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Analysis of the content of secondary metabolites using Uv-vis and Ftir Spectrophotometry from the Methanol extract *of Rhizophora mucronata* Leaves

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ABSTRACT

This study aims to determine the content of secondary metabolites in the methanol extract of *R. mucronata* mangrove leaves. The test was started from mangrove leaf extraction using methanol solution with a ratio of 1: 4 (b / v). Further analysis was performed using UV-VIS and FTIR spectrophotometry. The results of UV-VIS and FTIR are the absorbance values of a compound and its functional groups. The wavelengths generated from the UV-VIS analysis were 228, 236, 280 nm. These wavelengths are classified into flavonoids and tannins. While the results of long-wave FTIR are 3424.60, 2927.57, 1631.06, 1449.97. According to the results of the infrared spectrum in the presence of –OH, C-H (aromatic), C-O, C = C (aromatic) groups, it supports that the isolate is a compound of the phenolic group such as flavonoids and tannins. Flavonoids and tannins are secondary metabolite compounds that have anti-bacterial properties so that they can be used as medicinal agents, both for humans and animals.

Key words : *Mangrove, Rhizophora mucronata, Flavonoids,Tannins*

Introduction

The use of plants as medicine has begun to be developed. This is due to the presence of organic compounds in the form of secondary metabolites. Organic chemists argue that secondary metabolites are the most important natural materials and play a role in survival (Nurlaila and Tukiran, 2017). Secondary metabolite compounds produced from plants are proven to be antibacterial, antiviral, anti-fungal, and antioxidant activity (Joel and Bhimba, 2010). Examples of secondary metabolite compounds are terpenoid compounds, alkaloids, flavonoids, tannins, and steroids (Aljaghtmi *et al.*, 2018). The resulting compounds usually vary depending on the nature and type of the plant. One of the plants that contain secondary metabolite compounds is mangrove *Rhizophora mucronata*.

Mangrove *R. mucronata* is a mangrove plant that is widely used in medicine. Recently, extracts from mangrove *R. mucronata* have been shown to have activity against pathogens in humans, animals, and plants (Hridya *et al*., 2012). *R. mucronata* is a mangrove from the *Rehizophoraceae* family. Phytochemically, *R. mucronata* is rich in several kinds of compounds such as tannins, alkaloids, flavonoids, terpenoids, and saponins which play an important role in suppressing pathogenic microorganisms

(Pimpliskar, 2011). Analysis of the content of secondary metabolites can also be carried out using UV-VIS and FTIR spectrophotometry. The UV-Vis spectrophotometric method is widely applied in determining organic compounds in determining compounds on a very small scale (Ernawati *et al*., 2019). Meanwhile, measurements on the FT-IR Spectro were carried out to determine the functional groups contained in a compound (Abdi *et al*., 2019). Therefore, in this study, an analysis was carried out using UV-VIS and FTIR spectrophotometry to determine the absorption value and functional groups of the mangrove extract of *R. mucronata*.

Materials and Methods

Sample preparation

The mangrove leaves of *R. mucronata* that have been obtained are washed in running water. Then drying and powdering is carried out according to the method used (Sadeer *et al*., 2019).

Extraction of *Rhizophora mucronata* samples

Each sample was extracted by the maceration method. 50 g of dry leaves are immersed in 200 ml of methanol in a 500 ml Erlenmeyer flask for 2x24 hours. The extract was then separated from the dregs by filtering using Whatman No. 40. Then the extract was concentrated using a rotary vacuum evaporator to form a paste (Nurdiani *et al*., 2012).

Ultraviolet visible spectroscopy (UV-Vis)

The mangrove leaf filtrate of *R. mucronata* was diluted at concentrations of 100 µg / ml and 500 µg / ml and examined under ultraviolet and visible light for spectral analysis. The extracts were scanned at wavelengths ranging from 280-600ë using a UV-VIS Spectrophotometer (LMSP-UV 1000 B) and characteristic peaks were detected (Ray *et al*., 2016).

Infrared Spectroscopy Test (FTIR)

Spectrophotometry was carried out in direct transmission mode using a Perkin Elmer 180 spectrometer. The wavelength region was between 500 and 4000 cm^{-1}. Analyzes were performed using the potassium bromide pellet method (KBr). The solid sample was mixed with KBr with a mass ratio of 1: 100. Then the resulting mixture was compacted for 10 minutes using a compactor to produce a transparent plate. The transparent plate was tested, and the IR spectrum was interpreted using PerkinElmer software (Agi *et al*., 2018).

Results

UV-VIS spectroscopy is a very useful technique for extract analysis. UV-Vis analysis in Figure 1 shows the UV-VIS spectrum obtained in the mangrove leaf extract of *R. mucronata* using methanol as a solvent to identify the maximum wavelengths of 228 nm, 236 nm, and 282 nm.

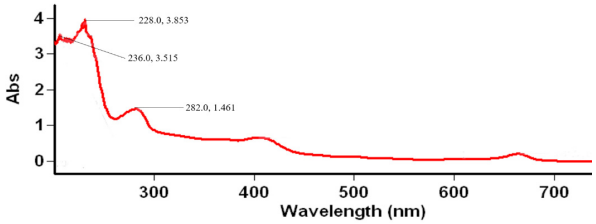

Fig. 1. UV spectral analysis of the methanol extract of *R. mucronata* leaves.

FTIR spectra results showed prominent peaks with (3424.60, 2927.57, 1631.06, 1449.97, 1383.66, 1251.17, 1062.96) different values (Figure 2).

Disscussion

UV-VIS spectrum, showing one or more peaks in this region from 200 to 400 nm. The wavelengths generated from the UV-VIS analysis were 228, 236, 280 nm. According to the wavelength of 210-280 nm, it is a group of compounds derived from flavonoids and tannins (Arshan *et al*., 2020). Other research also states that the maximum absorption range of phenolic compounds is at a wavelength of 200-400 nm (Saragih and Nasution, 2020).

Based on the results of FT-IR analysis, it shows that the wave 3424.60 is thought to be the absorption of the –OH group. The widened wave number 3462-3012 cm-1 is thought to be the absorption of the –OH group (Nurlaila and Tukiran, 2017). Wave 2927.57 belongs to the C-H group and wave 1631.06 belongs to the C = C group (Gnanadesigan *et al*., 2011). Then for wave 1449.97, it is included in the C-O group (Agi *et al*., 2018). According to the results of the infrared spectrum in the presence of –OH, C-H (aromatic), C-O, C = C (aromatic) groups, it supports that the isolate is a compound of the phenolic group such as flavonoids and tannins.

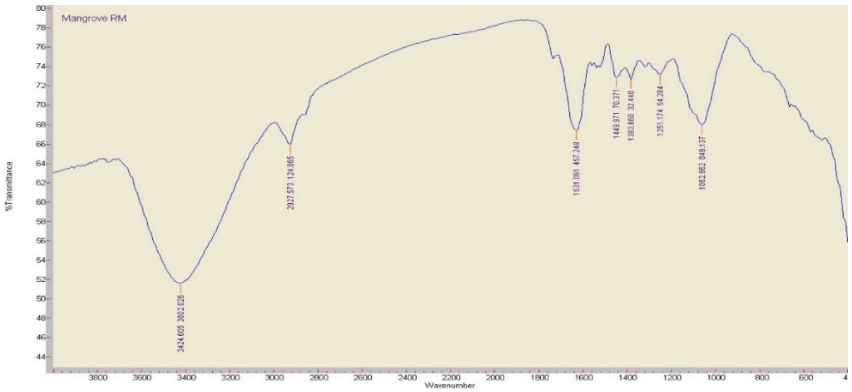

Fig. 2. FTIR Spectrum Analysis.

Based on the analysis of the compound content in the methanol extract of mangrove leaves of *R. mucronata*, it is known that there are flavonoid and tannin compounds, these compounds are included in the secondary metabolite compound (Eddy, 2018). Flavonoids and tannins have anti-bacterial properties so that they can be used as medicinal materials, both for humans and animals (Joel and Bhimba, 2010).

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