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GERMINATION OF *Phyllanthus urinaria* AS INFLUENCED BY MEDIA, ENVIRONMENT AND BRANCH POSITION

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GERMINATION OF *Phyllanthus urinaria* AS INFLUENCED BY MEDIA, ENVIRONMENT AND BRANCH POSITION

By

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Sincerely,

WONG YING YONG

CERTIFICATION

This study report entitled "GERMINATION OF *Phyllanthus urinaria* AS INFLUENCED BY MEDIA, ENVIRONMENT AND BRANCH POSITION" is prepared by Wong Ying Yong and submitted to the Faculty of Agriculture in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Horticultural Science.

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LIST OF ABBREVATIONS

ANOVA	Analysis of Variance
DAA	Day After Anthesis
DF	Degree of Freedom
GP	Germination Percentage
GR	Germination Rate
LSD	Least Significant Difference
MDG	Mean Daily Germination
NKEA	National Key Economic Area
NS	Not Significant
P	*Phyllanthus*
RCBD	Randomized Complete Block Design
RM	Ringgit Malaysia
VI	Vigor Index

ABSTRACT

Phyllanthus urinaria or 'Pokok Dukung Anak' is a common weed which can be found in cultivated land as well as abandoned area. This plant also serves as traditional herbs in many parts of the world to treat malaria, asthma, hepatitis and other diseases. The main propagation method of *P. urinaria* is through seeds, however it has been reported that the germination is low. Therefore, in this study, the seeds of *P. amarus* were grown to maturity and the naturally dehisced seed were harvested. In the first experiment, the seeds were treated with 5 different growing media in combination with 3 different environments in order to obtain high germination in *P. urinaria*. In the second experiment, the seeds were grown under the structured house and the seeds were harvested on 13 day after anthesis from main stem and first branch for germination improvement. The treatments were considered as two factorials. The seeds were subjected to germination test and monitored for 28 days. The experimental design used was be RCBD. The data was collected every day. The best result obtained from experiment one treatment M2E2 – 50% peat with 50% perlite under structured house. The germination percentage was as high as 85% with mean daily germination which was about 1.7 seeds/ day. The vigor index was 727.70. For experiment two, the best result was obtained in treatment M2B1 – 50% peat with 50% perlite peat where the seeds were harvested from first branch. The germination percentage was 81.7% with mean daily germination which was about 1.7 seeds/ day. The treatment has the highest vigor index (571.67) among the treatments. For better germination in *P. urinaria*, the recommended media to be used was 50% peat with 50% perlite under structured house. Also, seeds harvested from first branch will give better germination.

ABSTRAK

Phyllanthus urinaria atau 'Pokok Dukung Anak' ialah satu rumpai yang popular dan boleh dijumpai di tempat terbiar. Pokok ini juga digunakan sebagai herbal tradisional di merata tempat di dunia untuk mengubati penyakit malaria, asma, hepatitis and penyakit yang lain. Cara penanaman P. urinaria adalah melalui biji benih, namun germinasinya adalah sangat rendah. Oleh itu, dalam kajian ini, P. urinaria di tanam sampai matang dan biji benih yang meletup secara semula jadi di tuai. Dalam eksperimen yang pertama, biji benih ditanam di 5 media dengan 3 combinasi persekitaran yang berlainan yang bertujuan mendapatkan germinasi yang tinggi di P. urinaria. Dalam eksperimen yang kedua, beji benih ditanam di bawah rumah struktur dan pada hari ke-13 bunga kembang, biji benih akan dituai dari batang utama dan batang yang pertama untuk memperbaikkan lagi germinasi. Rawatan tersebut akan dilihat sebagai dua faktorial. Biji benih akan ditujukan untuk ujian germinasi dan diperhatikan selama 28 hari. Reka bentuk eksperimen yang digunakan adalah RCBD dan data direkodkan setiap hari. Keputusan yang paling baik adalah didapati daripada rawatan M2E2 – 50% peat dengan 50% perlite dibawah rumah struktur. Peratus percambahan adalah sebanyak 85% dengan purata percambahan setiap hari adalah 1.7 biji benih/ hari. Indeks vigor yang direkodkan adalah 727.70. Untuk eksperimen kedua, keputusan yang terbaik adalah didapati di rawatan M2B1 – 50% peat dengan 50% perlite dimana biji benih tersebut adalah didapati di batang yang pertama. Peratus percambahan yang direkodkan adalah sebanyak 81.67% dengan purata germinasi setiap hari adalah 1.7 biji benih/ hari. Indeks vigor juga adalah yang terbanyak (571.67). Untuk mendapati germinasi yang tinggi dalam P. urinaria, media yang disyorkan adalah

50% peat dengan 50% perlite di bawah rumah struktur. Di samping itu, biji benih yang dituai daripada batang yang pertama juga akan beri germinasi yang tinggi.

CHAPTER 1

INTRODUCTION

Phyllanthus urinaria is a common weed which can be found in cultivated land as well as abandoned areas. The genus *Phyllanthus* comprises about 800 annual, perennial, shrub, climber, and floating aquatic species. They are commonly found in the tropic and the subtropic regions. Some of the species are termed as 'Pokok Dukung Anak' in Malaysia and Indonesia (Zaki, 2007; Tharakan, 2012). *Phyllanthus* was initially categorized under the family *Euphorbiaceae*. However, with more systematic and scientific researches being carried out on this crop, it has now been categorized into the family *Phyllanthaceae*, due to the presence of a biochemical compound which is phyllanthin. Phyllanthin (extracted from the leaves) is a special characteristic for species within the family Phyllanthaceae as phyllanthin does not exist in other families. Due to its biochemical compounds, the local people in India usually use *Phyllanthus species* to treat malaria, asthma, hepatitis and other diseases (Calixto *et al*., 1998). Intense research has been conducted to study the phytochemical compounds in *P. urinaria* and the compounds extracted have been found to have hepaprotective, antiviral, anticancer, antioxidant, anti – inflammatory, antimalarial, antiplasmodial, diuretic and antibacterial properties (Patel *et al*., 2011). Due to its extensive medicinal uses, the plant has also become popular in Malaysia and the market price for dried *Phyllanthus* plant is RM70/kg in Malaysia. According to the World Bank, the global market value of the herbal plants is estimated to rise up to 5 trillion in year 2050. In view of the economic values possessed by *P. urinaria*, the Malaysian government has listed *P. urinaria* as one of the top five herbs on focus

in the National Key Economic Area (NKEA) in order to generate the interest of the growers to cultivate this herb in large scale and generate more income to boost the economy.

In order to cultivate *P. urinaria*, the main propagation method of the herbs is through seeds. High quality seeds which give high germination percentage are a must for the growers expecting high yield. However, the seeds produced in *Phyllanthus* are reported to be very low in germination, less than 50% in 10 days after sowing (Unander *et al*., 1995; Rajeswara – Rao, 2012). Also, it had been reported that low germination in *Phyllanthus* could be due to the dormancy in the seeds (Unander *et al*., 1995). Dormancy in the seeds was mainly due to the surrounding environment such as high temperature, absence of light and so on. Thus, these factors are possibly restricting the interest of farmers to cultivate *Phyllanthus* on large scale. Hence, it is necessary to find a method to either break dormancy or to select a suitable environment for germination of *Phyllanthus* seeds.

Various factors have been shown to influence germination in seeds. Although, Unander *et al*., (1995) and Rajeswara – Rao (2012) have mentioned that *Phyllanthus* seeds have dormancy, but others have shown that it may not be dormant as the percentage germination changes based on the condition where germination is carried out. One of the options that can be used to improve the germination percentage is by using different planting media and environment during the germination. These two factors have been successfully employed to improve the seed germination rate in *Jatropha curcas* (Gairola *et al*., 2011). Different growing media can be varied in terms of its pH, water holding capacity, aeration and so on in order to favor the germination of seeds. Different types of media not only effects germination of seeds but also directly influence the rooting system of the plants (Awang *et al*., 2009).

Apart from this, the environment, especially temperature and light during germination processes is also important in enhancing the rate of seed germination. Different plant species may require different optimal temperature and light intensity in order to ensure maximum germination. According to Relf (2009), it is very important to use suitable growing media and maintenance of optimum temperature to achieve high percentage of germination. This is because, when the seeds are sown in minimum temperature, the germination process will occur very slowly as the respiration rate has been lowered. Protein denaturation could happen if the seeds are sowed in maximum temperature (Miller, 2007; Relf, 2009). Hence, sowing the seeds in optimum temperature is very important to avoid slow germination and protein denaturation and to improve germination percentage. Elliott and French (1959) also stated that for germination to occur, the process depended on light and temperature.

Other than media and environment which could influence the germination percentage, it has also been found that seeds harvested from different position of the mother plants could enhance the germination as well. Khatun and Bhuiyan (2011) had claimed that the seeds harvested from the primary branch were better in germination and vigor index than the seeds harvested from secondary and tertiary branches. This could be the seeds near to the nutrient source will get more nutrients than the one located in the far. Selecting seeds from different position of the mother plant of *P. urinaria* and then germinating the seeds under favorable temperature and media might help to enhance the germination of the seeds.

Therefore, this study on *P. urinaria* was undertaken in order to propose a suitable environment for uniform germination of seeds. The specific objectives are as follows:

i. To determine the germination of *P. urinaria* seeds in different media and surrounding temperature.

ii. To improve the germination of *P. urinaria* seeds by selecting seeds from different branches.

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