BIOTECHNOLOGY AND ITS APPLICATIONS

The main three critical research a peas of biotechnology includes—

l. Providing the best catalyst in the form of improved organism usually a microbes or pure enzyme.

IL Creating optirnalconditions through engineering for a catalyst to art.

In. Downstream processing technologies to purify the protein or organic compounds.

Biotechnologkal Applications in Agriculture- food production can be i ncreased by

ai) Agro-chemical based agriculture
Orga nie agricultu re

c) Genetically engin e-ered crop -based agriculture..

- Plants,, bacteria. fungi and animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GM011. GM plants have many applications-
- More tolerant to abiotie stress li kes cold, drought, salt, heat etc.
- Reduced reliance of chemical pesticides {pest resistant cropsl
- Reduced post.hantest losses.
- In efficiency of mineral usage by plaints
- Enhanced nutritional value of f pod li ke Vitamin A enriched rice.
- Create tailor-made plants to supply alternative resources to industries as stare fuels and pharmaceuticals etc-

Application of Biotechnology in production of pest riNistant plants-

Pest resistant plants decrease the amount of pesticides used, St toxin Is produced by a bacterium called Erocithys thpringierrsfs.

ER cotton- Bacterium no r s *tinfrinvilerpsils* produce proteins that kill certain insects like le pido pte rens, colepterans beete Is) and di pterans (flies. mosquitoes).

'I The gene from B. thuringlensis has been incorporated into several crop plants lllk.e cotton, maize, rice etc. The toxin is coded by a gene named cry.. The protein coded by the genes crylAb and crylIAb control the cotton bollworms.. cdrylAb controls corn borer.

Pest Resistant Plants

Nematodes like Metoictegyne kpcognitki infects the roots of tobacco plants and causes reduction In yield. The infestation of these nematodes can be prevented by the process of RNA interference (A NAif. RNAI Is present In all eukaryotic organisms as cellular defence by silencing of specific rnRIVA due to complementary &RNA molecules that bind to and prevents translation of the rnRhIA_

Biotechnological Applications in Medicine

Genetically Engineered insulin

- Insulin consists of two short polypeptide chains- chain A and chain El, that are linked together by disulphide bridges.

- An American company. Eli Lilly in 1'983 prepared two DNA sequence corresponding to A and B chain of human insulin and introduced them in piasrnids of E.coli to produce insulin chain. Chain A and Chain 6 were produced separately, extracted and combined bycreatin.g disulphide bonds to form human insulin_

Gant Therapy

It is a collection of methods that allows correction al a gene defect that has been diagnosed in a child or embryo. This method is applied Irti a person with a hereditary disease. In this method, genes are inserted into a person's cells and tissues to treat a disease_

- The correction pf gene -defect involves delivery. of a normal gene into the individual pr embryo to takeover the function of and compensate for nonfunctional gene.
- The first clinical gene therapy was done in 1990 to a 4 year old girl with adenosine clearninase IADA) deficiency.

Molecular Diagnosis

Conventional method *of diagnosis* such as serum or urine analysis is riot able to early detection cif disease causing Rath Bens or wiru5. F.:Alt:ming methods can be used to diagnosed earlier-

I_ Recombinant DNA technology
IL Polymerase Cha in Reaction (PCR)
ILL. Enzyme Linked Immuno•spitient Assay (ELISA).

EL1545. is based on the principle of antigen-antibody interaction_

Transgenie Animals

Animals that have had their DNA manipulated to possess and express a foreign gene are known as transgenic animals. Transgenic mice, rats, rabbits, pigs, sheep,. cows and fish have been produced_ Common reasons for deveio pment of transgenic animals-

The first transgenic cow Rosie (in 1997} produced human protein -enriched milk. The milk contain the human alpha-lactalbulm, which Is nutritionally more balanced than cow milk.

Ethical Issues

- The Indian government has set up organisations. Ilke GEAC (Genetic Engineering, Approval Comnitteeli which make decision regarding the validity or 5N1 research and saferirof introducing GIVI•organ isms for public services.

lopiracy

Use of bio-resources by multinational copripanies and other organizations without proper authorization from the countries and pi-apple concerned without compensatory payment. There has been growing realization of injustice, inadequate compensation and benefit sharing between developed and develo ping countries.