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THE GROWTH OF *Casuarina equisetiofolia* SEEDLING ON VARIOUS GROWTH MEDIA DENSITIES OF OIL PALM FRUIT FIBER

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Abstract

The aim of study was to know the growth and biomass of C. equisetifolia at various growth densities of oil palm fruit fiber. The study was carried out at the research station of Agricultural Faculty, Bengkulu University. Three media growth densities were 1.125,1.00, dan 0.875 gram/mm^3. Research design that been applied was randomize complete block design with four replications. The result showed that the growth media density of oil palm fruit fiber resulted in significantly affect the growth of C. equisetifolia seedlings. The media growth density with 1.00 gram/cm^3 was the best media for the growth of C. equisetifolia seedlings, diameter, stem dry weight, root dry weight, and seedling quality were 23.50 ± 5.42 cm,1.919 ± 0.24 mm, 0.185 ± 0.091 gr plant-1, 0.188 ± 0.075 gr plant^{-1}, and 0.025± 0.0094 respectively.

INTRODUCTION

*Casuarinaequisetifolia*is an importan species for coastal conservation. It has been used as windbreak and as protector from abrasion. In plantation, traditionally, equisetifoliaseedlings were prepared using top soil and manure as growing media, and packed in plastic containers or polybags.

The use of top soil in nursery practicesmay have some drawbacks, such as: reducing soil fertility of the areas where the top soil were removed (Hendromono dan Durahim, 2004), physically heavy and not compact and, lot of risk of pest and disease (Hendromono, 1988). Therefore, an alternative growing media to assure a compact media that may keep better root system, especially during transportation is needed. A better growing media may have effect on the success of the plantation and how the trees will grow. On a marginal condition, tree growth will be affected by root conditions, water stress and how well root connected to the media (Nyland, 2002).

Quality of seedlings in the nursery mostly depend on the condition of growth media, especially on the condition of mass organic and the availability of nutrition (Durahim dan Hendromono, 2001). Growth media has a function as a place where water, nutrition and oxygen are available for plantphysiological processes and for soil microbes. Growth media is

also the place where roots grow and develop to support the seedlings (Nursyamsi dan Tikupadang, 2014).

A good growth media must be able to supply nutrition for the seedlings, to protect root from damage and dryness, and to quarantee a better growth while seedlings in preparation, in the nursery, in the storage or during transportation. Good growth media should also be easy to handle, efficient, compatible with the plantation technique and tool, and assuring best survivability and growth of the trees after planting (Nyland, 2002).

Oil palm fruit fibers is an organic matters that has not yet optimally used as high economically materials. Based on their origin, organic matters may come from organic plant materials such as leaves, branches, stems, fruits and roots (Indriani, 2007).Oil palm proccessing may produce waste of fresh fruit fibers as much as 11.5%. Dry weigh of this waste material contains nitrogen (0,320 %), phosfor (0,080 %), kalium (0,470 %), magnesium (0,020 %), and calcium (0,110%) (Direktorat Pengolahan Hasil Pertanian Department Pertanian, 2006).Organic compost may repair soil structure by increasing soil organic content and keeping water content in the soil (Isro'i, 2007). Many researches have shown that integrating organic material positively affect seedlings quality. These reasons provide an opportunity for establishing a research on effects of oil palm fruit fiber growth media densities on growth of *Casuarina equisetifolia*.

METHODOLOGY

The research was conducted in the nursery of the Forestry department, Agricultural faculty , Bengkulu university, from March to June 2016. The experiment was planned using Randomized Block Design with 3 blocks as replication and 4 seedlings per unit penelitian. The treatment is three levels of oil palm fruit fiber growth media densities, which:1.125, 1.00, and 0.875 gram/mm^3. Oil palm fruit fibers were mix together with glue prepared from sago starch and water (2400ml water/0,25 kg sago starch) and packed according to densities. Height and diameter of the seedlings were observed every 14 days, until all about 12 observations. At the end of the observation dry weight of the seedlings biomass were measured after being dried in an oven for 3 days at 80^{o}C, then grouped for leave, stem and root. Quality Index of Seedlings was calculated following Bickelhaupt formula :(Rusdiana*et al*. 2000)

$$\mathbf{Q} = \frac{Stem\ Dry\ Weight\ (gram)\ +\ Root\ Dry\ Weight(gram)}{\frac{Stem\ Height\ (cm)}{Stem\ Diameter\ \ (mm)} + \frac{Stem\ Dry\ Weight(gram)}{Root\ Dry\ Weight\ (gram)}}$$

In which:
Q = Seedling Quality Index
Good Quality Seedling = Q > 0,09.

RESULT AND DISCUSSIONS

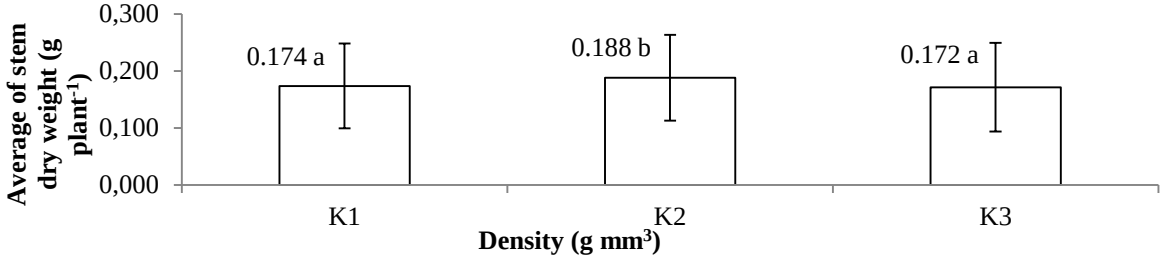
Seedling Growth

Results showed that treatments significantly affected the growth and biomassa of *C equisetiofolia* seedling. The media growth density with 1.00 gram/cm^3 was the best media for the growth of *C. equisetifolia* seedlings, diameter, stem dry weight, root dry weight, and seedling quality were 23.50 ± 5.42 cm,1.919 ± 0.24 mm, 0.185 ± 0.091 gr plant-1, 0.188 ± 0.075 gr plant^{-1}, dan 0.025± 0.0094 consequtively. This condition might be caused by the ability of the fruit fiber media at density with 1.00 gram/cm^3 to hold water better than the other. In addition the media were also give to provide a good aeration to the growth of root. The proper media environment could generate a good root system to support the seedling growth. According to Gardner et al., (1991) lack of water can inhibit the growth of the canopy and roots, but have a relatively larger impact on the growth of the canopy.

Table1. The growth of high, diameter, root, steam, and leaf dry of *C equisetifolia* seedling

Treatments	High (cm)	Diameter (mm)	Dry weight (g plant^{-1})		
			Leaf	Stem	Root
K1	22.77 ±5.37 a	1.846 ±0.22 ab	0.184 ±0.89 a	0.174 ±0.074 a	0.112 ±0.065 a
K2	23.50 ±5.42 b	1.919 ±0.24 a	0.185 ±0.091 a	0.188 ±0.075 b	0.151 ±0.080 b
K3	22.71 ±5.32 a	1.843 ±0.22 b	0.183 ±0.88 a	0.172 ±0.078 a	0.138 ±0.075 b

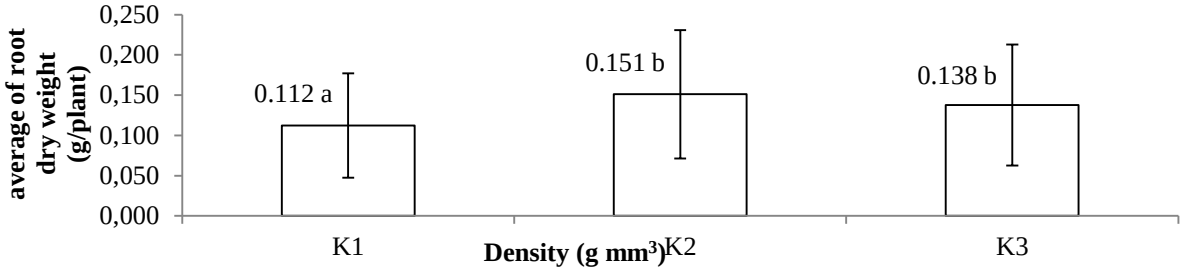
Figure 1 showed that the various density of oil palm fruit resulted in a significant effect on the average of dry weight of seedling stem. The highest mean of seedling stems occurred at the density media of 1.00 with the value about 0.188 ± 0.075 g plant^{-1}, that was followed by 1.125, and 0.825 g plant^{-1} with the value of 0174 ± 0074 and 0172 ± 0078 g plant^{-1}.



Note :
K1 : the density of media 1.125 gram/cm^3 K3 : the density of media 0.825 gram/cm^3
K2 : the density of media 1.00 gram/cm^3

Figure 1. The average of *C equisetiofolia* stam dry weight on various media density of oil palm fruit fiber.

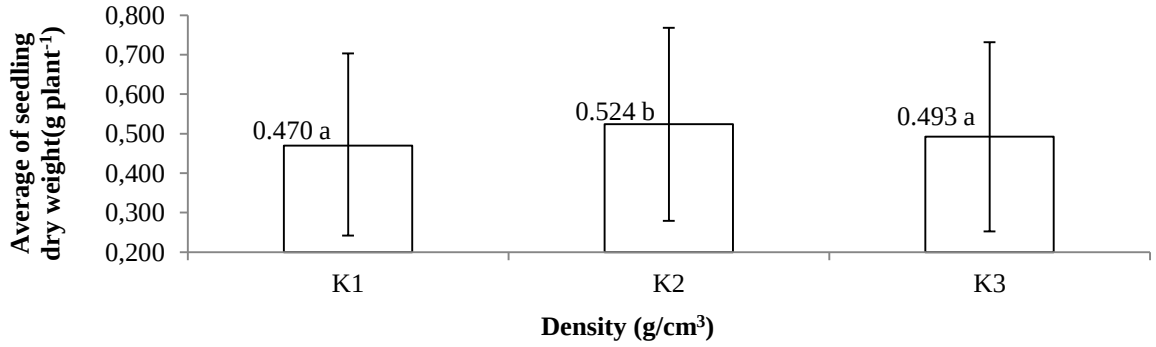
The highest value of root dry weight was resulted at the media density of 1.00 g plant^{-1} that followed by the media density of 0.825 and 1,125 g plant^{-1} with the value was about 0,151 ±0.080, 0.138 ±0.075, and 0.112 ±0.065 g plant^{-1} (Figure 2).



Note :
K1 : the density of media 1.125 gram/cm^3 K3 : the density of media 0.825 gram/cm^3
K2 : the density of media 1.00 gram/cm^3

Figure 2. The average of *C equisetiofolia* root dry weight on various media density of oil palm fruit fiber.

It indicated that the highest media density of oil palm fruit fiber was not capable to support the good growth of *C equisetifolia* due to the *C equisetifolia* root could not well develop in the media. On the other hand, the least media density of oil palm fruit fiber was not able to hold water so that the humidity of media was not suitable to the growth of *C equisetifolia* seedling. This condition would affect water absorbtion by the seedling root. According to Maynard dan Orcott (1987) the plant cell and tissue consict of water about 85-90%. Root biomass of *C equisetiofolia* could not able well grow and develop at the densest media because of the bad porosity of the media. According to Rusdiana et al, (2000) state that the soil density affects to the above and under-ground plant growth of *Paraserianthes falcataria*.

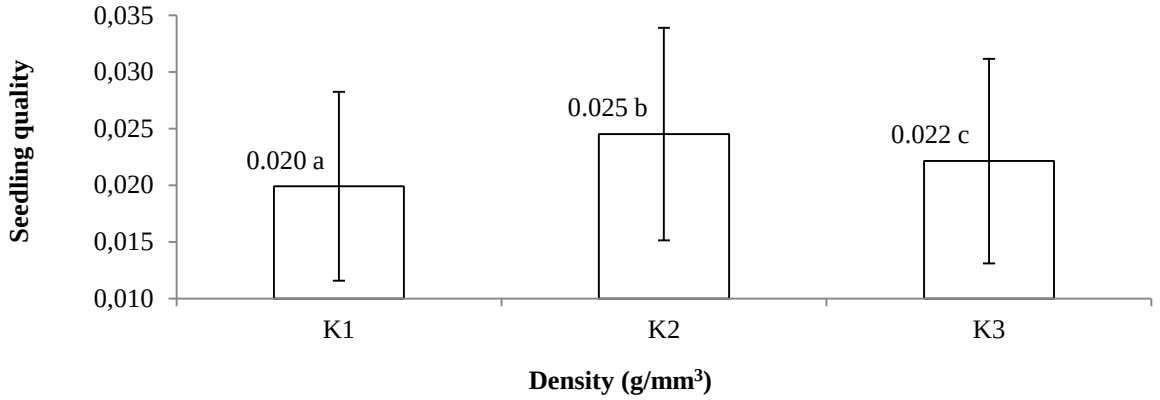


Note :
K1 : the density of media 1.125 gram/cm^3 K3 : the density of media 0.825 gram/cm^3
K2 : the density of media 1.00 gram/cm^3

Figure 3. The average of *C equisetiofolia* seedling dry weight on various media density of oil palm fruit fiber.

Seedling Quality

The analysis of the result showed the media density was also significantly affect the quality of seedling (Figure 4).



Note :

K1 : the density of media 1.125 gram/cm^3 K3 : the density of media 0.825 gram/cm^3

K2 : the density of media 1.00 gram/cm^3

Figure 4.The quality of *C equisetifolia* seedling that growing at the various media density of oil palm fruit fiber.

The highest quality of C equisetifolia occurred at the growth media of oil palm fruit fiber with the density of 1.00 g plant^{-1}. It was followed by the growth media of oil palm fruit fiber with the density of 0.825 and 1.125 g plant^{-1}. The lowest seedling quality occurred at the growth media of oil palm fruit fiber with the density of 1.125 g plant^{-1} because the seedling root could not well growth and develop at the growth media

CONCLUSION

The growth media density of oil palm fruit fiber resulted in significantly affect the growth of *C. equisetifolia* seedlings. The media growth density with 1.00 gram/cm^3 was the best media for the growth of *C. equisetifolia* seedlings, diameter, stem dry weight, root dry weight, and seedling quality were 23.50 ± 5.42 cm,1.919 ± 0.24 mm, 0.185 ± 0.091 gr plant-1, 0.188 ± 0.075 gr plant^{-1}, dan 0.025± 0.0094 consequtively.

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