

Effect of the seedling age and Compost to the growth of Palm Date Lulu (*Phoenix Dactylifera* L.) Nursery and Investigation of Female Seedling on Soil of Sub-Optimal Land

*Pengaruh Umur Kecambah dan Kompos terhadap Pertumbuhan Bibit Kurma Lulu (*Phoenix Dactylifera* L.) dan Investigasi Bibit Kurma Betina di Tanah Lahan Sub-Optimal*

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ABSTRAK

Impor buah kurma sangat tinggi mencapai 9,99 juta kg atau sebesar US\$ 13,18 M, karena itu perlu usaha untuk pengembangan penanaman kurma di Indonesia. Penanaman tentu saja dimulai dari persemaian sampai penanaman dan panen. Penelitian ini bertujuan untuk menginvestigasi ciri bibit kurma betina dan untuk mengetahui pengaruh kompos terhadap pertumbuhan bibit kurma. Penelitian ini perlu dilakukan karena belum adanya informasi tentang pembibitan kurma betina, seperti diketahui tanaman ini berumah dua. Pada penelitian ini ada 2 tahap penelitian yaitu: faktor pada penelitian pertama pemberian kompos pada persemaian (tanpa kompos dan diberi kompos) dan umur pindah tanam kecambah ke polibeg yaitu 15 hari dan 30 hari kecambah. Dari perlakuan tersebut dihitung pertumbuhan dan jumlah yang tumbuh. Pada tahap kedua adalah pemindahan bibit umur 30 hari untuk mengidentifikasi kurma betina dengan menanam sebanyak 20 tanaman per nampan dan diulang sebanyak 3 nampan. Dari penelitian ini dihitung jumlah kurma betina yang dicirikan oleh daun melingkar setelah 30 hari transpaning. Hasil penelitian menunjukkan bahwa kompos sangat penting dalam mempercepat pertumbuhan daun dan akar bibit kurma, serta bibit yang umur 30 hari di semai dan sudah tumbuh daun pertama mempunyai kemampuan tumbuh sangat tinggi di polibeg (>90%), sedangkan umur 15 hari hanya (45%). Didapatkan juga bahwa rerata kurma betina adalah 25% sedangkan sisanya (75%) merupakan kurma jantan atau seteril. Perlu penelitian lebih lanjut di lapangan untuk penanaman kurma betina dan untuk membuktikan apakah nantinya dapat berbuah.

Kata kunci: kurma, tanaman, umur, bibit, kompos, ciri, betina

ABSTRACT

Indonesia imported very high amount of date palm fruits about 9.99 million kg or US\$ 13.18 M, because of that it is necessary to develop a research about date palm seedling nursery and investigation of female date, since this is a dioecious plant. The aim of this investigation was to find out characteristics of female date seedling and the effects of seedling age and compost on seedling growth. There were 2 steps in this research: the first

was application of compost on seedling (without and plus compost treatments) and the age of seedling (15 and 30 days old) for transplanting into polybag, the growth ability of plant was monitored. The second step was transplanting seedling at 30 days old into pan for investigation female date, which 20 seedlings were planted in one pan and replicated 3 times. Results showed that compost increased roots and leaves growth on seedling. Transplanted at 30 days old seedling had the ability to grow about 95% compared to 15 days old was only 45%. It was found that female seedling was about 25% and the rest (75%) was male or sterile. It is needed further investigation on growing female seedling in the field and can it produce fruit.

Keywords: date, palm, seedling, age, compost, characteristics, female

INTRODUCTION

Date palm is one of the most imported fruits in Indonesia, date fruits were imported 9.99 million kg or about US\$ 13.18 million from January to March 2016 according (Badan Pusat Statistik 2017). One of the highest palm date producer is Nigeria, where date plantations were in South East of this country. According to Zango *et al.* (2016) the highest amount of rainfall was 160 mm a month in South Nigeria and palm tree was able to produce fruits twice a year in April and August, where rain season begun at August up to October and dry season started at April up to October. This is rather similar with the climate in Indonesia, so palm date tree can be cultivated in Indonesia. Actually, Janick (2005) postulated that palm date tree was popular with the slogan “the foot was in running water and the head was in sky fire”, this indicated date palm needed a lot of water.

Many researches had been done about application of animal manures on palm date yield (Baldi *et al.* 2010, Dialami & Mohebi 2010, Elsadig *et al.* 2017 & Ibrahim *et al.* 2013) or the effect of compost on seedling at 18 months old which needed about 20 kg/plant (Al-Ravi & Al-Rawi 2018), but research about the addition of compost on the initial seedling has not been done yet. The addition of compost for early seedling was important because young seedling needed crumb soil and compost contained macro and micro nutrients also hormones (Bernas *et al.*, 2015, Lazcano *et al.*, 2009, Reeve *et al.*, 2012, and Wen *et al.*, 2007).

Organic matter is important because it's easily to be made and environmentally safe (El-Sheikha 2016). Compost was made of Rhododendron plant (*Melastoma malabathricum* L.) had a high potential for nutrient sources because it had high pH (7.9); 1.55% N; 0.14% P; 0.61% K and 20.59 CN ratio (Bernas *et al.*, 2017), this high pH compost would be suitable for palm date, because it grew in arid region where soils contained high base status and high pH as reported by Dialami & Mohebi 2010 which palm date grew well in pH 7.7 with the right addition of fertilizers.

Date palm tree is dioecious plant, where male and female are separately tree, that why it needed help for pollination by human, wind or animal (Janick 2005). Author mentioned that one male is enough for pollinating 100 female dates when pollination was done by hand. Several seedling palm dates were produced as tissue culture especially in Arabic Countries, however many still grow palm date using propagation and seed. Johnson *et al.* (2013) had done a research about growing wild seed date palm for genetic source seedling, because it had adapted very well to its environment. The certainty of male or female date could be achieved if the seedling was from propagation or tissue culture, but not from the seed. However, farmers in Nigeria had experiences to differentiate between male and female, such as if the first leaf grew and penetrated woven palm leaves above, then it was not female. On the other side if the first leaf was circle under the palm leaves and could not penetrated them, then it was a female

(Zango *et al.*, 2016). This method can be used in Indonesia, because tissue culture or propagation seedling are not available yet, even though it has to wait more than 3 years in order to find out male or female. Beside that identification of young female date from wild clone cannot be investigated genetically. As reported by Elmeer & Mattat (2012) had investigated 117 female palm dates and it did not showed any genetically properties of female date. Because of that, the traditional method of Nigerian farmer can be adapted in order to investigate female dates, especially if there is no tissue culture or propagation seedling available. Identification of female date seedling is important, otherwise it will waste a lot of time and input if we want to wait when palm date produces fruit.

Because of not many information about palm date seedling and to ascertain juvenile female date, it is necessary to investigate female seedling characteristics and the effects of seedling age and compost on palm date nursery. The aim of this investigation was to find out characteristics of female date seedling and the effects of seedling age and compost to seedling growth.

MATERIALS AND METHODS

The Experiment

There were two steps of this experiment i.e. finding the age of seedling and compost on seedling growth and the second step was finding the female seedling. Two factors were used in the first step of this research: the first treatment was compost: 1) seedling without compost and 2) seedling with compost. The second treatment was the age of transplanting seedling into polybag: 1) 15 days old seedling and 2) 30 days old seedling.

Seed Preparation

Seeds were from fresh Lulu palm date about 2 kg, where 1 kg was about 125 seeds. Good seeds were sorted and washed thoroughly and removed outer skin. Then

seeds were soaked in warm water (50° C) and leaved for 24 hours then washed again.

Seed Germination

Seeds were put on plastic pan, which had been laid 3 layer tissues before and covered them with 3 layer tissues. Then sprayed with water to saturate all tissues, pan was opened every other day to check water saturated and watered it again if dried.

Compost Application

This research used compost made of Rhododendron plant which had been decomposed for 3 months. Compost was sterilized by steaming for one hour for killing bacteria or fungi. Compost was put into the pan when seedlings were 7 days old and seeds had grown roots at this time. Watering was still done up to 15 and 30 days old seedlings. The seedlings were transplanted into plastic pans and polybags. Transplanting Preparation and Investigating Female Seedling:

- a. Seedlings were transplanted in polybags for testing the ability of growing at the age of 15 and 30 days old. Each age of seedlings were transplanted at 60 polybags, thus there were 120 seedlings all together (Figure 10).
- b. In order to find out male or female palm date, 30 days old seedlings were transplanted in plastic buckets and 20 seedling were planted in one bucket and replicated 3 times (Figure 7 and Figure 8), then covered with woven coconut leaf about 10 cm above the bucket (Zango *et al.*, 2016).
- c. One month after transplanting, the first leaf was investigated, if the leaf was circle then it was a female and if the leaf was straight and grew crossing woven palm leaves then it was a male or sterile.

Data Analysis

Data of root length, leaf width and length, amount of female or male dates and seedlings growth were calculated using tabulation and standard deviation.

RESULTS AND DISCUSSION

Female Date Investigation

Based on circle leaf investigation, it was found out 5 (25%) females and 15 (75%) males or sterile out of 20 seedlings. Male and sterile dates were combined because there was no specific characteristic between this two, data was presented in Table 1. The amount of female dates (25%), this was lower than investigation by Zango *et al.* (2016) it was about 30%. This might due to farmers in Nigeria had sorted seeds that had characteristics as female seeds such as rather curve and pointed end (Figure 5). However, it was difficult to identify this characteristic for Lulu date seeds because of small seeds. Other characteristic was found during investigation where curly first leaf was emerged from a coiled root. So there were two types of root *i.e.* normal (not coiled) and coiled (Figure 1), it mean the coiled roots seedling could be chosen and through normal roots seedlings out at 15 days old. Other characteristic was the first circle leaf width about 3 mm but male leaf width was about 7 mm (Figure 4), then the leaves were rather similar width (7 mm) at 30 days old seedlings. It seemed the circle leaf was more compact than male leaf and female leaf widened at 30 days old. Those characteristics might be added beside other properties *i.e.* sharp point tips, curve and rough seeds in Figure 9 (Zango *et al.*, 2016). This inventory was important because Elmer & Mattat (2012) could not

investigate 117 female dates genetically and (Maryam 2016) postulated that we had to wait up to 5 years in order to find out a female date or when it produced fruits. This result showed that seedling date grew coiled roots at the 15 days old and produced circle leaf at the age of 30 days, so it did not need to wait until the first leaf emerged to find out that was a female date and this can save time, energy and space for nursery.

The Effect of Transplanting Age to Seedling Growth on Nursery

Age of transplanting seedling affected date growth significantly, where 15 days old seedling had 46.67% ability to grow, on the other hand, 30 days old seedling had about 95% ability to grow (Table 2). Beside that plant had grown secondary roots or root hairs (Figure 6) which could absorb water and nutrients in soil straight away. According to Amira & Mohamed (2014) roots palm date grew more on the upper part at the age of 64 days after emerging from the seed, but this research has showed seedling roots grew very well at 30 days old (Figure 10). The amount of roots were important in palm date even though from propagation, where hormone regulator growth used for roots growth thus it had increased the ability to grow as reported by (Al-Mana *et al.*, 1996 & Alkhateed *et al.* 2015). It may conclude, it is better to plant a seedling which has grown a leaf and root hairs so the ability to grow high at the age of 30 days.

Table 1. The amount of female and male or sterile date palm at 1 month old after transplanting

Plant Sex	Amount of Plant	Amount of Plant (%)
Female	5 ± 0	25 ± 0
Male	15 ± 0	75 ± 0
Total	20	100

Note: ± 0 = Standart deviation

Table 2. The effect of seedling age on the growth of plant in pot at 1 month old after transplanting

Plant	Replanting at 15 Days Old		Replanting at 30 Days Old	
	Plant Amount	Plant Amount (%)	Plant Amount	Plant Amount (%)
Life	9.3 ± 0.58	46.67 ± 2.89	19.0 ± 0.0	95.0 ± 0.0
Dead	11.7 ± 0.58	53.33 ± 2.89	1.0 ± 0.0	5.0 ± 0.0

Note: ± 0 = Standart deviation

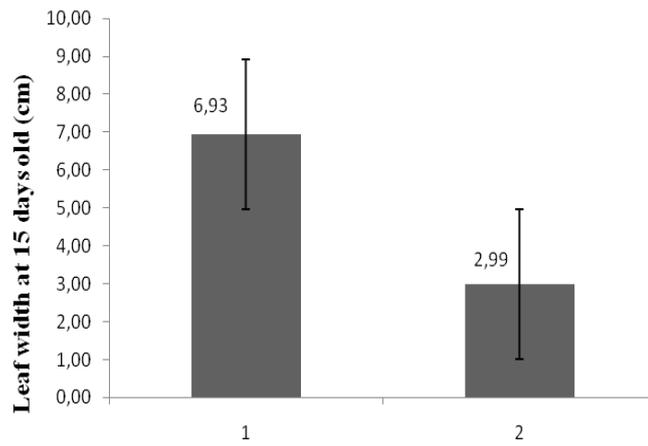


Figure 1. Leaf width for male date (1) and female (2) at the age of 15 days after transplanting, vertical line= standard deviation

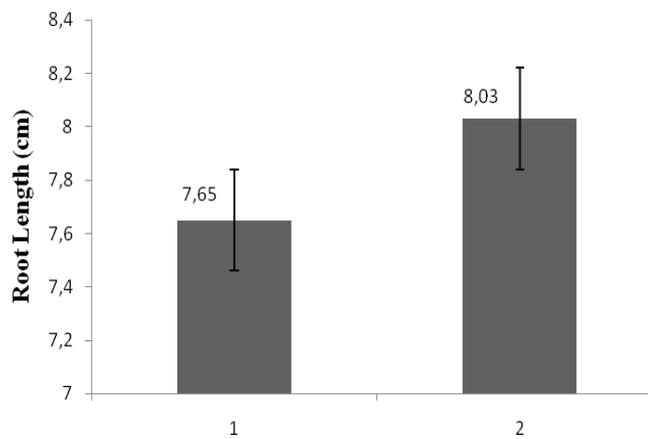


Figure 2. The effect of compost on root length, without compost (1) and with compost (2), vertical line= standard deviation

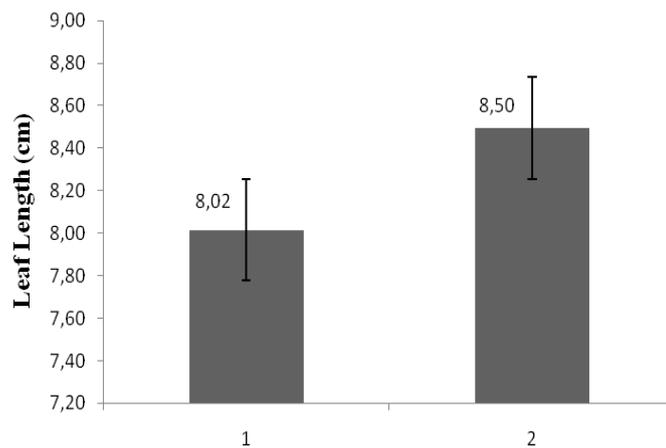


Figure 3. The effect of compost on leaf length, without compost (1) and with compost (2), vertical line= standard deviation

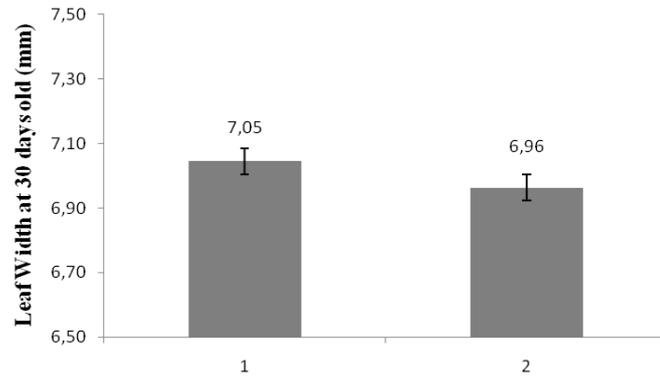


Figure 4. The effect of compost on leaf width, without compost (1) and with compost (2) at the age of 30 days after transplanting, vertical line= standard deviation



Figure 5. Female coiled root at 15 days old



Figure 6. Had grown root hairs and a leaf at 30 days old



Figure 7. A pop out leaf is male or sterile



Figure 8. Female with the a blue tag

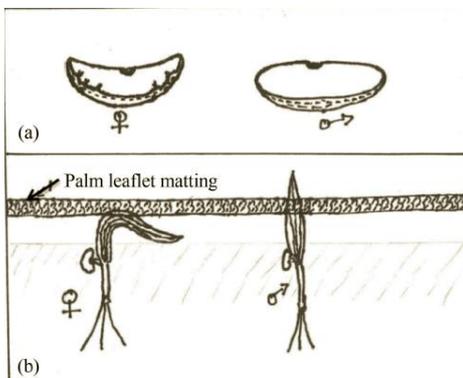


Figure 9. (a) female seed (left) and male (right), (b) circle leaf (female) and straight leaf (male) (Zango et al., 2016)



Figure 10. Female date with a circle first leaf

The Effects of Compost on Seedling Growth

Compost increased roots length and leaf length, but the amount of leaf was similar only one blade compared to without compost treatment (Figure 2 and Figure 3). Leaf length was 8.50 cm with compost and 8.02 cm without compost treatments (Figure 4). The length of root was 8.03 cm with compost and 7.65 without compost. The treatment with compost gave higher root length and leaf length than without compost, this due to compost contained macro and micro nutrients and high pH (Bernas *et al.*, 2017). This results similar to research done by (Aisueni *et al.*, 2009) showed that 100 g compost per seedling was enough for 6 months old plant and (Dialami and Mohebi 2010) found date plant grew well on high pH. Compost was important for root growth and plant growth simulator because it contained humic substance and auxine (Al-Mana *et al.*, 1996, Canellas *et al.*, 2002, Baldi & Toselli 2013, Enujeke 2013 & Trevisan *et al.*, 2010), increased nutrients absorption (Walker & Bernal 2008), when roots contact closely to the compost it created more contact space between hair roots and nutrients in compost (Bernas *et al.*, 2017 dan Curtis & Claassen 2005), this was occurred on palm date seedling nurseries. In producer date countries according to Klein and Zaid (2000) palm date needed a lot of compost or animal manure, where it needed about 15 kg per plant at beginning of planting in sandy soil. Similar results also reported by Al-Wasfy & El-Khawaga 2008 dan Elamin *et al.* 2017 organic and mineral fertilizers were commonly combined together for palm date on sandy soil. Therefore organic fertilizer (compost) are important in increasing root and plant growth starting from seedlings up to adult trees.

CONCLUSION

It was concluded compost and date seedling age affected female seedling and growth. Compost gave better in root and

leaf length growth than without compost. Transplanting was better at the age of 30 days than 15 days old seedling, the ability to grow about 95% for 30 days old but it was only 45% for 15 days old seedling. It was found that female seedling was about 25% and the rest (75%) was male or sterile. Beside curly first leaf, other characteristic of female seedling was coiled root and it was visible at 15 days old seedling. It is needed further investigation on growing female seedling in the field and could it produce fruit.

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