CONFERENCE PROCEEDING

Determination of Phenolic Compounds from *Tabebuia Rosea* (USIM Sakura) Trees Extracted Oil Using Fourier-Transform Infrared Spectroscopy

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ABSTRACT

Tabebuia rosea, locally known as 'tecoma' or 'Malaysian Sakura' is a popular planted trees along roadsides with beautiful pink and white flowers. In this study, the functional groups such as phenolic compounds containing in the extracted oil from *T. rosea* flowers were investigated. The fall flowers of *Tabebuia rosea* were collected, dried and grounded. The powdered samples were subjected to solid-liquid extraction process using ethyl acetate as a solvent (100 g/L) for 48 hours to extract the oil. Fourier-Transfrom Infrared Spectroscopy (FTIR) were furthered carried out and the sample were found to have phenolic and flavonoid compounds.

Keywords: *Tabebuia rosea, phenolic, tecoma, oil extraction, solid-liquid extraction*

INTRODUCTION

Universiti Sains Islam Malaysia (USIM) is a university located in Negeri Sembilan, Malaysia. Its specific campus location is located on a piece of land in Nilai, Negeri Sembilan Malaysia. In line with the rapid development, until now USIM has 9 faculties and offers various courses at the bachelor's, master's and doctoral level.

The green area around USIM is estimated at about 40% of the total campus area. This green area covers the lake near GENIUS Insan College, the secondary forest area near the Faculty of Science and Technology, the garden area and around the water catchment pond, the secondary forest area around the water tank near the staff housing.

Tabebuia rosea is a flower which can be found around the green area of USIM. Hence, this study is focusing to investigate the organic compounds of this flower trough out a few methods.

Plant extracts are extremely potent and can be utilised for a wide range of applications. Around 80% of the world's population relies on traditional medicine for health care, and the majority of therapies rely on plant extracts and active chemicals (Winston, 1999), implying that two-thirds of all plant species have medicinal potential (Krishnaiah *et al*., 2011). Most therapeutic herbs have antioxidant capabilities, according to previous reported research (Saeed *et al*., 2012).

Natural antioxidants are being employed in cosmetics, foods, and medicinal goods due to their ability to scavenge free radicals. Reactive oxygen species (ROS) are produced in response to pollution, food xenobiotics, and radiation exposure, and these ROS cause oxidative stress (Al-Gubory *et al*., 2014). Antioxidants prevent the

development of reactive oxygen species (ROS), neutralise them, and repair the harm they cause (Ighodaro *et al*., 2018).

There are several methods for identifying phytochemical substances in plant extracts. Qualitative analysis is a preliminary study and essential to identify the phytochemicals constituent present in medicinal plants (Mumtaz *et al*., 2014). Fourier-transform infrared spectroscopy (FTIR), for example, uses infrared light beams to identify functional groups in gaseous, liquid, and solid materials (Khan *et al*., 2018).

The objectives of this study are to extract the bioactive compound from *Tabebuia rosea* flowers collected from USIM campus through solid-liquid extraction process. Crude extract solution obtained were then screened through qualitative phytochemicals analysis to examined the phytochemicals compound and further investigation were carried out to determine the functional groups presence in the flowers'extracts.

MATERIALS AND METHODS

Sample Preparation

Based on Figure 1, this research was conducted around Universiti Sains Islam Malaysia, (USIM) with coordinate of 2.48° N, 101.78 ° E. Flowers were collected around this university green area and the flowers were washed and measured the weight (Figure 2). Then, the flowers were dried in oven at temperature 60℃ for 24 hours. The dried sample were grounded to obtain the powdered by using a grinder (Figure 3). The grounded samples were weighted, sorted and kept in a Schott Duran bottle for further used.

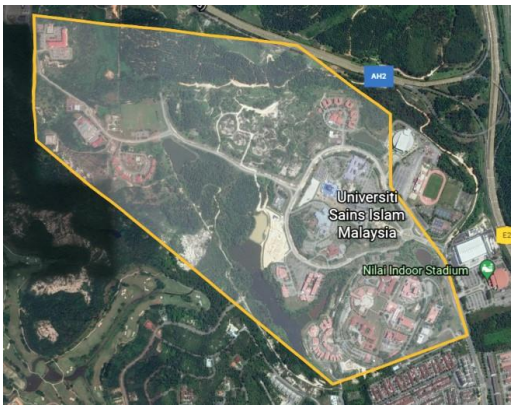

Figure 1. USIM campus with surrounded by green area

Figure 2. *Tabebuia rosea* tree

Extraction Process

As shown in Figure 4-7, 10 g of each sample was extracted with 100 ml of ethyl acetate solution at room temperature for 48 hours. The solution from each sample was separated by using the pipette and then a rotary evaporator was used to evaporate ethyl acetate solution at temperature 50 ℃. So, the concentrated extract solution was produced and used for Fourier- Transform Infrared Spectroscopy (FTIR).

Phytochemical Screening

This method was conducted by using the ethanol extracts. The extracts were produced by ethyl acetate must be added a few drops of ethanol before using for phytochemical screening.

i) Detection of Flavonoid

Three test tubes were taken and 1 ml of the extract was added into the test tube. 1 ml of 10% NaOH was added to each test tube. The presence of Flavonoid was indicated by a yellow colour (Edewor and Usman., 2011).

ii) Detection of Phenolic

1 ml of each extract was dropped on a blue litmus paper. The presence of Phenolic compounds was identified when the blue litmus paper turned red (Ali and Neda., 2011).

iii) Detection of Resins

Three test tubes were taken and 1 ml of the extract was added into each test tubes. 1 ml of hydrochloric acid solution, HCl was added to each test tubes. The presence of Resins was indicated by the appearance of turbidity (Edewor and Usman., 2011).

iv) Detection of Steroid

Three test tubes were taken and 1 ml of the extract was added into each test tubes. 1 ml of sulphuric acid, H_2SO_4 was added to each test tubes. The presence of steroid was indicated by a red precipitate (Edewor and Usman., 2011).

Fourier- Transform Infrared Spectroscopy (FTIR)

FTIR method was used to identify the presence of the functional group of *Tabbuia Rosea* (Figure 12). This method was used to identify the presence of the functional group of each flower samples. The sample can be in solid or liquid condition because the result will be same. The powders of flowers were characterized using FTIR analysis, and the frequency range are measured as wave numbers 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

Sample Collection

Figure 3 The grounded powder of *Tabebuia rosea*.

Extraction Process

Figure 4. Ethyl acetate was measured to extract the flower powder

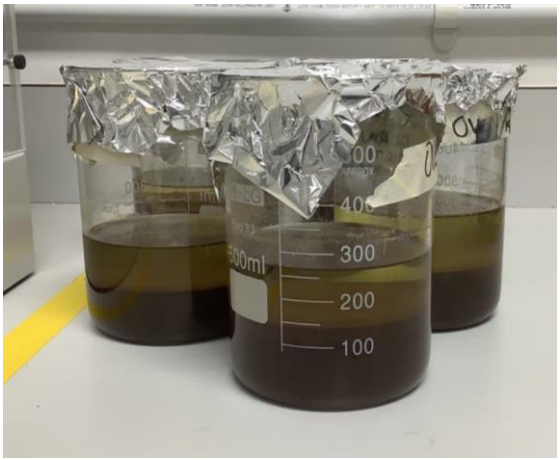

Figure 5. The extraction after 48 hours in room temperature

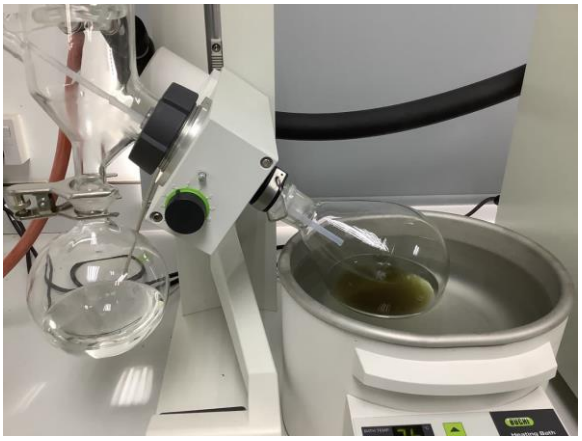

Figure 6. The production of pure extracts by using rotary evaporator

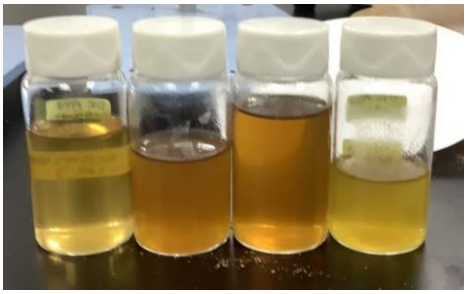

Figure 7. The pure extracts of *Tabebuia rosea*

Phytochemical Screening

Figure 8 until Figure 11 showed the phytochemical screenings results of *Tabebuia rosea*.

i) Detection of Flavonoid

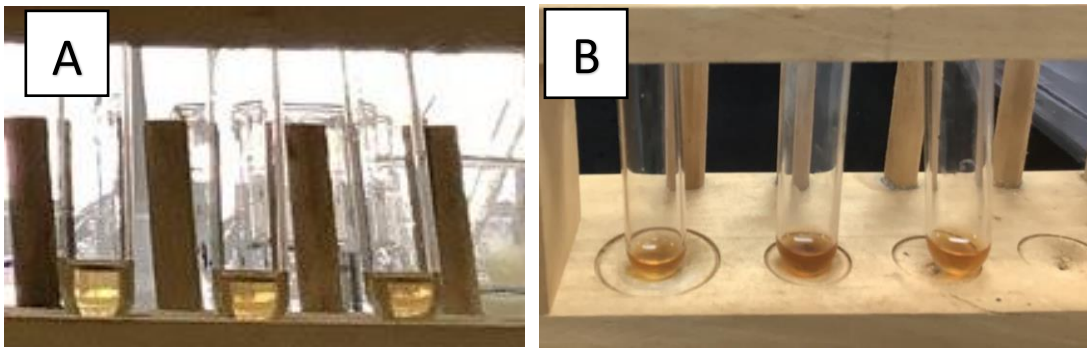

Figure 8 Flavonoid test A) Before B) After

ii) Detection of Phenolic

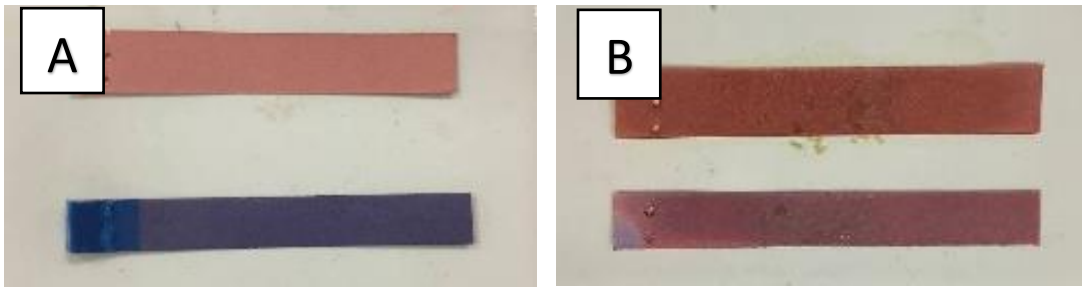

Figure 9 Phenolic test A) Before B) After

iii) Resins

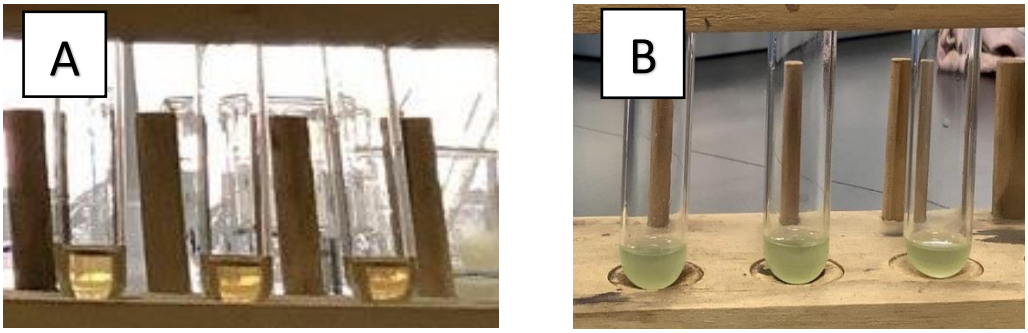

Figure 10 Resins Test A) Before B) After

iv) Steroid

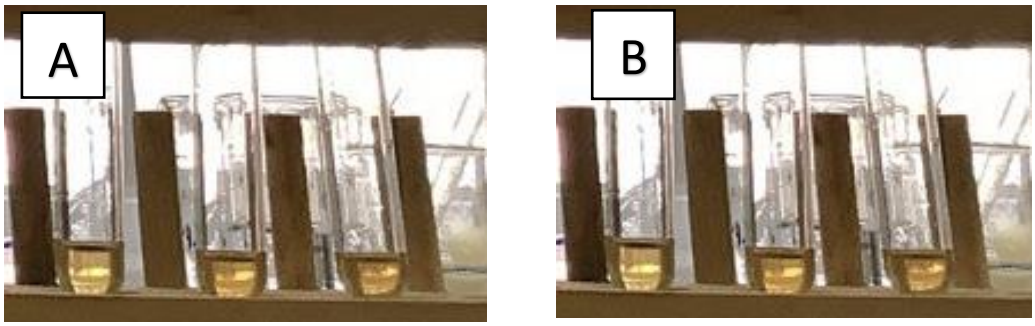

Figure 11. Steroid test A) Before B) After

Table 1. Phytochemical screening results of *Tabebuia rose*

Organic Compound	Phenolic	Flavonoid	Resins	Steroid
Presence of Organic Compound	+	+	+	-

Fourier- Transform Infrared Spectroscopy (FTIR)

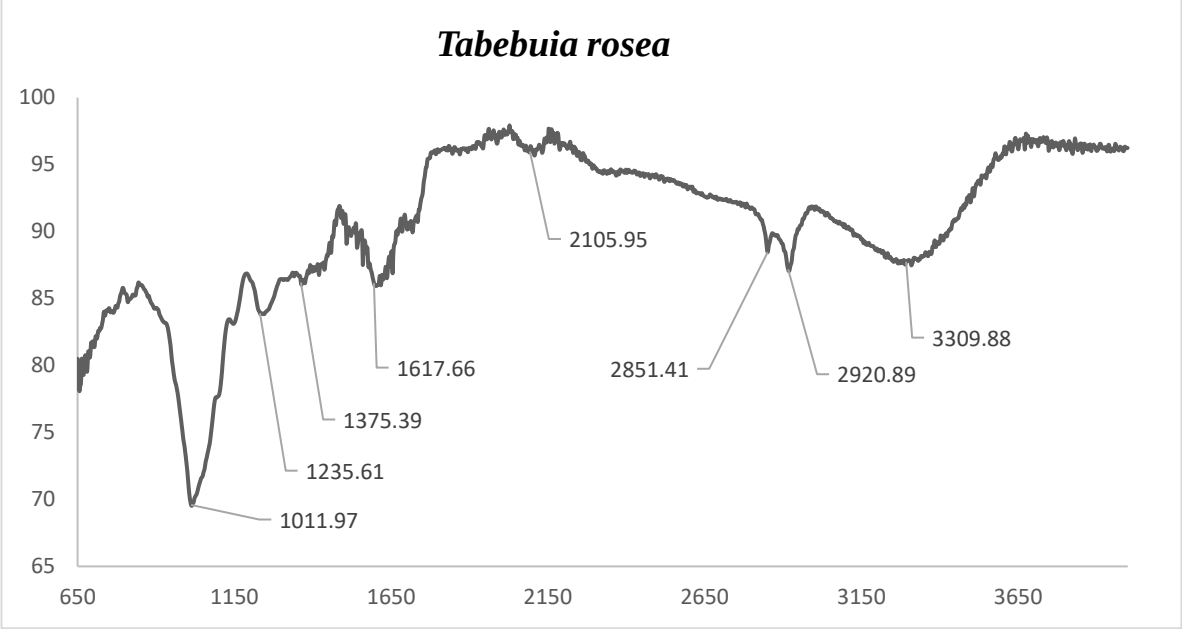

Figure 12. Graph of Fourier-Transform Infrared Spectroscopy (FTIR) result

Table 2. Fourier-Transform Infrared Spectroscopy (FTIR) Result of *Tabebuia rosea*

Functional group assignment	Wavenumber cm^{-1}	Wavenumber cm^{-1} (8)	Predicted compound
OH stretch	3309.88	3200-3550	Alcohol
-C-H_2 stretch	2920.89	~2900	Alkanes
C-H stretch	2851.41	2800-2900	Aldehydes
C=C stretch	2105.95	2100-2250	Alkynes
C=C stretch	1617.66	1440-1625	Aromatic
NO_2 stretch	1375.39	1300-1390	Nitro
C-F stretch	1235.61	1000-1400	Alkyl
C-F stretch	1011.97	1000-1400	Alkyl

Discussion

Phytochemicals are secondary metabolites that have a variety of health advantages and have colour, fragrance, and flavour in plants. Alkaloids, flavonoids, tannins, phenolics, saponin, steroids, glycosides, terpenes, and other compounds are all found in plants (De Silva *et al.*, 2017). They help to protect plants from illness and contribute to the colour, scent, and flavour of the plants. Furthermore, when their food intake is significant, they have a function in human health protection. In this study, the phytochemical compound contained in the extract of *Tabebuia rosea* from USIM were screened and shown in Table 1. The tested flower was found to have organic compounds such as flavonoid, phenolic and resins. Based on the results, it was found that flavonoid, resins and phenolics compound were detected in ethanol extracts for this flower. Steroid was not detected in flowers extracts.

Flavonoids are class of polyphenolic secondary metabolites found in plants, and thus commonly consumed in the diets of humans. Phytonutrients like flavonoid have beneficial anti-inflammatory effects and it can protect human cells from oxidative damage that can lead to diseases (Saxena *et al.*, 2013). The dietary containing flavonoids play a role as antioxidants which can prevent the development of cardiovascular diseases, diabetes, cancer and cognitive diseases (Ali & Neda, 2011).

Phenolics are aromatic benzene ring compounds with one or more hydroxyl groups produce by plants mainly for protection against stress. Phenolics are able to act as antioxidants where the antioxidant capacity of phenolic compounds is also attributed to their ability to chelate metals involved in the production of free radicals (Saeed *et al*., 2012). Resins can be used in pharmaceutical and cosmetic preparations, and in functional foods, due to their antioxidant effects in oil substrates (Assimopoulou *et al*., 2004). The presence of flavonoid, phenolics and resins in *Tabebuia rosea* extracts indicates the flowers as a source of antioxidants.

The chemicals bonds or functional groups present in the *Tabebuia rosea* extracts were furthered predicted using FTIR. The bonds were determined by interpreting the infrared absorption spectra. Figure 12 shows the spectrum of the flower extracts and the interpretation of the functional groups detected in the extracts. These results demonstrated the present of hydroxyl group (alcohol), alkanes, benzoid compounds (aromatic), aldehydes and alkyl.

Flavonoids are polyphenols characterised by two benzene rings joined by a linear carbon chain (Asep *et al*., 2019). The identification of benzenoid compounds via FTIR spectrophotometry supported the findings from the phytochemical screening, which detected the presence of phenols and flavonoids. The alkanes and phenols present were considered the major functional groups of bioactive compounds (Khan *et al*., 2018).

CONCLUSION

The phytochemicals compounds present in the ethanol extracts were flavonoid, phenolics and resins.Based on FTIR result, the major functional groups identified were hydroxyl group (alcohol), alkanes, benzoid compounds (aromatic), aldehydes and alkyl. Further studies will focus on the biological activities such as antibacterial and antioxidant analysis from this flower. The findings in this study are significant as they remark the potential of *Tabebuia rosea* collected in USIM campus as antioxidants sources for pharmaceutical and nutraceuticals applications.

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