
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2007/2008

April 2008

BBT 304/3 – Plant Tissue Culture
[Kultur Tisu Tumbuhan]

Duration: 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains FIVE printed pages before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi LIMA muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions: Answer **FIVE** (5) out of **SIX** (6) questions, in English or Bahasa Malaysia. Each question carries 20 marks.

[Arahan: Jawab **LIMA** (5) daripada **ENAM** (6) soalan yang diberikan dalam Bahasa Inggeris atau Bahasa Malaysia. Tiap-tiap soalan bernilai 20 markah.]

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1. Somatic embryo formation was found to be easily initiated from callus tissues derived from the petiole explants of celery (*Apium graveolens*). The callus was initiated from the petiole sections using Murashige and Skoog agar medium supplemented with 0.5 mg/L 2,4-D and 0.6 mg/L kinetin. Somatic embryos were formed on the same medium and continued to be produced when the callus was subcultured. The embryoids gave rise to a mass of plantlets when transferred to a medium without 2,4-D and kinetin. Based on the given information, describe in detail the establishment of a protocol for the mass production of celery plantlets.

(20 marks)

2. Artemisinin, a secondary metabolite, was reported to accumulate in the leaves of *Artemisia annua* L. However, the climatic condition, time of planting and harvesting of *A. annua* can influence the artemisinin content in these plants. Plant cell suspension culture was proposed as the alternative method for consistent and sustainable production of artemisinin. Describe in detail how artemisinin can be produced using the two-stage cell culture system.

(20 marks)

3. Slipper orchid (*Paphiopedilum barbatum*) is facing threats of extinction due to their slow growing characteristics and inefficient propagation. *In vitro* seed germination is the alternative for regeneration of slipper orchid plantlets. Describe in detail how to obtain the aseptic seeds of slipper orchid for *in vitro* germination.

(20 marks)

4. Auxins and Cytokinins are by far the most important classes of plant growth regulators for regulating growth and morphogenesis in plant tissue and organ cultures. Describe their effects to the plant tissues when they were supplemented into the culture medium.

(20 marks)

5. Hyoscyamine and scopolamine are tropine alkaloids with medicinal values produced in the roots of *Hyoscyamus niger* L. Hairy root cultures can be initiated from the leaf explants of *H. niger* using *Agrobacterium rhizogenes*. Describe the establishment of the hairy root cultures of *H. niger* for the production of these two tropine alkaloids.

(20 marks)

6. Write short notes on any two of the following:

[a] Protoplast culture.

(10 marks)

[b] Germplasm storage.

(10 marks)

[c] Production of virus-free plants.

(10 marks)