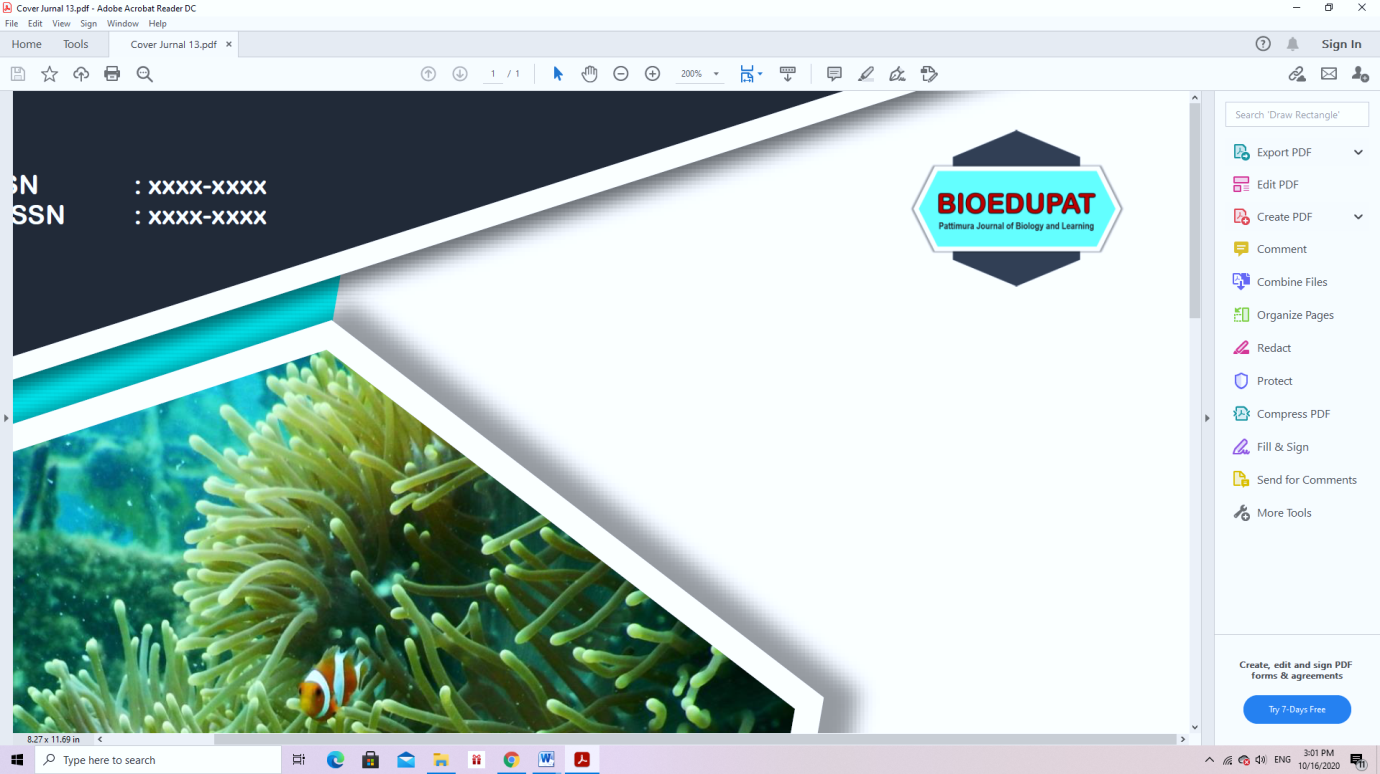
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***Research Article***

**Analysis of leaf cellulose in gayam (*inocarpus vagiver*)**

**based on different altitudes**

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**ABSTRACT**

Gayam (*Inocarpus vagiver*) contains natural chemicals in the form of primary metabolites that play an important role in plant survival. The primary metabolites are directly involved in the growth of the Gayam plant. Cellulose is the main component of plant cell walls .Cellulose is a natural material that can be renewed and its uses are very broad. This is because cellulose is widely used for the manufacture of paper and products with various properties. The purpose of this study was to determine the cellulose content of the leaves of the Gayam plant based on different altitudes. The method used in this research is descriptive quantitative and qualitative with the sampling technique using purposive sampling. Based on the iodine test, Gayam leaves in Ema vilage and Airlouw both have cellulose compounds. The average cellulose content in Ema vilage is 0.23315% while Airlouw is 0.20008% which means the higher cellulose content is in Ema.

**Keywords:** gayam, cellulose, metabolite

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**INTRODUCTION**

Indonesia is one of the world's centers of biodiversity and is known as a megabiodiversity country. This high biodiversity is a natural wealth that can provide versatile benefits as a basic capital for development and is the lungs of the world that is absolutely needed both now and in the future (Suhartini, 2009). With high biodiversity, especially local plants, it can also have great potential to meet the needs of human standards and produce high chemical diversity, but in Indonesia there are still many plants that have not been cultivated optimally, and have not been studied much, one of which is the Gayam plant (Inocarpus vagiver). Gayam plant (Inocarpus vagiver) is a native plant from the eastern part of Malesiana, especially in Indonesia which has a height of up to 20 m (Falanruw, 2015). This plant is also called the archipelago tree because Indonesia is one of the distribution areas of the Gayam plant that lives at an altitude of 500 m above sea level (Setyowati & Wawo, 2015). This plant usually lives in swampy areas or environmental areas where there are abundant water sources (Heyne, 1987). Gayam plant (Inocarpus vagiver) has many benefits including being used as an alternative food ingredient and traditional medicine, to treat dysentery and urinary tract infections (Segatri in Sukadana, 2017). The old Gayam stems can be used as building materials and processed as furniture products, such as beds, cabinets, and photo frames. The old Gayam leaves can be used to wrap tempeh and animal feed. Gayam leaves can also be processed into vegetable pesticides to kill insects on plants (Wawo, Setyowati, and Utami 2011).

Cellulose is the basic component of cell walls and fibers that give fiber strength (Moniriqsa, 2012). Based on research that has been done according to Norman (1937) there are 62% - 79% cellulose in pineapple leaves, while Hidayat (2008) states that pineapple leaves contain 69.5% - 71.5% cellulose. Furthermore, research that has been carried out from processing for Gracilaria sp produces cellulose content of 20.17%. While Septiany (2013), produced cellulose content of Gracilaria verrucosa of 13.04% and Eucheuma cottonii of 9.51%. The potential utilization of cellulose can meet almost all aspects of standard human needs, ranging from conventional materials, such as the wood and paper industry, to advanced materials, such as energy sources, composites, biomedical applications, and drug delivery (Fernandes, Pires, Mano & Reis, 2013).

**METHODS**

This type of research is a descriptive study to see or reveal the cellulose compounds in Gayam leaf (Inocarpus vagiver) and the cellulose content of Gayam leaf (Inocarpus vagiver) at different altitudes. The research location was in Negeri Ema, South Leitimur District and Airlouw Hamlet, Nusaniwe District on August 13, 2021 – June 16, 2022. The object in this study was the leaves of the Gayam plant (Inocarpus vagiver) which were found at the research location. Observational data analysis technique in this study is quantitative descriptive data. The qualitative and quantitative observation data obtained were then analyzed descriptively.

**Tools and Materials**

Tools: scissors, blender, sieve, scale, Erlenmeyer flask, measuring cup, Dessicator, stirring rod, dropper, test tube, oven, porcelain cup, camera, label, stopwatch, water bath, and basin.

Ingredients: Gayam (Inocarpus vagiver) leaf, aquadest, H2SO4 72%, NaClO 10%, NaOH 12%, Iodine, water, plastic.

**Research procedure**

1. Stage of preparation of Gayam leaf sample (Adinugraha et al, 2005 with modification)

a. Gayam leaf (Inocarpus vagiver) samples were taken from the area of Negeri ema and Dusun Airlouw

b. Gayam leaf (Inocarpus vagiver) samples were put into plastic that had been labeled according to strata with tree branches.

c. The Gayam leaf (Inocarpus vagiver) sample was then cleaned of adhering dirt using clean water

d. The Gayam leaf (Inocarpus vagiver) sample was again washed with 1000 ml of distilled water, to remove the remaining dirt that was still attached.

e. Gayam leaf (Inocarpus vagiver) sample that has been cleaned and then dried

f. After that, the Gayam (Inocarpus vagiver) leaf sample was cut into small pieces using scissors with a size of ± 1 cm after which the sample was aerated to dry.

g. Furthermore, the sample of Gayam leaf (Inocarpus vagiver) that has been baked, then blended and sieved with a size of 90 mesh to obtain Gayam leaf powder.

2. Cellulose Isolation Stage Gayam leaf sample (Adinugraha et al, 2005 with modification)

a. Gayam leaf delignification (Inocarpus vagiver)

Gayam leaf powder (Inocarpus vagiver) was weighed as much as 50 g and then heated with 500 ml of 12% NaOH for 3 hours at 80ºC. After 3 hours, the solution was filtered and then dried at room temperature to dry.

b. Bleaching (Purification)

Delignification of Gayam leaf powder (Inocarpus vagiver) was then heated with 10% NaClO for 1 hour at 60ºC using a hot plate. Then the solution was filtered and then dried in an oven at 100ºC for 2 hours and the residue was rinsed with distilled water until the pH was neutral

3. Qualitative test of cellulose content of gayam leaves (Inocarpus vagiver) Using Iodine test:

a. a gram sample of Gayam leaf powder was dissolved in 10 ml of distilled water into a beaker, then put into a test tube and added 3 drops of Iodine reagent while shaking.

b. Observe the color changes that occur. A brown color change indicates a positive reaction for cellulose.

4. Quantitative test of cellulose content of gayam leaf (Inocarpus vagiver)

a. 500 ml Erlenmeyer which is symbolized by (x) was weighed and 1 gram of the residue of Gayam leaf was added, and 200 ml of distilled water was added.

b. For 2 hours the solution in the Erlenmeyer was heated while stirring several times. Next, the filter paper denoted by (k) is weighed and the solution is filtered using filter paper. The remaining filter on the filter paper is heated using an oven at a temperature of 105°C to a constant weight which is denoted by (l).

c. After that, 200 ml of 0.5 M H2SO4 was added to a 500 ml erlenmeyer which had been filled with residue, using filter paper the residue was filtered again and 25 ml of 72% H2SO4 was added and then left for 3 hours in a 500 ml erlenmeyer.

d. Furthermore, for 2 hours it was heated using a water bath at a temperature of 100°C to which 150 ml of distilled water had been added into the erlenmeyer.

e. Then add distilled water until the volume is 300 ml. The filter paper is weighed which is denoted by (i) and the residue is filtered using filter paper.

Furthermore, the constant weight symbolized by (j) and the cellulose content can be calculated using the formula from Denyita et al, (2018), which is as follows:

% Cellulose Content :

Information:

x: Erlenmeyer's initial weight

l: Constant weight after oven temperature of 105ºC

k: Weight of initial filter paper

i: Weight of final filter paper

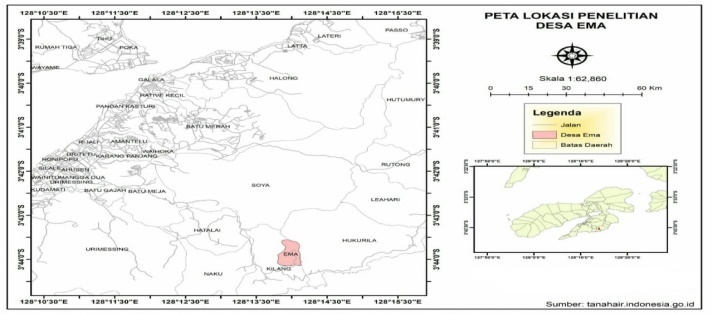
j: Final constant weight

**RESULTS AND DISCUSSION**

**1. Description of Sampling Location**

Gayam leaf sampling was carried out at two places with different heights, namely Negeri Ema, South Leitimur District and Airlouw Hamlet, located in Nusaniwe District. Ema Country is located on the island of Ambon, South Leitimur District, at an altitude of 600 meters above sea level with an area of 13 hectares of Ema Country. In general, Ema Country is bordered to the north by Soya Country, to the south by Hukurila Beach, to the east by Leahari Country and to the west by Kilang Village. The research location can be seen in Figure 1 below

**Picture 1.** Research location



This Nusaniwe country consists of two hamlets, namely Dusun Erie and Dusun Airlouw. The location of Airlouw Hamlet is at an altitude of 200 meters above sea level. In general, Airlouw Hamlet is bordered by the outer Ambon Bay, to the south by the Banda Sea, to the west by Latuhalat and Seilale States, to the east by Amahusu and to the State of Seilale Urimesing

1. **Environmental Characteristics**

Environmental characteristics at the sampling location are shown in Table 1 as follows.

**Table 1.** Environmental Characteristics

|  |  |  |  |
| --- | --- | --- | --- |
| NO. | Parameters | Ema Vilage | Dusun Airlouw |
| 1 | Place elevation | 600 m dpl | 200 m dpl |
| 2 | Light intensity | 17.000 Lux | 20.000 Lux |
| 3 | Humidity | 8 RH | 4 RH |
| 4 | Temperature | 28°C | 38°C |

In Table 1. It can be seen that the environmental characteristics in the sampling location of Ema vilage for a light intensity of 17,000 lux and is a low light intensity category compared to the light intensity in Airlouw Hamlet, this is due to the presence of several plants around the sampling location in the land of Ema, where Gayam plants grow such as langsa trees, mangosteen, and coconuts. According to Fatchurrozak, et al., in Tanamal, (2013) said that the higher a place is, the more content of compounds produced. Ema vilage with an altitude of 600 m above sea level has a higher humidity of 8 RH with a temperature of 28ºC compared to Airlouw Hamlet which has an altitude of 200 m above sea level with a lower humidity of 4 RH with a temperature of 38ºC. Differences in temperature and humidity in the environment greatly affect plant metabolic processes related to enzymatic reactions while light intensity affects the rate of photosynthesis, transpiration and plant respiration (Yuliani et al, 2015).

1. **Qualitative Analysis**

Based on phytochemical tests in Ema Vilage and Dusun Airlouw both have cellulose compounds which can be seen in Figure 2.

**Figure 2.** Phytochemical test of cellulose compounds

|  |  |
| --- | --- |
| E:\2022\DOKUMENTASI DILAB\UJI IODIUM\DSC03114.JPGE:\2022\DOKUMENTASI DILAB\UJI IODIUM\DSC03114.JPG  **E:\2022\DOKUMENTASI DILAB\UJI IODIUM\DSC03096.JPG**  **E:\2022\DOKUMENTASI DILAB\UJI IODIUM\DSC03096.JPG**  Gayam Leaf Powder before being given Iodine reagent | Gayam Leaf Powder after being given Iodine reagent |

The results of the analysis of the cellulose content carried out in two areas showed a change in color from the previous yellowish to brown color. The color change that occurs indicates a positive reaction to cellulose compounds in the leaves of the Gayam (Inocarpus vagiver) plant.

1. **Quantitative Analysis**

The results of the calculation of the average cellulose content in Ema vilage and Airlouw Hamlet can be seen in Table 2.

**Table 2.** Calculation of Average Cellulose Content

|  |  |  |
| --- | --- | --- |
| Reapet | Cellulose Content (%) | |
| Ema | Dusun Airlouw |
| 1 | 0,23434 | 0,18666 |
| 2 | 0,23196 | 0,21350 |
| mean (%) | 0,23315 | 0,20008 |

The results showed that the average cellulose content in Ema Country was 0.23315% greater or higher than Airlouw Hamlet 0.20008% and the location was lower.

**DISCUSSION**

At both locations, leaf samples were taken from Gayam (Inocarpus vagiver) plant in Ema and Dusun Airlouw. The aim was to determine the presence of cellulose compounds in the leaves of the Gayam plant which were tested qualitatively and the levels were carried out quantitatively. Moniriqsa (2012) stated that cellulose is the main component of biomass, and is also a basic component of cell walls and fibers that give strength to fibers. Cellulose is never found in a pure state in nature, but is always associated with other polysaccharides such as lignin, so it is necessary to isolate cellulose. The delignification process in this study used 100 ml of 12% NaOH which was used to dissolve the non-cellulose components present in Gayam (Inocarpus vagiver) leaves and to reduce lignin because it could increase the stiffness of a compound. Then through a bleaching process (purification) using 10% NaClO which aims to the bleaching process and remove the remaining lignin contained in the cellulose extract (Susana, 2011).

The test was carried out by adding 3 drops of Iodine reagent in the test solution. The presence of cellulose compounds can be seen from the color change from the initial yellowish color to brown. According to Desyanti (2013), the iodine test aims to identify polysaccharides. For quantitative tests, the determination of total cellulose content was carried out by weighing constant weight of cellulose compounds which referred to the Chesson (1978) procedure in Datta (1981) using the Gravimetric method. Based on the results of this study, the total cellulose content of Gayam leaves in Negeri Ema was 0.23315% while the cellulose content in Airlouw Hamlet was 0.20008%. The cellulose content in the sample from Ema was higher than that of the sample taken from Dusun Airlouw, which had lower levels. Like that according to Laily (2012), which suggests that altitude is one of the factors that affect the growth of a plant. The results of cellulose content at different altitudes indicate that altitude can affect the cellulose content of Gayam (Inocarpus vagiver). It is evident from the results of the analysis carried out, the cellulose content in Negeri Ema is greater than the cellulose content in Airlouw Hamlet which is dominantly less.

**CONCLUSION**

Gayam leaf (Inocarpus vagiver) in Negeri Ema which is an area with an altitude of 600 m asl contains cellulose with an average cellulose content of 0.23315% which is considered higher. Meanwhile, Gayam leaf (Inocarpus vagiver) in Airlouw Hamlet with an altitude of 200 m asl contains cellulose with an average cellulose content of 0.20008% which is relatively low.

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