UNIVERSITI PUTRA MALAYSIA

GROWTH PERFOMANCE OF *Centella Asiatica* (L.) GROWN ON DIFFERENT SOILLESS MEDIA IN VERTICAL FARMING

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By

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ABSTRACT

Centella asiatica or pennywort belongs to the family of Apiaceae is one of medicinal herbs that has high potential to be commercialized. It has been used as an aid to meditation and listed as one of the Traditional Chinese Medicine (TMC) in China in order to promote faster healing for small wound. On the other hand, due to the increasing population in Malaysia, urban agriculture is being encouraged by the government to the urban population as an alternative way to address the problem of food demand. In this experiment, soilless culture and vertical farming which is part of urban agriculture were used. The purpose of this experiment were to study the growth performance of *Centella asiatica* grown on various combination of soilless substrates and to determine the best soilless substrates for cultivating *Centella asiatica*. There were four treatments have been used in this experiment which are ; 100% cocopeat, 70% cocopeat + 30% rice husk, 70% cocopeat + 30% peat moss, and 70% cocopeat + 30% empty fruit bunch. The experiment was laid out in a Randomized Complete Block Design (RCBD) with four replications. Analysis of variance indicated that there were significant differences ($P < 0.05$) among the treatments in total leaf area, fresh weight and dry weight, relative chlorophyll content, and the macronutrients. The phytochemicals *of Centella asiatica* was not significantly affected by the combination of substrates. Based on the result, the combination of cocopeat and rice husk produced higher biomass and yield compared to the other treatments.

ABSTRAK

Centella asiatica atau pegaga berasal dari keluarga Apiaceae merupakan salah satu herba yang berpotensi tinggi untuk dikomersilkan. Ia telah digunakan sebagai bantuan meditasi dan disenaraikan sebagai salah satu daripada Perubatan Cina Tradisional di China untuk menggalakkan penyembuhan luka kecil. Di sisi yang lain, berikutan dengan jumlah penduduk yang semakin bertambah di Malaysia, pertanian Bandar digalakkan oleh kerajaan untuk penduduk Bandar sebagai cara alternatif bagi menangani masalah permintaan makanan yang semakin meningkat. Dalam eksperimen ini, kultur tanpa tanah dan pertanian menegak yang merupakan sebahagian daripada pertanian Bandar telah digunakan. Tujuan eksperimen ini adalah untuk mengkaji prestasi penumbuhan pokok pegaga yang ditanam di atas pelbagai kombinasi substrat dan untuk menentukan substrat yang terbaik bagi penanaman pokok pegaga. Terdapat empat rawatan telah digunakan dalam eksperimen ini iaitu ; 100 % gambut kelapa, 70% gambut kelapa + 30% sekam padi, 70% gambut kelapa + 30% tanah gambut, dan 70% gambut kelapa + 30% buah tandan kosong. Eksperimen ini dibentangkan dalam bentuk "Randomized Complete Block Design" (RCBD) dengan empat replikasi. Analisis varian menunjukkan bahawa terdapat perbezaan yang signifikan ($P < 0.05$) antara rawatan pada jumlah luas daun, berat basah dan berat keing, kandungan klorofil, dan makronutrien. Fitokimia pada pokok pegaga dilihat tidak dipengaruhi oleh gabungan substrat yang digunakan. Berdasarkan keputusan, gabungan gambut kelapa dan sekam padi menghasilkan biojisim dan hasil yang lebih tinggi berbanding dengan rawatan lain.

CHAPTER 1

INTRODUCTION

Over the years, soilless culture has been used as a commercial means of growing both ornamental plant and food resources. Today, it is widely used with the same purpose and also in research facilities to study plant nutrition. Soilless culture is a cultivation technique by which plants are grown above from the ground. Plants are cultivated in container filled with liquid or solid growing medium. Using solid medium can enhance the retention of nutrients and water. Farmers usually choose to use soilless culture system as it can avoid soil-borne diseases.

Due to limited land and unpredictable weather condition, farming on the land become difficult and risky. Hence, vertical farming system is introduced and used to counter the problems particularly for highly populated areas such as in the urban or city. Vertical farming allows growers to cultivate crops on limited land individually and at the same time can also increase the crop yield.

Vertical farming is system where farms are stacked on top of one another, instead of branching out horizontally. Usually vertical farming is done in a building or green house where the container filled with growing medium are hanged on the wall. The growing medium used in container culture must possess light weight characteristic so that filled containers can be easily handled. The growing medium must have good nutrient and water-holding characteristics, and provide good aeration to the root system. Materials that meet these requirements are peat moss, bark, shavings, coco peat, sawdust, vermiculite and rice husk.

Media such as rockwool, perlite and vermiculite are expensive because they have to be imported. Hence, alternative substrates that are cheaper and locally available such as coco peat, rice husk and peat moss should be used as alternative media. Different substrates have different characteristics according to their water holding capacity and soil aeration. Several studies have been conducted to analyze the physical properties of growth media including available water capacity (AWC) and air-filled porosity (AFP) (De Boodt and Verdonck et al., 1973; Prasad, 1979; Abad et al., 2001). AWC indicates the water content of substrates and AFP gives the estimation of oxygen availability or level of aeration in the substrates (Wall and Heiskenen, 2003). According to Humara et al. (2002), high water content in the growing substrates can reduce both AFP and aeration, which can lead to logging and hypoxia which are detrimental to most plant species. Sufficient amount of water in growing substrates is one of the most critical factors for plant gowth and development (Beardsell et al., 1979). Combining different substrates will complement each other and create better media for plant growth.

Centella asiatica (L.) is a small herbaceous annual plant from Apiaceae family. It is also known as Asiatic pennywort or *pegaga* in Malaysia. In India, *C. asiatica* has been used as an aid to meditation. It is also listed as one of the Traditional Chinese Medicine (TCM) in China in order to promote faster healing for small wound. Malaysian often eats it fresh with rice especially among villagers.

The objectives of this experiment were to study the growth performance of *C.asiatica* grown on various combination of soilless substrates and to determine the best soilless substrates for cultivating *C.asiatica*.

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