

Chapter 9 Strategies For Enhancement in Food Production

Important Terminologies

ANIMAL BREEDING

mating or crossing of animals to improve the desirable qualities and yield or production.

ANIMAL HUSBANDRY

the agriculture practice of breeding and raising livestock e.g. buffaloes, cow, pigs, horses, sheep, camel etc.

BREEDING

bee keeping production of honey. DAIRY FARM management the management of animals for milk and its product for human consumption.

FISHERIES

an industry devoted to rearing, catching, processing or selling fish shellfish or other aquatic animals.

GREEN REVOLUTION

dramatic increase in food production in 1960s as a result of cultivation of high yielding disease resistant varieties of wheat rice and maize etc. developed through breeding techniques is referred to as green revolution.

MUTUAL BREEDING

obtaining crop plants with desirable characters by artificial or induced mutations and using them a material in breeding programs is called mutation breeding.

PLANT BREEDING

the purposeful manipulation of plant species (crop) to create desirable plants best suited for cultivation gives better yields and is disease resistance.

SCP OR SINGLE CELL PROTEINS

industrially or commercially produced edible proteins by culturing suitable micro organism or large scale for nutrition for animals and human beings.

SOMACLONES

genetically

identical organisms or plants derived from single organisms through micro propagation are called somatic hybrid e.g tomato protoplasm and potato protoplasm.

TISSUE CULTURE GROWING

whole plant from a part of plant such as leaf root pollen etc. by growing these on an artificial nutrient medium under aseptic condition is called tissue culture.

TOTIPOTENCY

the quality of isolated cells or tissue of an organism by virtue of which it can generate the whole organism is called totipotency.

Animal Breeding-objectives:

- 1.Improved growth rate.
- 2.Increased production
3. Improve desirable qualities.
- 4.Improved resistance to diseases
- 5.Improved resistance to adverse environmental conditions

Methods:

i). Inbreeding :- Breeding between same breed for 4-6 generations. Eg.- cows, buffaloes, poultry .
(Advantage: Increases homozygosity and develops pure line, removes less desirable genes)

In breeding depression :- continued in breeding reduces fertility even productivity. A single outcross often helps to overcome inbreeding depression

ii) Outbreeding :- breeding between unrelated animals. It is of two types -

1.) Out crossing :- mating within the same breed but not having ancestors.

2.) Crossbreeding :- superior males of one breed are mated with superior females of another breed to get better progeny.e.g.- cows of inferior breed with superior bull.

Hisardale :- is a new breed of sheep developed in Punjab by crossing Bikaneri Ewes and Marino Rams.

3) Interspecific hybridization :- male and female animals of two different species are mated.
E.g.- mule is crossbreed of male donkey and female horse.

4.) Control breeding :- it is done by artificial insemination and multiple ovulation embryo transfer technology (MOET)

(a) Artificial insemination :- semen of superior male is collected and injected into the reproductive tract of the selected female. The spread of certain diseases can be controlled by this method.

(b) MOET :- Technique for herd improvement by successful production of hybrids.

i) Hormone(FSH) are administered to the cow for inducing follicular maturation and super ovulation.

ii) Cow produces 6-8 eggs instead of one egg & is either mated with elite bull or artificially inseminated.

iii) Fertilised egg at 8-32 cell stage are recovered non-surgically & transferred to surrogate mother.

iv) Done in cattle, sheep, rabbits etc.

Steps in Plant breeding:-

1 Collection of variability :- Collection and preservation of all different wild varieties, species, relatives of cultivated species etc. are also called germplasm collection.

2.Evaluation and selection of parents :- Germplasm is evaluated to identify plants with desirable traits.

3.Cross hybridization among the selected parents :- Two plants having two desired characters are hybridized to get new hybrid having two desired characters.

4.Selection and testing of superior recombinants :- Selection of the plants having desired character combinations.

5.Testing, release and commercialization of new cultivars :- Newly selected lines are evaluated for their yield, agronomic traits, disease resistance etc. and released into the market.
Green revolution - Crop production.

White revolution - Milk production

Blue revolution - Fish production

Biofortification :-

Breeding crops with higher levels of proteins, vitamins and minerals eg. Vitamin C rich bitter gourd, mustard, tomato; protein rich beans lablab French in Garden peas. Vitamin A rich carrots, Spinach, pumpkin, iron and calcium rich spinach and bathua etc. to improve public health.

SCP (Single cell protein) :- Protein rich cell biomass from microbes such as bacteria, yeast, algae are used as alternative food.

Eg-Spirulina can be grown in waste water (from potato processing plant) to produce protein rich biomass treated as food.

Advantages :-

i) Provides protein rich food supplement in human diet

ii) Reduces pressure of conventional agricultural production

iii) Use of Waste water reduces pollution level

iv) High rate of biomass production in large amount in short period.

Methylophilus methylotrophus (250 gm) can be expected to produce 25 tonnes of protein due to its high rate of biomass production and growth

Tissue culture :-

Technique of in vitro regeneration of whole plant by growing any plant part called explant in culture medium under aseptic condition. includes following methods:

1.Callus culture :- Cell division in explant form an unorganized mass of cell called callus.

2. Suspension culture :- Involves small group of cells suspended in a liquid media.

3.Meristem Culture :- Apical shoot meristem is used as explant & support multiple shoot development.

4.Embryo Culture :- Excision of young embryos from developing seeds & culture in nutritional media.

5.Anther culture :- Production of haploid plant species by desired anther cultured in suitable medium.

6. Protoplast culture and somatic hybridization :- In this method, hybridization of different species could produce variants of economic value as follows:

- i) Isolation of desired single cells
- ii) Digestion of cell wall by pectinase & cellulase enzyme for exposure of protoplast
- iii) Fusion of protoplast by Polyethylene glycol(PEG)
- iv) Hybrid protoplast culture resulting in desired variety of plant eg., Pomato is obtained by somatic hybrid of potato and tomato.

7. Micropropagation :-

Tissue culture technique used for rapid vegetative multiplication of ornamental plants and fruit trees by using small explants. Micropropagation is done by shoot meristem culture & somatic embryogeny. It results in genetically identical plants & used widely in forestry & floriculture.

8. Somaclonal variation :- Genetic variation in plants regenerated from a single culture is used to develop several useful varieties eg., Short duration sugarcane, Rust resistant wheat.

- Uses:
- a) Rapid clonal multiplication
 - b) Production of virus free plants
 - c) Production of transgenic plants
 - d) Germplasm collection