ADVANTAGES OF PLANT TISSUE CULTURE

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Summery of the presentation

- Introduction about my self and Bangladesh
- Introduction of some unique plant species
- Propagation of plants through tissue culture
- Application of tissue culture in plant genetic engineering.
WHO AM I?

Full Name: Abdullah Mohammad Shohael
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Academic qualifications:
PhD: 2006, South Korea (Agriculture)
MSc: 2001, Bangladesh (Biotechnology)
Bachelor: 1999, Bangladesh (Plant Science)
Introduction of Bangladesh
Bangladesh at a glance*

Name: People`s Republic of BANGLADESH
Capital: Dhaka
Mother tongue: Bengali (Bangla)
Area: 144,000 km$^2$ (water 7%)
Population: 147 Million
Currency: Taka

There are 6 different seasons in Bangladesh:

- **SUMMER**: APRIL-MAY
- **RAINY**: JUNE-JULY
- **AUTUMN**: AUG-SEPT
- **DRY**: OCT-NOV
- **WINTER**: DEC-JAN
- **SPRING**: FEB-MAR
National symbols of Bangladesh

Anthem: Amaar shonar bangla
Animal: The Royal Bengal Tiger
Bird: Oriental magpie Robin
Fish: Hilsha
Flower: White water lily
Fruit: Jackfruit
Sports: Kabadi
Fashion
Each tablet contains the equivalent of three miracle fruit berries. Japanese researchers are promoting the tablets as a way for diabetics to enjoy sweets without eating sugar.
Miracle fruits and Miraculin

- **Species name:** *Richadella dulcifica* (Schum and Thonn) Fami
- **English name:** Miracle fruit.
- **Origin:** West African ever green tree.
- **Flower and fruits:** Multiple whitish small flowers perpetual flowering. And long oval shape berry. (Oct/Nov).

**Characteristics:**
A ripen red berries can convert a sour taste into a sweet taste. For example, lemons taste sweet, like oranges, after chewing the pulp of the red berries. Due to this unusual property, the berry has been called the “miracle fruit”. The active ingredient in the berry, miraculin, causes citric acid, ascorbic acid, and acetic acid, which are normally sour, to be perceived as sweet after being held in the mouth. The African native has ate this berry before drinking palm wine and eating corn bread to give a sweetness to these foods.
Tissue Culture!

1. Root Tip
2. Dissociate Cells
3. Root Cells
4. Culture Root Cells
5. Root Cell Form Calluses
6. Grow from Calluses
7. Cloned Plants
What is Tissue culture???

Tissue culture is a process of growing cells artificially in the laboratory.

Tissue culture involves both plant and animal cells.

Tissue culture products are called clones, where all cells have the same genotype.
Advantages of plant tissue culture

- It can create a large number of clones from a single seed or explants.
- It takes shortened time, no need to wait for the whole life cycle of seed development.
- For species that have long generation time, low levels of seed production, or seeds that do not readily germinate, rapid propagation is possible.
- It overcomes seasonal restrictions for seed germination.
- It helps to eliminate plant diseases through careful stock selection and sterile techniques.
Condition of Tissue culture

- Appropriate tissue

- A suitable growth medium containing energy sources and inorganic salts to supply cell growth needs. This can be liquid or semisolid

- Aseptic (sterile) conditions, where microorganism cannot grow.
Basic requirements for plant tissue culture

- Inorganic salts
  - Macronutrients (N, P, K)
  - Micronutrients
- Vitamins
- Organic
  - Carbon source
  - Growth regulators
Plant Tissue culture Techniques

1. Embryo Culture
2. Organ Culture
3. Callus Culture
4. Cell Culture
5. New Adult Plant
What Is Genetic Engineering?

Genetic engineering is a laboratory technique to change the DNA of living organisms. Alteration of the structure of genetic material in a living organism.
Steps of genetic engineering

- **Isolation of the genes of interest.**

- **Insertion of the genes into a transfer vector.**

- **Transfer of the vector to the organism to be modified.**

- **Transformation of the cells of the organism.**

- **Separation of the genetically modified organism (GMO) from those that have not been successfully modified.**
Plant genetic Engineering

1. Restriction enzyme and DNA ligase
   - DNA containing the gene of interest

2. Introduction into plant cells in culture
   - Recombinant Ti plasmid

3. Regeneration of plant
   - Plant with new trait

Agrobacterium tumefaciens

- Site where restriction enzyme cuts
- T DNA

Plant genetic Engineering

- Ti plasmid
- T-DNA
- Chromosome

- Chromosomal DNA
- T-DNA
- Crown root

Transformed plant cell

- Agrobacterium tumefaciens
Miraculin Gene (MIR)

PCR Cloning of MIR gene

mRNA → Reverse Transcription

AAAAA TTTTTTT

cDNA

AAAAAA TTTTTTT

Synthesis

Specific Primer1
Specific Primer2

PCR

Transformation of MIR gene into lettuce

Infection with plant cell

Agrobacterium

pBI121

MIR
Genetic engineered Tomato and Lettuce Plant
Thank you everybody for your kind participation.

I am very glad to answer your questions/queries.