THE STUDY ON PLANT HORMONES AND SPENT MUSHROOM COMPOST ON THE GROWTH OF *Ficus carica*

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Master of Science.

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Ficus carica (F. carica) atau pokok ara dari keluarga mulberi (Moraceae) dikenali sebagai 'buah tin' di kalangan rakyat Malaysia tinggi permintaannya dari bidang farmaseutikal. oleh kerana nilai nutrisinya. Objektif penyelidikan ini adalah untuk mengetahui teknik pensterilan dan kepekatan pengatur pertumbuhan tanaman dan penggunaan SMC yang optimum. Penanaman *in vitro* tanaman ara di bawah persekitaran terkawal diperkenalkan untuk memenuhi permintaan penyebaran besar bahan penanaman berkualiti tinggi dan kompos cendawan *Pleurotus ostreatus* (SMC) yang merupakan substrat sisa digunakan sebagai pembekal nutrien alternatif. Pada penanaman *in vitro* tanaman ara, Ujian fitokimia dan spektoskopi Fourier transformasi inframerah (FTIR) juga dijalankan untuk mengenal pasti kumpulan metabolit sekunder yang berkaitan dengan tumbuhan ini yang dapat memberi manfaat kepada bidang perubatan. Bahagian pertama dalam penanaman *in vitro* tanaman ara adalah penghasilan anak pokok aseptik melalui proses pensterilan. Teknik pensterilan terbaik adalah rawatan 3 (T3) 70% etanol selama 10 minit, 30% clorox ditambahkan dengan dua titis Tween 20 selama 10 minit dan 0.01% perak asetat selama 5 minit. Bahagian kedua adalah induksi pucuk dan akar yang dilakukan dalam berbagai jenis media yang dilengkapi dengan pengatur pertumbuhan tanaman (PGR), SMC dan gabungan PGR dan SMC. Proliferasi tunas tertinggi dengan adanya hormon tumbuhan dicapai pada 15 µM Kinetin. Untuk percambahan akar, bilangan akar tertinggi terdapat pada kultur 30 µM IAA. Untuk penanaman *in vitro* di media yang dilengkapi dengan SMC, jumlah pucuk tertinggi diperoleh pada media SMC 10%. Walau bagaimanapun, akar baru gagal berkembang di media yang dilengkapi dengan SMC sahaja. PGR (15 µM Kinetin dan 30 µM IAA) dan SMC (10%) kemudian digabungkan dengan proliferasi pucuk tertinggi dalam media gabungan 15 µM Kinetin dengan SMC 10% dengan bilangan percambahan maksimum yang dicapai (3.00 ± 1.27) dengan panjang pucuk 0.23 cm ± 0.08. Bilangan maksimum akar (0.50 ± 0.84) dengan panjang akar 0.10 ± 0.16 dicapai dalam kultur 30 µM IAA + 10% SMC. Ujian fitokimia yang dilakukan untuk ekstrak daun *F.carica* menunjukkan adanya kumpulan metabolit sekunder yang berfungsi seperti amina, aromatik, nitril, karbonil, alkena, nitro dan alkil halide selari dengan keputusan FTIR. Kesimpulannya, penggunaan pengatur pertumbuhan tanaman dan SMC yang optimum memungkinkan untuk mempromosikan tunas dan akar baru untuk kultur nodal. SMC dapat berinovasi dari bahan buangan untuk menyediakan karbon dan nutrien dan meminimumkan penggunaan hormon tumbuhan dalam mikropropagasi tanaman ara.

ABSTRACT

Ficus carica (*F. carica*) or fig tree from mulberry family (Moraceae) known as 'buah tin' among Malaysians highly demand from pharmaceutical area for its nutritional value. The objective of this research is to determine the optimize sterilization technique and concentrations of plant growth regulator and SMC use. *In vitro* culture of fig plant under controlled environment was introduced in fulfilling the demand for mass propagation of high quality planting material and *Pleurotus ostreatus* spent mushroom compost (SMC) which is a waste substrate was used as an alternative nutrient supplier. Upon *in vitro* culture of fig plant, phytochemical test and Fourier transform infrared spectrophotometer (FTIR) analysis were also conducted to highlight the important functional groups of secondary metabolites related to this plant that can give benefits to medicinal area. The first part is production of aseptic plantlets through sterilization process for *in vitro* fig's culture. The best sterilization technique was treatment 3 (T3) of 70% ethanol for 10 minutes, 30% clorox added with two drops of Tween 20 for 10 minutes and 0.01% silver acetate for 5 minutes. The second part is the shoots and root inductions conducted in different types of media that supplemented with plant growth regulator, SMC and combination of PGR and SMC. The highest shoot proliferations in presence of plant hormone were achieved at 15 µM Kinetin. For roots proliferation, the highest number of root was found in 30 µM IAA cultures. For media supplemented with SMC, the highest number of shoots was obtained in 10% SMC media. However, new roots were failed to grow in media supplemented with SMC only. PGR (15 µM Kinetin and 30 µM IAA) and SMC (10%) were combine with highest proliferations of shoots in combination media were 15 µM Kinetin with 10% SMC media with maximum number of shoot proliferation achieved (3.00 ± 1.27) and length of shoots (0.23 cm ± 0.08). The maximum number of root (0.50 ± 0.84) and length of root (0.10 ± 0.16) was achieved in 30 µM IAA + 10% SMC culture. The phytochemical test conducted for extracts of *F.carica* leaves indicates the presence of functional group of secondary metabolites such as amine, aromatic, nitrile, carbonyl, alkene, nitro and alkyl halide which is align with FTIR result. In conclusion, optimal use of plant growth regulator and SMC enables the promoting of new shoots and roots for fig nodal culture. SMC can be innovate from waste material to provide carbon and nutrient and minimizes the usage of plant hormone in micropropagation of fig plant.

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