UNIVERSITI PUTRA MALAYSIA

THE EFFECT OF MOISTURE AND METHODS OF BREAKING SEED DORMANCY ON GERMINATION OF *Mimusops elengi*

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FP 2015 220

ASMAH HUSNA BINTI ABAS BACHELOR OF AGRICULTURAL SCIENCE 2014/2015

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ACKNOWLEDGEMENT

Praise to Allah, with His blessings, guidance and help, I can complete the writing of this report. I dedicate this acknowledgement to my lovely parents, Abas bin Ahmad and Faridah binti Sulaiman and my siblings who continuously supported me both mentally and physically in order to complete this project. Next, to the one who absolutely deserve my appreciation, my supervisor, Assoc. Prof. Dr. Uma Rani Sinniah for her guidance from the very beginning of the project, selecting the topic, support and patience throughout the whole process of research until the completion of this project.

My sincere thanks also go to the post graduate students who currently work under the same supervisor, Ms. Izzah and Mrs. Greetha who helped me on finding materials and improve my research techniques. Besides that, I want to address my gratitude to Mr. Yusof, staff of Seed Technology Unit, Department of Crop Science, Faculty of Agriculture, Universiti Putra Malaysia for his concern and generous cooperation.

My special thanks to my beloved friends, Kamil Alif Mohd Safian, Nurulain Amirah, Nurul Hidayah, Nurul Afiqah, and Nur Aziera, for their encouragement, moral support, help and advice in the completion of this study. Last but not least, to all my friends and acquaintances who helped me directly or indirectly in completing this project.

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ABSTRACT

Mimusops elengi is a crop which often planted as an ornamental and shade tree in gardens and along roads, also in coastal sites. This plant also has valuable value as medicinal plant which has been used for treat diseases. So far in our country, this plant is not exploited commercially for various applications. Malaysia has potential to produce products based on this plant and establish industry which is now abandoned. For establish this industry, need regular supply of the plant. The most important thing is planting materials to continue the production. This crop can be grown both from seeds and cuttings with seeds having preference due to easy handling and transportations. However, the seeds have been reported that the seeds take very long time to germinate when sown. In order to establish a method to store Mimusops seeds, the present study was carried out to determine the effect of desiccation, cryopreservation (-196°C), treatments breaking seed dormancy, and practical way to break seed dormancy on the germination of *Mimusops elengi*.

In the first experiment, Mimusops seeds were desiccated using two methods which are using laminar air flow and silica gel methods. The seeds were desiccated from 34.9% moisture content to 30%, 20%, 15%, 10% and 7% followed by germination on sterilized sand. Results showed that desiccation affect the germinability of Mimusops seeds. For 20% moisture content and above, the percentage of germination is between 11-14% which are low whereas 20% moisture content and below, none of the seeds was germinated within fifty days.

In the second experiment, clipped and unclipped seeds desiccated to 30%, 20%, 15%, 10% and 7% moisture content were subjected to liquid nitrogen (-196°C)

exposure for 24 hours. Results showed that both clipped and unclipped seeds do not germinate within time of observation (50 days).

In the third experiment, effect of treatment breaking seed dormancy on germination of Mimusops seeds was done. For mechanical scarification using sand paper, on day 17, the seeds started to germinate. The percentage of germination is high about 70-80% within the time of observation.

In the forth experiment, the seeds of Mimusops was sowing by using Petri dish with wet cotton as the medium for the germination of seeds instead of using sand. There were four conditions where the seeds still have the seed coat, without seed coat, the upper part of the seed was clipped and the lower part of seed was clipped. Results showed that all the conditions of the seed can germinated successfully (90-100%) but the seeds without seed coat were fastest germinate than others which on day 5. Therefore, the identification of practical seed dormancy breaking procedures was found. The growers can easily adapt this way by using wet cotton as medium for sowing the seed with break the hard seed coat.

ABSTRAK

Mimusops elengi adalah sejenis tumbuhan yang biasanya ditanam sebagai tumbuhan tanaman hiasan dan tanaman teduhan serta ianya ditanam di sepanjang jalan dan juga di tapak pantai. Tanaman ini mempunyai nilai perubatan yang telah digunakan bagi merawat pelbagai penyakit. Pada hari ini di negara kita masih belum mengeksploitasi secara komersial bagi kepelbagaian kegunaannya. Malaysia mempunyai potensi untuk menghasilkan produk-produk dari tumbuhan ini dan menghidupkan industri ini dimana sehingga kini ianya di abaikan. Bagi mewujudkan industri ini, bekalan tanaman yang tetap diperlukan. Pengeluaran yang berterusan di perlukan bahan tanaman. Tumbuhan ini boleh dibiakkan secara percambahan biji benih atau keratan batang dan biasanya pokok ini dibiakkan secara percambahan biji benih kerana mudah dikendalikan dan diagihkan. Walaubagaimanapun, disebabkan biji benih tanaman ini mengambil masa yang sangat lama untuk bercambah. Untuk mengetahui kaedah yang sesuai untuk mengatasi masalah, kajian ini telah dijalankan untuk menentukan kesan pengeringan, krioawetan (-196°C), rawatan-rawatan mematahkan benih dorman dan kaedah praktikal bagi mengatasi masalah dorman terhadap keupayaan percambahan pokok *Mimusops elengi*.

Dalam eksperimen pertama, biji benih dikeringkan dengan menggunakan dua kaedah iaitu aliran udara laminar dan kaedah gel silica di dalam desikator. Kandungan air biji benih segar dikeringkan dari 34.9% kepada 30%, 20%, 15%, 10% dan 7% dan dicambahkan dalam pasir yang telah disteril. Keputusan menunjukkan pengeringan mempengaruhi keupayaan biji benih Mimusops untuk bercambah. Bagi kandungan air 20% dan keatas, peratusan percambahan di antara 11-14% manakala kandungan air 20% dan kebawah, tiada biji benih yang bercambah dalam masa 50 hari.

Dalam eksperimen kedua, biji benih yang ditebuk dan tidak ditebuk kulitnya dikeringkan kepada 30%, 20%, 15%, 10% and 7% kandungan air dan disimpan ke dalam cecair nitrogen (-196℃) selama 24 jam. Keputusan menunjukkan kedua-dua keadaan biji benih tidak bercambah.

Dalam eksperimen ketiga, telah dijalankan kesan rawatan pematahan biji benih dorman terhadap perkecambahan. Bagi rawatan skarifikasi mekanikal menggunakan kertas pasir, pada hari ke 17, biji benih telah mula berkecambah. Peratus perkecambahan agak tinggi berbanding sebelum rawatan iaitu 70-80% sepanjang sesi pemantauan dijalankan.

Dalam eksperimen keempat, biji benih telah disemai menggunakan "Petri dish" dengan kapas lembap sebagai media tanaman selain dari pasir. Terdapat empat keadaan di mana biji benih masih mempunyai kulit luar, biji benih tanpa kulit luar, biji benih yang telah ditebuk kulitnya pada bahagian atas dan biji benih yang telah ditebuk kulitnya pada bahagian bawah. Kemudian keempat-empat biji benih ini ditanam. Keputusan menunjukkan semua keadaan biji benih berjaya bercambah (90-100%) tetapi yang membezakannya adalah biji benih tanpa kulit luar bertindak paling cepat untuk bercambah iaitu pada hari ke 5. Sehubungan dengan itu, pengenalpastian kaedah yang paling praktikal bagi pematahan benih dorman telah dijumpai. Para petani dapat menyesuaikan diri menggunakan cara mudah ini dengan menjadikan kapas lembap sebagai media perkecambahan serta menyemai biji banih dalam keadaan tanpa kulit luar yang keras.

CERTIFICATION

This project paper entitled Effect of Moisture and Methods of Breaking Seed Dormancy on Germination of *Mimusops elengi* is prepared by Asmah Husna bt Abas and submitted to the Faculty of Agriculture in partial fulfilment for requirement of PRT 4999 paper for award of the degree of Bachelor of Agricultural Science.

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CHAPTER 1

INTRODUCTION

Mimusops elengi Linn. (Family, Sapotaceae) native to India, Sri Lanka and the Andaman Islands is called as 'Tanjong' in Malay language and used as an ornamental and medicinal plant in Peninsular Malaysia. This plant is called Bakula in Sanskrit, Magizham in Tamil, Pikul in Thai, Bakul in Hindi, Munamal in Sinhalese, Kha-Yay in Myanmar and Bullet wood tree in English. It is an evergreen tree used for various medicinal purposes in India, Burma, Pakistan, Thailand and Malaysia. This plant is economically important, but it is not studied in depth.

In Asia, it is often planted as an ornamental and shade tree in gardens and along roads, also in coastal sites. This plant is valuable as medicinal plant which has been used to treat diseases. The bark is used for cooling, a cardio tonic, alexipharmic, stomachic, anthelmintic, tonic, astringent which cures biliousness, diseases of the gums and teeth (Basavaraj, 2010). The flower is used for cooling, to cure the disease of blood, liver complaints, diseases of the nose, headache, and their smoke is good for controlling asthma. The fruit is astringent to the bowel, good for the teeth, causes flatulence. The seed can fix loose teeth and used as a cure for headache (Bharat, 2010). The root is aphrodisiac, diuretic, good for gonorrhea and used as a gargle which causes relaxation of the gums. The flowers, which appear twice a year, are somewhat fragrant and powerfully aromatic.

In a test in Indonesia, the wood of *Mimusops elengi* was demonstrated to be very durable, even when exposed to the weather or in contact with the ground. It is reportedly resistant to marine borer attack and to dry-wood termites. The heartwood

is very resistant to impregnation with preservatives. The heavy, strong and durable wood of *Mimusops elengi* is well known to be suitable for heavy general construction, bridge building, marine construction, furniture and cabinet work, and many more. A good quality veneer and plywood can be manufactured from the wood. *Mimusops elengi* also yields a good fuelwood.

So far in our country, this plant is not exploited commercially for various applications though it is commonly planted as an ornamental plant, a fragrant flowering tree in gardens and for shade around houses. Malaysia has potential to produce products based on this plant and establish industry which is now abandoned. To establish this industry, regular supply of the plant will be needed. The most important thing is planting materials to continue the production. This plant is propagated through seeds and cuttings. Nevertheless, trees propagated by cuttings show a lower longevity and have lower drought and disease resistance than those propagated with seeds (Heller, 1996). This is because plants from seeds develop a taproot and four lateral roots, whereas it has been reported that cuttings do not develop a taproot (Heller, 1996).

The most common method today is by using seed because it is easy to handle in term of planting and transportation. Therefore, upon collection seeds need to be stored under suitable condition until the seeds are used for planting. Seed storage aspires to preserve seed with initial quality until it is needed for planting. The purpose of seed storage is to maintain the seed in good physical and physiological condition from the time they are harvested until the time they are planted. Seeds have to be stored, because there is usually a period of time between harvest and planting.

In order to be able to store the seed accordingly, the ability of the seeds to tolerate desiccation is very important as seed moisture content and storage temperature are the two most important criteria for prolonged storage. Deterioration is inevitable and in oily seed this process is enhanced. Therefore, cryopreservation has been recommended as an alternative. Cryopreservation is generally understood as storage between -79 and -196°C, the low extreme being the temperature of liquid nitrogen (Bekheet et al., 2007). The major advantage of storing plant materials at such a temperature is that both metabolic process and biological deterioration are considerably slowed or even halted (Karthe, 1981). In addition it is believed that cryopreserved materials remain genetically stable, thus having advantage over conventional conservation method (Withers 1980, 1983).

This study was carried out in order to evaluate the sensitivity of Mimusops seeds to desiccation with different moisture content. Cryopreservation was attempted as a means to establish a long-term storage protocol for *Mimusops elengi*.

Therefore, the objectives of this study were:

1. To determine the effect of desiccation on germination of *Mimusops elengi* seeds.
2. To determine the effect of cryopreservation on survival of *Mimusops elengi* seeds.
3. To establish practical seed dormancy breaking procedures that can be adapted by growers.

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