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Microscopic Identification and Determination of Total Flavonoid Content of Moringa Leaves Extract and Ethyl Acetate Fraction (*Moringa oleifera* L.)

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Abstract

This research was conducted to identify simplicia microscopically, phytochemical screening and determination of total flavonoid content of extract and ethyl acetate fraction from Moringa (*Moringa oleifera* L.) leaves using UV-Vis Spectrophotometry method. The experimental design used in this study was to perform microscopic identification of Moringa leaf powder simplicia, make 96% and 70% ethanol extract and ethyl acetate fraction of Moringa leaves from 70% ethanol extract, then carry out phytochemical screening and determination of total flavonoid content with quercetin standards. Phytochemical screening on the ethyl acetate fraction of Moringa leaves included tests for the content of flavonoids, saponins, tannins and alkaloids. The results of microscopic identification of Moringa leaf simplicia showed the presence of calcium oxalate crystals in the form of rosettes, mesophyll and stomata. The result of determination of total flavonoid content in 96% ethanol extract was 16.69 ± 0.74% (w/w), 70% ethanol extract was 10.84 ± 0.49% (w/w), Moringa leaf ethyl acetate fraction 14 .45 ± 0.90% (w/w). The highest total flavonoid content was found in the 96% ethanol extract of Moringa leaves in accordance with the Indonesian Herbal Pharmacopoeia 2017, that the thick extract of Moringa leaves containing no less than 6.30% (w/w) total flavonoids was calculated as quercetin.

Keywords: quercetin, *Moringa oleifera*, microscopic, flavonoid

Identifikasi Mikroskopis dan Penentuan Kandungan Flavonoid Total Ekstrak Daun Kelor dan Fraksi Etil Asetat (*Moringa oleifera* L.)

Abstrak

Penelitian ini dilakukan untuk mengidentifikasi simplisia secara mikroskopis, skrining fitokimia dan penetapan kadar flavonoid total ekstrak dan fraksi etil asetat dari daun kelor (*Moringa oleifera* L.) dengan metode Spektrofotometri UV-Vis. Rancangan percobaan yang digunakan dalam penelitian ini dengan melakukan identifikasi mikroskopis pada simplisia serbuk daun kelor, membuat ekstrak etanol 96% dan 70% serta fraksi etil asetat daun kelor dari ekstrak etanol 70% kemudian dilakukan skrining fitokimia dan penetapan kadar flavonoid total dengan standar kuersetin. Skrining fitokimia pada fraksi etil asetat daun kelor meliputi uji kandungan flavonoid, saponin, tanin dan alkaloid. Hasil identifikasi mikroskopis simplisia daun kelor menunjukkan adanya kristal kalsium oksalat berbentuk roset, mesofil dan stomata. Hasil penetapan kadar flavonoid total pada ekstrak etanol 96% sebesar 16,69 ± 0,74 % (b/b), esktrak etanol 70% sebesar 10,84 ± 0,49 % (b/b), fraksi etil asetat daun kelor 14,45 ± 0,90 % (b/b). Kadar flavonoid total paling besar terdapat pada ekstrak etanol 96% daun kelor sesuai dengan Farmakope Herbal Indonesia 2017, bahwa ekstrak kental daun kelor mengandung flavonoid total tidak kurang dari 6,30 % (b/b) dihitung sebagai kuersetin.

Kata Kunci: kuersetin, *Moringa oleifera*, mikroskopis, flavonoid

1. Introduction

Moringa plant (*Moringa oleifera*) is a species of the genus Moringa belonging to the family Moringaceae, which is easy to grow in tropical areas such as Indonesia. Moringa can grow in tropical and subtropical areas on all types of soil and is resistant to dry seasons within six months. Moringa leaves are widely used by the community as traditional medicine, vegetables, beauty and fatty foods. One of the benefits of Moringa leaves as beauty is as an antiaging (premature aging), moisturizing and overcoming dry skin.[1] Moringa leaf extract also has antidiabetic activity[2], tyrosinase inhibitor[3], antibacterial[4], antioxidant, anti-inflammatory and anti-arthritis.[5]

Moringa leaves contain flavonoids and are rich in pro vitamins A, C, E, especially carotene which will be converted into vitamin A in the body and significantly affect hepatoprotective. The content of glucocyanate and isothiocyanate compounds in Moringa plants is known to the public as hypotensive, anti-cancer, inhibiting bacterial and fungal activity.[6] Determination of levels and studies on the content profile of secondary metabolites of the flavonoid group can be used as the basis for determining the isolation of potential compounds as antidiabetic, antioxidant, antiaging or other compounds that can become active raw materials for drugs.[7]

Based on previous research, Moringa leaves contain secondary metabolites including alkaloids, flavonoids, tannins and saponins.[9] Flavonoids are one of the largest natural phenolic antioxidant compounds and are found in all plants, so it can be ascertained that there are flavonoids in these plants. Phytochemical compounds in Moringa leaves that act as high antioxidant compounds are flavonoids so that the total flavonoid content in Moringa leaves can be determined using a UV-Visible spectrophotometer.[10] Determination of the total flavonoid content of an extract of natural ingredients can use quercetin as a standard. Natural extracts are reacted with $AlCl_3$ compounds and form complex compounds whose levels can be determined by visible spectrophotometry.[10,11] The complex reaction between standard quercetin and $AlCl_3$ is shown in Figure 1. This study aimed to determine the total flavonoid content in the extract and the ethyl acetate fraction of Moringa leaves.[8]

2. Materials and methods

2.1. Materials

The tools used in the research were microscope, maceration vessels, separating funnels, electric stoves, laboratory glassware (pyrex), digital scales, stirring rods, 10 ml measuring pipettes, test tubes, aluminium foil, rotary evaporator, water baths, porcelain crucibles, funnels, filter paper, oven, cream containers, vortex, universal pH, ruler, adhesive and dispersible test equipment and their weights, cuvette and UV-Vis spectrophotometer (Thermo Scientific Evolution 201). The materials used in this study included Moringa leaves (*Moringa oleifera* L.) from Beringharjo Market Yogyakarta, 70% ethanol, 96% ethanol, ethyl acetate, petroleum ether, quercetin (Sigma Aldrich), 10% $AlCl_3$ and 5% acetic acid.

2.2. Research sites

This research was conducted at the Integrated Chemistry Laboratory and Phytochemical Laboratory, Bachelor of Pharmacy Study Program, Alma Ata University Yogyakarta in May 2021.

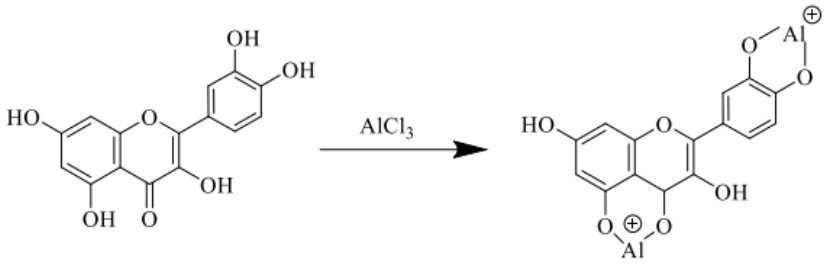

Figure 1. Complex Reaction Between Quercetin and $AlCl_3$[8]