
CBSE Test Paper 02
Ch-9 Strategies for Enhancement in Food Production

1. Polyploidy is induced through
 - a. Colchicine
 - b. Ethylene
 - c. Mutagenic chemicals
 - d. Irradiation
2. Crosses between two plants by the same variety are called
 - a. Interspecific
 - b. Intergeneric
 - c. Intravarietal
 - d. Intervarietal
3. Which of the following variety of wheat is resistant to leaf and strip rust and hill bunt disease?
 - a. Kalian sona
 - b. Hingiri
 - c. Sonalika
 - d. IR-78
4. In crop improvement program, haploids are important because they
 - a. Require one half of nutrients
 - b. Grow better under adverse conditions
 - c. Are helpful in study of meiosis
 - d. Form perfect homozygous individuals on diploidisation
5. The capacity to generate a whole plant from any cell or ex-plant is called
 - a. Totipotency
 - b. Pluripotency
 - c. Tissue culture
 - d. Cell cloning
6. Inbreeding is necessary if you want to evolve a
 - a. Pure line
 - b. Better variety
 - c. GM food

d. Heterozygosis

7. Write the name of one fresh water fish and marine fish.
8. Mention the property that enables the explants to regenerate into a new plant
9. Any one interspecific hybrid mammal.
10. Name any five hybrid varieties of crop plants which have been developed in India.
11. State the importance of biofortification.
12. What is meant by plant tissue culture? Name two types of plant tissue culture.
13. Name the two techniques involved in controlled breeding experiments.
14. The steps in a programme are: - Collection of germplasm - Cross breeding the selected parents - Selecting superior recombinant progeny - Testing, releasing and marketing new cultivars
 - i. What is this programme related to?
 - ii. Name two special qualities as basis of selection of the progeny.
 - iii. What is the popular term given to this outcome? Also name the Indian scientist who is credited with chalking out this programme?
15. Briefly describe various steps involved in plant breeding.

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Answer

1. a. Colchicine, **Explanation:** Polyploidy is a condition in which multiple sets of chromosome is present in same cell in place of usual two sets (diploid). Cell division involves karyokinesis followed by cytokinesis. Colchicine prevents the cytokinesis that results the more than two sets of chromosome.
2. c. Intravarietal, **Explanation:** The crosses between two plants of same varieties is called intravarietal cross. The hybrid obtained from intravarietal cross is more vigorous as they are heterogenic.
3. b. Himgiri, **Explanation:** Himgiri wheat variety is resistant to disease like leaf and strip rust and hill bunt disease that cause great loss of productivity due to loss of plant parts.
4. d. Form perfect homozygous individuals on diploidisation, **Explanation:** In crop improvement program, haploids are important because they form perfect homozygous individuals on diploidisation. Homozygous individuals are required for plant breeding programs.
5. a. Totipotency, **Explanation:** The capacity to generate a whole plant from any cell or ex-plant is called totipotency. Plants are totipotent and from small part of plant new whole plant can be grown.
6. a. Pure line, **Explanation:** Pure line is necessary for carrying out breeding programmes. Pure line is obtained by inbreeding plants followed by test crossing until we get homozygous plants for particular traits.
7. i. Fresh water fish - The Indian carp (*Labeo rohita*) also known as the rohu is a freshwater fish species in the minnows. The natural diet of rohu are plants, fruits, insects, crustaceans & planktons
ii. Marine fish - Hilsa fish is a fish of saltwater. They live in a group in the coastal area of the sea. Hilsa is the national fish of Bangladesh.
8. Totipotency is the ability of a single cell to divide and produce all of the differentiated cells in an organism. Spores and zygotes are examples of totipotent cells.

9. A mule is the offspring of a male donkey and a female horse. Horses and donkeys are different species, with different numbers of chromosomes.

10.

	Crops	Varieties
(i)	Wheat	Himgiri
(ii)	Rice	Jaya, Ratna
(iii)	Brassica	Pusa Swarnim
(iv)	Cow pea	Pusa Komal
(v)	Chilli	Pusa Sadabahar

11. The process of breeding crops with higher level of vitamins and minerals, higher proteins, healthier fats, to improve public health is known as biofortification. **It helps to improve:** This can be done either through conventional selective breeding, or through genetic engineering.

- Protein content and quality;
- Oil content and quality;
- Vitamin content; and
- Micronutrient and mineral content.

12. The technique of maintaining and growing plant cells, tissues or organs on artificial medium in suitable culture vessels under controlled environmental conditions is called plant tissue culture.

- Meristem culture:** Meristem culture is the in vitro culture of a generally shiny special dome like structure measuring less than 0.1mm in length and only one or two pairs of youngest leaf primordia, most excised from the shoot apex.
- Callus culture:** Usually explants from suitable materials (such as, carrot root, potato or sweet potato tuber, stem of tobacco, hypocotyl and cotyledon of soya bean etc..) are taken. The explants are first surface sterilised with 1.6% sodium hypochlorite solution or 0.1% mercuric chloride solution or 1% aqueous solution of bromine. Then the inner uncontaminated tissue is excised. If the excised tissue (such as, root, hypocotyl, cotyledon etc..) is taken from a seedling then the seed before germination is surface sterilised and allowed to germinate under aseptic conditions.

13. Animal breeding is producing improved breeds of domesticated animals by

improving their genotypes through selective mating.

i. **Artificial insemination (AI):** The semen of superior male is collected and injected into the reproductive tract of the selected female by the breeder. The semen can be used immediately or can be frozen for later use. When a bull inseminates a cow naturally approximately 5 to 10 billion sperms are deposited in the vagina. However, when semen is deposited artificially, considerably fewer sperms are required to achieve conception. Therefore, artificial insemination is very economical. The spread of certain diseases can be controlled by this method.

ii. **Multiple Ovulation embryo Transfer Technology (MOET):** In this method, hormones (with FSH-like activity) is given to the cow for inducing follicular maturation and super ovulation instead of one egg, which they usually give per cycle, they produce 6-8 eggs. The cow is either mated with a best bull or artificially inseminated. The embryos at 8-32 cell stage are recovered and transferred to surrogate mothers. The genetic mother is available for another super ovulation. MOET has been done in cattle, sheep, rabbits, buffaloes, mares, etc.

14. (i) Plant breeding is the genetic improvement of the crop in order to create desired plant types that are better suited for cultivation, give better yields and are disease resistant. The four steps are: 1. Creation of genetic variation by various means 2. Selection 3. Evaluation and Release as a variety and 4. Seed multiplication and distribution among farmers.

(ii) High yield and pest resistant for increase in food production.

(iii) Green revolution, M.S. Swaminathan.

15. **Steps in plant breeding:**

i. **Collection of variability:** Collection and preservation of all the different wild varieties, species and relatives of the cultivated species is a prerequisite for effective exploitation of natural genes available in the populations.

The entire collection (of plants / seeds) having all the diverse alleles for all genes in a given crop is called germplasm collection.

ii. **Evaluation and selection of parents:** The germplasm is evaluated so as to identify plants with desirable combination of characters.

The selected plants are multiplied and used in the process of hybridization. Pure lines are created wherever desirable and possible.

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- iii. **Cross hybridization among the selected parents:** The desired characters have very often to be combined from two different plants (parents), for example high protein quality of one parent may need to be combined with disease resistance from another parent. This is possible by cross hybridizing the two parents to produce hybrids that genetically combine the desired characters in one plant.
- iv. **Selection and testing of superior recombinants:** This step consists of selecting, among the progeny of the hybrids, those plants that have the desired character combination. The selection process is crucial to the success of the breeding objective and requires careful scientific evaluation of the progeny. This step yields plants that are superior to both of the parents (very often more than one superior progeny plant may become available). These are self pollinated for several generations till they reach a state of uniformity (homozygosity), so that the characters will not segregate in the progeny.
- v. **Testing, release and commercialization of new cultivars:** The newly selected lines are evaluated for their yield and other agronomic traits of quality, disease resistance, etc. This evaluation is done by growing these in the research fields and recording their performance under ideal fertilizer application irrigation, and other crop management practices. The evaluation in research fields is followed by testing the materials in farmers' fields, for at least three growing seasons at several locations in the country, representing all the agroclimatic zones where the crop is usually grown. The material is evaluated in comparison to the best available local crop cultivar - a check or reference cultivar.