GROWTH PERFORMANCE OF *Paraserianthes falcataria* (BATAI) PLANTED IN BIOPLASTIC POTS TITLE

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ABSTRACT

Paraserianthes falcataria, a fast growing tree species was evaluated for 180 days planted in bioplastic pots. Six different ratios of newspaper and bioplastic mixture (N100:B0, N90:B10, N70:B30, N50:B50, N30:B70 and N10:B90) were used for pot making. The heights of the seedlings were measured together with root penetrations through the bioplastic pots at the end of evaluation period. Results showed that the seedlings planted in 100% fully newspaper pot had the highest percentage of mean height 4964.94% meanwhile the N30:B70 had the lowest percentage of height 4396.65%. No significant difference between the height and the ratio of bioplastic mixing at the p≤0.05 for the seedlings and negative impact to the plant growth. From the observation also, the number of seedling roots penetrated through the bioplastic pots were more than 10 roots where the root systems were able to break through the pot wall.

Key words: *Paraserianthes falcataria*, Bioplastic Pot, Root, Growth.

Introduction

Paraserianthes falcataria also known as Batai, originated from Indonesia. It is a fast growing tree species and able to grow in any soil conditions. Thus, the species is a favourable species for plantation purpose. Besides that, *P. falcataria* was one of the recommended timber species by Malaysia Timber Industry Board (MTIB) for the Development of Forest Plantation Programme (MTIB, 2015) in Malaysia.

Like the other fast growing species, this species had become more demand and expected to be more important to the supply for wood industry (Haruni *et al*., 2011). As such for the expansion of plantation to meet market demand, more petroleum-based

polybags are needed. This indirectly causes the disposal of polybags which becomes an issue to the plantation sector. The usage of polybag also affects the growth performance of the seedlings where the roots would tend to bend into J-shape at the bottom of the polybag. This reduces the plant growth and survival of the seedlings when transplanted into the field (Evan & Karcher, 2004). Therefore, an alternative solution is needed such as the usage of bioplastic pots to promote seedling growth. The bioplastic pots were produced from bio-based materials and able to degrade by themselves. Evan & Kracher (2004) also mentioned that this attempt enables the planting activity carried directly out into the field and reduces the planting time. Nevertheless, the design of the bioplatic pot promotes the growth of roots and the roots are able to break through the pots (Evan et al., 2010; Schettini et al., 2013).

Despite the introduction of bioplastic pot, limited study had been published regarding to the growth performance of plants grown in bioplastic pot. Research done by Yamauchi et al. (2006) had made degradable pot from sweet potato distillation lees and newspaper. The results show that the plants had grown well in the pots. Thus in this study, the objectives were to measure the height of the *P. falcataria* and the number of roots penetrated through the bioplastic pot.

Materials and methods

Newspaper, tapioca starch, vinegar, glycerol (99.5% concentration) and water were used as raw materials to form bioplastic pots. Collected newspapers obtained from the recycled centre were shredded and soaked overnight before undergone defibrillization for 15 minutes using Valley Beater.

Appropriate amount of bioplastic and newspaper pulp were weighed based on the ratio (Newspaper:Bioplastic) - (N90:B10, N70:B30, N50:B50, N30:B70, N10:B90). The mixture for each ratio was mixed together and heated on the hot plate at 70-80°C until sticky gel texture was achieved based on Liew and Khor (2013) where plasticization occurred. Besides that, pots made from 100% newspaper pulp were also made as Control in this study. Thirty replicates for each ratio including Control were produced. The bioplastic pots were formed into a shape with the measurement of 35 mm width, 100 mm height and 2 mm thick. The formed pots were oven-dried at 70°C for 24 hours to achieve the equilibrium moisture content. Conditioned bioplastic pots were planted with *P. falcataria* seeds obtained from Forest Research Centre (FRC) Sandakan.

The initial heights of the seedlings were measured from the range of 0.1 mm-20.0 mm and the final heights measured at the end of 180 days. The percentage of seedlings height was calculated based on the formula below. The numbers of root penetrated through the pots were also calculated using the following equation.

$$\text{Percentage of height (\%)} = \frac{H_f - H_i}{H_i} \times 100\%$$

H_i = Initial height (mm)
H_f = Final height (mm)

Results and discussion

P. falcataria grew well throughout the evaluation period. From Figure 1, it was shown that the plant grown in 100% fully newspaper pot had the highest percentage mean of seedling height 4964.94±1654.02% meanwhile bioplastic pot N30:B70 showed the lowest percentage of height 4396.65±1571.33%. However, from the ANOVA analysis, there was no significant difference ($P=0.848$) between the height and the bioplastic ratio at the $p \leq 0.05$. Thus, it shows that there was no negative impact in retarding the growth of seedlings. The seedlings grew suitably in any of the bioplastic pots.

At the end of the evaluation period, the bioplastic pots were observed for the development of roots from the seedlings. From Figure 2 we can observe that most of the bioplastic pot had more than 10 root penetrations through the pot. The primary roots were able to break through the wall and promote better growth on the root system of seedlings (Figure 3). This is in accordance with the research done by Evan et al. (2010) and Schettini et al. (2013). Moreover, the primary root did not grow in bended J-shaped and the root system is widely spread corresponding to the research done by Evan & Kracher (2004).

Conclusion

In conclusion, this research showed good growth performance of *P. falcataria* seedlings in bioplastic pot. As overall, *P. falcataria* seedlings that grow in 100% fully newspaper had higher percentage mean of height (4964.94%). However, there was no significant different between the seedlings height and the bioplastic pot from different mixing ratios. Thus, the seedlings were able to grow in any of the bioplastic pot and at the same time allowed the seedlings to develop very active root system. Most of the bioplastic pot had more than 10 root penetrations. Thus, the design of the pot allowed penetration of roots.

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Figure 1: Average percentage mean of plant height at 180 days.
[NS] Not significant at P>0.05

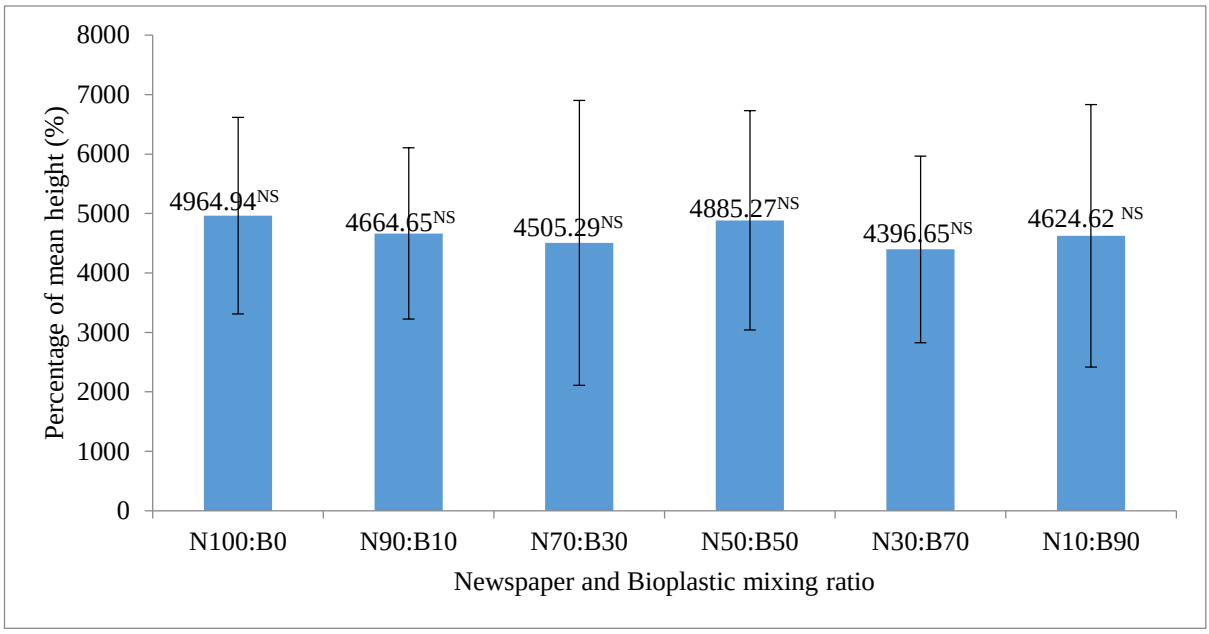

Figure 2: Percentage of number of root penetrated on bioplastic pot.

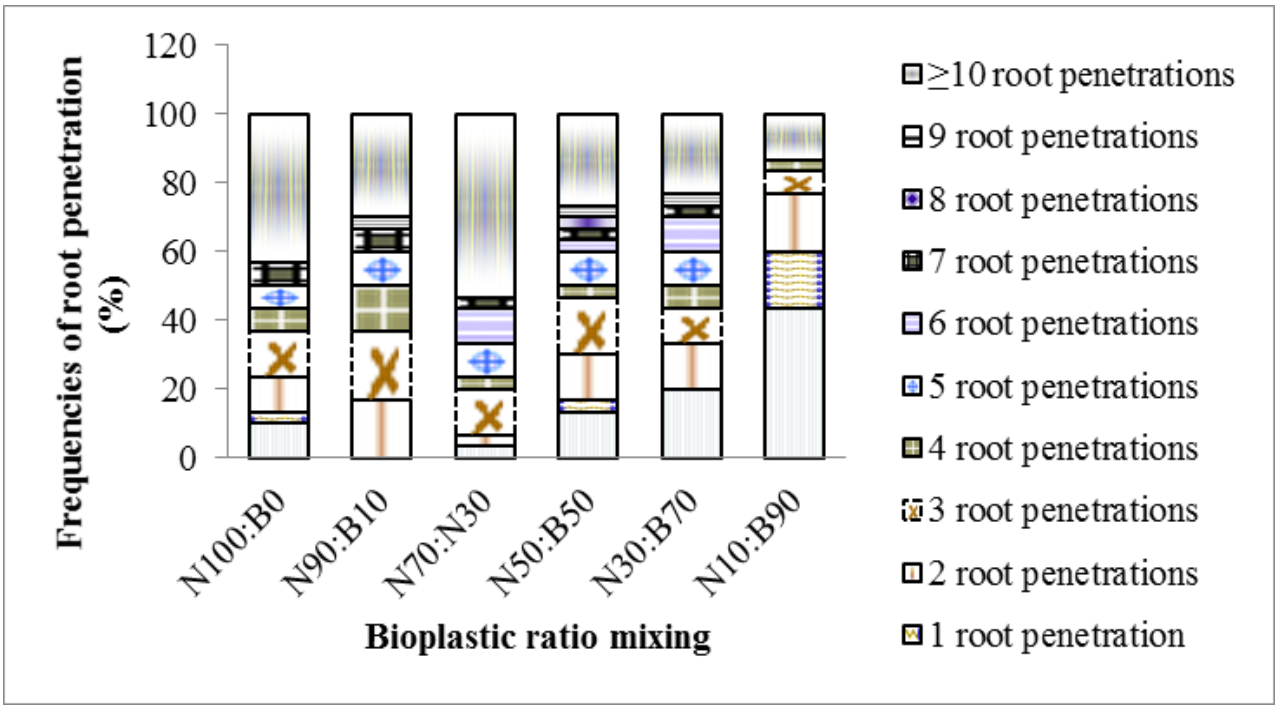

Figure 3: Root developments in newspaper pot (a) and different mixing ratio of bioplastic pot (b) N90:B10, (c) N70:B30, (d) N50:B50, (e) N30:B70, (f) N10:B90.


(a)


(b)


(c)


(d)


(e)


(f)

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