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SEMESTER END THEORY EXAMINATION
B. Sc. (Agri.)
MODEL ANSWER

Semester: III (Old) **Academic year**: 2020-21
Course No.: BOT-233 **Title**: Principles of Plant Breeding
Credits: 2+1=3 **Total Marks**: 80
Day and Date: **Time**:

NOTE 1. All questions from **SECTION "A"** are compulsory (24 Marks).
2. Solve any Twelve questions from **SECTION "B"** (24 Marks)
3. Solve any Eight questions from **SECTION "C"** (32 Marks)
4. Draw neat and labeled diagrams wherever necessary.

SECTION "A"

Q. 1 Multiple Choice Questions ***(All are compulsory)***

1. The process of bringing wild species under human management is known as
   a. Introduction
   b. Domestication
   c. Plant breeding
   d. Adaptation

2. Tristyly heteromorphic self incompatibility is governed (controlled) by
   a. **Two genes**
   b. Three genes
   c. Four genes
   d. None of the above

3. Which of the following male sterility is unstable?
   a. Cytoplasmic
   b. Genetic
   c. Cytoplasmic genetic
   d. Transgenic

4. The process that leads to the adaptation of a variety into new environment is known as
   a. Adaptation
   b. **Acclimatization**
   c. Introduction
   d. None of the above

5. Method of crop improvement in which a large number of plants of similar phenotype are selected and their seeds are mixed together to constitute the new variety?
   a. Pure line selection
   b. Bulk Method
   c. Single seed decent method
   d. Mass selection

6. The variety developed by pedigree method is
   a. **Homozygous and homogeneous**
   b. Homozygous and heterogeneous
   c. Heterozygous and heterogeneous
   d. Heterozygous and homogeneous

7. In bulk method of breeding which of the following selection is used after F_2 generation?
   a. Artificial selection
   b. Natural selection
   c. **Both a and b**
   d. None of the above

8. In which method of recurrent selection homozygous tester is used?
   a. Reciprocal recurrent selection
   b. Simple recurrent selection
   c. Recurrent selection for GCA
   d. Recurrent selection for SCA

9. Hybridization means
   a. Crossing between two parents
   b. Emasculation
   c. Artificial pollination
   d. None of the above

10. *Titicale* is the example of which hybridization
   a. Inter-varietal
   b. Inter-specific
   c. **Inter-generic**
   d. Intra-varietal

11. Composite variety consists of
   a. Several homozygotes
   b. Several heterozygotes
   c. **Both a and b**
   d. None of the above

12. Clonal selection method of breeding used in
   a. Self pollinated crops
   b. Often cross pollinated crops
   c. Cross pollinated crops
   d. Asexually propagated crops

13. Which of the following is not application of mutation breeding in crop improvement?
   a. Development of mutant variety
   b. Development of male sterility
   c. Development Haploids
   d. Combination of desirable characters

14. The term of heterosis is coined by
   a. Hull
   b. G. H. Shull
   c. Devenport
   d. East

15. Inbreeding depression increases
   a. Homozygosity
   b. Heterozygosity
   c. both a and b
   d. None of the above

16. Floral biology is study of
a. Flower
b. Androecium
c. Gynoecium
d. Corolla

17. Self pollination also called as
a. Allogamy
b. Autogamy
c. Heterogamy
d. None of the above

18. Emasculation means removal of
a. Gynoecium
b. Corolla
c. Calyx
d. Androecium

19. For production of double cross hybrid, how many inbred lines are involved?
a. Two
b. Three
c. Four
d. Six

20. Cross pollination increases
a. Heterozygosity
b. Homozygosity
c. Both a and b
d. None of the above

21. Dichogamy mechanism promotes
a. Cross pollination
b. Self pollination
c. Both a and b
d. All of the above

22. Monoecious condition occurs in the case of
a. Jowar
b. Maize
c. Papaya
d. All of the above

23. Triple fusion means
a. Union of male and female gamete
b. Union of one sperm and two pollar nuclei
c. Both a and b
d. None of the above

24. Which of the following requirement of inbred lines for development of synthetic variety?
a. Testing of specific combining ability
b. Testing of general combining ability
c. Both a and b
d. None of the above

SECTION 'B'

Q. 2 Answer in One Sentence (*Any twelve*)

1. Define pollination.
Ans: Transfer of pollen grains from anther to stigma.

2. Define plant breeding.
Ans: A technology of developing superior crop plants for various purposes.

3. Give the classification of crop plants according to life cycle.
Ans: Three type 1) Annual 2) Biannual 3) Perennial

4. Expand the full form of NBPGR
Ans: National Bureau of Plant Genetic Resources

5. Give the types of plant introduction
Ans: The types of plant introduction are primary and secondary introduction.

6. What is apomixis?
Ans: Development seed without sexual fusion.

7. Define male sterility.
Ans: A condition in which pollen is either absent or non-functional in flowering plant

8. What is clone?
Ans: The progeny obtained from single plant through asexual reproduction.

9. What is inbred?
Ans: It is homozygous line maintained by continuous inbreeding.

10. Define hybrid?
Ans: The progeny produced from crossing of genetically unlike plant.

11. Define diploid?
Ans: An individual carrying two sets of homologous chromosomes.

12. What is reproduction?
Ans: The process by which living organisms gives rise to the offspring.

13. Define heteroploid.
Ans: An individual carrying other than 2n chromosome number.

14. What is self incompatibility?
Ans: The failure of fusion of male and female gametes after self pollination.

SECTION 'C'

Q. 3 Write the answer in 3-4 lines (*Any eight*)

1.Give the genetic basis of pure line selection.
Ans:

i. All the plants of pureline have exactly the same genotype and are true breeding.
ii. Pure line varieties are homozygous and homogeneous population.
iii. They have narrow genetic base and poor adaptability.
iv. There is no genetic variation in a pureline.
v. Selection is ineffective.

2. Describe barriers in wide hybridization.
Ans:

a. Cross incompatibility-
In ability of the functional pollens of one species or general to effect fertilization of the female gametes of another species or genera.

b. Hybrid inviability-
Fertilization occurs and zygote formation takes place.
But the zygote does not grow into normal.

c. Hybrid stability – The inability of a hybrid to produce viable offspring.

d. Hybrid breakdown –

F_1 plants are vigorous and fertile their F_2 progeny is weak and sterile.

3. Describe in short any four mechanisms to promote self pollination.

Ans:

i. Bisexuality- The presence of bisexual flowers is must for self pollination.

ii. Homogamy- Maturation of anthers and stigma of a flower at the same.

iii. Chasmogamy- Opening of flowers only after the completion of pollination.

iv. Cleistogamy- When pollination and fertilization occur in unopened flower bud.

v. Position of anthers- stigmas are surrounded by anthers in such a way that self pollination is ensured.

4. Describe the applications of self incompatibility in plant breeding.

Ans: It is useful in two main ways

a) **Production of hybrids-**
self incompatibility has been utilized for production of commercial hybrids in Brassica and sunflower. Two self incompatible lines are planted in the alternate row for hybrid seed production.

b) **Combining desirable genes-**
self incompatibility system permits combining of desirable gene in a single genotype from two or more different self incompatible lines.

5. Give the significance of asexual reproduction.

Ans:

i. It leads to continuity of same genotype with great precision.

ii. It is useful in obtaining large number of genetically identical individuals of a genotype.

iii. Promising individuals occurring at any stage in a breeding programme can be easily picked.

iv. It makes use of desirable bud mutations mutants can be directly released as varieties.

6. Describe types of hybridization.

Ans:

a. Intra varietal hybridization:
The parents involved in inter varietal hybridization being to the same variety.

b. Inter varietal hybridization-
The parents involved in inter varietal hybridization being to the same species.

c. Distant Hybridization-
It includes cross between different species of the same genus or of different genera of same family.

i. Inter specific hybridization- when two species of the same genus are crossed.

ii. Inter generic hybridization- when two species of the different genus are crossed.

7. Enumerate any four features of autoploids.

Ans:

a. Stems are thicker and stouter.
b. Leaves are fleshy, thicker, larger and deep green in colour.
c. Roots are stronger and longer.
d. Flowers, anther, ovary, pollens and seeds are larger than diploids.
e. Maturity duration is longer and growth rate is slower than diploids.
f. Water content more and dry matter less than diploid.

8. State any four applications of backcross method.

Ans:

This method of breeding is application to the self and cross pollinated crops

i. Intervarietal transfer of simply inherited characters.

ii. Intervarietal transfer of quantitative characters.

iii. Interspecific transfer of simply inherited characters.

iv. Transfer of cytoplasm.

v. Transgressive segregation.
vi. Production of isogenic lines.
vii. Germplasm conservation.

9. Write any four characteristics of mutation.

Ans:

i. Mutations are generally recessive but dominant mutations also occur.
ii. Mutations are harmful to the organisms.
iii. Mutations are random i.e. they may occur in any gene.
iv. Mutations are recurrent.
v. Induced mutation show pleiotropy.

10. Describe methods of estimation of heterosis.

Ans:

a. Mid parent/ relative/ average heterosis-

The heterosis is estimated over mid parent i.e. mean value or average value of the two parents.

b. Better parent heterosis/ Heterobeltiosis-

The heterosis is estimated over the better parent.

c. Useful heterosis-

i. The heterosis is estimated over commercial cultivar.
ii. The heterosis is estimated over the standard commercial hybrid.

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