

HAND WRITTEN SHORT NOTES

BIOTECHNOLOGY AND ITS APPLICATION

Ch. BIOTECHNOLOGY AND ITS APPLICATION

Application in plants:

Agriculture: Organic Farming
manure, yield $\downarrow$
- Fertilizers: yield $\uparrow$
1947 - population: 55 million
2001 - population: 1 Billion
• Demand for food $\uparrow$

#Green Revolution

M.S. Swaminathan (1970)

White Revolution $\rightarrow$ milk

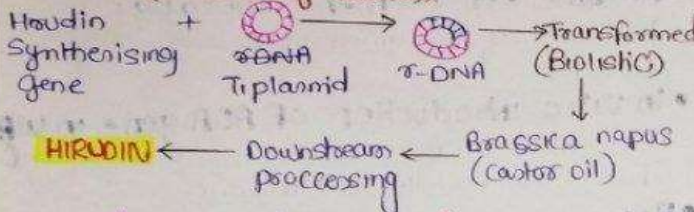
Red Revolution $\rightarrow$ Medicines

Blue Revolution $\rightarrow$ fish

Silver Revolution $\rightarrow$ Egg

2. Anti-Coagulant:

Houdin (Saliva of leech)



RNAi / RNA interference / Gene Silencing:

Coag Mellow + Andrew Fire $\rightarrow$ G. elegans (nematode)

Prokaryotes $\rightarrow$ Natural defence $\rightarrow$ RE

Eukaryotes $\rightarrow$ Natural defence $\rightarrow$ Against dsRNA

RISC $\Rightarrow$ RNA induced silencing complex

Tobacco plant $\rightarrow$ dicot $\rightarrow$ Fibrous root.

Infected by melodogyne

Incognita

#Mechanism:

• Introduced dsRNA in the cell such that it produce dsRNA

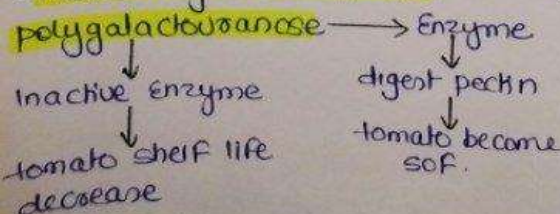
• dsRNA is introduced dicer protein.

• dicer protein attach to dsRNA forming RISC Factor

• RNA will be no more functional & hence M. Incognita Cannot grow.

4. Flavr Savr Tomatoes:

• Increasing the shelf life



#Drawbacks:

- seeds were expensive
- Biomagnification
- Disruption of food chain
- Permanent loss of soil fertility

1. Golden Rice!

Biofortification



Biotechnology:

GMO's = Genetically modified organisms

Ideal = ① High yield

Plant ② Disease Resistant

③ Tolerant for climatic change

④ High nutritional value

⑤ less dependent on water

⑥ low cost seeds

Ingo Potrykus & Peter Beyer

3. Insecticide Resistant plant:

Bacteria $\Rightarrow$ *Bacillus thuringiensis*

Cry gene (Cry protein)

Inactive in bacteria pro-toxin

Alkaline gut of insect

active toxin

Creates pores in midgut of insect (starvation)

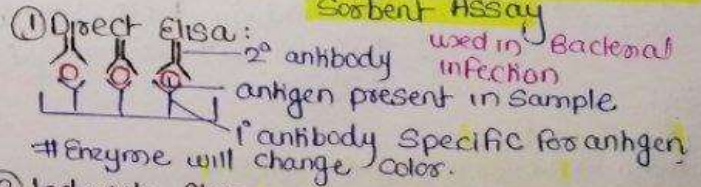
1st plant in India = BT Cotton

Cry I Ab $\Rightarrow$ Corn borer

Cry I Ac & Cry II Ab $\Rightarrow$ Cotton bollworm

Molecular Diagnosis Technique

I. ELISA: Enzyme linked Immuno-Sorbent Assay



② Indirect ELISA: # color change used in case of AIDS



③ Probe:

ssDNA / ssRNA + Radioactive labelled = probe

@Garggaurke

Join telegram: garimagoel007_g2

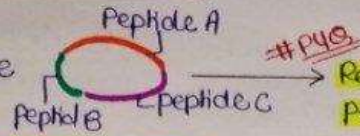
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BIOTECHNOLOGY AND ITS APPLICATION

Application of Biotech in Animals: # Produced by Elitily (1983)

1. Humulin:

Chromosome → Insulin gene
PBR322



Removal of Peptide C → # Active Insulin
disulphide bond

Qu. why Insulin:

Diabetes Mellitus → Blood Sugar ↑

① Oral Insulin: Insulin proteinaceous in nature
broken down in stomach

② Source of Insulin: slaughter pig & cattle
Pancreas → Insulin
Cause Allergy in humans!

③ Biotech: Synthetic Insulin (Humulin)

5. Gene Therapy:

1990, 4 yr old girl

SCID (Severe Combined Immunodeficiency)

ADA (Adenosine deaminase) enzyme deficiency

↓
lymphocyte proliferation reduced
Immune system weakens.

Ethical Issues:

GEAC - Genetic Engg Approval Committee

- Animals → not treated as factories
- Unique feature of organism should not be transferred.

Biopatent

biological product
Copyright given to owners.

Eg.

① Basmati Rice:

- India → 2,00,000 varieties of rice
- 27 documented as basmati
- US Company stole
- WTO gave patent to India.

② Neem:

- Indian culture → antifungal & antibacterial

③ Turmeric:

- medicinal value (Antiseptic)

@Garigakee

2. Sheep - Tracy:

- α-1 Antitrypsin drug
- Treatment of Emphysema

3. Rosie - Cow:

Protein enriched milk

- α-lactalbumin
- 2-4 gm/l of milk

4. Transgenic Mice:

- 95% • Clinical trials of drugs
- Vaccine safety
- Study disorders, chemicals.

Solutions:

Enzyme Replacement Therapy:

Injection of ADA given after ~~3~~ every 3 months

In vitro introduction of ADA gene in WBC

ADA gene → WBC → introduced in girl
∴ but WBC has limited lifespan

Bone marrow transplant:

donor problem + expensive permanent

Change defective gene at embryonic stage: