Lab (7)
Plant tissue culture media

Explants are grown in vitro on synthetic media , Which supplemented with all necessary nutrients for growth . The success of plant tissue culture is greatly influence by the type of the culture media use, because its inability to photosynthesis.

Types of Nutrient media

1- **Arnon and Hogland media** is the best media to seeds culture and seedling germination which is composed of macro and micro nutrients and ferrous citrate
2- **White's medium** is one of the earliest plant tissue culture media originally formulated for root culture.
3- **Murashige and Skoog (MS)** medium is the most suitable and commonly used medium for callus initiation, plant regeneration from tissues and callus. This is a high salt medium due to its content of potassium and nitrogen salts.
4- **B5 medium** works well for protoplast culture. It has lesser amounts of nitrate and particularly ammonium salts than MS medium.
5- **Nitsch's medium** developed for anther culture contains salt concentration.

Generally this media consist from :

a- Inorganic compounds

consist from **macronutrient** **which add at large amount such as nitrogen, potassium, calcium, phosphorus, magnesium, sulphur**. Or **micronutrient** **add at small amount such as iron, nickel, chlorine, manganese, zinc, boron, copper and molybdenum.**

b- Organic compounds

This consist from:

1- Carbon and energy source: which when analysis produce ATP molecules that is very important to explant activity.

2- Vitamins: acts as catalyst in enzyme reactions, such as Thiamnine, pyridoxine , Nicotinic acid.

3- Amino acid: such as glycine, asparagine, alanine, glutamine and proline , etc. which asource of reduced nitrogen.

4- Plant Growth Regulators: are organic compound that add at small amount but have high effect on explant development.

The two main classes used of plant growth regulators were **auxins** and **cytokinins.** While others are of less than importance, Gibberellins, Abscisic acid, Ethylene.

C- Gelling agents : are adding to the culture media for solidified it for explant remain above the surface of the media. Many gelling agents are used for plant culture media e.g. agar, agarose , and gellan gum.

Agar (a seaweeds derivative) is the most solidifying agent used because it don't have biological activity, melting easily when heated and solidified in room temperature.

pH is very important of the solidified of media .Example pH of Murashige and Skoog (MS) medium ranges from 5.8 to 6.0 pH higher than 6.0 gives a hard media and below 5.8 doesn't allow satisfactory gelling of the agar.

Plant Hormones

Plant hormones (phytohormones): are a group of organic chemical substances naturally occurring which influence physiological processes at low concentrations. A processes like growth, differentiation and development. Major plant hormones are: **Auxins, cytokinins, gibberellins, abscisic acid**, and **ethylene**.

Characteristics of plant hormones

1- Synthesized by the plant. Active in low concentration

2- Promote or inhibit growth and developmental responses.

3- They are produced only when needed, they are not stored prior to requirement.

4- Hormones usually cause long term effects like change in behavior, growth, etc.

5- Hormones are low molecular weight and they diffuse readily.

6- Plants have no specialized organs for hormone synthesis and secretion. Leaves, stem tips, root tips, flowers, seeds, and fruits all produce hormones.

Some of Auxin Functions:

1. Activates cellular elongation by increasing the plasticity of the cell wall

2. The auxin supply from the apical bud suppresses growth of lateral buds (apical dominance).

3. Stimulates cell division in the vascular cambium

Some of Cytokinins Functions

1. Stimulates cell division.

2. Stimulates morphogenesis (shoot initiation/bud formation) in tissue culture.

3. Stimulates the growth of lateral buds (release of apical dominance).

Some functions of gibberellins

1-Stimulate stem elongation by stimulating cell division and elongation.

2. Stimulates bolting/flowering in response to long days.

3. Breaks seed dormancy in some plants which require stratification or light to induce germination.

Some of Abscisic Acid Functions

1- Stimulates the closure of stomata (water stress increased ABA synthesis).

2- Inhibits shoot growth but will not have as much effect on roots

3- Induces seeds to synthesize storage protein

Some of Ethylene Functions

1. Stimulates the release of dormancy, and seed germination.

2. Stimulates shoot and root growth and differentiation.

3. Stimulates leaf and fruit abscission.