

Strategies for Enhancement in Food Production

Topic 1: Animal Husbandry

Previous Years' Examination Questions

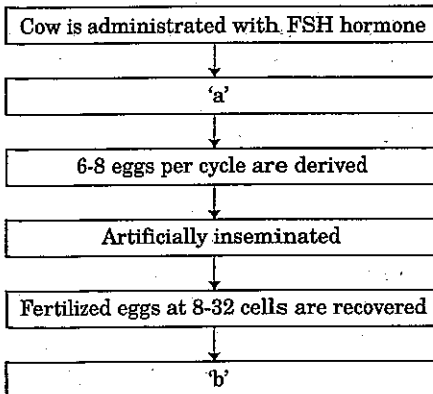
1 Mark Questions

- Write the name of the following
 - The most common species of bees suitable for apiculture.
 - An improved breed of chicken.

[All India 2012]
- Which one of the following is used in apiculture?
Hilsa, Apis indica, Sonalika
[Foreign 2009]
- List any two economically important products for human obtained from *Apis indica*.
[Delhi 2008]

2 Marks Questions

- Study the flow chart given below



- Identify the events that take place at stages 'a' and 'b' respectively.
 - State the importance of the technology explained above.
[Foreign 2011]
- Honey collection improves when beehives are kept in crop-fields during flowering season. Explain.
[Delhi 2010]
 - MOET programme has helped in increasing the herd size of the desired variety of cattle. List the steps involved in conducting the programme.
[All India 2009]
 - List any four important components of poultry farm management.
[Delhi 2009]
 - Give the scientific name of most common species of honey bee reared in India. Why is it advantageous to keep beehives in crop-fields during flowering periods.
[Delhi 2009C]

3 Marks Questions

- What is the programme called that is involved in improving success rate of production of desired hybrid and herd size of cattle?
 - Explain the method used for carrying this programme for cows.

[All India 2012]

10. What is inbreeding depression and how is it caused in organism? Write any two advantages of inbreeding. [Delhi 2011]
11. Describe the technology that has successfully increased the herd size of cattle in a short time to meet the increasing demands of growing human population. [All India 2011]
12. (a) Inbreeding is advantageous as well as disadvantageous. Explain.
(b) Differentiate between inbreeding and outbreeding. [Delhi 2010C]
13. MOET is a good technology to increase the herd size of high yielding cattle. How is it done? Explain the procedure. [All India 2010C]
14. Expand MOET. Explain the procedure of this technology in cattle improvement [Delhi 2008]
15. Explain the advantages of inbreeding in cattle population. What effect does inbreeding depression have on cattle population and how is it overcome? [Foreign 2008]
16. Out-crossing and cross-breeding are two breeding practices in animal husbandry. How are the two practices different from each other and what advantages are they do to the breeders? Explain. [All India 2008C]

Explanations

1. (a) *Apis indica*
(b) Leghorn
2. *Apis indica*
3. Honey, bees wax
4. (a) (i) The hormone induces follicular maturation and super ovulation, i.e., production of 6-8 eggs.
(ii) They are transferred to surrogate mother.
(b) The technology called MOET is used to increase the herd size by breeding high milk yielding breeds of females with high quality meat yielding bulls.
5. This is because pollination efficiency increases and improves crop yield. It also improves the yield of honey.
6. Steps involved in MOET programme :
(i) A cow is administered hormones with FSH-like activity to induce follicular maturation and super ovulation.
(ii) The cow produces 6-8 eggs instead of one egg produced normally.
(iii) Mating is done either with an elite bull or artificial insemination is carried out.
(iv) When the fertilized eggs attain 8-32 cells stage, they are non-surgically removed and transferred to a surrogate mother.
(v) The genetic mother can now be again super-ovulated.
7. Important components of poultry farm management :
(i) Selection of disease free, suitable breeds.
(ii) Proper and safe conditions of farm.
(iii) Proper food and water.
(iv) Hygiene and health care of birds.
8. Most common honey bee species reared in India—*Apis indica*.
Keeping beehives in crop fields during flowering period increases both crop yield and honey yield.
9. (a) Multiple Ovulation Embryo Transfer Technology (MOET).
(b) Refer to Ans 6.
10. Inbreeding between closely related individuals within the same breed for 4-6 generation, usually results in reduction of fertility and productivity. This is called **inbreeding depression**.

Strategies for Enhancement in Food Production

Advantages of inbreeding :

- Increases and evolves a pureline.
- Recessive genes are exposed by inbreeding which are then eliminated by selection.

11. Multiple Ovulation Embryo Transfer Technology (MOET) is a programme that has successfully increased the herd size of cattle in a short time.

For technology refer to Ans. 6.

12. (a) Advantages of Inbreeding :

- It increases and evolves a pureline.
- Recessive genes are exposed by inbreeding which are then eliminated by selection.
- Superior genes can be accumulated by inbreeding by eliminating undesirable genes.
- By selection at every step, productivity of inbred population is increased.
- Disadvantages of inbreeding.
- Close inbreeding leads to the reduction of fertility and productivity. This is due to inbreeding depression.

(b) Differences between inbreeding and outbreeding.

Inbreeding	Out-breeding
It refers to the mating between closely related individuals with in the same breed for 4-6 generation.	It refers to breeding of unrelated animals either of the same breeds but do not have common ancestor or of between different breeds or even different species

13. MOET is a programme for herd improvement in animals like cattle, sheep, rabbits, buffaloes mares, etc. High milk-yielding breeds of female have been breed with high quality meat yielding bulls to increase herd size in lesser time.

Refer to Ans. 6.

14. MOET–Multiple Ovulation Embryo Transfer Technology.

For procedure refer to Ans 6.

15. Advantages of inbreeding in cattle population :

- It increases the homozygosity.
- It is required to develop a pureline in any animal.
- It helps in the accumulation of superior genes and elimination of less desirable genes.
- It exposes harmful recessive genes and their elimination of selection.
 - Effect of inbreeding depression :
 - It reduces the fertility and over productivity of animals.
 - Inbreeding depression can be overcome by mating of selected animals with unrelated superior animals of same breed. It helps to restore the fertility and yield in the cattle.

16. Differences between out-crossing and cross-breeding.

Out-crossing	Cross-breeding
This refers to the mating of animals within the same breed, but having no common ancestors on either side of their pedigree up to 4-6 generation.	In this method superior males of one breed are mated with superior females of another breed.

Advantages of Out-crossing

- It is the best method for animals that are below average in productivity in milk production, growth rate, etc. It helps to overcome inbreeding depression.

Advantages of Cross-breeding

- It allows the desirable qualities of two different breeds to be combined.
- Progeny may be used for commercial production.
- Many new breeds have been developed by this approach.

Previous Years'
inuation Questions

1 Mark Questions

1. Name the following :
 - (i) The semi-dwarf variety of wheat is high-yielding and disease resistant.
 - (ii) Any one inter specific hybrid mammal.

[Delhi 2012]
2. Write the names of the semi-dwarf and high yielding rice varieties developed in India after 1966.

[Delhi 2012]
3. State the importance of biofortification.

[All India 2011]
4. Name the organism commercially used for the production of single cell protein.

[Delhi 2009]
5. How are the two following varieties of sugarcane different from each other?
 - (i) *Saccharum barberi*
 - (ii) *Saccharum officinarum*

[Delhi 2009]
6. Which of the following is the semi-dwarf wheat that is high yielding and disease resistant?
Pusa Shubra, Kalyan Sona, Ratna

[Foreign 2009]
7. Which of the following produces single cell proteins?
Sonalika, Spirulina, Saccharomyces.

[Foreign 2009]
8. What is the economic value of *Spirulina*?

[All India 2008]

2 Marks Questions

9. Explain the advantage of cross-breeding of two species of sugarcane in India.

[Delhi 2011]
10. Enumerate, in sequential order, the 4 steps that a plant breeder should follow to obtain a disease-resistant crop.

[Delhi 2009C]

11. List any four objective that you would recommend for biofortification.

[Delhi 2008C]

3 Marks Questions

12. How can crop varieties be made disease resistant to overcome food crisis in India? Name one disease resistant variety in India of :
 - (a) Wheat to leaf and stripe rust.
 - (b) *Brassica* to white rust

[Delhi 2011]
13. Mention the property of plant cells that has helped them to grow into a new plant in 'in vitro' conditions. Explain the advantages of micropropagation.

[Delhi 2011]
14. Scientists have succeeded in recovering healthy sugarcane plants from a diseased one.
 - (i) Name the part of the plant used as explant by scientists.
 - (ii) Describe the procedure the scientists followed to recover the healthy parts.
 - (iii) Name the technology used for crop improvement.

[All India 2011]
15. IARI has released several varieties of crop plants that are biofortified, like three examples of such crops and their biofortifications.

[Foreign 2011]
16.
 - (i) Mention the property that enables the explants to regenerate into a new plant.
 - (ii) A banana herb is virus-infected. Describe the method that will help in obtaining healthy banana plants from this diseased plant.

[All India 2010]
17. How are somaclones cultured from explants in *in vitro* conditions? Why are somaclones so called?

[Foreign 2010]

18. Why are plants obtained through micro propagation termed somaclones? Name three food plants produced on commercial scale using this method. [All India 2009C]
19. Define totipotency of a cell. List the requirements if the objective is to produce somaclones of a tomato plant on commercial scale. [Foreign 2008]
20. (i) What is micropropagation? Why are the plants produced by micropropagation called somaclones?
(ii) Name the technique by which healthy plants can be recovered from the diseased plants. [Foreign 2008]

Explanations

- (i) Sonalika and Kalyan Sona are the semi-dwarf varieties of wheat that are high-yielding and disease resistant.
(ii) Mule is an interspecific hybrid mammal.
- Jaya and Ratna are two semi-dwarf and high yielding rice varieties developed in India after 1966.
- Biofortification improves the nutritional quality of food materials and is the most practical means to improve public health.
- Spirulina*.
- (i) *Saccharum barberi* grows in North India. It has poor sugar content and yield.
(ii) *Saccharum officinarum* grows in South India. It has thicker stems, more sugar content and yield.
- Kalyan Sona.
- Spirulina*.
- Spirulina* is rich in protein, minerals, vitamins, fats and carbohydrates. It can be easily grown on materials like straw, molasses, animal manure, sewage, etc., and there by reduces pollution.
- Sugarcane grown in North India, i.e., *Saccharum barberi* has poor sugar content and poor yield. Sugarcane grown in South India, i.e., *Saccharum officinarum* has thicker stems and higher content of sugar, but cannot grow in North India climatic conditions.
The hybrid produced by cross breeding these two species has the following desirable traits :
 - High yield
 - Thick stems
 - High sugar content
 - Ability to grow in North Indian sugarcane fields.
- Steps to be followed by a plant breeder to get disease-resistant crop :
 - Screening germplasm for resistance.
 - Hybridization of selected parents.
 - Selection and evaluation of the hybrids.
 - Testing and release of new varieties.
- Objective of biofortification:
 - Protein content and quality.
 - Oil content and quality.
 - Vitamin content.
 - Micronutrient and mineral content.
- Ways to make disease resistant crop varieties :
 - By conventional breeding techniques. It includes screening the germplasm for the source of resistance, hybridization of selected individuals, selection and evaluation of hybrids and evaluation of hybrids and testing and release of the variety.
 - By mutation breeding. It involves inducing mutations artificially and selecting and using the plants that have the desirable character as a source of disease-resistance in breeding.
 - Himgiri
 - Pusa Swarnim (Karan Rai)

- 13.** Plant cell has a property called 'totipotency' by which each cell can grow into a new plant. Advantages of micropropagation :
- (i) Thousands of plants can be grown in a short period.
 - (ii) Meristem culture can provide virus-infected plants and virus-free plants can be raised.
 - (iii) Plants are genetically identical, so certain desirable characters can be continued through generations.
 - (iv) Hybrids can be produced by hybridization.
- 14.**
- (i) Shoot tip
 - (ii) The shoot tip is grown in a test tube under sterile conditions in special nutrient media. The nutrient medium should contain sugar, inorganic salts, vitamins, amino acids and growth regulators like auxins, cytokinins, etc. The tiny plantlets are later shifted to the field for further growth.
 - (iii) Micropropagation.
- 15.** Biofortified crops released by IARI :
- (i) Vitamin-A enriched carrots or spinach.
 - (ii) Iron and calcium enriched spinach.
 - (iii) Protein enriched beans.
 - (iv) Vitamin-C enriched bittergourd or mustard.
- 16.**
- (i) Totipotency of cells is the property that enables the explants to regenerate.
 - (ii) Meristem culture is the method by which healthy banana plants can be obtained from virus-infected plant. The apical and axillary meristem is free of virus. The meristem is removed from the plant and grown *in vitro* by micropropagation. The plants produced are virus-free.
- 17.** The explant is grown in a petridish/test tube under sterile conditions in a special nutrient medium.
- (i) The medium must contain carbon source like sugar, inorganic salts, vitamins, minerals, amino acids, growth regulators like auxins and cytokinins.
 - (ii) The medium should be replaced regularly to restore nutrients in it.
 - (iii) Because all plants (produced by tissue culture) are genetically identical to the original plant from where they are cultured, so they are called somaclones.
- 18.** Refer to Ans. 17.
- Food plants produced by micropropagation are tomato, banana, apple, etc.
- 19.** Totipotency of a cell can be defined as the capacity of a cell explant to grow into a whole plant.
- Requirements to produce somaclones of tomato plants :
- (i) **Explant** It is any part of a plant taken out for growing a new plant in special nutrient medium under sterile/aseptic conditions.
 - (ii) **Nutrient medium** It must have a carbon source such as sugar, inorganic salts, vitamins, amino acids, growth regulators like auxins, cytokinins, etc.
 - (iii) Suitable condition of light and temperature. This is a tissue culture method by which a number of genetically similar plants called somaclones can be grown.
- 20.**
- (i) **Micropropagation** It is a method of growing a number of plants through tissue culture. Because all plants (produced by tissue culture) are genetically identical to the original plant from where they are cultured, so they are called somaclones.
 - (ii) Meristem culture.