Plant growth regulators

Stage 2

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Cytokinin are signaling hormonal molecules (they are purine derivatives) that play an essential role in regulating cytokinesis (cell division). In plant, the living cells in both the root and the shoot are capable of producing CKs as well as the auxin signalling hormone.

However, production of these major hormonal signals does not occur randomly but is regulated by the synthesizing cells in the plant body and their developmental stage, and is influenced by environmental conditions.

- ***Major cytokinins***
- ***BAP*** ***6-benzylaminopurine***
- ***2iP*** ***2-isopentyl adenine***
- ***Kinetin*** ***6-furfurylaminopurine***
- ***Thidiazuron*** ***1-phenyl-3-(1,2,3-thiadiazol-5-yl)urea***
- ***Zeatin*** ***4-hydroxy-3-methyl-trans-2-butenylaminopurine***

GIBBERELLNS:

They are involved in regulating cell elongation, and are important in determining plant height and fruit-set. Only a few of gibberellins are used in plant tissue culture media. GA_3 being the most common.

ABSCISIC ACID:

ABA inhibit cell division. It is most commonly used in plant tissue culture to promote distinct developmental pathways such as somatic embryogenesis.

ETHYLENE:

It is gaseous, naturally occurring, plant growth regulator most commonly associated with controlling fruit ripening and its use in plant tissue culture is not widespread. It does, though, present a particular problem for plant tissue culture. Some plant cell cultures produce ethylene, which, if it builds up sufficiently, can inhibit the growth and development of the culture.

- The ratio of the auxin to cytokinin in different stage of explant growth determining the type of culture established or regenerated. A high auxin to cytokinin ratio generally favours root formation, and, a high cytokinin to auxin ratio favours shoot formation. An intermediate ratio favours callus production.

- Many features of the explants are known to effect the efficiency of culture initiation. Generally, younger, more rapidly growing tissue (or tissue at an early stage of development) is most effective.

CELL SUSPENSION CULTURES:

Callus culture may be compact or friable, in compact callus the cells are densely aggregated, whereas in friable callus the cells are only loosely associated with each other and the callus become soft and breaks apart easily.

Friable callus provides the inoculation to form cell suspension culture when a friable callus is placed into a liquid medium (usually the same composition as the solid medium used for the callus culture) and Under the correct conditions, these released cell continue to grow and divide, eventually producing a cell-suspension culture

If cells are left in the stationary phase for too long, they will die and the culture lost. Therefore, cells should be transferred as they enter the stationary phase. It is therefore important that the batch growth cycle parameters are determined for each cell suspension culture.

Important note

.The friability of callus can sometimes be improved by manipulating the medium components or by repeated sub culturing. The friability of the callus can also sometimes be improved by culturing it on semi-solid medium (medium with a low concentration of gelling agent).

PROTOPLASTS:

Are plant cells with the cell wall removed. Protoplast are most commonly isolated from either leaf mesophyll cells or cell suspension, although other sources can be used. Two general approaches to removing the cell wall can be taken: mechanical or enzymatic isolation.

Mechanical isolation often result in low yields, poor quality and poor performance in culture due to substances released from damaged cells.

Enzymatic isolation is usually carried out in a simple salt solution with a high osmoticum, plus the cell wall degrading enzymes.