LESSON-24 GENETICS AND SOCIETY

Today, we find many applications of the knowledge of genetics in the fields of agriculture, medicine and forensic science. Some technologies related to genetics such as gene cloning, recombinant DNA technology, DNA fingerprinting, raising genetically modified crops will be touched upon in this lesson.

- From prehistoric times, humans have had a curiosity to know how traits (features) are inherited.
- Domestication of animals and cultivation of crops like rice, wheat, maize and date palm can be traced to earlier then 5000 BC.
- Modern genetics began after Mendel's laws of inheritance were accepted. Soon after it become clear that genes are carriers of hereditary features and they are present on chromosomes. That genes mutate also became known.
- The last fifty to sixty years have been an era of Molecular Genetics when it was confirmed that DNA is the genetic material and the mechanism of DNA replication and protein synthesis in a cell were discovered.
- In the last few years, many techniques such as rDNA technology, DNA fingerprinting have been put forth.
- **Gene cloning** means producing and preserving desired genes in a clone of bacteria through recombinant DNA technology.
- A **gene bank** is one where several clones of bacteria carrying different desired foreign genes (for example genes of humans) are preserved for future use of products of these genes.
- **Genetic engineering**, also called recombinant DNA technology uses specific restriction endonuclease from different bacteria to cut genes, that is, particular DNA sequences from DNA molecules of an organism (e.g. humans) and similar sequences from plasmids and join the foreign DNA to the plasmid and introduce the plasmid with foreign DNA into its host bacterium and raise a bacterial clone.
- Genetic engineering is useful for creating genetic libraries, gene therapy and genetically modified organisms.

TRANSGENIC MICROBES, PLANTS AND ANIMALS

- Genetically modified organisms are also called **transgenics.** Transgenic microbes, plants and animals carry in their genetic make up, gene or genes of another kind of organism. Transgenic bacteria are used for extracting metals and decomposing pollutants. Transgenic plants are herbicide and pest resistant. Transgenic animals are larger in size and transgenic goats may carry a human gene responsible for a particular protein which is then released in its milk.
- **Bt crops** are genetically modified crops and are therefore also called transgenic crops. The name Bt crops is because the transgene or the foreign gene is transferred into the crop by the soil bacterium ***Bacillus thuringiensis*** (Bt).
- **Bio-safety:** In early 2000, several countries agreed to a Bio-safety protocol by which the safety of using GM foods is first ascertained before using them. In our country, Department of Biotechnology, in compliance with rules of Environment Protection Act (EPA) has to be consulted granting permission for research and use of any GM organism only after testing its safety to humans, other animals and the environment.
- **Biopatent** A patent is an official document. Possession of this document permits the

- **PCR or polymerase chain reaction** is a technique to make many copies of a small amount of DNA.
- **DNA fingerprinting** is a technique to identify the DNA of a particular person. It is used to scientifically investigate a crime and identify the real criminal.
- **Genomics** is the analysis of a complete set of genes found in an organism. The complete set of genes is called a genome.
- **Genetic counselling** is the advise given by an expert on the chances of an unborn baby getting a genetic disorder.
- The pattern of inheritance of a particular trait (feature) among humans is identified by the method of **pedigree analysis**.

Test Yourself

1. Use the example of Bt crops to state the importance of transgenic crops?
2. Write notes on: (a) Biopatent (b) Biosafety.
3. Mention the benefits of Genetic Engineering.