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EFFECT OF MS MEDIUM STRENGTH AND IBA ON ROOTING OF DRAGON FRUIT (Hylocereus polyrhizus)

AHMAD ALFAN HIDAYAT BIN AHMAD KHALILI

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EFFECT OF MS MEDIUM STRENGTH AND IBA ON ROOTING OF DRAGON FRUIT (*Hylocereus polyrhizus*)

BY

AHMAD ALFAN HIDAYAT BIN AHMAD KHALILI

A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Agricultural Science

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CERTIFICATION

This project report entitled Effect of MS Medium Strength and IBA on Rooting of Dragon Fruit (*Hylocereus polyrhizus*) is prepared by Ahmad Alfan Hidayat bin Ahmad Khalili 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 Agricultural Science.

Student's name: Student's signature:

Ahmad Alfan Hidayat bin Ahmad Khalili

Bachelor of Agricultural Science ……

Certified by:

……..

(Assoc. Prof. Dr. Maheran Abd Aziz)

Department of Agriculture Technology,

Faculty of Agriculture,

Universiti Putra Malaysia,

43400 Selangor Darul Ehsan.

Date:……

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LIST OF ABBREVIATIONS

%	Percent
°C	Celsius Degree
µmol m^{-2} s^{-1}	Micromole per meter square per second
ANOVA	Analysis of Variance
CAM	Crassulacean acid metabolism
DMRT	Duncan Multiple Range Test
et al.	et alia
g	Gram
g/L	Gram per liter
HCl	Hydrochloric acid
IAA	Indole-3-butyric acid
IBA	Indole-3-acetic acid
kPa	Kilo Pascal
LDP	Long day plant
mg/L	Milligram per litre
mg/ml	Milligram per milliliter
ml	Millilitre
NAA	1-Naphthalene acetic acid
NaOH	Sodium hydroxide
pH	Measure of acidity
TDZ	Thidiazuron
w/v	Weight per volume

ABSTRACT

This study was conducted to determine the effect of full and half strength Murashige and Skoog (MS) medium in combination with different levels of Indole-3-butyric acid (IBA) on rooting of *Hylocereus polyrhizus* under in vitro condition. In vitro shoots obtained from previous study were taken and cultured into vials for rooting until week 11. In the experiment, different levels of IBA (0.0, 0.5, 1.0, 1.5 and 2.0 mg/L) were added into full and half strength MS media. Each treatment consisted of 12 replications and each replication contained a single explant. Based on the number of roots produced and the percentage of shoot producing roots, treatment consisting of 1.5 mg/L IBA was the best for rooting of *H. polyrhizus* shoots in both full and half strength MS media.

ABSTRAK

Kajian ini dijalankan untuk menentukan keberkesanan media MS penuh dan separuh dengan kombinasi hormon IBA yang berbeza pada pertumbuhan akar *Hylocereus polyrhizus* dalam keadaan in vitro. Bahan tanaman in vitro diperolehi daripada kajian yang lepas pada pertumbuhan pucuk *H. polyrhizus* dan dikulturkan ke dalam vial selama 11 minggu. Eksperimen menggunakan media MS penuh dan separuh yang ditambahkan dengan kombinasi hormon IBA. Lima rawatan dengan kepekatan IBA dari 0 hingga 2 mg/L (0.0, 0.5, 1.0, 1.5 and 2.0 mg/L) telah diuji. Rawatan kawalan bagi kajian ini tidak mengandungi sebarang hormon. Setiap rawatan terdiri daripada 12 replikasi dan setiap replikasi dalam rawatan mengandungi satu eksplan. Berdasarkan bilangan akar dan peratus pucuk yang mengeluarkan akar, 1.5 mg/L IBA merupakan rawatan yang terbaik untuk pertumbuhan akar pokok buah naga apabila dikulturkan pada media MS penuh dan separuh.

CHAPTER 1

INTRODUCTION

1.1. Dragon fruit

The dragon fruit is a tropical climbing cactus with triangular fleshy stems growing to a height of 1-3 meters or more and has perennial flowers (Jacobs, 1999). Dragon fruit is also known as pitaya or pitahaya in Latin America, strawberry pear and night blooming cereus in English and *mata naga* in Malaysia (Masyahit et al., 2009b).

Dragon fruit has gained popularity in many countries especially in Asia. Commercial cultivation of dragon fruit is expanding in several parts of Asia such as Vietnam, Taiwan, Philippines, Thailand and Malaysia (Mizrahi et al., 1997; Liaotrakoonet al,. 2013). The white-flesh *(Hylocereus undatus*) and red-flesh (*Hylocereus polyrhizus*) dragon fruits are commercially planted in Malaysia (Liaotrakoon et al., 2013). Those varieties have been brought in by the former Malaysian Prime Minister, Tun Dr. Mahathir from Colombia to be propagated in Malaysia (Zuraida et. al., 2008). In Malaysia, dragon fruit cultivation shows great expansion due to the high market demand since 2006 (Ridzuan and Adnan,2012). The fruit has gained much interest in the society because of its exotic features, attractive colours, nutritional value and pleasant taste (Le Bellec et al., 2006).

This exotic fruit is utilized as fruit beverages, jam, jellies, ice cream and other dairy products (Ridzuan and Adnan, 2012; Lee et al., 2013). The fruit can also be turned into wine in the downstream process. Dragon fruit is rich in vitamin C (http//www.ilovepitaya.com, 2013). According to Liaotrakoon et al. (2013), dragon fruit is rich in Vitamin E, which can be considered as a natural antioxidant.

Dragon fruit comes in a number of varieties (Figure 1), and each can be distinguished from another by either the color of the pulp skin (exocarp) and the colour of the soft fleshy centre (mesocarp or endocarp) which contains the seed (Masyahit et. al., 2009a; (Ariffin et al., 2009)). Dragon fruit is commonly propagated by using stem cutting. By stem cutting, fruiting occurs as early as six month. Through stem cutting, the genetic constituents transferred from the mother plant are preserved and produces uniform plants. However, planting materials through cutting are limited in production (http://www.ilovepitaya.com, 2013)

Dragon fruit plant is known to be a long day plant (LDP) which needs a long period of light, and it is also categorized as Crassulacean Acid Metabolic (CAM) plant which produces food at night (Zainudin, 2006). Dragon fruit is a large, oblong fruit with a red peel and large green scales. The scales turn yellow upon ripening. The skin color begins to change 25 to 30 days from flowering in both *H. undatus* and *H. polyrhizus* (Paull, 2007).

Figure 1: Types of dragon fruit (a) *Hylocereus polyrhizus* (red-skinned fruit with dark red flesh), (b) *H.undatus* (red-skinned fruit with white flesh), (c) *H. costaricensis* (red-skinned fruit with red flesh) and (c) *H. megalanthus* (yellow-skinned fruit with white flesh).

1.2. Justification

H. polyrhizus is usually propagated vegetatively using stem. This is a popular method, however, this method limits the number of planting materials and unable to fulfill the commercial demand. Besides that, the seeds of *H. polyrhizus* are difficult to obtain especially in West Malaysia since *H. polyrhizus* are commercially grown in Sarawak. Moreover, stem cuttings are bulky, and difficult to transport from one place to another, which may be located far away.

In vitro propagation is a well-known method which enables the production of pathogen free plants, allows rapid multiplication and allows international exchange of germplasm (Savita et al., 2010). *In vitro* propagation of *H. polyrhizus* is expected to increase the number of planting materials, in fulfilling the demand especially for West Malaysia as well as to reduce the difficulty related with the transportation issue. *In vitro* shoots have been succssfully produced in a previous Bachelor of Agricultural Science final year project carried out in the Agrobiotechnology Laboratory of the Department of Agriculture Technology. This study was therefore focused on inducing roots on the shoots to enable them to be acclimatized and later transferred to the field.

1.3. Objectives

The objective of this study was to determine the most effective IBA concentration in full and half strength MS media for rooting of *in vitro* shoots of *H. polyrhizus*.

1.4. Hypothesis

The null hypothesis (H_O): There is no significant difference between the various IBA concentrationsin full and half strength MS medium on rooting of *H. polyrhizus* shoots.

The alternative hypothesis (H_A): There is a significant difference between the various IBA concentrationsin full and half strength MS medium on rooting of *H. polyrhizus* shoots.

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