(A) plant growth stimulators

(1) Auxins

→ First phytohormone discovered
→ First isolated in 1926 from a plant :- IAA (Indole Acetic Acid)
→ IAA is indigenously synthesized in plants.
→ It is derived from Greek words "auxein" which means "to grow".
→ It is discovered by charles darwin

→ Occurance

→ Present in large amount in shoot apical bud or meristem
→ Also synthesized in young leaves, seeds & fruits

→ MoA

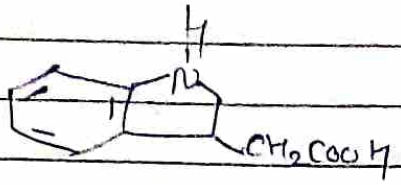
(1.) → IAA interacts with one or more Component of biochemical System involved in synthesis of proteins.

(2.) IAA alters the osmotically active content of cell Vacuole during Cell expansion or cell wall extension

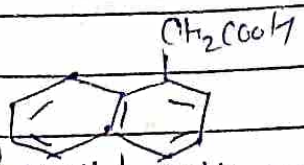
Auxins

(A) Natural Auxin
(1) Indole acetic acid (IAA)
(2) Indole-3-acetonitrile (IAN)
(3) phenyl Acetic Acid (PAA)

(B) Synthetic Auxin
(1) Indole-3-butyric acid (IBA)
(2) α-naphthyl acetic acid (NAA)
(3) 2-naphthyloxy acetic acid (NOA)
(4) 1-naphthyl Acetamide (NAD)



IAA



α-Naphthyl acetic acid

→ Functions

-> Auxin involved in cell elongation & stem elongation.
-> It cause root formation, delaying leaf senescence, fruit ripening & used in embryogenesis.

-> promote leaf growth, fruit growth, etc.
-> It promote xylem differentiation.
-> It involves in flower initiation.
-> It is involved in initiation of vascular tissue.

Applications

1) Treatment with Auxins (IAA, NAA, 2,4-D) :- Increase alkaloid production in certain Fungi Submerged cultures of certain Ergot strains.

2) Treatment 2,4-D :- In Tropane alkaloid of Datura, morphological changes in plant were observed.

(3) On treatment with derivative of NAA :- Seedling & young plants of Mentha piperita, gave increased yield of oil which itself contained 4.5 to 6% more menthol

(2) Gibberelling

→ It is discovered as metabolite of fungus Gibberella fujikuroi, which cause Bakane's disease in Rice plant

→ They belong to class of plant growth stimulator.

→ There are about 50 Gibberelling at present in which GA occurs in green plants & other in some fungi

→ Occurance

→ It is produced in root, shoot & younger leaves, developing fruits, seeds.

→ Highest concentration in developing fruits & germinating seeds.

→ Mechanism of action

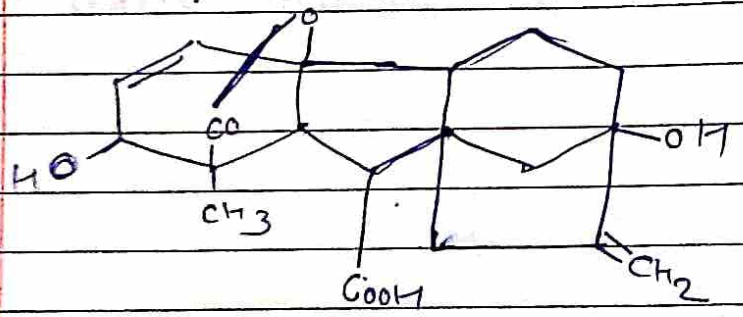
• Produce gluconeogenic enzyme during early stage of seed germination :-

Rapid conversion of lipid to sucrose, which support growth & development of embryonic axis to shoot & root system.

- Induce Synthesis of α-amylase & other hydrolytic enzyme during germination of Monocot Seeds.
- They are involved in mobilizing Seed storage reserve during germination & Seedling emergence.

* Gibberellin A1:-

→ It is isolated in 1938.
→ Mixture of 6 Gibberellins: GA_1, GA_2, GA_3, GA_4, GA_7, GA_9.
→ GA_3 is known as Gibberelic acid.



Giberellic Acid.

→ Functions:-

→ It promote flowering, Seed germination & stem elongation
→ Increase in size of leaf & root or Shoot elongation.
→ Rarely used compared to Cytokinin & Auxin.
→ It is able to produce morphological change in plants
→ flower initiation
→ Fruit growth → Induction of parthenocarpy
~~→ Increase in size of leaves~~

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Applications

① Volatile oil

(i) Gibberellic acid treatment of Chenopodium and Anethum species increases volatile Content

(ii) Gibberellic acid treatment on mentha leaves the volatile oil Content

② Alkaloids :-

(i) Seeds of Datura, Hyoscyamus & Datura exhibit protracted dormancy or erratic germination. GA treatment of seeds induce total & Uniform germination.

(ii) GA treatment of Catharanthus roseus & Rauvolfia Screening leaves alkaloid Content.

③ Glycosides

(i) GA treatment of Digitalis purpurea plant increases Cardiac glycoside.

(ii) If GA is given to Ocimum gratissimum, it leads to
① Reduces Sennoside Content of leaves, but slightly increases dry weight of shoot.

④ Fixed oil

→ GA treatment of Castor plant, increases height five times, but no effect on quality & quantity of fixed oil.

(3) Cytokinins

→ They are naturally occuring plant hormone or Synthetic substance which induce cell division.

-) It is discovered by F Skoog

→

→ Cyto + kinin
↓ ↓
Cell + division = Cell division.

-) They contain purine ring in its structure. It has Acropetal transport (towards the tip)

→ Occurrence

-) It is present in actively dividing tissue of seed, Seedling, apical meristems, fruit, leaves & wound tissue sites.

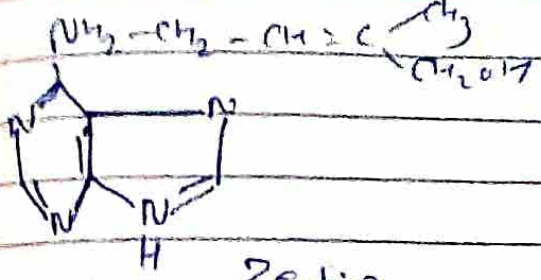
→ Role

→ In regulation of Nucleic acid Metabolism
→ Increase protein Synthesis
→ Transport of nutrient to cytokinin treated area that prevent senescence.

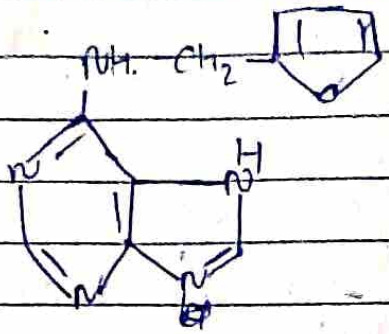
Cytokinins

(A) Natural Cytokinins
(1) Zeatin
(2) N⁶ Dimethyl amino Purine

(B) Synthetic Cytokinins
(1) Kinetin
(2) Adenine
(3) N,N - Diethyl Urea.



Zeatin



Kinetin

- Functions

-) Stimulation of cell division
-) Release of induced bud formation
-) Development of embryos during seed development
-) promote cytokinesis.
-) Retard leaf senescence
-) Induction of flowering.

- Application

-> After kinetin treatment :-

(1) Dubosia hybrid :- After kinetin treatment, there is 18% increase in leaf yield & 16% increase in hyoscine content.

(2) In opium :- After kinetin treatment, there is formation of elongated capsule & reduce in alkaloid content.

(3) In Cassia angustifolia plant :- After kinetin treatment, there is increase in Sennoside content & dry weight of shoot.

(4) leaves of coffee :- After kinetin treatment, there is increase in 10% of caffeine content.

* Plant Growth inhibitor

(1) Ethylene.

-) It is gaseous hormone synthesized in cultured cell, fungi & bacteria.

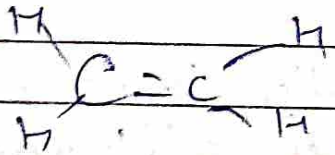
-) At higher concentration it inhibit growth of plant, so, also known as plant growth inhibitor hormone.

-) Associated fruit ripening, flavour, softening & senescence of fruits.

⇒ Occurrence

-) ethylene is produced in many plant organs especially in ripening fruit, fading flowers & aging leaves prior to Abscission.

- Present in very less quantity in plant about 0.1 ppm.



Functions

-) It promotes fruit ripening, senescence & leaf abscission
-) At low concentration, it sometime promotes growth but at high conc. always inhibit growth.
-) It can increase cell expansion.
-) flower senescence, flower petal discolouration
-) Inhibition of root & stem growth.

-) Application

-> At low Concentration, it increases Sennoside conc. in Cassia Angustifolia (Senna)

-) In tobacco leaves, it Stimulate production of stress compound phytuberin & phytuberal.

-) When sprayed on scraped bark of rubber trees, it increases latex yield by 36% to 130%.

(2) Abscisic Acid (ABA)

-> plant hormone responsible for leaves Abscission.
-) It is natural plant growth inhibitor.

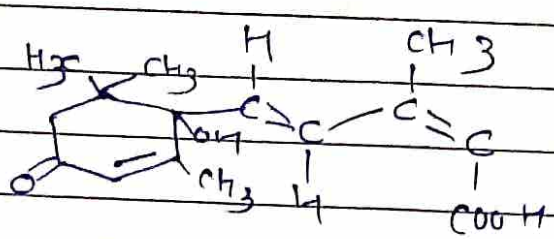
=) Occurance

-) Ubiquitous in all higher plants
-) occur mainly in Shedding leaves, fruit, flower, stem

Abscisic acid

(A) Natural ABA
(1) Abscisin I
(2) Abscisin II.

(B) Synthetic ABA
(1) Maleic hydrazide
(2) Daminozide
(3) Glyphosine



Abscisic acid

-) ABA conc. is high in stress condition like mineral deficiency, injury, drought flooding. So it is also called as stress hormone.

Function

→ Inhibits other plant growth substance.
→ Seed & bud dormancy.
-) Promote leaf Abscission
-) Promote fruit "
-) Anti-transpirant : close the stomata when applied to leaves.
-) Control of water & ion uptake by root.

→ Applications

→ Spraying of ABA on plants of Datura stramonium & Datura innoxia decreases height & total alkaloid content.