regeneranated.

PLANT ORGANOGENESIS

ORGANOGENESIS

FIG NO. 12. CALLUS FORMATION

FIG NO. 13. ORGAN FORMATION

PLANT ORGANOGENESIS

IMPORTANC OF ORGANOGENESIS

- Plant tissue culture has value in studies such as:
  cell biology, genetics, and many other research areas.
- Crop Improvement.
- Genetic Transformation.
- Plants can be produced quickly.
- Plantlets can be used for germplasm conservation.

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SUMMARY

•Organogenesis is refers to development of the complete plant from the isolated explants.

•Organogenesis is carried out in two ways –

Direct method

Indirect method

•Organogenesis has wide application in plant tissue culture.

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CONCLUSION

- Peanut (*Arachis Hypogea)* regeneration through organogenesis has been done.
- Growth regulators such as TDZ, BAP, and HA stimulate plant regeneration.
- Both TDZ and BAP produce more viable shoots during organogenesis.
- Lower concentrations gave better results.
- Ongoing work includes replicating the procedure using other species of peanut (*Arachis Hypogea)* plant.

PLANT ORGANOGENESIS

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THANKYOU