

STRATEGIES FOR ENHANCEMENT IN FOOD PRODUCTION

STUDY-NOTES

I. Animal husbandry

- It is the agricultural practice of breeding and raising livestock.
- Animal husbandry deals with the care and breeding of livestock like buffaloes, cows, pigs, horses, cattle, sheep, camel, goat etc.
- It includes poultry farming and fisheries.
- Fisheries include rearing, catching, selling, etc., of fish, molluscs (shell-fish) and crustaceans (prawns, crabs, etc.)
- More than 70% of livestock population of the livestock live in India and China.

MANAGEMENT OF FARM AND FARM ANIMALS

A professional approach of farm management has increased the food production many folds. Some of the management procedures applied in various livestock are as follows:

(i) Dairy Farm Management

Dairying is the management of animals for its milk and its product for human consumption. In dairy farm management, we deal with processes and systems that increase yield and improve quality of milk.

- (a) Selection of good breeds having high yielding potential, combined with resistance to diseases is very important.
- (b) Cattle have to be housed well, should have proper water and be maintained disease free.
- (c) The feeding of cattle should be carried out in a scientific manner (quality and quantity of fodder).
- (d) Strict cleanliness and hygiene are importance while milking, storage and transport of the milk and its products.

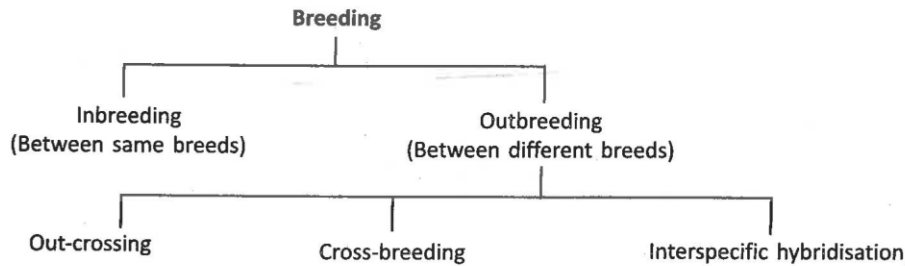
(ii) Poultry Farm Management

Poultry Farm Management- poultry is the class of domesticated birds used for food or for their eggs. It mainly includes chicken and ducks and with turkey and geese. Important components of poultry farm management include:

- (a) Selection of disease free and suitable breeds.
- (b) Proper and safe farm condition.
- (c) Proper feed and water
- (d) Hygiene and healthcare

ANIMAL BREEDING

- It aims at increasing yields of animals and improving the desirable qualities of the product.
- A breed is a group of animals related by descent and similar in most of the characters like general appearance, features, size, configuration etc.
- There are two kinds of breeding
 - (i) **Inbreeding:** breeding between animals of same breeds
 - (ii) **Outbreeding:** crosses between different breeds
 - (i) **Inbreeding**
 - **Inbreeding depression:** Continued inbreeding reduces fertility and even productivity. This is called inbreeding depression. Whenever this becomes a problem, selected animals of the breeding population should be cross-bred with unrelated superior animals of the same breed. This usually helps restore fertility and yield.



(ii) Out-breeding

- Out-breeding is the breeding of unrelated animals, which may be between individuals of same breed but, having no common ancestors or between different breeds (cross breeding) or different species (interspecific hybridisation).
 - (a) **Out-crossing:** Mating of animals within the same breed but having no common ancestors on either side of their pedigree up to 4-6 generations. The offspring are called out-cross.
 - (b) **Cross breeding:** Superior male of one breed are mated with superior female of another female of another breed. Cross breeding allows the desirable qualities of two breeds to be combined.
 - (c) **Interspecific hybridisation:** Male and female animals of two different species are mated. The progeny may combine desirable features of both the parents. Ex- mule.

Controlled breeding experiments

These are carried out using **artificial insemination**. The semen is collected from the male parent and injected into the reproductive tract of the selected female by the breeder.

Multiple Ovulation Embryo Transfer Technology (MOET)

- It is used to increase the success rate of artificial insemination.
- In this method, a cow is administrated hormones (FSH) to induce follicular maturation and super ovulation, instead of one egg; they produce 6-8 eggs.
- The fertilised eggs 8-32 cells stages, are recovered non-surgically and transferred to surrogate mothers.
- The genetic mother is available for another round of super ovulation.

BEE-KEEPING

- Bee-keeping or apiculture is the maintenance of hives of honeybees for the production of honey.
- Honey is a food of high nutritive value and also finds use in the indigenous systems of medicine. It also produces beeswax.
- The most common species of honey bee is *Apis indica*.
- The following points are important for successful bee-keeping:
 - (a) Knowledge of the nature and habits of bees
 - (b) Selection of suitable location for keeping the beehives
 - (c) Catching and hiving of swarms
 - (d) Management of beehives during different seasons
 - (e) Handling and collection of honey and of beeswax
 - (f) Keeping beehives in crop fields during flowering period increases pollination efficiency and improves the yield.

FISHERIES

- Fishery is an industry devoted to catching, processing or selling of fish, shellfish or other aquatic animals.
- Fresh water fishes which are very common include catla, rohu and common carp. Common marine fishes are Hilsa, sardines, mackerel and pomfrets.
- Different techniques have been applied to increase production like aquaculture and pisciculture. Blue Revolution is implemented to increase fish production.

● Differences between pisciculture and aquaculture

Pisciculture	Aquaculture
(i) It is a process of growing fish and selling it or using its products for domestic or commercial use.	It is a process of growing aquatic animals and plants, and selling them for commercial purposes.
(ii) Fish can be grown both in salt water or fresh water.	It involves feeding, harvesting and many other processes in salt water and fresh water.
(iii) Only fish are reared in ponds or tanks.	The most popular one's grown under controlled environments are shrimps, crab, fish, lobster and few others.

II. Plant breeding

- Plant breeding is the purposeful manipulation of plant species in order to create desired plants that are better suited for cultivation, give better yields and are disease resistant.
- Classical plant breeding involves crossing or hybridisation of pure lines, followed by artificial selection to produce plants with desirable traits of higher yield, nutrition and resistance to disease.
- The main steps in plant breeding are:
 - (i) Collection of variability** is the collection and preservation of all the different wild varieties, species and relatives of the cultivated species. The entire collection having all the diverse alleles for all genes in a given crop is called germplasm collection.
 - (ii) Evaluation and selection of parents** is the identification of plants with desirable combination of characters. The selected plants are multiplied and used in the process of hybridisation.
 - (iii) Cross hybridisation** is performed among the selected parents to obtain desired crop characters. For example, high protein quality of one parent may need to be combined with disease resistance from another parent. This is possible by cross hybridising the two parents to produce hybrids that genetically combine the desired characters in one plant.
 - (iv) Selection and testing of superior recombinants:** 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.
 - (v) Testing, releasing and commercialisation of new cultivars:** The newly selected lines are evaluated for their yield and other agronomic traits of quality, disease resistance, etc.
 - Wheat and Rice: Production of wheat and rice increased tremendously between 1960-2000 due to introduction of semi-dwarf varieties of rice and wheat. In 1963, several varieties such as Sonalika and Kalyan Sona, which were high yielding and disease resistant were introduced all over the wheat growing field of India. Semi-dwarf rice varieties were derived from IR-8, and Taichung Native-1 were introduced in 1966. Later better-yielding semi-dwarf varieties Jaya and Ratna were developed in India.
 - Sugarcane: *Saccharum barberi* and *Saccharum officinarum* were crossed to get the desirable qualities of high yield, thick stems, high sugar and ability to grow in the sugarcane areas of north India.
 - Millets, hybrid maize, jowar and bajra are developed in India. These varieties are high yielding and resistant to water stress.

Plant Breeding for Disease Resistance

Several fungal, bacterial and viral pathogens affect the yield and quality of plant products. To minimize this loss disease resistant varieties were developed. Breeding is carried out by conventional method or by mutation breeding.

Steps for breeding disease resistant plants:

- (i) Selection of genome with disease resistant traits
- (ii) Mating of the selected parents
- (iii) Selection of superior hybrids
- (iv) Testing of the hybrid for superior variety
- (v) Release of the new variety

- Some crop varieties bred by hybridisation and selection for disease resistance to fungi, bacterial and viral disease are released:

Crop	Variety	Resistance to diseases
Wheat	Himgiri	Leaf and stripe rust, hill bunt
Brassica	Pusa swarnim (Karan rai)	White rust
Cauliflower	Pusa Shubhra Pusa Snowball K-1	Black rot and Curl blight black rot
Cowpea	Pusa Komal	Bacterial blight
Chilli	Pusa Sadabahar	Chilly mosaic virus, Tobacco mosaic virus and Leaf curl

- Mutation is the process by which genetic variations are created through changes in the base sequence within genes resulting in the creation of a new character or trait not found in the parental types. It is done by using mutants like chemicals or radiations. This process is called mutation breeding. e.g
 - Mung bean resistance to yellow mosaic virus and powdery mildew were induced by mutation.
 - Resistance to yellow mosaic virus in bhindi (*Abelmoschus esculentus*) was transferred from a wild species and resulted in a new variety of *A. esculentus* called Parbhani kranti.

Plant Breeding for Developing Resistance to Insect Pests

- Crop plant and crop products are destructed by insects and pests on large scale. To Prevent this loss, new resistant varieties are developed.
- Steps for breeding disease resistant plants:
 - Selection of genome with disease resistant traits
 - Mating of the selected parents
 - Selection of superior hybrids
 - Testing of the hybrid for superior variety
 - Release of the new variety

Crop	Variety	Insect Pests
(i) Brassica (rapeseed mustard)	Pusa Gaurav	Aphids
(ii) Flat bean	Pusa Sem 2, Pusa Sem 3	Jassids, aphids and fruit borer
(iii) Okra (Bhindi)	Pusa Sawani Pusa A-4	Shoot and Fruit borer

Bio-fortification

- Breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats. Breeding for improved nutritional qualities have following objectives of improving
 - Protein content and quality
 - Oil content and quality
 - Vitamin content
 - Micronutrient and mineral content
- Atlas 66, having a high protein content, has been used as a donor for improving cultivated wheat.
- IARI, New Delhi have released many varieties of vegetables crops rich in vitamins and minerals like vitamin A enriched carrot, spinach and pumpkin and vitamin C enriched bitter guard, bathua (*Chenopodium*), mustard, iron and calcium enriched spinach and bathua; and protein enriched beans—broad, lablab, French and garden peas.

Single Cell Protein (SCP)

- Alternate source of protein for animal and human nutrition. Microbes are grown on industrial scale as a source of good protein.
- Microbes like *Spirulina* can be grown easily on materials like waste water from potato processing plants having starch, molasses, animal manure and even sewage to produce large quantities and can serve as food rich in protein, minerals, fats, carbohydrates and vitamins.
- *Methylophilus methylotrophus* has high rate of biomass production and growth. It can be expected to produce 25 tons of protein by 250 g of microorganisms.

III. Tissue culture

- The capacity to generate whole plants from any cell/explant is called **totipotency**. Thousands of plants can be produced from explants in short interval of time using suitable nutrient medium, aseptic condition and use of phytohormones. This method of producing thousands of plant is called **micropropagation**.
- Each of these plants will be genetically identical to the original plant from which they were grown, i.e., they are **somaclones**. Many important food plants like tomato, banana, apple.
- **Meristem Culture**: The recovery of healthy plants from diseased plants can be done by meristem culture. Though the plant is infected with a virus, the meristem (apical and axillary) is free of virus. Hence, one can remove the meristem and grow it *in vitro* to obtain virus-free plants.
- **Somatic Hybridisation**: Isolation of single cells from their plants and after digesting their cell wall fusing the cytoplasm of two different varieties is called somatic hybridisation and these hybrids are called somatic hybrids.

QUESTION BANK

MULTIPLE CHOICE QUESTIONS

1. In virus-infected plants the meristematic tissues in both apical and axillary buds are free of virus because
 - (a) The dividing cells are virus resistant
 - (b) Meristems have antiviral compounds
 - (c) The cell division of meristems are faster than the rate of viral multiplication
 - (d) Viruses cannot multiply within meristem cell(s).
2. Continued inbreeding can cause inbreeding depression. Whenever, this becomes a problem, selected animals of the breeding population should be mated with
 - (a) Related superior animals of same breed
 - (b) Related superior animals of different breed
 - (c) Unrelated superior animals of same breed
 - (d) Unrelated superior animals of different breed
3. The best explant to raise virus free plant is
 - (a) Embryo
 - (b) Root
 - (c) Meristem
 - (d) Leaf
4. Several South Indian states raise 2-3 crops of rice annually. The agronomic feature that makes this possible is because of
 - (a) Shorter rice plant
 - (b) Better irrigation facilities
 - (c) Early yielding rice variety
 - (d) Disease resistant rice variety
5. The scientific procedure through which crop plants are enriched with some desirable nutrients is called
 - (a) Crop protection
 - (b) Breeding
 - (c) Bio-fortification
 - (d) Bio-remediation
6. Which one of the following is NOT a fungal disease?
 - (a) Rust of wheat
 - (b) Red rot of sugarcane
 - (c) Black rot of crucifers
 - (d) Smut of Bajra
7. The term 'totipotency' refers to the ability of a
 - (a) Cell to generate whole plant
 - (b) Buds to generate whole plant
 - (c) Seeds to germinate
 - (d) Stems to generate a whole plant

8. The agriculture practice of breeding and raising livestock is called
 (a) Breeding (b) Biofortification (c) Domestication (d) Animal husbandry
9. Inbreeding is carried out in animal husbandry because it
 (a) Improves the breed (b) Increases vigour
 (c) Increases heterozygosity (d) Increases homozygosity
10. Sonalika and Kalyan Sona are crop varieties of
 (a) Rice (b) Wheat (c) Millet (d) Tobacco
11. Select the incorrect statement.
 (a) Plant breeding does not require molecular genetic tools.
 (b) All our major food crops are derived from domesticated varieties
 (c) Classical plant breeding involves crossing or hybridisation of pure lines, followed by artificial selection
 (d) Genetic variability is the root of any breeding programme.
12. Given below are a few statements regarding somatic hybridisation. Choose the correct statements.
 (i) Protoplasts of different cells of the same plant are fused.
 (ii) Protoplasts from cells of different species can be fused.
 (iii) Treatment of cells with cellulase and pectinase is mandatory.
 (iv) The hybrid protoplast contains characters of only one parental protoplast.
 (a) (i) and (iii) (b) (i) and (ii) (c) (i) and (iv) (d) (ii) and (iii)
13. Use of certain chemicals and radiation to change the base sequences of genes of crop plants is called
 (a) Recombinant DNA technology (b) Transgenic mechanism
 (c) Mutation breeding (d) Gene therapy
14. Consider the following statement.
 I. In spite of having more than 70% of the world livestock population, the contribution of India and China to the world farm produce is only 25%.
 II. The productivity per unit of cattle in these countries is very low.
 Select the correct option.
 (a) Both I and II are true, and II explains I (b) Both I and II are true, but does not explain I
 (c) I is true, but II is false (d) Both the statements are not true
15. Which of the following is most important factor that would lead to increased milk yield in cattle?
 (a) Selection of good breeds
 (b) Resistance to diseases
 (c) Stringent cleanliness and hygiene
 (d) Provision of ideal environmental conditions to cattle
16. Which one of the following combinations would a sugarcane farmer look for in the sugarcane crop?
 (a) Thick stem, long internodes, high sugar content and disease resistant
 (b) Thick stem, high sugar content and profuse flowering
 (c) Thick stem, short internodes, high sugar content, disease resistant
 (d) Thick stem, low sugar content, disease resistant
17. An explant is
 (a) Part of the plant (b) Dead plant
 (c) Part of the plant used in tissue culture (d) Part of the plant that expresses a specific gene.
18. A group of animals related by descent and similar in most characters like general appearance, features, size, configuration, etc., are said to belong to a
 (a) Variety (b) Species (c) Strain (d) Breed

19. Semi-dwarf rice varieties derived from IR-8, were developed at
 (a) Mexico (b) Philippines (c) India (d) Maldives
20. A collection of all the alleles of all the genes of a crop plant is called
 (a) Germplasm collection (b) Protoplasm collection
 (c) Herbarium (d) Somaclonal collection
21. The biggest constraint of plant breeding is
 (a) Availability of desirable gene in the crop and its wild relatives
 (b) Infrastructure
 (c) Trained manpower
 (d) Transfer of genes from unrelated sources
22. Which one of the following products of apiculture is used in cosmetics and polishes?
 (a) Honey (b) Oil (c) Wax (d) Royal jelly
23. Fungicides and antibiotics are chemicals that
 (a) Enhance yield and disease resistance (b) Kill pathogenic fungi and bacteria, respectively
 (c) Kill all pathogenic microbes (d) Kill pathogenic bacteria and fungi respectively
24. Micropropagation is
 (a) Propagation of microbes in vitro (b) Propagation of plants in vitro
 (c) Propagation of cells in vitro (d) Growing plants on smaller scale
25. Among the following the number of fresh water fishes is
 Catla, Rohu, Common Carp, Hilsa, Sardines, Mackerel, Pomfrets
 (a) 2 (b) 3 (c) 4 (d) 5
26. Semi-dwarf rice varieties were derived from
 (a) IR-8 (b) IR-18 (c) IR-28 (d) IR-38
27. Protoplast is
 (a) Another name for protoplasm (b) An animal cell
 (c) A plant cell without a cell wall (d) A plant cell
28. There are several species of honey bees which can be reared. Of these the species reared in India is
 (a) *Apis indica* (b) *Apis dorsata*
 (c) *Apis mellifera* (d) None of these
29. *Saccharum barberi* was originally grown in
 (a) South India (b) West India (c) Central India (d) North India
30. *Saccharum officinarum* was originally a crop of
 (a) South India (b) West India (c) Central India (d) North India
31. The varieties which belong to okra are
 (a) Pusa Gaurav, Pusa A-4 (b) Pusa Sawani, Pusa A-4
 (c) Pusa Sem 2, Pusa Sawani (d) Pusa A-4, Pusa Sem 2
32. The best explant to raise virus free plant is
 (a) Embryo (b) Sees (c) Meristem (d) Root
33. International Rice Research Institute is located in
 (a) India (b) Philippines (c) Indonesia (d) China
34. Which one of the following is a marine fish?
 (a) Rohu (b) Hilsa (c) Catla (d) Common Carp

35. **Hisardale** is a new breed of

- (a) Sheep developed by crossing Bikaneri ewes and Marino rams
- (b) Sheep developed by crossing Bikaneri rams and Marino ewes
- (c) Goat developed by crossing Bikaneri ewes and Marino rams
- (d) Goat developed by crossing Bikaneri rams and Marino ewes

36. Match the following.

List I	List II
A. Protoplast fusion	I. Totipotency
B. Plant tissue culture	II. Pomato
C. Meristem culture	III. Soma clones
D. Micropropagation	IV. Virus free plants

Select the correct option.

- (a) A-II, B-I, C-IV, D-III
- (b) A-III, B-I, C-IV, D-II
- (c) A-IV, B-I, C-I, D-III
- (d) A-III, B-II, C-IV, D-I

37. Which of the following is a variety of Chilli?

- (a) Pusa Sadabahar
- (b) Pusa swarnim
- (c) Pusa Shubhra
- (d) Pusa Komal

38. The bird flu occurs due to

- (a) Bacteria
- (b) Virus
- (c) Fungi
- (d) Pathogenic algae

39. Inbreeding depression is

- (a) Reduced motility and immunity due to close inbreeding
- (b) Decreased productivity due to mating of superior male and inferior female
- (c) Decrease in body mass of progeny due to continued close inbreeding
- (d) Reduced fertility and productivity due to continued close inbreeding

40. Hybridisation refers to the crossing between

- (a) Genetically dissimilar plants
- (b) Genetically similar plants
- (c) Phenotypically dissimilar plants
- (d) Phenotypically similar plants

41. In hybridisation, the crossing of species may be between

- (a) Intervarietal
- (b) Interspecific
- (c) Intergeneric
- (d) All of these

42. Pusa Snowball K-1 is a variety of

- (a) Chilli
- (b) Cauliflower
- (c) Capsicum
- (d) Cowpea

43. Which of the following factors are included for improvement in the variety of crops?

- (a) High yield
- (b) Improved quality
- (c) Biotic and abiotic resistance
- (d) All of these

44. Which of the following is not an objective of Bio-fortification in crops?

- (a) Improve vitamin content
- (b) Improve micronutrient and mineral content
- (c) Improve protein content
- (d) Improved resistance to diseases

45. Polythene glycol method is used for

- (a) Gene transfer without a vector
- (b) Biodiesel production
- (c) Seedless food production
- (d) Energy production from sewage

46. Mutation in plant cells can be induced by

- (a) Gamma rays
- (b) Zeatin
- (c) Kinetin
- (d) Infra-red rays

47. While planning for an artificial hybridisation programme involving dioecious plants, which of the following steps would not be relevant?
- (a) Bagging of female flower (b) Dusting of pollen on stigma
(c) Emasculation (d) Collection of pollen
48. Which of the following is not a step in Multiple Ovulation Embryo Transfer Technology (MOET)?
- (a) Cow is fertilised by artificial insemination.
(b) Fertilised eggs are transferred to surrogate mothers at 8-32 cell stage.
(c) Cow is administered for hormone having LH like activity for super ovulation.
(d) Cow yields about 6-8 eggs at a time.
49. Pusa Komal is variety of
- (a) Chili (b) Cauliflower (c) Capsicum (d) Cowpea
50. Pusa Shubhra is variety of
- (a) Chilli (b) Cauliflower (c) Capsicum (d) Cowpea
51. Which of the following is linked to the discovery of Bordeaux mixture as a popular fungicide?
- (a) Bacterial leaf blight of rice (b) Downy mildew of grapes
(c) Loose smut of wheat (d) Black rust of wheat
52. Select the incorrect statement.
- (a) Inbreeding helps in elimination of deleterious alleles from the population.
(b) Inbreeding is necessary to evolve a pure line in any animal.
(c) Continued inbreeding reduced fertility and leads to inbreeding depression.
(d) Inbreeding cannot be overcome by outcrossing.
53. Mixed cropping is
- (a) Growing two or more crops at the same time on the same field in a definite pattern
(b) Growing two or more crops at the same time on the same piece of land
(c) Both (a) and (b)
(d) None of the above
54. Intercropping is
- (a) Growing two or more crops at the same time on the same field in a definite pattern
(b) Growing two or more crops at the same time on the same piece of land
(c) Both (a) and (b)
(d) None of the above
55. What is the genetic importance of outcrossing?
- (a) Outcrossing is a characteristic of pollinators
(b) Outcrossing increases genetic diversity in a population
(c) Outcrossing increases the chances of sterility
(d) Outcrossing promotes inbreeding in a population
56. Select the incorrect statement.
- (a) Inbreeding helps in the accumulation of superior genes and the elimination of undesirable genes.
(b) Inbreeding is essentially homozygosity.
(c) Inbreeding is essential to evolve purelines in any animal.
(d) Inbreeding selects harmful recessive genes that reduce fertility and productivity.
57. Which of the following is being utilised as a source of a biodiesel in the Indian countryside?
- (a) *Euphorbia* (b) Beetroot (c) Sugarcane (d) Pongamia

58. Select the correct sequence in plant breeding programme.
- Collection of variability
 - Selection and testing of superior recombinants
 - Evaluation and selection of parents
 - Cross hybridisation among the selected parents
 - Testing, release and commercialisation of new cultivars
- Select the correct option:
- (a) A B C D E (b) A D C B E (c) A C D B E (d) A D C E B
59. Which of the following is correctly matched?
- Central Rice Research Institute-Shimla
 - National Botanical Research Institute-Delhi
 - Central Drug Research Institute-Cuttack
 - Central Food Technology Research Institute-Mysore
60. Which of the following crops are produced through somaclones?
- Tomato, banana
 - Banana, apple
 - Pear, mango
 - Custard apple, apple
61. In maize, hybrid vigour is exploited by
- Bombarding the protoplast with DNA
 - Crossing of two inbred parental lines
 - Harvesting seeds from the most productive plants
 - Inducing mutations
62. Haploids are more suitable for mutation studies than the diploids. This is because
- Haploids are reproductively more stable than the diploids
 - Mutagens penetrate in haploids more effectively than in diploids
 - Haploids are more abundant in nature than diploids
 - All mutations, whether dominant or recessive are expressed in haploids
63. Jaya and Ratna developed for green revolution in India are the varieties of
- Rice
 - Wheat
 - Bajra
 - Maize
64. The crops engineered for glyphosate are resistant/tolerant to
- Fungi
 - Bacteria
 - Insects
 - Herbicides
65. One of these protozoans is threat to apiculture and sericulture
- Eimeria*
 - Ceratium*
 - Nosema*
 - Monocystis*
66. In mung bean, resistance to yellow mosaic virus is developed by
- Mutation breeding
 - Hybridisation
 - Selection
 - Polyploid breeding
67. The practice of mating of animals within the same breed, but having no common ancestors on either side of their pedigree up to 4-6 generations, is called
- Inbreeding
 - Out-crossing
 - Cross-breeding
 - Inter-specific hybridisation
68. Himgiri is a variety of
- Rice
 - Wheat
 - Tea
 - Chilli
69. Which of the following is the fodder crop?
- Berseem
 - Sudan grass
 - Both (a) and (b)
 - None of these
70. Which of the following can be used for obtaining single cell protein?
- Spirogyra*
 - Scytonema*
 - Sargassum*
 - Spirulina*
71. Crop yields can be increased by
- Crop variety improvement
 - Crop production improvement
 - Crop protection management
 - All of these

INPUT-TEXT BASED QUESTIONS

Read the following paragraphs and answer the following questions.

I. The traditional breeding techniques failed to keep pace with demand and to provide sufficiently fast and efficient systems for crop improvement, another was developed. It was learnt by scientists, during 1950s, that whole plants could be regenerated. This was a unique capacity of plants. The nutrient medium must provide some nutrient source, inorganic salts, vitamins, amino acids and growth regulators. By application of these methods it is possible to achieve propagation of a large number of plants in very short durations. This method of producing thousands of plants through tissue culture is called micropropagation.

Each of these plants will be identical to the original plant from which they were grown, i.e., Many important food plants have been produced on commercial scale using this method.

- Which unique capacity of plants has been referred in the given para?
(a) Producing oxygen (b) Being green in colour
(c) Generation of whole plant from any cell (d) All of these
 - The capacity for regeneration of whole plant from any cell is known as
(a) Totipotency (b) Somaclonal variation (c) Micropropagation (d) None of these
 - The plant part which helps in regeneration of whole plant is called
(a) Seed (b) Rot (c) Embryo (d) Explant
 - Which of the following is produced by micropropagation?
(a) Tomato (b) Banana (c) Apple (d) All of these
 - The plants identical to original plant is known as
(a) Totipotent (b) Somaclones (c) Somatic hybrids (d) Both (b) and (c)
- II. The Indian Agricultural Research Institute has released several vegetable crops that are rich in vitamins and minerals, such as carrots, spinach, pumpkin; bittergourd, bathua, mustard, tomato; iron and calcium enriched spinach and bathua; and some protein enriched beans.
- Indian Agricultural Research Institute is located in
(a) Pune (b) Mumbai (c) Lucknow (d) New Delhi
 - The protein enriched beans are
(a) Broad lablab (b) French peas (c) Garden peas (d) All of these
 - In the given paragraph, carrot and spinach are rich in
(a) Vitamin A (b) Vitamin D (c) Vitamin C (d) Vitamin E
 - The crops, bittergourd, bathua, mustard, and tomato are enriched for
(a) Vitamin A (b) Vitamin D (c) Vitamin C (d) Vitamin E
 - The enrichment of crops with minerals and vitamins is known as
(a) Biofortification (b) Biomagnification (c) Bioaccumulation (d) Bioproduction

ANSWERS

- | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (c) | 2. (c) | 3. (c) | 4. (c) | 5. (c) | 6. (c) | 7. (a) | 8. (d) | 9. (d) | 10. (b) |
| 11. (a) | 12. (d) | 13. (c) | 14. (a) | 15. (a) | 16. (a) | 17. (c) | 18. (d) | 19. (b) | 20. (a) |
| 21. (a) | 22. (c) | 23. (b) | 24. (b) | 25. (b) | 26. (a) | 27. (c) | 28. (a) | 29. (d) | 30. (a) |
| 31. (b) | 32. (c) | 33. (b) | 34. (b) | 35. (a) | 36. (a) | 37. (a) | 38. (b) | 39. (d) | 40. (a) |
| 41. (d) | 42. (b) | 43. (d) | 44. (d) | 45. (a) | 46. (a) | 47. (c) | 48. (c) | 49. (d) | 50. (b) |
| 51. (b) | 52. (d) | 53. (b) | 54. (a) | 55. (b) | 56. (d) | 57. (d) | 58. (c) | 59. (d) | 60. (a) |
| 61. (b) | 62. (d) | 63. (a) | 64. (d) | 65. (c) | 66. (a) | 67. (b) | 68. (a) | 69. (c) | 70. (d) |
| 71. (d) | | | | | | | | | |

EXPLANATION

1. In virus-infected plants the meristematic tissues in both apical and axillary buds are free of virus because the cell division of meristems are faster than the rate of viral multiplication.
4. Several South Indian states raise 2-3 crops of rice annually. The agronomic feature that makes this possible is because of early yielding rice variety.
6. Black rot of crucifers is a bacterial disease.
9. Inbreeding is carried out in animal husbandry because it increases homozygosity.
10. Sonalika and Kalyan Sona are varieties of wheat.
11. With advancements in genetics, molecular biology and tissue culture, plant breeding is now increasingly being carried out by using molecular genetic tools.
13. Use of some chemicals and radiation to change the base sequences of genes of crop plants is termed as mutation breeding. Mutation is induced artificially through use of chemicals or radiations like gamma radiations. In mung bean, resistance to yellow mosaic virus and powdery mildew were induced by mutations.
16. Thick stem, long internodes, high sugar content and disease resistant, combination would a sugarcane farmer look for in the sugarcane crop.
17. An explant is a part of the plant used in tissue culture.
20. A collection of all the alleles of all the genes of a crop plant is called germplasm collection.
21. The biggest constraint of plant breeding is availability of desirable gene in the crop and its wild relatives.
22. Wax is a product of apiculture used in cosmetics and polishes.
23. Fungicides and antibiotics are chemicals that kill pathogenic fungi and bacteria, respectively.
27. Protoplast is a plant cell without a cell wall.
34. Freshwater edible fishes: *Rohu, Catla and Common carp*.
Marine edible fishes: *Sardines, Hilsa, Mackerel and Pomfrets*.
37. Pusa Sadabahar variety of chilli is resistant to many diseases such as Chilli mosaic virus, Tobacco mosaic virus, and Leaf curl.
40. Hybridisation refers to the crossing between genetically dissimilar plants.
41. In hybridisation, the crossing of species may be intervarietal, interspecific, and intergeneric.
53. Mixed cropping is growing two or more crops at the same time on the same piece of land.
54. Intercropping is growing two or more crops at the same time on the same field in a definite pattern.
58. Steps of plant breeding programme:
 - A. Collection of variability
 - C. Evaluation and selection of parents
 - D. Cross hybridisation among the selected parents
 - B. Selection and testing of superior recombinants
 - E. Testing, release and commercialization of new cultivars
69. Berseem and sudan grass both are used as fodder crops.
71. The crop yields can be increased by improving crop variety, and crop production. Crop protection management also helps in increasing yield of the various crops.

Input-Text Based Answers

I.	1. (c)	2. (a)	3. (d)	4. (d)	5. (b)
II.	1. (d)	2. (d)	3. (a)	4. (c)	5. (a)