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Botany [Application of biology]

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Test tube baby

- The first test tube baby in world is "Louis Brown"
- The first test tube baby in Nepal is "Om Mani Tamang"
- Test tube baby is also known as "In vitro fertilization" (I.V.F)
- Test tube baby embryo is implanted into surrogate mother uterus at "32 cell stage" [Blastocyst stage]
- Surrogate mother is Non-genetic mother.

FSH → follicle stimulating Hormone

Follicle → mature egg cells are known as follicle.

→ This FSH help in fertilization by maturing the eggs

Q Test-tube baby is a process in which fertilization is done outside the body and baby growth is done inside the body.

Amniocentesis

→ process of keeping out Amniotic fluid by using a Hypodermal Syringe is called Amniocentesis.

Purpose = Detection of pre-natal disorder of the baby
[before birth]

→ Gender of the baby can be identified by this process.

→ Amniotic fluid is present in Amniotic Sac.

→ It is also known as "pre-natal diagnostic technique".

→ The time period for Amniocentesis is during 1st trimester of pregnancy.

[1st 3 month of pregnancy]

→ Volume of Amniotic fluid taken out by syringe is (5-10ml)

→ Amniotic fluid provides nutrition to baby & prevents from Mechanical injury.

→ The main composition of Amniotic fluid is "water"

Organ transplantation

There are four types of transplantation

→ The most successful transplantation is "Autograft"

→ The most unsuccessful transplantation is Xenograft

→ Autograft (Same body)

→ Isograft (twins)

→ Allo/Homograft
(Same species)

→ Xenograft/Heterograft
(two species)

→ The most common examples of Auto graft is Skin graft. It is used in plastic surgery.

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→ The donor region for skin graft within the same person is "Thigh region"

• Note: Eye donation means cornea donation.

→ Cornea implantation is medically known as "keratoplasty"

* Antibiotics

→ First Antibodies is known as "penicillin" discovered by Sir Alexander Fleming in 1928 AD.

→ The source of Antibiotics are Bacteria & fungi.

→ The Antibiotics name was given by Selman Waksman

→

Bacteriostatic → Stop or inhibit.

Bacteriocidal → Killed directly
सबसे मारने

* Antibiotics are used as

(1) Bacteriocides

Antibiotics

Sources

- | | |
|--------------------|-----------------------|
| 1) Penicillin | → Penicillin. Notatum |
| [Commercially] | → P. Crysoogenum |
| 2) Streptomycin | → S. Griseus |
| 3) Chloromphenical | → S. venezualae |
| 4) Tetracycline | → S. aureofaciens |
| 5) Erythromycin | → S. erythraeus. |

* Fermentation [Zymosis]

- we manufacture alcohol through fermentation.
- "Zymase" is enzyme required for fermentation.
- "Zymase" is produced by "fungus" called yeast i.e. *Saccharomyces cerevisiae*
- Fermentation is "exothermic" process
- Ethyl alcohol is produced from "glucose"
- Molasses
 - Dark color solution which is rich in sugar
 - Obtained from sugarcane
- Fermentation is "Anaerobic" & microbial process.
- Yeast is also used in Bakery, Alcoholic beverage production.

plant tissue culture

- Aseptic condition → [This should be done during disease/virus/pathogen free condition]
- Ex-plant → parts of plants taken for tissue culture.
- Callus → undifferentiated mass of cell in tissue culture.
- Meristem culture → Disease free culture/virus free culture or pathogen free culture.
- 2 hormones used in tissue culture
 - Rooting hormone → Auxin ⇒ Root tip → Root system
 - Shooting hormone → Cytokinin ⇒ Shoot tip → Shooting system

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Application of tissue Culture

→ Anther culture / ovule culture / Haploid production

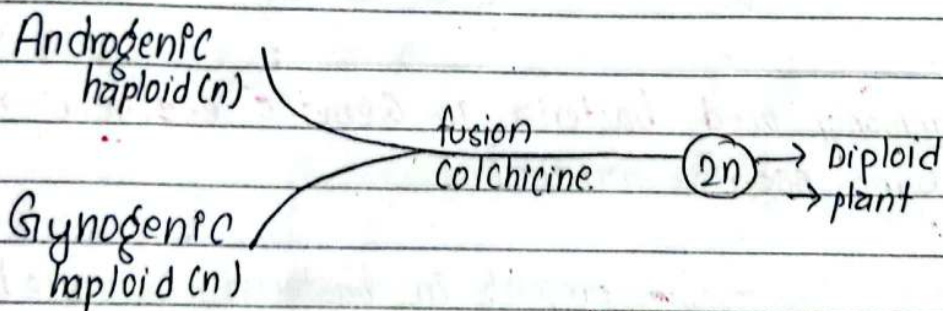
→ Protoplast fusion / Somatic hybridization.

• **Note:** Another name of "shoot tip culture" is meristem culture.

Anther culture / ovule / Haploid:

→ The haploid obtained from the culture of Anther is called "Androgenic haploid" (n)

→ The haploid obtained from the culture of ovule is called "Gynogenic haploid" (n)



→ "Colchicine" is the chemical used in fusing of 2 haploid.

protoplast fusion

→ protoplast is the plant cell without cell wall.

→ The two enzymes used for breakdown of cell wall are

① cellulase

② pectinase.

→ Two protoplast can be fused by PEG [polyethylene glycol]

◦ Somatic hybridization

↳ The cross between 2 somatic cell is somatic hybridization.

eg: potato + tomato $\xrightarrow{\text{PEG}}$ Pomato 😊

Note: Genetically modified organisms is called Transgenic organism.

Genetic Engineering

→ Also called as "Recombinant DNA technology"

→ In genetic engineering, the gene we take from "Bacteria" E. coli

Q: Most commonly used bacteria in Genetic engineering is?
⇒ E. coli [Gram negative bacteria]

→ The extra chromosome present in bacteria is called "Plasmid"

→ The gene are located inside "plasmid".

→ The most common enzyme used in genetic engineering are. 1) Restriction endonuclease enzyme

or

DNA ligase

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- cutting enzymes.

Modification of gene in G-E

↳ also called molecular diagnosis of DNA.

↳ production of multiple DNA

Gene therapy → Treatment of genetic disease.

→ plant → Tobacco

→ Animal → Dolly/sheep

Biofertilizer

Source of biofertilizer are:-

- ① Bacteria

② fungi

③ Cyanobacteria.

* Bacteria as biofertilizer

Biofertilizer

Symbiotic

eg: Rhizobium
• present in root of legume plants

Free-living

eg: Azotobacter, Clostridium

→ helps in nitrogen fixation by enzyme nitrogenase.

→ The red pigment present in the root nodules of leguminous is Leghaemoglobin: [to protect nitrogen fixation enzyme]

* Cyanobacteria as a biofertilizer

Free living

eg: Nostoc

Symbiotic

eg: Anabaena - Azolla.

Q The best biofertilizer for rice/paddy is.

⇒ Anabaena - Azolla

Q Fast growing aquatic fern is.

⇒ Azolla.

* Fungi as a biofertilizer.

Study of fungi → Mycology.

→ Symbiotic relationship → Mycorrhizae

→ The symbiotic relationship of fungus with the root of higher plant is "mycorrhizae"

↓
Ectomycorrhizae

↓
endomycorrhizae.

The another name for endomycorrhizae is **VAM** → vesicular arbuscular mycorrhizae.

* Manure.

- Green Manure (Imp)
- Compost manure
- Farmyard manure.

Q// Green manure is prepared by?

⇒ ploughing down green crops into the soil.

Generally ÷ Legume crops.

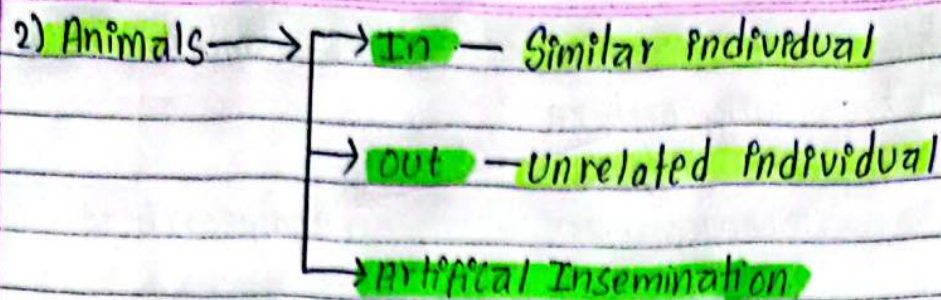
* Breeding or Reproduction.

1) plants

- acclimatization (adaption)
- Selection
- Hybridization
- tissue culture
- genetic engineering
- polyploid breeding

• plant having more than 2 set of chromosome

• chemical used in polyploid is **Colchicine**



• Note: In Artificial Insemination the Semen or Sperm are stored at very low temperature about -196°C in liquid nitrogen.

Hybridization [Crossing of 2 plants]

Heterosis / Hybrid Vigour.

Q// If the hybrid are superior than their parents, then they are called.....
⇒ Heterosis

Q// Emasculation is the removal of anther to prevent.....
⇒ Self pollination

Q// The easiest & Quickest method of plant breeding is.....
⇒ Acclimatization