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| C:\Users\staff\Desktop\LOGO.jpg | GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022 |
| B. Tech Degree Examinations, April / May – 2021  (Sixth Semester)  Sub. Code – Sub. Name  (Branch Name) |
| Time: 3 hrs Maximum: 100 Marks | |

**Answer ALL Questions**

**The figures in the right hand margin indicate marks.**

**PART – A: (Multiple Choice Questions) (2 x 10 =20 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Q.1. Answer ***ALL*** questions | | | [CO#] | [PO#] |
| a. | **Totipotency refers to \_\_\_\_\_\_\_\_\_\_\_.** | |  |  |
|  | (i) Development of fruits from flowers in a culture | (ii) **Development of an organ from a cell in a culture medium** |  | PO |
|  | (iii) Flowering in a culture medium | (iv)  All of the above |  |  |
| b. | **Haploid plants can be obtained from\_\_\_\_\_\_\_\_** | |  | PO |
|  | (i) **Anther culture** | (ii) Bud culture |  |  |
|  | (iii) Leaf culture | (iv) Root culture |  |  |
| c. | **In-plant tissue culture, the callus tissues are generated into a complete plantlet by altering the concentration\_\_\_\_\_\_\_\_.** | | CO |  |
|  | (i) Sugars | (ii) Amino acids |  |  |
|  | (iii) **Hormones** | (iv) Vitamins and minerals |  |  |
| d. | **Synthetic seeds are produced by the encapsulation of somatic embryos with\_\_\_\_\_\_\_\_\_\_\_.** | |  | PO |
|  | (i) Sodium acetate | (ii) Sodium nitrate |  |  |
|  | (iii) Sodium chloride | (iv**) Sodium alginate** |  |  |
| e. | **In which of the following conditions do the somaclonal variations appear?** | | CO |  |
|  | (i) **Plants raised in tissue culture** | (ii) Plants exposed to gamma rays |  |  |
|  | (iii) Plants growing in polluted soil or water | (iv) Plants transferred by a recombinant DNA technology. |  |  |
| f. | Golden rice is | |  | PO |
|  | (i) Hybrid rice developed by traditional plant breeding | (ii) A rice variety obtained by plant tissue culture |  |  |
|  | (iii) **A rice variety obtained by recombinant DNA technology** | (iv) None of the above |  |  |
| g. | The modification of exogenous compounds by plant cells is called | | CO |  |
|  | (i) Biotransformation | (ii) Bioconversion |  |  |
|  | (iii) B**oth i and ii** | (iv) Biophytomodification |  |  |
| h. | Bt cotton is a | |  | PO |
|  | (i) A cotton variety obtained by crossing two different cotton plants | (ii) A cotton variety brought from South America |  |  |
|  | (iii) An insecticide sprayed on cotton plant | (iv) A **transgenic cotton variety** |  |  |
| i. | **Secondary metabolites are used by plant cells for\_\_\_\_\_\_\_\_\_\_** | |  | PO |
|  | (i) Production of nucleic acids | (ii) **For making plasma membrane** |  |  |
|  | (iii) Morphological differentiation | (iv) All the above |  |  |
| j. | **Production of secondary metabolites by plant tissue culture technique is preferred because** | | CO |  |
|  | (i) Production yield is very high | (ii) Aseptic conditions can be easily maintained |  |  |
|  | (iii) No skilled person is required | (iv**) Product recovery is easy** |  |  |

**PART – B: (Short Answer Questions) (2 x 10=20 Marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| Q.2. Answer ***ALL*** questions | | [CO#] | [PO#] |
| a. | Define totipotency |  | PO |
| b. | What is Single cell culture? |  | PO |
| c. | How do you sterilize explants? | CO |  |
| d. | What are the factors affecting somatic embryogenesis? | CO |  |
| e. | How synthetic seeds are produced? | CO |  |
| f. | Define electroporation |  | PO |
| g. | What is the Flavr Savr tomato? | CO |  |
| h. | How do weeds become resistant to herbicides? | CO |  |
| i. | What are the functions of primary and secondary metabolites in plants? | CO |  |
| j. | What are the examples of primary metabolites? |  | PO |

**PART – C: (Long Answer Questions) (15 x 4= 60 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Answer ***ALL*** questions | | Marks | [CO#] | [PO#] |
| 3. a. | Explain microspore culture for haploid plant production |  | CO |  |
| b. | What is embryo culture and their application? |  |  | PO |
|  | (OR) |  |  |  |
| c. | Write the composition of MS medium? Why sucrose is used in MS media? |  | CO |  |
| d. | What are different phases in suspension culture? |  |  | PO |
|  |  |  |  |  |
| 4. a. | Why is somatic embryogenesis important? |  |  | PO |
| b. | What are synthetic seeds? When explants produce callus and forms embryo is called? |  | CO |  |
|  | (OR) |  |  |  |
| c. | What are the possible outcome of protoplast fusion? |  | CO |  |
| d. | What is organogenesis in plant tissue culture? What hormones are important Organogenesis? |  | CO |  |
|  |  |  |  |  |
| 5. a. | What are the benefits of genetic transformation? |  |  | PO |
| b. | Why is herbicide resistance so important to farmers? |  | CO |  |
|  | (OR) |  |  |  |
| c. | Why is pesticide resistance a problem? |  |  | PO |
| d. | How Bt cotton is different from normal cotton? Why did BT cotton fail in India? |  | CO |  |
|  |  |  |  |  |
| 6. a. | Write the importance of alkaloids? |  |  | PO |
| b. | What are the phases of biotransformation? |  |  | PO |
|  | (OR) |  |  |  |
| c. | How is secondary metabolite production related to microbial growth? |  | CO |  |
| d. | What is the function of secondary metabolites? |  |  | PO |

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**Answer ALL Questions**

**The figures in the right hand margin indicate marks.**

**PART – A: (Multiple Choice Questions) (2 x 10 =20 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Q.1. Answer ***ALL*** questions | | | [CO#] | [PO#] |
| a. | **Totipotency refers to \_\_\_\_\_\_\_\_\_\_\_.** | |  |  |
|  |  | (ii) **Development of an organ from a cell in a culture medium** |  |  |
| b. | **Haploid plants can be obtained from\_\_\_\_\_\_\_\_** | |  |  |
|  | (i) **Anther culture** |  |  |  |
| c. | **In-plant tissue culture, the callus tissues are generated into a complete plantlet by altering the concentration\_\_\_\_\_\_\_\_.** | |  |  |
|  | (iii) **Hormones** |  |  |  |
| d. | **Synthetic seeds are produced by the encapsulation of somatic embryos with\_\_\_\_\_\_\_\_\_\_\_.** | |  |  |
|  |  | (iv**) Sodium alginate** |  |  |
| e. | **In which of the following conditions do the somaclonal variations appear?** | |  |  |
|  | (i) **Plants raised in tissue culture** |  |  |  |
| f. | Golden rice is | |  |  |
|  | (iii) **A rice variety obtained by recombinant DNA technology** |  |  |  |
| g. | The modification of exogenous compounds by plant cells is called | |  |  |
|  | (iii) B**oth i and ii** |  |  |  |
| h. | Bt cotton is a | |  |  |
|  |  | (iv) A **transgenic cotton variety** |  |  |
| i. | **Secondary metabolites are used by plant cells for\_\_\_\_\_\_\_\_\_\_** | |  |  |
|  |  | (ii) **For making plasma membrane** |  |  |
| j. | **Production of secondary metabolites by plant tissue culture technique is preferred because** | |  |  |
|  |  | (iv**) Product recovery is easy** |  |  |

**PART – B: (Short Answer Questions) (2 x 10=20 Marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| Q.2. Answer ***ALL*** questions | | [CO#] | [PO#] |
| a. | 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. |  |  |
| b. | The basic principle of **single cell culture** is the isolation of large number of intact living cells and cultures them on a suitable nutrient medium for their requisite growth and development. **Single** cells can be isolated from a variety of tissue and organ of green plant as well as from callus tissue and **cell** suspension |  |  |
| c. | Soak the capsule in a 100% bleach solution for 30 minutes. Dip the capsule into 95% alcohol, and flame. Under aseptic conditions, open the capsule and scrape out the seed. Carefully layer the seed over the surface of the culture medium |  |  |
| d. | * Explant. The choice of explant depends on the species of plant to be induced for embryogenesis. ... * Genotype. The genotypic variation between the plants also affects the process of embryogenesis. ... * Growth Regulators. ... * Nitrogen Source. ... * Polyamines. |  |  |
| e. | Hydrated synthetic seeds are produced by encapsulating the somatic embryos in hydrogels like sodium alginate, potassium alginate, carrageenan, sodium pectate or sodium alginate with gelatine. |  |  |
| f. | Electroporation is a microbiology technique in which an electrical field is applied to cells in order to increase the permeability of the cell membrane, allowing chemicals, drugs, or DNA to be introduced into the cel |  |  |
| g. | The FLAVR SAVR™ tomato was developed through the use of antisense RNA to regulate the expression of the enzyme polygalacturonase (PG) in ripening tomato fruit. |  |  |
| h. | Herbicide resistance refers to the inherited ability of a weed or crop biotype to survive an herbicide application that the original population was susceptible to. Currently, the three known resistance mechanisms plants employ are: An alteration of the herbicide site of action |  |  |
| i. | Primary metabolites are compounds that are directly involved in the growth and development of a plant whereas secondary metabolites are compounds produced in other metabolic pathways that, although important, are not essential to the functioning of the plant. |  |  |
| j. | Examples of primary metabolites include: ethanol, lactic acid, and certain amino acids. In higher plants such compounds are often concentrated in seeds and vegetative storage organs and are needed for physiological development because of their role in basic cell metabolism |  |  |

**PART – C: (Long Answer Questions) (15 x 4= 60 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Answer ***ALL*** questions | | Marks | [CO#] | [PO#] |
| 3. a. | The process of production of haploid plants from anther or isolated pollen culture is known as androgenesis. Here, the male is the sole source of the genetic material in the embryo. ... The embryo developed through direct androgenesis mimics zygotic embryos, however, the suspensor and endosperm are absent |  |  |  |
| b. | Plant embryo culture has now been used to speed up breeding programme and to overcome the cross ability barrier in plants. In breeding work with crop plant and horticultural plant, embryo culture method is very useful for the production of hybrid plants with desirable characters. |  |  |  |
|  | (OR) |  |  |  |
| c. | It is categorized into two groups: Macronutrients (Calcium, magnesium, nitrogen) and micronutrients (copper, iron, and zinc). Organic nutrient: It mainly includes vitamins and amino acids, required for the growth and differentiation of the cultures. MS media supplemented with 3% sucrose showed better rooting of buds and appeared morphologically normal roots as compared to those grown at higher and lower concentrations (Figure 1 and Table 1). Sugar has provided the tissue culture plant with carbon in organic form that is not required for those grown from seeds. |  |  |  |
| d. | In this type of culture, single cells or cell aggregates multiply or divide when agitated in a liquid medium. The suspension cultures of single cells help in the understanding of the growth and developmental processes of a plant |  |  |  |
|  |  |  |  |  |
| 4. a. | Somatic embryogenesis has served as a model to understand the physiological and biochemical events that occur during plant developmental processes as well as a component to biotechnological advancement |  |  |  |
| b. | These encapsulated micro propagules have been termed as synthetic seeds or artificial seeds. ... Unipolar or bipolar propagules can be used explants for somatic embryo that can be encapsulated in a suitable hydrogel matrix. Indirect embryogenesis occurs when explants produced undifferentiated, or partially differentiated, cells (often referred to as callus) which then is maintained or differentiated into plant tissues such as leaf, stem, or roots. |  |  |  |
|  | (OR) |  |  |  |
| c. | By protoplast fusion it is possible to transfer some useful genes such as diesese resistance,nitrogen fixation ,rapid growth rate ,more product formation rate,protein quality,frost hardiness,drought resistance,herbicide resistance ,heat and cold resistance from one species to anothe |  |  |  |
| d. | Several tissues are organized together to form an organ, such as leaves, roots, flowers and the vascular system. The process of initiation and development of an organ is called organogenesis. In plant tissue culture, inducing organogenesis is an important way to regenerate plants from the culture. There are five main types of plant hormones which are the auxin, cytokinin, gibberellins, abscisic acid and ethylene. Auxin is the hormone that causes the plants to carry out cell division and elongation (Chawla, 2009). |  |  |  |
|  |  |  |  |  |
| 5. a. | Genetic transformation provides direct access to a vast pool of useful genes not previously accessible to plant breeders. The first transgenic plants with Bacillus thuringiensis (Bt) genes were produced in 1987, while most of the insect-resistant transgenic plants have been developed by using Bt endotoxin gene. Genetic transformation involves the transfer and incorporation of foreign DNA into a host genome. In order for this transferred DNA to be transmitted to later generations, transformation of germline or other appropriate cells of the recipient species is essential. |  |  |  |
| b. | This is to prevent their crops from being killed together with the weeds. Weeds that emerge during the growing season are controlled using narrow-spectrum or selective herbicides. Weeds can be beneficial, attracting pollinators, and improving the soil (i.e. adding nutrients when composted). ... Weeds compete with crops for nutrients, light and water, so it is important to manage them. Leaving some areas of weeds can help to provide food for pollinating insects and improve soils. |  |  |  |
|  | (OR) |  |  |  |
| c. | Over time many pesticides have gradually lost their effectiveness because pests have developed resistance – a significant decrease in sensitivity to a pesticide, which reduces the field performance of these pesticide. Pesticide resistance at a population level, as opposed to just a few individual pests within a species, can occur after repeated exposure to a single type of pesticide. ... When a resistant population occurs, the pesticide is no longer useful for managing that specific pest and other management options must be sought out. |  |  |  |
| d. | Bt cotton is unlikely to work for more than a few years in India because it is fundamentally at odds with the agricultural and climatic conditions here. Insects are likely to develop resistance quite fast, making the variety useless in a few years. Bt cotton is unlikely to work for more than a few years in India because it is fundamentally at odds with the agricultural and climatic conditions here. Insects are likely to develop resistance quite fast, making the variety useless in a few years. |  |  |  |
|  |  |  |  |  |
| 6. a. | Alkaloids are useful as diet ingredients, supplements, and pharmaceuticals, in medicine and in other applications in human life. Alkaloids are also important compounds in organic synthesis for searching new semisynthetic and synthetic compounds with possibly better biological activity than parent compounds. |  |  |  |
| b. | |  |  | | --- | --- | | **Phase I** | **Phase II** | | Oxidation | Sulfate conjugation | | Reduction | Glucuronide conjugation | | Hydrolysis | Glutathione conjugation | | Acetylation | Amino acid conjugation | |  |  |  |
|  | (OR) |  |  |  |
| c. | Microbial secondary metabolites are compounds produced mainly by actinomycetes and fungi, usually late in the growth cycle (idiophase). ... These compounds are usually produced by liquid submerged fermentation, but some of these metabolites could be advantageously produced by solid-state fermentation |  |  |  |
| d. | Important roles of secondary metabolites include (i) protection against harmful environmental conditions, (ii) protection against pathogens and herbivores, (iii) feeding deterrence and (iv) attraction of pollinators and seed dispersers |  |  |  |

--- End of Paper ---

**cognitive bloom's taxonomy**

(knowledge, comprehension, application, analysis, synthesis, and evaluation).

**psychomotor domain of bloom's taxonomy**

physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution.