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BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – M.Sc.(BT)-2024

Course Name – Advances in Plant Biotechnology

Course Code - MBT20109

(Semester II)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Which bacterium is used in Agrobacterium-mediated transformation?
 - a) Escherichia coli
 - b) Bacillus subtilis
 - c) Agrobacterium tumefaciens
 - d) Pseudomonas aeruginosa
- (ii) What are binary vectors?
 - a) Vectors carrying only one gene
 - b) Vectors with two components: T-DNA and vir region
 - c) Vectors that can function in two hosts
 - d) Vectors used only in monocots
- (iii) What does Southern blot analysis detect?
 - a) RNA transcripts
 - b) Protein expression
 - c) Transgene integration and copy number
 - d) Metabolite levels
- (iv) What is a promoter trap used for?
 - a) Identifying functional promoters
 - b) Silencing genes
 - c) Gene overexpression
 - d) Protein detection
- (v) Why is particle bombardment useful for plant transformation?
 - a) It does not require bacteria
 - b) It does not require selectable markers
 - c) It is only used for monocots
 - d) It is used for transient expression only
- (vi) What are Recombinant Inbred Lines (RILs)?
 - a) Lines derived from single plants
 - b) Populations developed by repeated selfing
 - c) Lines obtained from hybrid crosses
 - d) Lines with high heterozygosity
- (vii) What does SSLP stand for?
 - a) Single Sequence Locus Polymorphism
 - b) Simple Sequence Length Polymorphism

- c) Sequence-Specific Linkage Polymorphism d) Short Sequence Linked Primer
- (viii) What is the function of a maintainer line in a three-line hybrid system?
- a) Maintains the sterility of the male-sterile line b) Restores fertility
c) Induces genetic mutations d) Increases heterozygosity
- (ix) Analyze why cytokinin is essential in shoot tip culture.
- a) Enhances callus growth b) Promotes cell elongation
c) Stimulates shoot multiplication d) Suppresses root formation
- (x) Determine how haploid culture can accelerate plant breeding programs.
- a) Produces homozygous lines in one generation b) Slows down breeding progress
c) Reduces genetic diversity d) Only useful in monocots
- (xi) Assess the impact of somatic hybridization on plant genetic diversity.
- a) Increases genetic variation b) Reduces hybrid vigor
c) Eliminates unwanted traits d) Slows down genetic improvements
- (xii) Assess the role of GM crops in improving plant architecture and productivity.
- a) Can modify plant height and branching b) Has no effect on crop growth
c) Only affects root systems d) Reduces photosynthesis
- (xiii) Evaluate the role of RNA interference (RNAi) in developing pest-resistant GM crops.
- a) Silences specific pest genes b) Enhances plant height
c) Reduces fruit quality d) Suppresses photosynthesis
- (xiv) Identify the type of Bt toxin that is effective against lepidopteran pests.
- a) Cry1 b) Cry2
c) Cry3 d) Cry4
- (xv) Illustrate how synthetic biology can enhance plant traits.
- a) Design novel metabolic pathways b) Suppress enzyme activity
c) Lower gene expression d) Increase stress susceptibility

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Compare plastid transformation with nuclear transformation in plants. (3)
3. Apply a method to identify the integration site of a transgene. (3)
4. Describe the metabolic engineering that is used to improve stress tolerance in plants. (3)
5. Evaluate the effectiveness of colchicine-induced diploidization in haploid plants. (3)
6. Analyze the key differences between organogenesis and somatic embryogenesis. (3)

OR

Analyze why synthetic seeds are an important application of in vitro propagation. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Explain the process and advantages of plastid transformation. (5)
8. Explain how transgene copy number is determined in transgenic plants. (5)
9. Analyze the role of genetic modification in enhancing nutritional content in crops. (5)
10. Analyze the process of somatic hybridization and its advantages over conventional hybridization techniques. (5)
11. Analyze the techniques and significance of diploidization in haploid plants. (5)
12. Create a strategic model for sustainable transgenic crop adoption in developing countries. (5)

OR

Design a regulatory framework for ensuring the safe commercialization of GM crops.

(5)

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(Semester V)