UNIVERSITI TEKNOLOGI MARA

EFFECTS OF DIFFERENT CULTURING SYSTEMS ON MICROPROPAGATION *Melastoma decemfidum*

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MSc

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduates, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Melastoma decemfidum is an important medicinal plant as it contains the anticancer compounds kaempferol and naringenin. As traditional propagation via stem cutting has its limitations and is time consuming, micropropagation by tissue culture technique can be considered as an alternative method to cultivate the plant. This research aims to optimize *in vitro* micropropagation of *M.decemfidum* for its rapid mass propagation and continuous supply. In this study, an efficient protocol that utilised BAP and NAA individually and in combination was studied. About 1 cm of nodal explants of *in vitro* plantlets of *M. decemfidum* were cultured onto 25 treatments MS media supplemented with various combinations of BAP and NAA hormones (0.1, 0.2, 0.25, 0.3 mg/L). The highest mean number of shoots at 9.67 ± 0.33 and shoot length at 0.61 ± 0.03 cm were obtained from the nodal explant cultured on 0.30 mg/L BAP. The highest number of leaves at 23.83 ± 0.47 and roots at 4.33 ± 0.33 were recorded for the nodal explant in the MS media containing 0.25 mg/L BAP and 0.1 mg/L BAP in combination with 0.2 mg/L NAA. The experiment also revealed that the combination of BAP and NAA hormones encourages callus formation (indirect regeneration). Then, the best treatment was used to study the effects of different culture systems on *M. decemfidum*'s growth rate. The second research involved the micropropagation of *in vitro* plantlets of *M. decemfidum* via different culture systems such as agar gelled cultures (AGCS), permanent immersion culture system (PICS) and temporary immersion bioreactor culture system (TIBS). Under TIBS, *in vitro* plantlets were temporary immersed in liquid nutrient medium. The use of TIBS showed many quantitative benefits, most notably recording the highest proliferation rate in comparison with both solid and liquid culture systems. As mentioned, *in vitro* plantlets cultured in temporary immersion bioreactor (TIBS) recorded the highest growth rate with significance differences ($p<0.05$) in terms of shoot multiplication (4.62 ± 0.39), shoot length (0.34 ± 0.03) cm and leaf number (10.67 ± 0.54) compared to PICS and AGCS. Therefore, it can be said that in this study, the *in vitro* propagation of *M. decemfidum* was successfully optimized using TIBS. Considering the importance of detection of secondary metabolites in medicinal plants, Total Phenolic Content (TPC) was evaluated at different growth conditions. From the results obtained, the highest TPC reading of 25.32 ± 1.06 mg/g was for the TPC of *ex vitro* leaves, followed by *in vivo* (23.00 ± 1.60 mg/g), *in vitro* leaves cultured from TIBS (9.70 ± 0.34 mg/g), *in vitro* leaves from PICS (8.24 ± 0.34 mg/g) and *in vitro* leaves from AGCS (7.46 ± 0.24 mg/g). ANOVA analysis conducted showed that there is significance difference ($p<0.05$) between the TPC results of five samples. The highest TPC result showed that the *ex vitro* of *M. decemfidum* obtained using the acclimatization from plant tissue culture technique contains high contents of phenolic compounds which can be considered a good source of secondary metabolites.

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