
UNIT VIII: BIOLOGY IN HUMAN WELFARE

Chapters 9

STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION

A. One mark questions:

1. What is animal husbandry?

Animal husbandry is the agricultural practice of breeding and raising livestock like cows, buffaloes, pigs, horses, sheep, camels, goats etc., that are useful to mankind.

2. What is dairy farm management?

Dairying is the management of animals for milk and its products for human consumption.

3. Name an improved breed of cow.

Jersy.

4. What is poultry?

Poultry is the class of domesticated fowl (birds) used for food and eggs.

5. Name an improved breed of poultry bird.

Leghorn

6. What is a breed?

Breed is group of animals related by descent and similar in most characters like general appearance, features size, configuration, etc.

7. What is inbreeding?

It is a cross made between same breed.

OR

It is a mating between closely related individuals within the same breed for 4-6 generations.

8. What is out breeding?

It is the breeding of the unrelated animals which may be between individuals of the same breed but having no common ancestors for 4-6 generations or between different breeds or different species.

9. What is out-crossing?

Mating of animals within the same breed but having no common ancestor on either side of their pedigree upto 4-6 generations.

10. What is cross-breeding?

Superior male of one breed is mated with superior female of another breed.

11. What is inbreeding depression?

Continuous inbreeding reduces fertility and productivity is called inbreeding depression.

12. Name a breed of sheep developed in Punjab by crossing Bikaneri ewes and Marino rams.

Hisardale.

13. What is interspecific hybridisation?

It is the cross between two different species.

14. Name an animal which is the progeny of interspecific hybridisation between donkey and horse.

Mule.

15. What is artificial insemination?

The semen collected from the selected male is injected into the reproductive tract of the selected female.

16. What is plant breeding?

Plant breeding is the purposeful manipulation of plant species in order to create desired plant types that are better suited for cultivation, give better yields and are disease resistant.

17. How is a mule produced?

The mule is produced by breeding between male donkey and female horse (mare).

18. Name a Nobel Laureate who developed semi dwarf variety of wheat.

Norman E. Borlaug.

19. Name an organism that causes black rot of crucifer.

Bacteria.

20. Define Biofortification.

Breeding crops which produce higher levels of nutrients like vitamins, minerals, protein and fats to improve public health.

21. Define single cell protein.

Production of protein biomass in large scale using micro organisms and growing them in low cost raw material is called single cell proteins.

22. Name a micro-organism that can produce large amount of single cell protein.

Methylophilus methylotrophus

23. Give the meaning of the term Totipotency.

Ability of a plant cell, tissue or organ that can multiply and regenerated into a new plant is called totipotency.

24. Give the meaning of the term Explant.

Explant is any parts of plant like cell, tissue or organ grown in a test tube containing artificial nutrient medium, under sterile condition.

25. Give the meaning of the term Micropropagation.

The method of production of thousands of plants using explant through tissue culture technique is called micropropagation.

26. Give the meaning of the term Somaclones.

Plants obtained by micropropagation using somatic cells and they are genetically identical.

27. What is somatic hybridisation?

It is a technique of fusion of protoplasts isolated from two different plants which have desirable characters to obtain a hybrid a protoplast.

28. Name the chemical used to fuse two protoplasts.

PEG or Polyethylene glycol.

29. Give an example for a plant which is an outcome of somatic hybridisation.

Pomato.

30. A plant growing in a natural habitat infected by virus. Which part of the plant do you suggest which is suitable to get a viral free plant through tissue culture.

Using apical meristem which is free from virus.

31. What is the economic value of spirulina?

Spirulina can serve as food rich in proteins, minerals, vitamins, fats and carbohydrates.

32. Mention the strategy used to increase homozygosity in cattle for desired character.

Inbreeding.

33. Name the Indian variety of rice patented by an American company.

Basmati rice.

34. Why is the South Indian sugarcane preferred by agriculturists?

South Indian sugarcane has thicker stem and higher sugar content.

35. Sucrose is necessary in the plant tissue culture nutrient medium. Give reason.

As a carbon source.

36. Name a technology that has successfully increased herd size of cattle in a short time.

MOET (Multiple Ovulation and Embryo Transfer).

B. Two mark questions:

1. Name any four poultry birds which are used for food and eggs.

chicken, ducks, turkeys, geese

2. Write any four proper poultry farm management.

- Selection of disease free and suitable breeds.
- Proper and safe farm conditions.
- Proper feed and water.
- Hygiene and health care.

3. Name two major types of animal breeding experiments.

- Inbreeding
- Out breeding

4. Name the breeds used to develop a new breed of sheep Hisardale in Punjab.

Bikaneri ewes and Marino rams.

5. Name any two controlled breeding experiments in animals to improve the quality of progeny.

- Artificial insemination (AI)
- Multiple Ovulation Embryo Transfer (MOET)

6. What is blue revolution?

Increasing production of the fish is called Blue revolution.

7. Write two advantages of artificial insemination.

- The semen collected may be used immediately or can be frozen for later use.
- The semen can be transported in a frozen form to where the female is housed.

8. Mule is a progeny obtained by interspecific hybridisation. Who are the parents of mule?

Male donkey and female horse.

9. Write the four traits for which plant breeding is done.

- a) Increased crop yield
- b) Improve quality
- c) Increased tolerance to environmental stresses (salinity, extreme temperature, and drought).
- d) Resistant to pathogens (viruses, fungi, and bacteria)
- e) Increase tolerance to insect pest.

10. What is inbreeding? What is the drawback of inbreeding?

- a) Mating of more closely related individuals within the same breed for 4-6 generations.
- b) Continuous inbreeding reduces fertility and even productivity (inbreeding depression).

11. Write the reason for inbreeding depression. How, it can be overcome?

- a) Continuous inbreeding for several generations causes depression.
- b) It can be overcome by out crossing.

12. Name two high yielding wheat varieties introduced in India in 1963.

Sonalika and Kalyan Sona.

13. Which are the two rice varieties used to develop semi dwarf rice variety in 1966 in India?

IR-8 and Taichung Native-1.

14. Name two semi dwarf rice varieties developed in India during 1966.

Jaya and Ratna

15. Name any two fungal diseases in plants.

Brown rust of wheat, Red rot of sugarcane, Late blight of potato etc.

16. Name any two viral diseases in plants.

Tobacco mosaic, Turnip mosaic etc.

17. Mention any four improving objectives of biofortification.

- a) Protein content and quality
- b) Oil content and quality
- c) Vitamin content and
- d) Micronutrient and mineral content

18. Name two plants used to obtain pomato.

Potato and Tomato

19. Name any two enzymes required to isolate plant protoplasts.

Cellulase and pectinase.

20. Mention any two advantages of inbreeding.

- a. It exposes harmful recessive genes that are eliminated by selection.
- b. It helps in developing a pure line.

21. What is meant by germplasm collection? What are its benefits?

The collection of all the diverse alleles of all the genes of a crop plant is called germplasm collection. The breeder selects the most favourable characters of a particular gene and manipulates its transfer to a desirable parent.

22. Name the improved characteristics of wheat that helped India achieve green revolution.

- a) Semi-dwarf nature
- b) Quick yielding feature
- c) High yielding feature
- d) Disease resistance feature

23. Do you know of a man made cereal? Trace how it was developed.

Triticale is a man made cereal. It was developed by crossing wheat (*Triticum aestivum*) and rye (*Secale cereale*).

24. How are biofortified maize and wheat considered nutritionally improved?

Biofortified maize had twice the amount of amino acids, lysine and tryptophan, compared to existing hybrids and the wheat variety had increased protein content.

C. Three mark questions:

1. What is inbreeding? Write any two advantages of inbreeding.

Mating of more closely related individuals within the same breed for 4-6 generations.

Advantages:

- a) Mating of more closely related individuals within the same breed for 4-6 generations.
- b) Inbreeding increases **homozygosity**.
- c) Inbreeding is necessary to create **pure line** in any animal.
- d) Inbreeding exposes harmful recessive gene that are eliminated by selection.
- e) Helpful in accumulation of superior genes.

2. Give any three examples of plants whose productivity is improved through biofortification.

- a) Hybrid maize developed with twice the amount of amino acids lysine and tryptophan, compared with existing maize.
- b) Wheat variety Atlas 66, having high protein content has been used as donor for improving cultivated wheat.
- c) Iron fortified rice developed with five times more iron content than existing variety.

3. IARI, New Delhi has developed some biofortified plants which are rich in some nutrients. Name the nutrients and the plant in which they are derived.

- a) Vitamin A enriched carrots, spinach pumpkin.
- b) Vitamin C enriched bitter gourd, bathua mustard tomato.

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- c) Iron and Calcium enriched spinach and bathua.
 - d) Protein enriched beans- broad, lablab, French and garden peas.

4. Write three applications of plant tissue culture.

- a) Production of large number of plant from small tissue or single cell.
- b) Production of genetically identical plants (somaclones).
- c) Recovery of healthy plants from diseased plants by meristem culture. Although the plant infected with virus, the meristem is free of virus.

5. Write the components that are used in the tissue culture nutrient medium.

- a) Distilled water
- b) Inorganic salts
- c) Vitamins
- d) Amino acids
- e) Growth hormones
- f) Sucrose
- g) Agar

6. Explain the advantage of cross-breeding of the two species of sugar cane in India.

Saccharum barberi, grown in north India, had poor sugar content and yield, whereas *Saccharum officinarum*, grown in south India, had thicker stem and higher sugar content. The sugarcane species obtained after cross breeding between these two species, had thick stems, high sugar content, high yield and ability to grow in north India also.

7. Give one example of disease caused each by fungi, bacteria and viruses in crop plants.

- a) Fungal disease: Red rot of sugarcane, brown rust of wheat
- b) Bacterial disease: Citrus canker, black rot of crucifers
- c) Viral disease: Tobacco mosaic, Turnip mosaic

D. Five mark questions:

1. If your family owned a dairy farm, what measures would you undertake to improve the quality and quantity of milk production?

- a. Well housed.
- b. Should have adequate water
- c. Maintained disease free cattle and environment.
- d. Feeding should be scientific manner with quantity and quality of fodder.
- e. Stringent cleanliness and hygiene.
- f. Regular visit by a veterinary doctor would be mandatory.

2. Explain five advantages of inbreeding.

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- a. More milk per lactation is the criteria for superior female for cow and buffalo.
 - b. Superior male which gives rise to superior progeny.
 - c. Inbreeding increases homozygosity.
 - d. Inbreeding is necessary to create pure line in any animal.
 - e. Inbreeding exposes harmful recessive gene that are eliminated by selection.
 - f. Helpful in accumulation of superior genes.

3. Explain the steps involved in MOET.

- a. Cow is administered hormones with FSH-like activity induce follicular maturation and super ovulation
- b. Production of 6-8 eggs instead of one egg per cycle.
- c. The female is either mated with an elite bull or artificially inseminated.
- d. Non-surgical recovery of fertilized eggs at 8-32 cells stages. Each one transferred to surrogate mother.
- e. The genetic mother is available for another round of super ovulation.

4. Explain the five steps involved in plant breeding techniques.

- a) Collection of genetic variability
 1. Genetic variability is the root of any breeding programme.
 2. Pre-existing genetic variability is available from wild relatives of crop.
 3. Collection and preservation of all the different wild varieties, species and relatives of the cultivated species.
 4. Evaluation for their characteristics.
 5. The entire collection (of plants /seeds) having all the diverse alleles for all genes in a given crop is called germplasm collection.
- b) Evaluation and selection of parents
 1. The germplasm is evaluated so as to identify plants with desirable combination of characters.
 2. The selected plants are multiplied and used in hybridization.
 3. Pure line is created wherever desirable and possible.
- c) Cross hybridization among the selected parents
 1. Cross hybridization of two selected parent by emasculation and bagging, to produce hybrid of combined character of both parents.
 2. For example high protein quality of one parent may need to be combined with disease resistance from another parent.
 3. Usually one in few hundred to a thousand crosses offsprings shows desirable combinations.
- d) Selection and testing of superior recombinants
 1. Selection is done from the progeny of hybrids produced by cross hybridization.
 2. It requires careful scientific observations and evaluation of progeny.
 3. Hybrid plants that are superior to both of the parents are selected.
 4. These hybrids are self-pollinated for several generations till they reach a state of uniformity (homozygosity).
- e) Testing, release and commercialization of new cultivars

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1. Selected pure lines are evaluated for their yield and other agronomic traits of quality, disease resistance etc.
 2. This evaluation is done in the research fields and recording their performance under ideal fertilizer, irrigation
 3. Testing is done in the farmers 'fields' at least for three generation.
 4. The material is compared with best available local crop cultivar (a reference cultivar).

