Int. j. adv. multidisc. res. stud. 2023; 3(4):746-749

Received: 16-06-2023
Accepted: 26-07-2023

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Analysis of Production and Nutrient Potential of *Rhizophora mucronata* Liter in the Puntondo Mangrove Conservation Area in Laikang Village, Mangarabombang Sub-District, Takalar District

[1] Yolanda, [2] Asbar, [3] Muhammad Yunus

[1] Student, Marine Science Study Program, FPIK, Indonesian Muslim University, Makassar, Indonesia
[2, 3] Lecturer, Marine Science Study Program, FPIK, Indonesian Muslim University, Makassar, Indonesia

Corresponding Author: **Asbar**

Abstract

Yolanda, 2023 This study aims to determine how much leaf litter production, nutrient content (C, N, P, and K) from *rhizophora mucronata* leaf litter in the mangrove conservation area Puntondo Hamlet, Laikang Village, Mangarabombang District, Takalar Regency. Litter has a major influence on nutrients that enter the soil because most of the nutrients return to the soil through fallen leaves. Sampling for mangrove vegetation analysis is carried out by transect-squared method. Litter fall is captured by *litter-trap*, the average value of litter production is calculated using the formula of the average value of production per plot, for the production of nutrient potential from litter, nutrient analysis (C, N, P, and K) is carried out in the laboratory. Rhizhophora mucronata litter production in the Puntondo Hamlet Mangrove Conservation area at station III amounted to 15.51 tons / ha / year, station II 13.71 tons / ha / year, station I 11.31 tons / ha / year. The nutrient content of Rhizhophora mucronata is carbon (C) with an average of 16.53 tons / ha / year, nitrogen content (N) with an average of 1.06 tons / ha / year, forsor content with an average of 0.77 tons / ha / year, and an average potassium content of 0.95 tons / ha / year.

Keywords: Puntondo Mangrove Conservation Area, Litter Production, Nutrients

Introduction

Mangrove forests are typical forest formations and grow in tidal areas, especially on sheltered (calm) beaches, lagoons, and river estuaries with muddy or slightly sandy soil (Arief 2003) [3]. Analysis of nutrient composition in litter production can show limiting nutrients and efficiency of nutrients used, so that the nutrient cycle in mangrove forest ecosystems will be maintained (Vitousek 1982) [11]. Boonruang (1984) explained that the productivity of mangrove litter is a source for fisheries productivity in estuaries and a contributor of nutrients to the surrounding waters.

This makes mangroves play a unique role and cannot be replaced by forests or other ecosystems, namely as an important nutrient cycle link for aquatic organisms (Amarangsinghe & Balasubramanian, 1992) [2]. Mangrove plants are a potential food source, in various forms, for all biota living in mangrove ecosystems. Unlike other coastal ecosystems, the basic component of the food chain in the ecosystem is not the mangrove plants themselves, but litter derived from mangrove plants (Bengen 2004) [4].

Puntondo Mangrove conservation area, Laikang Village is located in Mangarabombang District, Takalar Regency. In this area, there are many mangroves with different types protected by the surrounding community, one of which is the type of *rhizophora mucronata*. The litter produced on mangrove leaves is an important part in the transfer of organic matter from vegetation into the soil. Nutrients produced by litter are very important in mangrove growth and as a source of detritus for marine ecosystems and estuaries in supporting the life of various acoustic organisms.

Therefore, this study aims to determine how much litter production and potential nutrient content of *rhizophora mucronata* in the mangrove conservation area of Puntondo hamlet, Takalar regency. The results of this study are expected to provide insight into litter production and nutrient content (C, N, P, and K) and provide a basis for more effective management and conservation efforts in the region.

Materials and Methods

This research has been carried out in March 2023 – April 2023. Located in the Mangrove Conservation Area, Puntondo Hamlet, Laikang Village, Mangarabombang District, Takalar Regency, South Sulawesi. Sampling for mangrove vegetation

analysis is carried out by transect-squared method. Litter fall is captured with *litter-trap, litter production is* calculated using the formula of the average value of production per plot, for the production of nutrient potential from litter, nutrient analysis (C, N, P, and K) is carried out in the laboratory. The map of the research location can be seen in the picture below.

Fig 1: Research Location

The tools and materials used in this study can be seen in the table below.

Table 1: Tools and materials

Tool	Uses
Net/liter-trap. Size 5m x 5m	To accommodate mangrove leaves
Gram Scales	To weigh the alkaline weight and dry weight of mangrove dau
Plastic bag. Liter/bag	Accommodating samples
Leash	To tie Liter bag
Camera	Documentation
HVS Paper Bags	Sample placement
Stationery	To take notes
Stakes and Paper labels	Location and Sample Marking
Material	**Uses**
Leaf litter	Litter test
Rhizophora mucronata	Leaf Test

The sampling method to capture litter fall in mangrove forests within a certain time (*liner-fall*) is by *litter-trap* (Brown, 1984) [6]. *Litter-trap* in the form of a container net measuring 5 m x 5 m, which is made of nylon with a mesh size of about 1 mm and the bottom is ballasted. *Litter-traps* are placed among the nearest mangrove vegetation at a height above the highest tide line. At each station installed 2 holding nets.

The data obtained from the observation of the station are processed in the form of a table. The average litter data analyzed per period g/m²/day to determine the litter production was carried out using a formula (Rizal, 2018) [12].

$$Xj = (\sum Xi)/n$$

Information:

Xj = Litter production per period (grams dry weight/m²/7 days)

Xi = Dry Weight of Mangrove leaves (grams dry weight)

n = Litter-trap area (m^2)

$$P = (\sum Xj)/t$$

Information:

P = Daily litter production (grams dry weight/m²/day)

Xi = Dry weight of mangrove leaves per Period (grams dry weight)

t = Install time per period (7 days)

While the potential of nutrients that can be utilized (*litterfall nutrient accession*) can be done using the following equation (Djamaludin 1995):

$$NA = N \times P$$

Information:

NA = *Nuttrient accession* / nutrients produced (g / m2 / day)

N = Nutrient content

P = Litter production (g/m2/day)

Analysis of carbon and nitrogen content in mangrove litter was carried out descriptively. Furthermore, it will be displayed in the form of a graph/histogram that illustrates the relationship between carbon levels, nitrogen and phosphorus levels found at each observation station. Essential nutrients are absolute and needed by an organism, namely nitrate and phosphate because these two elements cannot be replaced by other elements. Nitrate (NO3) and phosphate (PO4) are nutrients that determine the stability of vegetation growth (Hartoko 2013) [9].

Sufficient nutrient content affects the growth rate of mangroves. Each mangrove has a different ability to absorb and store the same nutrients for growth. The most needed nutrients in large quantities are organic matter. Organic matter decomposed with the help of microbes will be a source of nitrates and phosphates. The difference in nutrient content can be influenced by the characteristics of the mangrove itself.

Results and Discussion

The results of litter production obtained litter production values can be seen in Table 2 below.

Table 2: *Rhizophora mucronata* litter production

Station	Plot	Wet Weight (gr)	Wet Weight (gr/m²/hr)	Dry Weight (gr)/m²/7 hr	Dry Weight(gr)/m²/hr	Litter Weight (ton)/ha/th
I	1	100	14.29	19.18	2.74	10.00
	2	80	11.43	24.2	3.46	12.62
Average		**90**	**12.86**	**21.69**	**3.10**	**11.31**
II	1	150	21.43	25.3	3.61	13.19
	2	80	11.43	27.29	3.90	14.23
Average		**115**	**16.43**	**26.30**	**3.76**	**13.71**
III	1	170	24.29	39.97	5.71	20.84
	2	85	12.14	19.53	2.79	10.18
Average		**127.5**	**18.21**	**29.75**	**4.25**	**15.51**

Based on Table 2 above. Mangrove litter produced per day based on Table 4 above at station I plot 1 amounted to 14.29 gr/m²/day plot 2 11.43 gr/m²/day with a total of 25.71 gr/m²/day, station II plot 1 amounted to 21.43 gr/m²/day plot 2 11.43 gr/m²/day with a total of 32.86 gr/m²/day, and station III plot 1 amounted to 24.29 gr/m²/day plot 2 12.14 gr/m²/day with a total of 36.43 gr/m²/day.

Mangrove litter produced per day based on Table 2 above at station I plot 1 amounted to 14.29 gr/m²/day plot 2 11.43 gr/m²/day with an average of 12.86 gr/m²/day, station II plot 1 amounted to 21.43 gr/m²/day plot 2 11.43 gr/m²/day with an average of 16.43 gr/m²/day, and station III plot 1 amounted to 24.29 gr/m²/day plot 2 12.14 gr/m²/day with an average of 18.21 gr/m²/ day.

Mangrove litter after heavy drying of litter / 7 days based on Table 2 above. So the results were obtained namely the dry weight at station I plot 1 of 19.18 gr/m²/7 days plot 2 of 24.22 gr/m²/7 days with an average of 21.69 gr/m²/7 days, station II plot 1 of 25.3 gr/m²/7 days plot 2 of 27.29 gr/m²/7 days with an average of 26.30 gr/m²/7 days, and station III plot 1 of 39.97 gr/m²/7 days, plot 2 of 19.53 gr/m²/7 days with an average of 29.75 gr/m²/7 days.

Dry weight of litter/day based on Table 2 above. So the results were obtained namely the dry weight at station I plot 1 of 2.74 gr/m²/day plot 2 of 3.46 gr/m²/day with an average of 3.10 gr/m²/day, station II plot 1 of 3.61 gr/m²/day plot 2 of 3.90 gr/m²/day with an average of 3.76 gr/m²/day, and station III plot 1 of gr/m²/day of plot 2 of 2.79 gr/m²/day with an average of 4.25 gr/m²/day.

The production of ton/ha/year of mangrove litter in Laikang Village produced based on Table 4 above, the results were found, namely litter production at station I plot 1 of 10.00 tons/ha/year plot 2 of 12.62 tons/ha/year, station II plot 1 of 13.19 tons/ha/year plot 2 of 14.23 tons/ha/year, and station III plot 1 of 20.84 tons/ha/year plot 2 of 10.18 tons/ha/year. The average annual litter contribution in the Puntondo Mangrove Conservation Area, Laikang Village, Mangarabombang District, Takalar Regency can be seen in Fig 2 below.

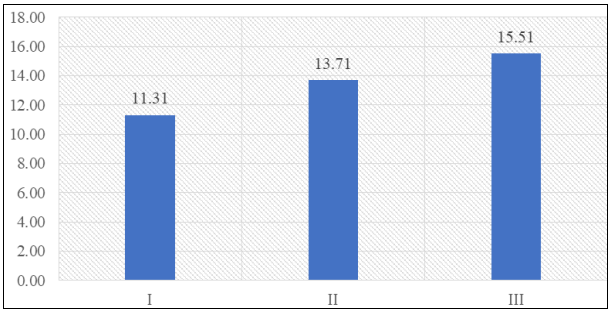

Fig 2: Litter Production (tons/ha/tahun)

Based on the diagram above, it is known that the average annual litter production produced by Rhizophora mucronata mangrove leaves in the largest Laikang Village at station III amounted to 15.51 tons / ha / year, station II 13.71 tons / ha / year, station I 11.31 tons / ha / year.

According to Andrianto, *et al*., (2015) explained that the shape and size of the leaves of the type of Rhizophora sp. larger so that it causes leaves to fall more easily when buffeted by wind, then Munir (2004) [10] explained that the physiological properties of leaves are also one of the causes of easy leaf fall, where leaves play an important role in photosynthesis to produce carbohydrates.

Tabel 3: Nutrient *Rhizophora mucronata*

Station	Nutrient Production (ton/ha/year)			
	Carbon	Nitrogen	Fosfor	Potassium
I	13.06	0.83	0.49	0.74
II	15.39	0.99	0.79	0.97
III	21.14	1.35	1.03	1.15
Average	16.53	1.06	0.77	0.95

Based on Table 3, that the amount of potential production of litter nutrients or potential nutrients that can be utilized in the Takalar Regency Mangrove Conservation Area shows that the carbon potential (C) with an average of 16.53 tons / ha / year, nitrogen content (N) with an average of 1.06 tons / ha / year, forsor content with an average of 0.77 tons / ha / year, and the average potassium content of 0.95 tons / ha / year.

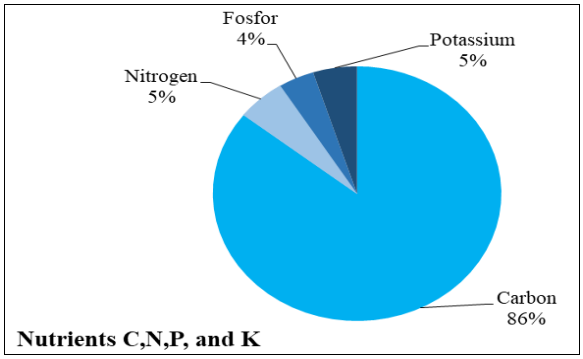

Fig 3: Nutrient Potential

Based on Fig 3 above, it can be seen that the content of element C in mangrove leaf litter is much greater than the production of element N content (5%) and the production of element K content (5%.) and the production of element P (4%).

Conclusion

The conclusions of this study are:

1. Rhizophora mucronata *litter production* in the Puntondo Hamlet Mangrove Conservation area at station III amounted to 15.51 tons / ha / year, station II 13.71 tons / ha / year, station I 11.31 tons / ha / year.
2. The nutrient content of *Rhizophora mucronata* is carbon (C) with an average of 16.53 tons / ha / year, nitrogen content (N) with an average of 1.06 tons / ha / year, forsor content with an average of 0.77 tons / ha / year, and an average potassium content of 0.95 tons / ha / year.

References

1. Andriano F, Bintaro A, Yuwono SB. Production and Decomposition rate of Mangrove Litter (Rhizophora sp.) in Durian Village and Batu Menyan Village, Padang Cermin District, Pesawaran Regency. Journal of Forestry and Agriculture. 2015; 1(3):13-15.
2. Amarangsinghe MD, Balasubramanians. The net primary productivity of two mangrove forests stands on

the Norwestern Coast of Sri Lanka in Developments in Hydrobiology. The ecology of mangroves and related ecosystems. Kluwets Academy Publishers. Netherlands, 1992, 41- 47.
3. Arief A. Mangrove Forest, Functions and Benefits. Kanisius Publishers; Yogyakarta, 2003, p47.
4. Bengen DG. Technical guidelines for the introduction and management of mangrove ecosystems. IPB Research Center for Coastal & Marine Resources. Bogor, 2004, p56.
5. Boonroom P. The rate of degradation of mangrove leaves, Rizhopora apiculata BL and Avicennia marina (FORSK) VIERH at Phuket Island, Western Peninsula of Thailand. In: Soepadmo, E., A.N. Rao & D.J Macintosh. (eds). 1984. Proceedings of the asian symposium on mangrove environment research and management. University of Malaya and UNESCO. Kuala Lumpur, 1984, 200-208.
6. Brown, Gillian and Yule George. Discovery Analysis. Cambridge: Cambridge University Press, 1984.
7. Bunyavejchewin S, Nuyim T. Litterfall production in a primary mangrove Rhizophora apiculata forest in southern Thailand. Silvicultural Research Report, 2001, 28-38.
8. Djamaluddin R. The contribution of mangrove forests in the provision of potential nitrogen and phosphorus in Likupang waters, Minahasa Regency, North Sulawesi. thesis. Bogor Agricultural University, Bogor, 1995, p104.
9. Hartoko A, Prijadi S, Ayuningtyas I. Analysis of chlorophyll-α, nitrate and phosphate in mangrove vegetation based on field data and geoeye satellite data on Parang Island, Karimunjawa Islands. Journal of Management of Aquatic Resources. 2013; 2(2):28-37.
10. Munir AM. Estimation of Litter Productivity of Mangrove Forest on Gili Sulat Island, West Nusa Tenggara. IPB: Bogor. Thesis, 2004.
11. Vitousek PM. Nutrient cycling and nutrient use efficiency. American Naturalist. 1982; 119:53-72.
12. Rizal. Production and Decomposition Rate of Mangrove Litter in Pengudang Bintan Village. King Ali Hajj Maritime University. Riau, 2018.