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UV-Vis and Infrared Spectroscopy Characterization of Ethanol Extract of Buni Fruits (*Antidesma bunius L.*) in Moncongloe Maros

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Abstract

The aim of this study is to extract buni fruit using ethanol solvents. The ethanol extract was characterized by using UV-Vis and Infraredspectroscopy. The extraction is done by maceration method, which is by soaking buni fruit for 24 hours using ethanol solvent. The measurements using UV-Vis spectroscopy were carried out in wavelength between 200 nm -700 nm. The UV-Vis characterization of the ethanol extract showed two band at the maximum wavelength 279 nm and 548 nm. Infrared Spectroscopy characterization showed a C-H bondas aromatic functional group at 1058,96 cm^{-1}, C-O bond at 1230,63 cm^{-1}, C=O bond at 1732,13 cm^{-1}, OH functional group at 1425,44 and 3419,90 cm^{-1}. Based on the result of UV-Vis and Infrared spectroscopy characterization can be concluded that the ethanol extract of buni fruit containing flavonoid compounds.

Keywords: *Extraction, Buni Fruits (Antidesma bunius L), UV-Vis Spectroscopy, Infrared Spectroscopy, Flavonoid*

1. Background

Buni fruit (Antidesma bunius L.) is one of the plant species that has potential as an antioxidant because allegedly containing flavonoid. This is indicated by the purplish red color of the Buni fruit which is indicating the presence of flavonoid compounds. Antioxidant is a compound that act as an antidote of free radical and prevent damage caused by radical compound (Vihakas, 2014). Every natural product has different bioactivity capability due to its chemical composition (C. Karpagasundari and S. Kulothungan, 2014). The secondary metabolite compound content in each plant or natural product has enormous benefits in health and environmental fields. Some plant extracts have benefit as antioxidant (Kassem, Hashim, & Hassanein, 2013), antibacterial (Indrawati & Rizki, 2017), and have the ability as a medicine for various diseases (Prasanna & Anuradha, 2016). *Antidesma bunius (L.)Spreng*, known as buni plant, is widely used by the community as a traditional medicine for treating high blood pressure, palpitations, lack of blood, and syphilis (Indrawati & Rizki, 2017)

Sharma & Janmeda (2017) have extracted flavonoids using conventional maceration methods using ethanol solvents (Sharma & Janmeda, 2017). Sambandam *et al.,* (2016) have also extracted and isolated flavonoid compounds using conventional maceration using several solvents such as n-hexane, ethanol and ethyl acetate (Sambandam, Thiyagarajan,

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Ayyaswamy, & Raman, 2016). Ethanol is used as a solvent because it is polar, universal and easy to obtain.

The flavonoid content in Buni fruit (Antidesma bunius L.) can be identified using various instrument such as UV-Vis and Infrared spectroscopy (Lawrence & Gunasekaran, 2014)(Adinew, 2014). UV-Vis and Infrared spectroscopy is a common method used to identify and estimate the chemical content in natural product sample (C. Karpagasundari and S. Kulothungan, 2014) . In this study, the bioactive compounds from ethanol extract of Buni fruit is determined by using UV-Vis and Infrared spectroscopy. The characterization results can provide an overview of the ability of extract to be utilized in the health field.

2. Methods

Plant Material Collection

Buni fruit (*Antidesma bunius L.*) is obtained from Moncongloe area, Maros, South Sulawesi in April 2019. Buni fruit that is harvested is ripe fruit with a deep red color (burgundy). The Buni fruit's is separated flesh and seeds, and then the Buni fruit flesh is extracted.

Extraction

200 grams of Buni fruit (*Antidesma bunius L.*) flesh is extracted with ethanol solvent using maceration method, by soaking the Buni fruit flesh with ethanol for 24 hours at room temperature. The filtrate and residue are separated by filtering. The filtrate is then condensed using evaporation at 40^0C. Ethanol were obtained from Merck.

UV-Vis Spectroscopy Characterization

The resulting ethanol extract of buni fruit was measured using UV-Vis spectroscopy at a wavelength of 200 nm - 700 nm(Yasser & Widiyanti, 2019).

Fourier Transform Infrared Spectroscopy (FT-IR)Characterization

The IR spectrum of buni fruit extract was measured using Prestige-21 Shimadzu Infrared spectroscopy was used to identify the various functional groupof the buni fruit ethanol extract sample in range 400-4000 cm^3 using KBr pellet(Tahir, Wahab, Nafie, & Raya, 2019).

3. Results and Discussion

This study aims to determine the characterization of ethanol extract of Buni fruit using UV-Vis spectroscopy and FTIR. The result characterization from UV-Vis and Infrared spectroscopy provide a qualitative overview of the chemical groups contained in the sample.

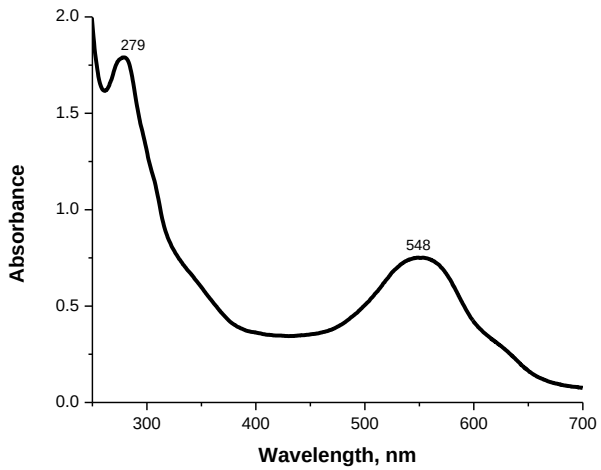

Figure 1. UV-Vis spectrum of buni ethanol extract macerated for 24 hours

The measurement results with UV-Vis spectroscopy showed the formation of 2 bands at wavelengths 279 nm and 548 nm. The two bands produced are identical to flavonoid compounds as anthocyanidin or anthocyanin (Markham, 1988). Each aromatic ring on flavonoids has a typical maximum wavelength absorption when measured using UV-Vis spectroscopy. Flavonoid compounds must have maximum absorption at around 240 nm - 290 nm, this is caused by the conjugation of ring A and substitution patterns. Some flavonoid compounds can experience conjugation in rings B and C through double bonds between carbon C_2 and C_3 on ring C which are characterized by maximum absorption of around 300 nm-550 nm (Vihakas, 2014) (Duan, 2014).

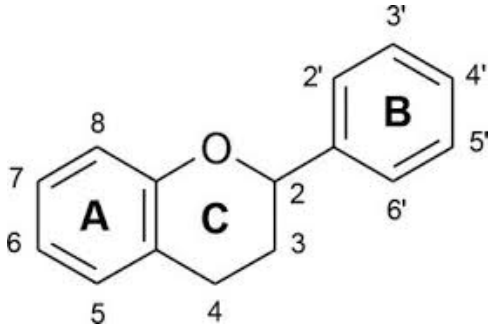

Figure 2. Structure of Flavonoids

Table 1**.** UV-Vis Spectrum Range of Flavonoid (Markham, 1988)

Band II (nm)	Band I (nm)	Type of Flavonoid
250 – 280	310 – 350	Flavon
250 – 280	330 – 360	Flavonol (3-OH substituted)
250 – 280	350 – 385	Flavonol (3-OH free)
245 – 275	310 – 330 shoulder	Isoflavon
275 – 295, 230 – 270	300 – 330 shoulder, 340 - 390	Flavonon dan dihidroflavonol Khalkon
(low strength) 230 – 270	380 -430	Auron
(low strngth) 270 – 280	465 – 560	Antosianidin dan Antosianin

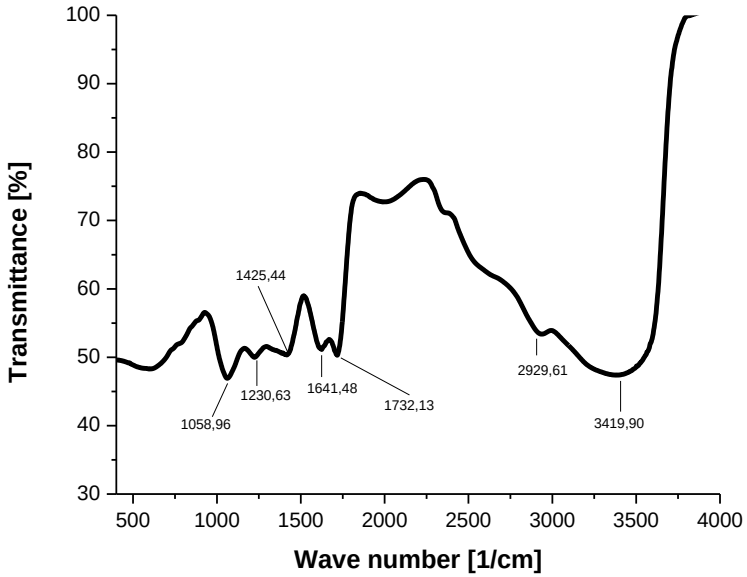

Figure 3. FTIR spectrum of buni fruit ethanol extract from maceration for 24 hours

Measurements with Infrared Spectroscopy are used to determine the functional groups contained in the sample (Liu, Sun, Lv, & Chan, 2006) (Pakkirisamy, Kalakandan, & Ravichandran, 2017) (Erwanto, Muttaqien, Sugiyono, Sismindari, & Rohman, 2016) . The measurement results with Infrared spectroscopyshow several peaks at various wave numbers. characterization showed a C-H bond as aromatic functional group at 1058,96 cm^{-1}. Some aromatic compounds are detected at wave numbers 1225 - 950 cm^{-1} with Aromatic C-H bonds in-plane bend (Coates, 2006) (Nandiyanto, Oktiani, & Ragadita, 2019). At wave number 1230,63 cm^{-1}indicates the presence of C-O streatching (O-C-H, phenolic) (Raj, Atray, & Ray, 2016) (Diblan, Kadiroglu, & Aydemir, 2018). C=C functional group was detected at wavenumber 1641,38 cm^{-1}. Bunny extract was also identified as having an OH group shown on the IR spectrum at wave number 3419,90 cm^{-1} which is a typical spectrum of OH groups. Based on the results of reading with FTIR, buni fruit ethanol extract can be classified as a class of phenolic compounds which are characterized by the presence of C-O bonds, aromatic bonds C=C and OH groups.

Table 2. Peak results of measurements with FTIR buni fruit ethanol extract macerated for 24h

Wavenumber [1/cm]	Functional Group Assignment	Reference
1058,96	C-H, Aromatic	(Coates, 2006), (Nandiyanto, Oktiani, & Ragadita, 2019), (Prasetyaningtyas, Renata Putri, Supartono, 2017)
1230,63	C-O streatching (O-C-H, phenolic)	(Nandiyanto et al., 2019), (Coates, 2006)
1425,44	Phenol or tertiary alcohol, OH bend	(Diblan, Kadiroglu, & Aydemir, 2018), (Coates, 2006)
1641,48	C=Cstretching phenyl	(Nandiyanto et al., 2019), (Diblan et al., 2018), (Silva, Feliciano, Boas, & Bronze, 2014)
1732,13	C=O (Carbonyl)	(Nandiyanto et al., 2019), (Coates, 2006)
2939,61	-CH	(Lu et al., 2011), (Coates, 2006)
3419,90	-OH	(Hu et al., 2016), (Nandiyanto et al., 2019)

4. Conclusion

Ethanol extract of buni fruit was identified to contain flavonoids. This is in accordance with the results of extract measurements using UV-Vis and Infrared Spectroscopy. Maximum uptake of measurement results using UV-Vis spectroscopy showed the formation of 2 bands indicating the typical absorption of flavonoids, namely at wavelengths of 279 nm (band II) and 548 nm (band I). This is reinforced by the results of measurements using Infrared Spectroscopy, which identified that the extract contained a phenol (-OH) functional group, C-H aromatic and C-O (phenolic) bonds.

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