



Formulation, Evaluation of Physical Properties, and *In Vitro* Antioxidant Activity Test of *Moringa* Leaf (*Moringa oleifera* L.) Ethanolic Extract Capsules

Annisa Fatmawati^{1*}, Depita Sucianingsih¹, Revalina Riswan¹, Emelda Emelda¹, Nurul Kusumawardhani¹, Rizal Fauzi¹, Daru Estiningsih¹, Muhammad Abdurrahman Munir¹, Marisa Yansiani¹, Hamam Hadi², Mika Matsuzaki³

¹Department of Pharmacy, Faculty of Health Science, Alma Ata University, Yogyakarta, Indonesia; ²Department of Public Health, Graduate School, Faculty of Health Sciences, Alma Ata University, Yogyakarta, Indonesia; ³Department of Human Nutrition, International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA

Abstract

Edited by: Sinisa Stojanowski
Citation: Fatmawati A, Sucianingsih D, Riswan R, Emelda E, Kusumawardhani N, Fauzi R, Estiningsih D, Munir MA, Yansiani M, Hadi H, Matsuzaki M. Formulation, Evaluation of Physical Properties, and *In Vitro* Antioxidant Activity Test of *Moringa* Leaf (*Moringa oleifera* L.) Ethanolic Extract Capsules. Open-Access Maced J Med Sci. 2022 Jan 03; 10(T8):108-113. https://doi.org/10.3889/oamjms.2022.9499
Keywords: Antioxidant; *Moringa oleifera* L.; Capsule; COVID-19
***Correspondence:** Annisa Fatmawati, Department of Pharmacy, Faculty of Health Science, Alma Ata University, Yogyakarta, Indonesia. E-mail: annisafatma20@almaata.ac.id
Received: 13-Oct-2021
Revised: 21-Nov-2021
Accepted: 02-Dec-2021
Copyright: © 2022 Annisa Fatmawati, Depita Sucianingsih, Revalina Riswan, Emelda Emelda, Nurul Kusumawardhani, Rizal Fauzi, Daru Estiningsih, Muhammad Abdurrahman Munir, Marisa Yansiani, Hamam Hadi, Mika Matsuzaki
Funding: This research did not receive any financial support
Competing Interest: The authors have declared that no competing interest exists
Open Access: This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0)

BACKGROUND: Supplements that contain antioxidants may enhance prevention and treatment effects of a wide range of diseases including COVID-19. Quercetin, a flavonoid compound, is a natural antioxidant that can neutralize free radicals.

AIM: The present study was conducted to formulate *Moringa* leaf (*Moringa oleifera* L.) ethanol extract capsules and to determine the quercetin antioxidant activity levels of *Moringa* ethanol extract capsule formulations.

MATERIALS AND METHODS: We tested the total flavonoid levels in solutions with concentrations of 20, 50, 60, 70, and 100 ppm using thin-layer chromatography densitometric method. Evaluation of physical properties of 96% *Moringa* leaf ethanol extract capsules included moisture content test, granule angle of repose test, granule flow property test, capsule weight uniformity test, and capsule disintegration time test. Antioxidant activity test using the 2,2-diphenyl-1-picryl-hydrazyl-hydrate method with two samples, namely, 96% *Moringa* leaf ethanol extract capsules with formulas I, II, and III, quercetin as a comparison.

RESULTS: The results of the evaluation of 96% *Moringa* leaf ethanol extract capsules showed that formula II (polyvinylpyrrolidone 50 mg) had good physical properties. Testing the antioxidant activity of capsules of the ethanol extract of *Moringa* leaves formulas I, II, and III, quercetin obtained IC50 values of 44.0 ppm, 40.2 ppm, 46.4 ppm, and 4.80 ppm, respectively.

CONCLUSION: The evaluation of the ethanol extract capsules of *Moringa* leaf formula II met the parameters of a good capsule evaluation test requirement and had very strong antioxidant activity seen from the acquisition of the IC50 value. The antioxidant properties of *Moringa* leaf extract capsules may be able to improve the immune system and clinical trials need to be carried out on patients to become candidates for prevention and therapeutic supplement for a range of diseases including COVID-19.

Introduction

Free radicals can cause oxidative stress and damage to our cells or tissues [1], [2] causing many diseases including type 2 diabetes mellitus, hypercholesterolemia, neurodegenerative diseases, and cancer [3], [4]. Free radicals are unstable due to their unpaired electrons. Free radicals or oxidants bind to other electrons by forming a new free radical in the oxidation reaction process [1]. Unpaired electrons react with other substances such as proteins, fats, and DNA in the human body [2]. Antioxidants can inhibit oxidation reactions with chemical structures that have a hydroxyl group on the flavone ring. Antioxidant compounds are essential for our body to neutralize and prevent the effects of free radical compounds [3], [4].

Flavonoid compounds are antioxidants [3]. Recent research states that flavonoids can improve the

immune system in preventing degenerative diseases and infectious diseases by viruses, such as COVID-19 [5]. In addition to antioxidant activity, flavonoid compounds also have antiviral activity that can potentially prevent severe illnesses from viral diseases like COVID-19 [6]. The COVID-19 virus directly affects the immune system which can trigger various diseases, inflammatory, and infectious complications of the virus [7]. Inflammation occurs characterized by white blood cells that will respond to the production of cytokines. Cytokines will bind to cell receptors so that they can trigger inflammation [8]. According to recent research by Mrityunjaya *et al.* (2020), quercetin compounds have the potential to be protective against SARS-CoV-2 which may prevent severe illnesses from COVID-19 by reducing inflammation [9]. Furthermore, studies have suggested that quercetin compounds may be able to reduce inflammation caused by COVID-19 and help prevent hospitalization due to COVID-19.

Moringa (*Moringa oleifera* L.) contains compounds that act as antioxidants. The previous