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The potency of *Moringa oleifera* as a medicinal herb in lowering uric acid: A review

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Abstract

Hyperuricemia can be the initial sign of health problem. In recent years, there is increasing in prevalence of hyperuricemia which become global health concern. Hyperuricemia is defined as a condition when there is an increasing in serum urate above normal level. This condition usually asymptomatic and clinical sign doesn't appear. However, hyperuricemia later can manifest symptomatic condition such as gout or another health problem related to increasing levels of uric acid. The elevating of uric acid levels can be caused by the dietary intake of foods which contain high levels of purine, disruption in catabolism of nucleic acid, problem in excretion, and many other factors. There are already several pharmacological agents used to lower uric acid levels. Still, as development in herbal medicine, *Moringa oleifera* is also known to have an anti-hyperuricemic effect which can lower uric acid levels in the body serum. This article aims to review the potential effect of *Moringa oleifera* in lowering uric acid levels so the prevalence of hyperuricemia and further health problem related to increasing in uric acid levels can be prevented.

Keywords: *Moringa Oleifera*; Hyperuricemia; Lowering uric acid; Herbal medicine

1. Introduction

Uric acid is a molecule that created as a result of purine metabolism in the body. The source of purine can be either exogenous from digesting foods contain purine or endogenous from nucleic acid metabolism. Most of mammals have an enzyme called urate oxidase which can convert uric acid to allantoin. Unfortunately, human doesn't have this enzyme so the excretion of uric acid depends mainly on the kidneys [1]. Hyperuricemia is defined as a condition when there is an increasing in serum's uric acid above normal level. Hyperuricemia more refers to an asymptomatic appearance of elevating uric acid in serum. On the contrary, gout is known as manifestation of symptomatic hyperuricemia which characterized by deposition of monosodium urate crystals in joints and soft tissues [2]. Hyperuricemia occurred when serum's uric acid > 7.0 mg/dl for men and > 6.0 mg/dl for women but it can be slightly difference based on laboratories and test methods [1,3].

The prevalence of hyperuricemia is increasing globally in the recent years. This increase is especially occurred in high-income countries and developmental countries which have adopted a western lifestyle [4]. From data obtained by The National Health and Nutrition Examination Survey (NHANES) in United States period 2015-2016 the prevalence of hyperuricemia sequentially among men and women was 20.2 % and 20 %. However, the hyperuricemia cases seemed to be stable in period 2007-2016 [5].

There are already several pharmacological agents to reduce serum's uric acid levels. Pharmacological agents which can inhibit xanthine oxidase such as allopurinol and febuxostat becomes first line to treat gout and can lower uric acid levels. Other medication focused on reducing inflammation in gout such as NSAID and colchicine [12]. However, development

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in herbal medicine also show alternative way to lower serum's uric acid levels with one of herb-plants named *Moringa oleifera*.

2. *Moringa oleifera* Effect in Medication

Moringa oleifera is a plant from *Moringaceae* family and it is one from 13 species with the same genus. *Moringa oleifera* usually grows in countries with tropical and sub-tropical climate but it is also growing in other areas due to it is ability in adapting. *Moringa oleifera* can be found especially in the Middle East, African, and Asian countries. All of the part of this plant including leaves, seeds, roots, and flowers is consumable for human. Furthermore, *Moringa oleifera* is also used in traditional medicine [6].

Some studies showed *Moringa oleifera* had beneficial effect in the medical field. *Moringa oleifera* contains various good nutrients that needed for human body such as vitamins, minerals, beta-carotene, omega 3 and omega 4 fatty acids, etc [7]. It also has several pharmacological effect when it is consumed like anti-inflammatory, antioxidant, anti-cancer, anti-tumor, anti-spasmodic, anti-pyretic, anti-ulcer, antioxidant, anti-epileptic, hepatoprotective, neuroprotective, hypoglycemic, diuretic, and blood lipid-reducing functions [7, 8, 9]. Some health problems such as skin infection, asthma, bronchitis, etc. already use this herb plant as herbal medicine [7].

3. *Moringa oleifera* Anti-hyperuricemic Effect

As the nutrients and pharmacological effect of *Moringa oleifera* has been known, application of it in the medicine is also becoming more widespread including its effect in lowering uric acid. *Moringa oleifera* leaves contain chlorogenic acid, rutin, quercetin glucoside, kaempferol rhamnoglucoside, polyphenol, etc. with high antioxidant and hepatoprotective effect [8]. These components and effect can become a sign of its potency to reduce uric acid in hyperuricemia [10].

From a study that has been done, *Moringa oleifera* playing role in reducing uric acid in the body serum by inhibiting xanthine oxidase [10]. Xanthine oxidase has a big role as an enzyme which contributing to produce high reactive oxygen species (ROS). Majority, the higher of ROS will be accompanied by the higher of uric acid. Moreover, ROS can damage and alter normal cell and tissue result in functional and metabolic impairment [11].

Otherwise, inhibition of xanthine oxidase showing a benefit in reducing uric acid either by increasing in renal excretion of uric acid by renal or degradation of uric acid. This effect will prevent deposition of uric acid in the body. As consequence, diseases and complications caused by hyperuricemia such as cardiovascular disease, gout, metabolic disease, and other else can be prevented or have a better outcome. [11,12].

From a research, it is known that phenolic and peptide fractions which contained in *Moringa oleifera* has important role in inhibiting xanthine oxidase which results in decreasing in uric acid production. This research using *Moringa oleifera* leaf hydrolysate (MOLH) from enzymatic hydrolysis process by trypsin. The effectiveness of its anti-hyperuricemic effect was assesed in a hyperuricemia induced rat model at doses of 200 and 500 mg/kg. The research's results showed there was significant effect of MOLH in reducing uric acid ($p < 0.05$ at 200 mg/kg, $p < 0.01$ at 500 mg/kg) [10].

Another experimental research evaluates the effect of *Moringa oleifera* in reducing serum acid and TNF-α levels over white rats. Ethanol extract of *Moringa oleifera* leaves is given at doses of 300, 600, and 1200 mg/kgBW/day. Significant results were acquired both in reducing uric acid and TNF-α with p value < 0.05. The higher the dosage was given the effect become more potent in reducing serum's uric acid. However, the difference between rats given at doses of 600 and 1200 mg/kgBW/day and rats given at doses of 300 mg/kgBW/day was not significant. It could be due to saturation phenomenon of dosage-receptor relation [13].

A research conducted to observe *Moringa oleifera* antioxidant activity from inhibition of xanthine oxidase enzyme. Methanol extract was carried out on the leaves, stems, and roots to analyze polyphenol and antioxidant in vitro. As a results, it was found chlorogenic acid, rutin, quercetin glucoside, and kaempferol rhamnoglucoside in methanol extract of *Moringa oleifera* leaves. In roots and stems, procyanidins were also found [14]. Procyanidins have a higher antioxidant capacity than vitamin E and vitamin C and ability to suppress ROS productions. Moreover, it has anti-inflammation activity by inhibiting MMP9, formation of NLRP3 inflammasome, blocking NF-κB signaling pathway, and other mechanism [15]. In xanthine oxidase model assay system, potential effect of antioxidant was assessed and showed 50% inhibition of oxidation (IC_{50}) of roots (16 μL), leaves (30 μL), and stems (38 μL). Thus, 2-deoxyguanosine assay model system assessed radical scavenging capacity and obtained IC_{50} values of leaves (40 μL), stems (58 μL), and roots

(72 µL). All of the parts of *Moringa oleifera* that observed had high potential especially roots for antioxidant potential and leaves for radical scavenging activity [14]. Previous study researched the twigs extract of *Moringa oleifera* then evaluate the total phenolic and total flavonoid related to antioxidant activity along with inhibition of xanthine oxidase. The research's outcome was phenolic component played huge roles in antioxidant activity while flavonoid contributed to inhibition of xanthine oxidase [16]. A study that had been conducted also revealed the high anioxidant effect from *Moringa oleifera* seed extract [17]. Based on its potential effect, it can be applied to reduce uric acid levels in the blood [8,10,11].

4. Conclusion

Moringa oleifera containing products that can lowering uric acid levels in body serum. The mechanism of it reduce uric acid levels especially by inhibiting xanthine oxidase and antioxidant activity which results in decreasing uric acid productions. Furthermore, antioxidant effect can block the negative impact from ROS. Most all of parts have high potency as anti-hyperuricemic and antioxidant. Several research has been conducted and showing significant effect of *Moringa oleifera* in lowering serum's uric acid. Development and further research continue to be expected as the promising potency of *Moringa oleifera* in lowering urid acid and even become alternative herbal medication in treating gout or another symptomatic condition related to hyperuricemia.

Compliance with ethical standards

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Disclosure of conflict of interest

The author states there is no conflict of interest.

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