Journal of TROPICAL BIODIVERSITY E-ISSN : 2774-4116

Distribution of Karamunting (*Rhodomyrthus tomentosa* AITON) in Several Regions and Its Secondary Metabolite Content

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Abstract

Karamunting (*Rhodomyrtus tomentosa* Aiton) (fam: Myrtaceae), also called Ceylon cherry, downy rose myrtle, is native to South Asia. It treats diarrhea, dysentery, leukorrhea, hemorrhoids, toothache, infection and bleeding after childbirth, heart, and clears cholesterol. The research was conducted between April and August 2016 in South Sumatra in Padamaran and Tanjung Batu Villages and West Kalimantan in Kawat, Karamunting, and Capkala Villages analyzed the distribution of the karamunting plant and its secondary metabolites. Purposive sampling with the transect method was used. The observation variables analyzed included the species present, the number of individuals of each species, height, DBH, and coverage area. Species Composition, Relative Density (KR), Relative Frequency (FR), Relative Dominance (DR), and Important Value Index (INP) were all instrumental to the data analysis calculation. The findings indicated that there were 48 seedlings and 19 sapling species. The density and frequency were greater than that of other plants at the growth rate of seedlings and saplings. While the distribution was dominant in the Capkala Village, the most abundant phenol of karamunting leaves was discovered in Tanjung Batu Village, plentiful flavonoids in Padamaran Village, and the highest saponins and tannins in Karamunting Village. Furthermore, tannin was plentiful in Capkala Village.

Keywords: important value index, karamunting *(Rhodomyrthus tomentosa* AITON),secondary metabolites.

Submission	:	March, 09th 2022
Revision	:	May 17th 2022
Publication	:	August 30th 2022

INTRODUCTION

Karamunting plant (*Rhodomyrtus tomentosa* Aiton), also called Ceylon cherrry, cheilon hill gooseberry in Australia, downy myrtle or downy rose myrtle in Hawaii, wild barley in Hong Kong, hill gooseberry, and hill guava in England is native to South Asia. The Myrtaceae family to which it belongs is adapted to various habitats, including coastal areas, forested jungles, wetlands, and swampy areas up to an altitude of 2400 meters (Csurhes and Hankamer, 2011). As a traditional medicinal plant, karamunting is used to treat diarrhea, dysentery, leukorrhea, hemorrhoids, infections, and toothaches, preventing infection and bleeding after childbirth (Burkill, 1966 in Krisyanella et al., 2010). Additionally, its fruit treats heart disease, reduces pain after delivery, cures diarrhea, anti-venom, skin infections, and scars on the eye cornea (Burkill, 1966: Bailey, 1930 in Krisyanella, et al., 2010). The most used portions of the plant are typically the leaves and flowers, which are rich in flavonoid antioxidants, saponins, and tannins (Tisnadjaya, 2010; Faravani, 2008). The ethanol extracted from its flowers, at a dose of 0.1 mg/g BW and 1 mg/g BW, has the same

effect as simvastatin in reducing cholesterol and triglyceride levels. However, the ethanol extract at a dose of 0.01 mg/g BW lowers cholesterol as simvastatin (Arief et al. 2012).

Vegetation analysis explores the structure composition to obtain quantitative information on a plant community. Data on species, including diameter and height, are needed to determine the vital value index of the forest community's constituents (Greig-Smith, 1983). The vegetation community can be grouped into three categories: estimating the composition of vegetation in a given area in comparison with other places to identify species boundaries; conducting hypothesis testing to research the diversity of species in an area; and studying the correlation between differences in vegetation and certain environmental factors (Greig-Smith, 1983). Vegetation analysis is crucial because it can provide quantitative information about the structure and composition of a plant community. Several methods can be used to perform vegetation analysis, including the Checked Method or quadratic sampling technique, the no-plot method, and the bitterlich method (Kusuma, 1997). In vegetation science, various methodologies have been developed to analyze vegetation according to its purpose. The number of species in the vegetation is determined by climate, habitat diversity, and area, among other factors.

Exploration is an activity undertaken to locate, collect, and research certain types of germplasm to avoid their extinction (Kusumo et al., in Andriani et al., 2010). The first step involves seeking information about the species and habitat from the regions and other relevant agencies. This information is then used to target the original locations for the distribution of plant species. Vegetation analysis is one of the activities involved in exploration. Kusumawati et al. (2003) explored the diversity and chemical content of medicinal plants in the tropical forest of Mount Arjuno and obtained 13 species belonging to 10 families. Phytochemical screening revealed that these plants contained 13 steroids/terpenoids, 12 flavonoids, and three alkaloids. Based on this background, it is necessary to conduct further research to:

i. Explore karamunting plants in West Kalimantan (Karamunting, Capkala, and Kawat Villages) and South Sumatra (Padamaran and Tanjung Batu Villages).
ii. Conduct vegetation analysis to determine the distribution of the karamunting population and other plants, to contribute to the efforts to preserve germplasm.
iii. Analyzing the content of secondary metabolites.

METHOD

1. Research Location

This research was conducted in West Kalimantan and South Sumatra, Indonesia. In West Kalimantan, it was conducted in Karamunting and Capkala Villages, Bangkayang Regency and Kawat Village, Sanggau Hilir Regency. In South Sumatra, it was carried out in Pedamaran II Village, Ogan Ilir Regency and in Tanjung Batu Village, Ogan Komering Ilir Regency. The secondary metabolites were analyzed at the Laboratory of Research Institute for Aromatic Medicinal Plants and Biopharmaceuticals, Bogor.

2. Research Material and Equipment

Equipment and materials needed for karamunting vegetation analysis included meter, haga altimeter, compass, hygrometer, thermometer, rope, stake, plastic bag, newsprint, label, *sasak*, sack, and alcohol. Equipment for analyzing chemical compounds (secondary metabolites) included a spectrophotometer, thermometer, analytical balance, digestion tube, evaporator, and filter paper. Furthermore, the materials used were karamunting powder, aquadest, diethylether, ammonium hydroxide, n-butanol, methanol-water 80%, 70% ethanol, potassium hexacyanoferrate, hydrochloric acid, and ferric chloride.

3. Research Implementation

The sample selection was done with the help of the transect method. There were ten 5x5 m plots for seedlings and saplings within one transect, with a 50 m distance between plots and a 5 m distance between transects. The composition and structure of a stand can be described by conducting a vegetation analysis, which includes calculating the Important Value Index (INP), Species Dominance, Species Diversity, and Species Similarity Index (Indriyanto, 2005). The experimental parameters were abiotic factors and components of vegetation analysis, such as species, number of individuals, number of species, height, diameter, and canopy cover. All of these components were needed to analyze data on Density (K), Relative Density (KR), Frequency (F), Relative Frequency (FR), Dominance (D), Relative Dominance (DR), Important Value Index (INP), Species Diversity (H').

RESULT

The results of the analysis conducted in Karamunting, Capkala, Kawat, Padamaran, and Tanjung Batu Villages were used to categorize species composition based on the categories of seedlings and saplings, as shown in Figure 1.

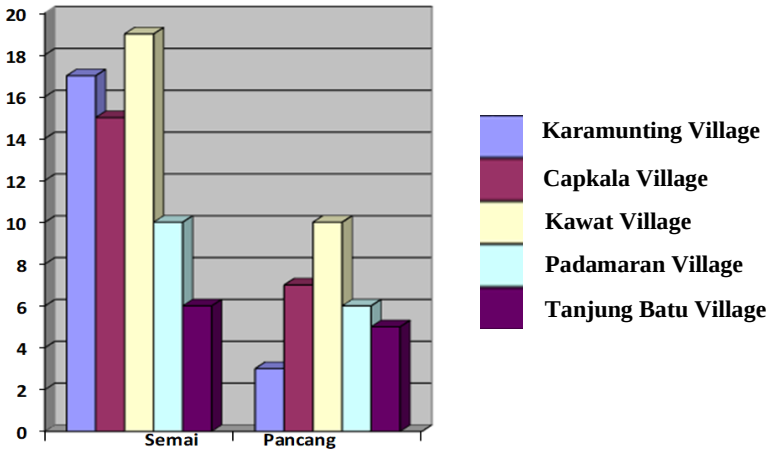

Figure 1. Composition of *R. tomentosa* seedlings and saplings in each village

The community structure showing different percentages was analyzed using INP as indicated in Table 1.

Table 1. Important Value Index (INP) of *R. tomentosa* in each village

Location	Seedling INP (%)	Sapling INP (%)
Capkala Village	58.4350	27.0216
Karamunting Village	81.9379	231.2565
Kawat Village	95.9084	92.9528
Padamaran Village	92.9400	78.1926
Tanjung Batu Village	70.1446	78.9438

The community structure of seedlings in Figure 2 and the saplings indicated in Figure 3 show that other plants in each village have different INPs and species.

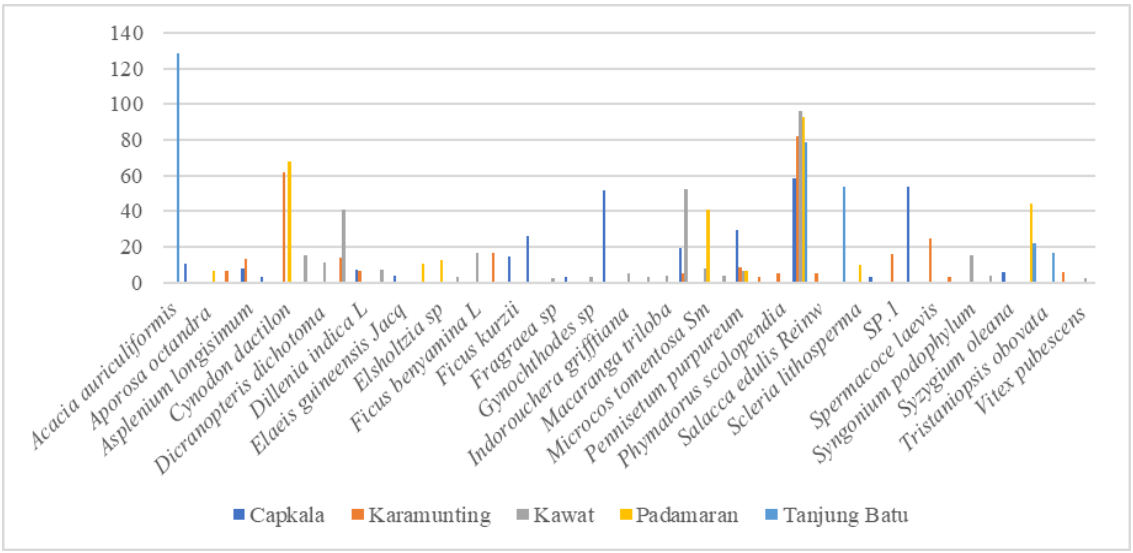

Figure 2. INP of the seedling category around the growth of *R. tomentosa*

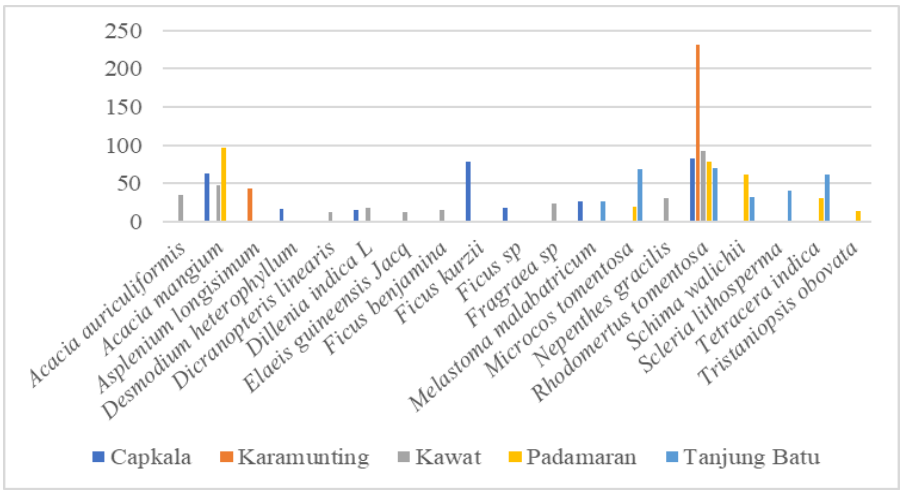

Figure 3. INP of the sapling category around the growth of *R. tomentosa*

The diversity index value (H') of plant species in each village based on exploration results are recorded in Table 2.

Table 2. Species Diversity Index (H') in each village

Location	H'
Capkala Village	3.476
Karamunting Village	2.7173
Kawat Village	2.7714
Padamaran Village	2.6459
Tanjung Batu Village	2.6373

Furthermore, the laboratory results for testing the secondary metabolites from the leaves and seeds were as shown in Table 3.

Table 3. Secondary Metabolite in each village

No.	Village	Leaf Content (%)				Seed Content (%)
		Phenol	Flavanoid	Saponin	Tanin	Tanin
1,	Padamaran Village	0.53	0.15	0.74	0.31	0.10
2.	Tanjung Batu Village	0.62	0.10	0.79	0.31	-
3.	Kawat Village	0.27	0.08	0.82	0.31	0.10
4.	Capkala Village	0.36	0.05	0.86	0.41	0.31
5.	Karamunting Village	0.41	0.05	0.94	0.42	0.30

DISCUSSION

The research was conducted in West Kalimantan, which mainly has PMK (Red-yellow podzolic) soil in Sanggau Regency and the coastal area in Bengkayang Regency that has alluvial soil. South Sumatra is dominated by lowland swamps composed of organosol soil.

Species Composition

From five locations, there were 48 species categorized at seedling growth rates and 19 at sapling growth rates. Additionally, there were 18 species belonging to 16 families in Karamunting Village and 17 species belonging to 11 Families in Capkala Village. There were 25 species belonging to 19 Families in Kawat Village, 13 species belonging to 10 Families in Padamaran Village, and 8 species belonging to 7 families in Tanjung Batu Village. The species composition in several regions differed due to the diverse conditions and habitat, especially the different soil types shown in Figure 1. Odum (1998) stated that the spread of a species is affected by various factors, including intra-species and inter-species competition. The presence of multiple individual plants in close proximity can lead to increased competition for resources, such as food and water. Additionally, organisms may react differently to changes in their environment when they are part of a larger group.

Figure 4. *R. tomentosa* in Padamaran Village (a) and Capkala Village (b)

Community Structure

The description of a plant community requires at least three quantitative parameters, including density, frequency, and dominance. The Important Value Index (IVI) is a

quantitative character used to determine the dominance of a species in a community. It is obtained from the sum of Relative Density, Relative Frequency, and Relative Dominance. Based on the data in Figures 2 and 3, the IVI of *R. tomentosa* in the Karamunting Village was 81.93% for the seedling and the highest value compared to other plants, while the sapling growth rate was 231.26%. In Capkala Village, the INP of the seedlings was the highest at 58.43%, while the sapling growth rate was 81.94%. In Kawat Village, the INP of the seedlings was 95.91% compared to other seedlings, and the sapling growth rate was 92.95%. Furthermore, in Padamaran Village, the INP of the seedling was 92.94%, while 78.19% represented the sapling growth rate, coming second after Acasia. In Tanjung Batu Village, the INP of the seedlings was 70.14% and the highest compared to other plants, while the sapling growth rate of 78.94% was the second highest after Acasia at 128.66%. Based on the data obtained in the sampling area, *R. tomentosa* at the seedling and sapling levels was the dominant species. A species is said to be dominant in ecology or biology if it has the highest INP.

Species Diversity

Species diversity is a way of measuring the biological organization of a community. This helps to understand the structure of the community, as well as its ability to remain stable in the face of adversity (Sugianto, 1994 in Indriyanto, 2012). Based on Table 2, the value of the species diversity index is highest in Capkala Village. According to the criteria proposed by Magurran (2004), the diversity index criterion (H)> 3.00 indicates a very high diversity in a location. Ariyati et al. (2007) explained that the low diversity index value indicates high ecological pressure, both in biotic and abiotic factors. Biotic factors can be observed in the competition between individual plants across all growth stages, while abiotic factors involves battling for nutrients from the soil.

Secondary Metabolites

As shown in Table 3, the leaves generally had the highest saponin levels. Saponins are bitter-tasting, dissolve in either cold or hot water, and often form foamy mixtures when shaken. It is widely recognized that the leaves of *R. tomentosa* contain the highest saponin content, making them a potential raw material for medicine or other medical purposes. Additionally, saponins can be used in the pharmaceutical field as raw materials for antibiotics, antifungals, treatments for diabetes mellitus, and antitumor compounds. The seeds of *R. tomentosa* were found to have a tannin content of 0.10-0.31% across the region. The hallmark of tannins in its efficacious astringent taste is an excellent antioxidant and lowers blood sugar levels. Furthermore, the tannin in the seeds can be used as a natural dye, usually blue-black or black-green. It also plays a crucial role in binding and precipitating proteins, making it suitable for treating diarrhea, and hemorrhoids, stopping inflammation, and a natural alternative for cleaning dentures (Hasibuan and Dimenta, 2017).

CONCLUSIONS AND SUGGESTION

Conclusion

The results showed that there were 48 seedlings and 19 sapling species in the five villages. The density and frequency were highest compared to other plants at the growth rate of seedlings and saplings, while the spread emerged dominant in Capkala Village. The yields of the secondary metabolites of karamunting leaves were high in Tanjung Batu Village for phenols, while those in Padamaran Village included flavonoids. The Karamunting Village

had the highest concentrations of saponins and tannins. Finally, the seeds with the highest tannin content were found in Capkala Village.

Suggestion

A study regarding the spread of *R. tomentosa* should be conducted in other regions in a bid to preserve the endangered germplasm.

ACKNOWLEDGMENT

The success of this research could not be possible were it not for the assistance of the following parties.

1. Ministry of Research, Technology, and Higher Education for granting a Competitive Grant for this research.
2. Chairman of the LPPM Universitas Nasional for the guidance and support of research facilities.
3. Dean of the Faculty of Agriculture Universitas Nasional for providing research facilities

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