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Lipid Profile Improvement of Moringa oleifera Leaf Powder from Different Leaf Stalk Colors: In Vitro and In Vivo Studies

[Trends in Sciences](#) • Article • Open Access • 2026 • DOI: 10.48048/tis.2026.13091 [Ariani, Lina Novi](#)^a; [Estiasih, Teti](#)^{a, b} ; [Sunarharum, Wenny Bekt](#)^a; [Khatib, Alfi](#)^c; [Raharjo, Sentot Joko](#)^d; [+1 author](#)^a Doctoral Program of Food Science, Department of Food Science and Biotechnology, Faculty of Agricultural Technology, Universitas Brawijaya, Malang, 65145, Indonesia[Show all information](#)

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Abstract

Moringa oleifera (MO) has long been known for traditional diseases preventions and treatments. This tree has wide genetic variabilities such as the distinctive leaf stalk colors. Moringa oleifera leaf powder (MOLP) is potentially used for a functional food ingredient. The high prevalence of hypercholesterolemia requires a search for ingredients for cholesterol-lowering food products. This study aimed to evaluate the ability of MOLP from different leaf stalk colors (red, white, green) in improving lipid profile in vivo. The mechanism of improvement was evaluated by in vitro HMG-CoA and pancreatic lipase inhibitory activities of MOLP extract and in vivo fecal concentration. The results showed that the highest HMG-CoA reductase inhibitory activity was obtained from the MOLP extract with white leaf stalk, followed by red and green ones. The highest inhibition was found in the aqueous extract of MOLP from red leaf stalk with an inhibitory activity of 81.06%, almost comparable to statin of 85.20%. The sequence of the HMG-CoA reductase activity from the highest was the water extract of MOLP from red leaf stalk (81.06%), followed by ethyl acetate extract of MOLP from green leaf stalk (97.30%), water extract of MOLP from white leaf stalk (75.72%). The highest lipase inhibition activity was exhibited by MOLP with red leaf stalk followed by white and green ones. MOLP with different leaf stalk colors reduced LDL-c, TG, and TC, but increased HDL-c significantly, that MOLP from the red leaf stalk was the best, followed by white and green ones. The number of identified phytochemicals from ethanol extracts was influenced by leaf stalk color. Flavonoids were the predominant phytochemicals for all MOLP extracts from different leaf stalk colors. MOLP increased fecal cholesterol concentration indicating inhibition of cholesterol absorption. MOLP has more advantages than MO leaf extract in modulating lipid profile due to its composition. © 2026, Walailak University. All rights reserved.

Author keywords

HMG-CoA reductase; Hypercholesterolemia; In vitro; In vivo; Moringa oleifera; Pancreatic lipase

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