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Biological Activity of *Moringa peregrina*: A Review

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Abstract

Plants are rich source of natural bioactive phytochemicals, since many of photochemical compounds are currently available as unregulated botanical preparations and their use by the public is increasing rapidly. The use of drugs and dietary supplements derived from plants has accelerated in recent years to treatment of infectious diseases. While more of current pharmaceuticals are derived from plants. Traditional healers have long used plants to prevent or cure infectious conditions. This review attempts to summarize the current status of chemical and biological screening efforts, as well as in vivo studies of their effectiveness and toxicity of *Moringa peregrina*. It is a wild tree and contains large number of phyto-constituents. Scientifically; it possessed various pharmacologic effects, including hypoglycemic, analgesic, anti-inflammatory, hypo-lipidimic and antioxidant activities.

Keywords

Moringa peregrina, Biological Activity, Phytochemicals

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1. A Brief History and Uses of *Moringa peregrina*

Medicinal powers in plants are an old idea. A small percentage of plants are used by human as food, even more are used for medicinal purposes. Medicinal plants are an important parts of the medicine background. Most of the populations in the world depend on herbal medicine for their health care needs [1]. A plant contains a multiple different molecules may act synergistically on targeted elements of the complex cellular pathway [2]. In addition, the use of medicinal plants in medical synthesis becomes well-liked due to toxicity and side effects of synthetic drugs. Thus, medicinal plants play an important role in the enlargement of new healing agents [3]. A large number of pharmacological investigations have been directed towards the plant kingdom as a source of therapeutic agents [4].

Antioxidants provide protection against degenerative diseases including cancer, coronary heart, and Alzheimer's diseases [5]. Reactive Oxygen Species (ROS), contribute to cellular aging, mutagenesis, carcinogenesis, and coronary heart disease, likely through destabilization of membranes, DNA and protein damage, and oxidation of low-density lipoprotein (LDL) [6]. Mechanism of action of antioxidants includes the suppression of ROS formation, the inhibition of enzymes or chelating of elements involved in free-radical production. Furthermore, antioxidants scavenge reactive species and upregulate antioxidant defences [7]. *Moringa peregrina* plants are considered to be more powerful antioxidants because they are rich of natural antioxidants like, tocopherols, carotenoids, vitamin C, flavonoids, and phenolic compounds [5, 8]. Flavonoids are known to be highly effective antioxidants by scavenging oxygen radicals, by having interesting anti-cancer, hypolipidemic, anti-ageing,

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and anti-inflammatory activities [9]. Moreover, the protective effects of flavonoids in biological systems are attributed to their capacity to scavenge free radicals, chelate metal catalysts, activate antioxidant enzymes, reduce alpha-tocopherol radicals, and inhibit oxidases [6]. Furthermore, phenolic compounds have phenolic hydroxyl groups which can dissociate to negatively charged phenolates.

2. Description and value of *Moringa peregrina*

Moringa is a small genus includes thirteen species of shrubs and trees originating in Asia and Africa that have been distributed in many othertropics lately. Miracle tree (*Moringa peregrina*) belongs to "Moringaceae" family [10), known in Arabic as "Habb El Yasar, Habb El Pan", the seeds are known as "Habba Ghalia" and it is a very fast growing tree or shrub [11]. It is one of the most useful trees in the tropics and subtropics of Asia and Africa, with a multiple of usesin agriculture, health, and industry for developing countries. However, the Moringa tree is most praised for its nutritional abilities and consists of vitamin and mineral concentrations [12], and widely grown in a wide geographic range of dry or semiarid countries from the Dead Sea area sporadically along the Red Sea to northern Somalia and around the Arabian Peninsula to the mouth of the Arabian (Persian) Gulf, Red sea coast Sinai Mountains [11, 13-16].

Moringa peregrina could soon become one of the arid land's most valuable plants, at least in humanitarian terms and in animal feeds. Its seeds have different economic and medicinal importance due to its unique composition of oil [16, 17]. *Moringa peregrina* is one of plant species that potentially become important in developing countries where hunger and undernourishment is a major concern. Traditionally, young seeds of the plant are eaten in India and the mature one are fried or roasted in Malawi [18]. Due to its valuable nutrient content and tolerant to severe drought, the plant could become an important future crop in arid and semi arid regions. To our knowledge only as edible oil by Tsaknis [19], antimicrobial activity and antioxidant stability of the *Moringa peregrina* seed oil were evaluated.

Moringa peregrina has a wide geographic range, growing from the Dead Sea area along the Red Sea to Northern Somalia and around the Arabian Peninsula to the mouth of the Arabian Gulf. It is an extremely fast growing tree or shrub that commonly reaches about 3 to 10 m in height just 10 months after the seed is planted [20]. It has a grayish-green bark, long, alternate leaves, and yellowish white to pink, showy, fragrant flowers [13]. The fruits are elongate capsules, with a beak, glabrous and slightly narrowed between the seeds. The seeds are globose to ovoid or trigonous. *M. peregrina* usually inhabits crevices and the rocky slopes of mountains. *Moringa peregrina* is one of the most economically important and valuable medicinal plants in the Egyptian desert. However, its existence is threatened by over-grazing, uprooting and disturbance through unmanaged human activities [21]. It is used extensively for its medicinal value. It is used to treat headaches, fevers constipation, burns, abdominal pains, back and muscle pains and labor pains [13]. An infusion of the leaves and roots in water is used to treat malaria, stomach disorders, hypertension, asthma and diabetes [22]. The young leaves are also used traditionally in folk medicine as an anti-oxidant and wound healer [23]. The seeds have different economic and medicinal importance due to its composition of oil which can also be used to treat abdominal pain [24]. The seeds are also used as medicine in the Middle East and Sudan and the leaves can be described as "phytoactive" [25].

3. Phytochemical Composition and Biological Activities of *Moringa peregrina*

The main product derived from *Moringa peregrina* is seed oil, called 'ben oil'. The use of the oil goes back to antiquity and is already referred to in old Egyptian texts and the Bible. The oil is used for cooking, in cosmetics and in medicine. In Yemen the oil is used as a lubricant for small machinery. The seeds are also used as coagulant to purify water, e.g. in Sudan. In southern Sudan and Yemen *Moringa peregrina* is a bee plant and its leaves are used as fodder. The seeds are used in medicine in the Middle East and Sudan. The oil is used to treat abdominal pain. The tuber of the young plant is eaten in Yemen and Oman. The plant is grown as ornamental in Saudi Arabia and the Middle East. The wood is collected for fuel in the southern Sinai, but it has now become scarce. The seed of *Moringa peregrina* contains about 50% oil. It is similar to the oil extracted from the seed of *Moringa oleifera* Lam. The approximate fatty acid composition of the oil is: palmitic acid 9%, stearic acid 4%, arachidic acid 2%, behenic acid 2%, oleic acid 71%, linoleic acid 1%, and gadoleic acid 2%. The oil contains the sterols campesterol, stigmasterol and β-sitosterol and the tocopherols α-, γ-, and δ-tocopherol. The water purifying properties of the seed are caused by a protein which coagulates dispersed particles [16, 19, 26].

Moringa peregrina is known for its uses as medicine, food, water purifying agents and biodiesel [27-30]. Moreover, the seed kernel has high oil content in the range of 42–54% [31]. Moringa oil has a high concentration of oleic acid (>73%) and very low amount of polyunsaturated fatty acids (<1%)

[32]. The development and increase of antibiotic resistance, as well as the continuously evolving new strains of disease causing bacteria, have pointed to the need for new and safe antibacterial agents discovery. Medicinal plants are an attractive source for new discoveries in antibacterial agents [33]. Various parts of *Moringa peregrina* possess antibacterial activity [34, 35]. Majorly, the mechanism of action for these antibacterial compounds is either to confer a death of the microorganism (bactericidal) or by preventing their growth (bacteriostatic). This is just a listing of antibiotic effects in general. More recently, *Moringa peregrina* aerial parts were fractionated using n-hexane and β-amyrin - β-sitosterol-3-O- -D-glucoside and apigenin were tested against various bacterial and fungal species. Results demonstrated that each of these constituents had significant antibacterial inhibitory effect as compared with standard antibiotics [36].

The chemical properties of *Moringa peregrina* were studied by [37]. The pharmaceutical functions were investigated as well and proved a significant role as anti-cancer drug for colon and breast cancer cells [38]. Seeds of *Moringa peregrina* have anti-oxidant effects and play role in improving the health and resistance of diseases. Elbatran et al. [37] investigated the phytochemical and pharmacological properties of *Moringa peregrina* and determined the presence of four flavonoidal compounds; quercetin, quercetin-3-0-rutinoside (rutin), chrysoeriol-7-0-rhamnoside and 6,8,3,5-tetramethoxy apigenin. The compounds displayed anti-inflammatory activities bysignificantly inhibiting carrageenan-induced rat pawoedema and they also exhibited marked analgesicproperties. In addition, *Moringa peregrina* inhibited the development of gastric lesion in rats [37]. Investigations into the ethanolic fractions of aerial parts of *Moringa peregrina* yielded several compounds which showed potent cytotoxic activity against colon cancer cells (HCT116) and breast cancer cells (MCF-7) comparable to that of doxocrubicin, a known anti-cancer drug. Both aqueous and ethanolic extracts of *Moringa peregrina* showed anti-hyperglycemic effects on streptozitocin induced diabetes in rats by causing a significant decrease in blood glucose levels [38]. Abdel-Rahman et al. [36] isolated six constituents from the aerial parts of *Moringaperegrina*: lupeol acetate, α-amyrin, β-amyrin, sitosterol, sitosterol-3-O-D-glucoside and apigenin which displayed antibacterial activity. The seed oil displayed significant antibacterial activity against *Candida albicans*, *Escherichia coli*, *Enterobacter cloacae*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* [39]. The seed oil also showed dose-dependent anti-cancer activity by inhibiting the growth of 3 cancer cell lines; breast adeno carcinoma cells (MCF-7), hepatocellular carcinoma (HepG2) and colon carcinoma (HCT-116). A full chemical characterization of the seed oil showed high levels ofoleic and gadoleic acids, while the dominant saturated acids were palmitic acid and stearic acid. β-sitosterol was found as the most predominant component of the sterolicfraction of the oil and campesterol, stigmasterol and brassicasterol were also found. α-, γ- and δ- tocopherols,which are natural anti-oxidants were also detected [19]. Hence, the seed oil of *Moringa peregrina* provides a significant source of anti-oxidant and anti proliferative compounds which are necessary for the promotion anti-proliferative compounds which are necessary for the promotion of health and prevention of diseases. *Moringa peregrina* has the potential to become one of theworld's most valuable plants due to its broad economical and medicinal importance; however, its existence is currently threatened in its environment due to human activities, hence the protection and conservation of its vulnerable habitat is very much needed. Anti-leukopenia effect of *Moringa peregrina* seeds oil was observed and reported by [40-42].

Moringa peregrina ranks high among seeds in both antioxidant quality and quantity [43]. The different extracts of the plant were also screened for In vitro anti-inflammatory and antioxidant activities [43], also, Elsayed et al. [44] suggest that oil isolated from *Moringa peregrina* seeds has potential cytotoxic properties against different cancer cell lines and anticancer properties. Majali et al. [45] described *Moringa peregrina* as miracle tree, because the valuable biological activities, such as antimicrobial, antiviral, anticancer, antioxidant, immune-modulatory. *Moringa peregrina* used as herbal medicines in south Asia for the treatment of a wide range of conditions, such as inflammation, gastrointestinal, hematological, cardiovascular, hepato and renal disorders [17, 46]. Also, *Moringa peregrina* has been used for diabetes and hypertension as well as liver protection [16, 47].

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