SELECTION OF PLANTS BASED ON NET CARBON DIOXIDE ABSORPTION FOR THE COASTAL GREEN OPEN SPACE

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ABSTRACT

The specific purpose of this study is to select coastal plant based on net carbon dioxide absorption. The coastal plants are Acacia sp, Pandanus tectonius, Swettiana mahagoni and Samaena saman (Jacq Merr). The value of carbon dioxide absorption rate is determined in one room of plant testing house. The results showed that P. tectonius has the highest CO_2 absorption rate compared to the other ones. Therefore, it is worth to select the plant for the application of coastal green open space.

Keywords*: Plants selection, carbon dioxide, absorption*

INTRODUCTION

Changes of environmental conservation system and the increase of landuse for human settlement impacted on coastal mangrove area. The plants are getting more experiencing degradation about 5 percent a year than the land itself. Mangrove forest covering 860 million hectares have been damaged around 530 million hectares. According to Brunes et al. (2001), these plants play an important role in stabilizing coastal ecosystem, as retarder of abrasion, wave erosion and strong wind either physically or biologically. But in terms of benefit, according to Ronaldo (2001), people have made the use of mangrove fruits to be consumed as a kind of food. For example *Bruguiera gymmonihiza*, its fruit is usually processed into a cake. The massive change of function of green open space give negative impacts to the coastal areas. Social and physical environment and its economic life aim to give a better and balanced environmental quality, however, the negative impact occured in urban areas especially coastal communities (Mangkoedihardjo, 2005). An approach to substitute for mangrove to other coastal plants has been conducted by researchers. One of the beach trees, which is widely used coastal countries is Acacia. In addition, according to Umezawa et al. (2008), even Acacia is one of the most important tropical plantation tree in Indonesia and Malaysia, however, its biotechnology is still at a primitive stage. In this research, the alternative solution being offered is alternative plants to replace coastal mangrove plants to be coastal vegetation. This research is supported by the fact that the provision of coastal plants is rarely conducted (Langkoke, 2010). In order to get the appropriate plant species, this study aims to determine a net CO_2 absorption to select plants for coastal green open space. The benefit of this study is to support sustainable sanitation development (Mangkoedihardjo, 2007a), which can prevent marine pollution in the area.

METHODS

This study was conducted in Marisso District, coastal area of Tanjung Bunga, Makassar. This research location was selected on purpose considering that it could represent two coastal areas as regional area. The plants tested were *Acacia* sp, *Pandanus tectonius*, *Swettiana mahagoni* and *Samaena saman* (Jacq Merr). The plants chamber were provided with the following size: 200 m (in length), 200 m (in width), 1.80 m (in height) (Heryani and Handayani, 2012). All plant species have a uniform height, ie 0.6 m.

This experimental design was highly affected by the sunlight, temperature, and humidity inside and outside of experimental plant chamber (Suhardyanto and Matsuoka, 1999). Therefore, the construction of plant chamber on roof position has top hole for natural ventilation, which functions as air circulation and radiation of the sun. Then soil sensor device of CO_2 flux system of air pollutant was required to detect how big the air pollutant affecting this experimented plant. After being treated, it was put into machine for 20 minutes and continued by analyzing the CO_2 gas absorption.

Carbon dioxide analysis used Gas Chromatography and its measurement used Gravimetric method (Heryani and Handayani, 2012) that all were conducted in Jakenan Laboratory of Agricultural Environmental Research in Pati, Central Java. The results below are the average of three experimental results.

RESULTS AND DISCUSSION

Table 1. *CO_2 absorption and emission rates for test plants*

Age *P. tectonius* (months)	Abosorption (g/kgDW/month)	Emission (g/kgDW/month)	Net Abosorption (g/kgDW/month)
1	10.81	1.20	9.61
2	15.27	1.77	13.50
6	19.31	2.72	16.59
9	20.30	2.64	17.66

From the results of Table 1, it is clear that *P. tectonius* is selected as a plant for coastal green open space. Furthermore, the selected plant was re-tested on the effect of plant age, young (1-2 months) and old (6-9 months). The results of the retest were presented in Table 2.

Table 2. *CO_2 absorption and emission rates for young and old P. Tectonius*

Age *P. tectonius* (months)	Abosorption (g/kgDW/month)	Emission (g/kgDW/month)	Net Abosorption (g/kgDW/month)
1	10.81	1.20	9.61
2	15.27	1.77	13.50
6	19.31	2.72	16.59
9	20.30	2.64	17.66

From the results of Table 2, there was a significant difference in carbon dioxide absorption due to differences in plant age. The difference is probably caused by intracellular CO_2 levels, which are affected by the plant age (Willmer et al., 1988). In addition, it is also possibly due to nutrient response and environmental factors such as no clipping during plant exposure that were found by Hodar et al. (2008), and days of planting (Mangkoedihardjo, 2007b).

CONCLUSION

The selection of coastal plant for *Pandanus tectonius* is greatly determined by net CO_2 absorption. There is a plant age, which shows the greatest absorption. This is a preliminary study, therefore further research is needed.

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