CONFERENCE PROCEEDING

Functional group determination of *Neptunia Oleracea* known as Malaysian water mimosa (*pucuk setangki*) using Fourier-Transform Infrared

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ABSTRACT

Neptunia Oleracea is locally known as *Pucuk Setangki* (Water Mimosa) that belongs to the Fabaceae family which is a herbal plant that is believed originated from India, Southeastern Asia and Tropical Africa. It is commonly known for its benefits as first aid medicine and food ingredients. Usually, Water Mimosa is used in the traditional medicines of Malaysia. It is part of treatments for earaches and even syphilis. It is also used as food ingredients such as *masak lemak cili api* (cook chili fat). Nowadays, people tend to use modern medicine that they have forgotten about the traditional herbs that our ancestors used. Thus, the goal of this research is to analyze the functional group of Neptunia Oleracea extract. Specifically, the research will focus on the functional group that is in the *pucuk setangki*. It can also increase people's knowledge of *pucuk setangki* and encourage them to use it more often. In order to prove its efficacy, functional group analysis of Neptunia Oleracea leaf extract was performed using Fourier Transform Infrared (FTIR). The spectrum and wavelength obtained can be used to identify the functional group and thus, the antimicrobial compound was discovered present in the plant. Based on this study, Neptunia Oleracea leaves do have antimicrobial compounds. Specifically, the research will focus on the functional group in the *pucuk setangki*. This research reminds people of the importance of *pucuk setangki* and its properties. This research is a contribution for other researchers to make other products based on this research and to help others to realize the benefits in *pucuk setangki*. The result will be shared throughout people so it can be use by people in the future.

Keywords: *FTIR, Neptunia oleracea, antimicrobial compound*

INTRODUCTION

In the tropical and subtropical regions of Malaysia, Neptunia oleracea or known as *Pucuk setangki* (water mimosa) grows in aquatic places such as freshwater ponds, lakes and rivers. It grows best in areas where annual daytime temperatures are within the range 25 - 35°c but can tolerate 15 - 38°c.When dormant, the plant can survive temperatures down to about 5°c. It prefers a mean annual rainfall in the range 1,500 - 2,000mm, but tolerates 1,000 - 4,000mm.

In order to float on the water, water mimosa inflates into a buoy with a length of between 1.2 and 1.5 metres between segments. In order to receive a lot of sunshine, these plants rise above the water's surface. The leaves are bipinnate and crossed (2-4 pairs), measuring 3–7 cm in length, and are dark green and reddish in colour. Water mimosa also has a flower with a composite structure that has 40–50 clusters of yellowish blossoms with petals that are 3-4.5 mm long. The leaves are used to treat Necrosis while the roots can also be used to treat nosebleeds. Water mimosa is usually soft and picked to be used as a vegetable and side dish.

Water Mimosa is used in phytoremediation, which refers to the use of plants to decontaminate soil or water from heavy metals. Water Mimosa is considered to be a nutritious vegetable which is high in calcium and iron. It also contains vitamin A, vitamin C, protein, and riboflavin.

Natural antimicrobials, from plants, microorganisms, and animals, cover a wide variety of compounds including phenolics, terpenes, bacteriocins, peptides, enzymes/proteins, natural polymers, fatty acids (lipids), organic acids and mixtures of bioactive compounds such as essential oils and plant extracts. Bio-based antimicrobials are modified or synthesized from chemicals obtained from biological sources.

The objectives of this study are to extract the bioactive compound from *Neptunia Oleracea* leaves collected from Pasar Pagi Batu Kikir through a solid phase extraction process and further investigation were carried out to determine the functional groups presence in the leaves' extracts.

MATERIALS AND METHODS

Sample collection

The sample used for this study is *Neptunia Oleracea* which is water mimosa. 27th November 2023. *Pasar* Pagi Batu Kikir will operate on Sunday only at Pekan Batu Kikir. Our supervisor went to this market to find *daun kayu*. There are a lot of *daun kayu*. There are several shops that sell different types of *daun kayu*. Our supervisor bought all the products of *daun kayu* in this market. The seller offered an affordable price and the total price of the sample is around RM50.

Picture 1. Fresh *Neptunia Oleracea*

Preparation of sample

Firstly, the samples were washed. Then, the samples were dried in an oven at temperature 60°C for 2 weeks. The samples were kept in a Schott Duran bottle for further used.

Picture 2. Dried *Neptunia Oleracea*

FTIR Analysis

This method was used to identify the presence of the functional group of *Neptunia Oleracea*. The sample can be in solid or liquid condition because the result will be the same. The leaves were characterised using FTIR analysis, and the frequency range is measured as wavenumbers in the range of 4000 – 650 cm^{-1}. Briefly, the samples were placed on the clean window of Agilent Cary 630 equipped with diamond ATR (Attenuated Total Reflectance). Then, the pressure clamp was closed until a click was heard and analysed using a real-time Micro-Lab software.

RESULTS AND DISCUSSION

Results

Using FTIR, the functional groups of compounds present in the *Neptunia Oleracea* leaves were identified. From the spectrum graph in Figure 1, the frequency of peaks was obtained. The frequencies were used to identify the functional groups of the plant in Table 1.

Table 1. Fourier-Transform Infrared Spectroscopy (FTIR) Result of *Neptunia Oleracea*

Frequency cm^{-1})	**Functional group**	**Predicted compound**
3262.60	O-H Stretch	Alcohols, phenols
2921.04	C-H Stretch	Alkane
2850.15	C-H Stretch	Alkane
1593.47	C=C stretch	Alkene
1406.57	S=O Stretch	Methyl

1232.57	C-N Stretch C-O Stretch	Carboxylic acids, alcohols, carboxylic acids, esters, ethers

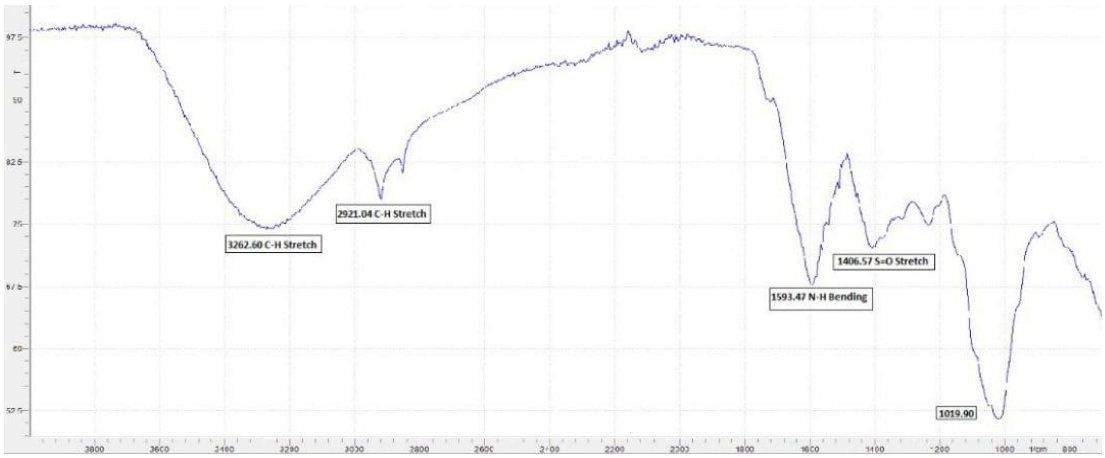

Figure 1. Graph of Fourier-Transform Infrared Spectroscopy (FTIR) result

From the spectrum graph, *Neptunia Oleracea* has functional groups which are the O-H stretch alcohols or phenols, C-H stretch alkane, C=C stretch alkene, S=O stretch methyl and C-N stretch aromatics amines.

The transmission measurements observed at 3262.60 cm−1 are attributed to O-H stretch alcohols or phenols, 2921.04 cm−1 attributed to C-H stretch alkane, while 2850.15 cm−1 are attributed to C-H stretch alkane. Furthermore, 1593.47 cm−1 attributed to C=C stretch alkene, 1406.57 cm−1 attributed to S=O stretch methyl. Other than that, transmission measurement of 1232.57 cm−1 attributed to C-N stretch aromatics amines. It was discovered through the spectrum and wavelength released by the FTIR.

DISCUSSION

From these functional groups collected, a functional group of vanillin and eugenol was identified as well. It shows that all those functional groups were found in *Neptunia Oleracea*. Then, at this point, it proves that *Neptunia Oleracea* do have antimicrobial activity.

CONCLUSION

Due to the identification of a functional group of *Neptunia Oleracea*, it is proven that the plant contains antimicrobial agents such as vanillin and eugenol. It also contains antimicrobial compounds which support the statement that this plant does have antimicrobial activity.

Besides that, this study is beneficial because the value of this plant contains antimicrobial properties that can be shown with strong evidence of scientific research. Community can use it as one of the traditional medicines to inhibit microbes. This study can also contribute as much as to the country's economy as this nutritious plant can be commercialized as traditional medicine with antimicrobial properties.

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