Application of Botany

By Drona sir

Biotechnology:- living organism use हुनु पर्छ।

→ Term was given by Karl Erkey.

→ Traditional biotechnology was based on natural capacity of microorganism

→ Modern biotechnology based on genetic engineering.

→ Oldest biotechnological process is fermentation technology and product is alcohol.

* Sterilizations:- prefers to any process that eliminates, removes, kills or deactivates all form of life and other biological agents present in a specified region. (Autoclave गोरे)

* Disinfections:- the process of elimination of pathogenic microorganisms. However, this process is not effective in case of vegetative spores.

Plant Tissue Culture:- under asceptic condition in artificially prepared medium.

→ Based on the theory of cellular totipotency. → by Haverlandt & exp by steward et. al.

→ (in animal, there is pluripotency).

→ Plant parts which is going to be cultured is explant. → can be sterilized by NaCa Hypo chloride

→ Undifferentiated mass of cells in tissue culture is callus.

→ (donot confuse with callose (present in sieve tube & pollen tetrad). → carbohydrate

→ Explant may be root, shoot, anther or any plant parts.

→ Embryoids:- non zygotic embryo in tissue culture.

* Media preparation in Tissue culture → pH → slightly acidic

→ Most commonly used carbohydrate:- Sucrose

→ Most commonly used amino acids:- Glycine

→ Most commonly used vitamin :→ B_1 (Thiamine)

→ Additional nutritive media like coconut milk (liquid endosperm, rich in cytokinin, which helps in cell differentiation). → obtained from cocus nucifera

→ Growth harmones:-

auxin:- root differentiation
cytokinin:- shoot differentiation
} fix ration → (callus बन्छ)

→ Agar-Agar → is polysacchride obtained from red algae like Gelidium.

: helps in solidify the medium.

ogy Botany | Physics
cell biology

Sub culturing callus:-

→ After sufficient growth of callus it should be periodically transferred to fresh medium to maintain viability of cells.
→ This subculture will be done at the interval of 4-6 weeks.
→ After a maximum growth, transfer into a potting soil under required condition.

Hardening:-

→ Once the new plant becomes large enough to handle, it can be removed from the culture tube and planted in growing medium. Newly transplanted plantlets are placed in controlled conditions of light, temperature and humidity for several weeks as they adjust to their new environment.
→ This is necessary as many young tissue culture plants have no waxy cuticle to prevent water loss.

Micropropagation

→ In vitro (lab) clonal propagation, in micropropagation large no. of plantlets are produced in short period of time.
→ Extensively used in horticulture and floriculture.
→ Clones:- genetically identical offspring obtained from vegetative (carbon copies) propagation.
→ Ramet:- individual member of clones.

Meristem tip culture:-

↳ high amt of auxin. / phloem absent.

Q. Virus free or pathogen free plants can be obtained from:-

(a) Meristem tip culture
(b) Shoot tip culture (2nd pg:)
(c) root tip culture
↳ best study material for mitosis.
(d) Anther tip culture

Anther culture:-

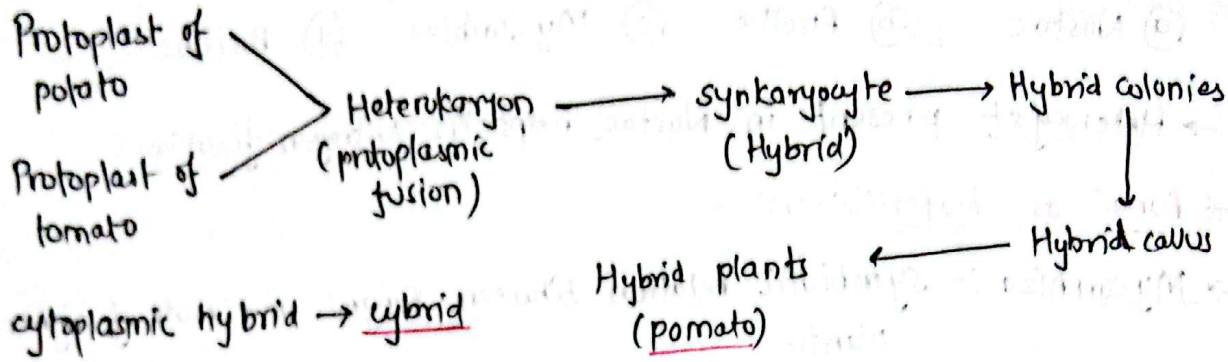
→ Haploids used as explant.
→ Production of androgenic haploids.
→ In haploids, recessive mutation can be expressed immediately, so used in research in genetic.
→ We can produce pure homozygous diploids or polyploids after treating with colchichine.
↳ mitotic poison arrest spindle fibre in metaphase stage

Protoplast fusion and culture / somatic hybridization

→ Protoplast :- cell without cell wall.

– cell wall can be dissolved by enzyme cellulase and pectinase.

→



→ cytoplasmic hybrid → cybrid

Q. Two protoplast can be fused by :-

(a) PEG (b) electrofusion (c) both a & b (d) glycerol

– Somatic hybrid between potato and tomato → Pomato

Q. Variation induced in tissue culture is :-

(a) Monoclonal variations (b) Somaclonal variations

(c) both a & b (d) No variation

Q. Auxenic culture is

↳ culture without contamination

Bio-fertilizers :-

→ Fertilizers of biological origin.

– induces bacteria, cyanobacteria & fungi

* Bacteria as biofertilizer

- Symbiotic :- Rhizobium in root nodules of legumes.
- Nitrogen fixation is carried out by enzyme: Nitrogenase.
- Red color of nodules is due to :- Leghaemoglobin (prevents the oxidation of nitrogenase reductase enzyme).
- NIF gene is present in plasmid of rhizobium.
- Frankia – symbiotically N_2-fixation in non-leguminous plant.

* Free living nitrogen fixer

- Aerobic :- Azotobacter
- Anaerobic :- Clostridium
- Photosynthetic :- Rhodospirillum

Zoology | Botany | Physics | Chem...
class of animals | cell biology | cell division

Nostoc, Anabenna, Azolla, etc

* Cyanobacteria as biofertilizers:—

- Symbiotic → Anabeanna — Azolla relations.
  → Azolla is fastest growing aquatic fern.
  → Nostoc - Anthoceros relations. → Coralloid roots — cycas relation

Q. Which is the best biofertilizers in paddy field?

(a) Nostoc (b) Azolla (c) Mycorrhiza (d) Bacillus

→ Heterocyst present in Nostoc helps in Nitrogen fixation.

* Fungi as biofertilizers:—

→ Mycorrhiza :- symbiotic relation between fungus and roots of higher plants.

→ Endomycorrhiza (VAM) :- Fungal hyphae penetrates the cortex of root and some form branched structure called : Arbuscles and some formed swollen structure called : vescicles, so called arbuscular vesicular mycorrhiza (VAM).

- Common fungus :- Ascomycetes e.g. Peniclinin, Aspergillus, Neurospora, yeast
  ↳ commonly seen in lower plants like orchids, cereals.
- Help in phosphate absorption.

→ Ectomycorrhiza :- Fungal resides outer surface of roots and helps in absorption of moisture, nitrogen, potassium, calcium, phosphorus, etc

- common fungus :- Basidiomycetes.
- common plants : pinus, oak, peach, eculyptus. @POPE

Q. VAM are responsible for:—

(a) Nitrogen absorption (b) ~~Potassium~~ Phosphate absorption
(c) Calcium absorbtion (d) None

Q. In addition to biofertilizers, which of the following fertilizers aids to maximum productivity?

(a) Potash fertilizers (b) Phosphate fertilizers
(c) Calcium fertilizers (d) None

Physics | Chemistry | Mother
... dimension | → chemical bonding

- **Farmyard manures:-** main constituents; cow dung and mix with other.
- **Composite manures:-** mainly rotten vegetable and mix with other.
- **Green manures:-** green crops used as manures. Increase the Fertility by 30-50%.

  e.g. lens esculenta (Masur), Sesbania (Dhaicha), Vigna sinensis (cowpea), crotalaria (sun hemp), trifolium.

Q. Green manures are prepared by:-
(a) storing green leaves in water tanks for 7 days.
(b) adding urea to the field
(c) Ploughing green crops in to the field.
(d) All of above.

Q. Green manures belongs to the family:-
(a) Graminae (b) leguminaceae (c) Cruciferae (d) Liliaceae.

Genetic engineering / recombinant DNA technology:-

→ Gene manipulation (deleting, adding or replacing of genetic units).
→ Paul bergh is the father of genetic engineering
→ Lysozyme enzymes:- helps to dissolve the membranes, opening of DNA.
→ Target or foreign DNA:- desired segment of DNA, which is going to be engineered or cloning.

- **Cleaving enzymes:-**

→ Endonucleases:- cleavage the segments except ends. ——— - - - ———
→ Exonucleases:- cleavage the terminal segments. - - - ——— - - -

Q. Most commonly used organism in recombinant DNA technology is:-
(a) E. coli (b) Agrobacterium (c) Salmonella (d) Haemophilus
→ used in plant g. engineering.
→ natural genetic engineer.

PMN
PM
FN PM
TFN

Zoology
class of mammals
Protozoa
Plasmodium
cell biology
cell division
Genetics
virus
bacteria
Plant kingdom

• Restriction endonuclease
→ most commonly used enzyme in Genetic engineering
→ Naturally found in bacteria.
→ Recognize specific sites/recognition sites, cleave the palindromic sequence
→ Restriction endonuclease obtained from E. coli.
→ also known as molecular or biological scissor or molecular scalpel.

Vectors or cloning vehicles
→ Vectors should have double stranded DNA, self replicating, cloning sites & selective marker (antibiotic resistance gene).
→ Plasmid :- extrachromosomal DNA - found in bacteria.
  → most commonly used vector in G. engineering.
  → used in cloning of short segments.
  → pBR 322 → artificially prepared plasmid.
→ Cosmid :- plasmid having cos (cohesive end site), found in λ-phage (virus affecting bacteria) also vector.
  → used in cloning of large DNA segments.

• DNA ligase (molecular glue) :- Joining enzyme & Combine DNA (hybrid DNA / recombinant DNA / chimeric DNA)

* Application of recombinant DNA technology
→ Interferons :- Glycoprotein, antiviral agent.
→ Transgenic (GMO) :- organism with foreign DNA is incorporated in normal genome. First transgenic crop is tobacco. They are genetically modified organisms (GMO). eg: Golden rice (with vit. A).
→ Riboflavin (Vit. B_2) :- obtained from (Ashpya gossypi)
→ Humulin :- Human insulin obtained from G.E using E-coli.
→ Bt cotton / Bt gene :- obtained from bacteria Bacillus thuringenesis.

Q. Vaccines obtained from genetic engineering is :-
(a) 1st generation
(b) 2nd generation (Hepatitis B)
(c) 3rd generation
(d) None

• 1st enzyme by G.E → Zymase

Victoria
Kingdom

Polymerase chain Reaction (Amplification of DNA)

→ Karry Mullis developed PCR.
→ Polymerase enzyme used in PCR is Taq polymerase (which is thermoresistant).
→ steps of PCR:- denaturation, annealing (जोड़िन्द) and extension.
→ PCR helps in amplification (2n) of DNA, DNA cloning.

Hybridoma Technology:-

→ Monoclonal antibody production.
→ Antibody producing cell → (B lymphocyte).
→ Tumor producing is myeloma cell.
→ Hybrid between these is Hybridoma. ← Hybrid.
→ Monoclonal antibodies used as immunosupressents in organ transplantation

Plant Breeding:-

→ Objectives:- increase quality, increase adaptation, disease resistance (normal लाई wild सब cross गराउने) variety, elimination of toxic substances, increase yield, resistance to lodging (ढल्ने). (@ QUADTYL)

Q. Lytharism is a disease caused by consumption of Khesari daal (neurotoxins) characterized by:-
(पसन्द)
(a) renal failure
(b) Musculoskeletal difficulties
(c) Cardiovascular problems
(d) Liver failure

* Types of plant breeding

1) Introduction:-
→ Quickest method.
→ Adjustment of introduced variety is acclimatization.

(2) Selection:- Natural selection
Artificial selection

→ Oldest and common method of plant breeding.

(a) Mass selection:- done among cross pollinated plants.
→ based on phenotypes

(b) Pure line selection:- Pureline: progeny of single homozygous.
→ plants obtained from self pollination/selfing.
→ done among self pollinated plants, based on ~~gametophytes~~ genotypes.

Zoology	Botany	Physics	Chemistry
class of animals	cell biology	" dimension	chemical bonding
protozoa	cell division		
Plasmodium	Genetics		
[illegible]	virus, pacteria		
	Plant kingdom		

(c) Clonal selection :- done among vegetatively propagated plants.

Hybridizations

→ crossing between genetically different species & production of hybrids (Heterozygous)

→ Hybrid vigor or Heterosis :- superiority of hybrids over their parent

→ helps to overcome the inbreeding depression.

* Types of Hybridizations

- Intra varietal :- crossing between same variety.
- Intervarietal | intra-specific :- crossing between different variety of same species.
  e.g. Brassica olerecea var. botrytis X Brassica olecerea var. capitata
- Interspecific | intra-generic :- crossing between different species of same genus.
  e.g. Solanum tuberosum (आलू) X solanum melongena (ग्रीवा)
- Intergeneric :- crossing between different genus of same family.
  e.g. Raphanus (cruciferae) X Brassica → Raphanobrassica.

* Process of Hybridization :-

→ Parents selection.

→ cultivation of parents

→ Emasculation :- removal of stamen from flower before anthesis to prevent self pollination. (male part)

→ Bagging and tagging

→ crossing

→ production of F_1-hybrids

Fermentation Technology :-

→ incomplete oxidation of organic compounds like carbohydrates into ethanol, carbondioxide and metabollic energy.

→ Oldest biotechnology.

→ Louis Pasteur 1st noticed the fermentation.

→ Commonly used yeast is :- ~~Sarch~~ Saccharomyces Cerevisae.

→ Fermentation is exothermic process.

→ Commonly involved enzyme : Zymase

→ Fermentation is carried out in bioreactor tank.

* Process of Fermentation:-

- Batch process:- is discontinuous process and fermentor is cleaned after each batch & fresh medium is added.
- Continous process:- medium containing product is removed in fixed interval & fresh medium is added into bioreactor.
- Immobilized process:- yeast cells are immobilized in columns & kept in bioreactor.

Alcoholic Beverages:-

- Undistilled product:- beer (5.5%) - obtained from germinating barley seed.
  Wine (12-14%) obtained from grapes.
- Distilled product:- Vodka, whisky, rum, brandy, etc.

Q. Regulation of introduced variety while transfering from one place to other place:-

(a) Selection
(b) ~~Quarentine~~
(c) Valentine
(d) Recombinant DNA technology

∴ Latest / Advanced method of plant breeding → Genetic engineering

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