



Mini Review

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A Review of the Pharmacological potential of the Water Lily *Nymphaea lotus*



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Abstract

Natural Product serve as a major source of drugs for centuries, and about half of the pharmaceuticals in use today are derived from Natural Product. Herbal medicines have become a popular form of therapy both in the developed and developing countries. However, many of these natural products are used by population despite the fact that the scientific data on their pharmacotoxic profile are unknown. In regard to this present trend, extracts from a medicinal plant widely spread in Africa, *Nymphaea lotus* L were the investigated natural material. This review summarizes thus the evidence for pharmacological activities of *Nymphaea lotus* Linn extracts, highlighting, where investigated, its pharmacotoxic potential.

Keywords: Natural products; *Nymphaea lotus*; Androgenic; Antioxydant; Libido

Mini Review

In many African countries, medicinal plants are commonly used as complementary or alternatives to commonly used pharmaceutical drugs [1]. The World Health Organization estimates that up to 80% of the population in Africa use traditional medicine to help meet their health care needs and 85% of these traditional medicines involve the use of plant extracts. This means that 66%-85% or about four billion people depend directly on plants as their source of medication [2].

Nymphaea lotus Linn (Nymphaeaceae) (*N. lotus*) commonly known as water lily, is a water plant with white flowers wide spread in tropical Africa [3]. *N. lotus* is endowed to possess numerous ethno medical uses. In West Cameroon, the flowers of *N. lotus* are used by the 'Bamileke' tribes to cure male sexual disorders or psychiatric conditions [4]. The whole plant aqueous decoction is used by the 'Hausas' in Northern Nigeria for the treatment of Guinea worm infection and by the 'Yoruba' in South Western Nigeria for the treatment of rheumatic pains and as an antitumor agent [5]. Yet others, *N. lotus* has been reported to possess antibacterial [6], antidiabetic [7] and antioxidant [8] effects. Taking into account the large ethnomedicinal uses of this plant, several scientific studies have been dedicated to prove these pharmacological applications. The reports

of phytochemical studies showed that the major bioactive metabolites in *Nymphaea* species are flavonoids and phenolic compounds. Further, two very unusual macro cyclic flavonoids have been isolated from the wild water lily *Nymphaea lotus* L [9,10]. In fact, flavonoids are widely distributed as secondary metabolites produced by plants and play important roles in plant physiology, having a variety of potential biological benefits such as antioxidant, anti-inflammatory, anticancer, antibacterial, antifungal and antiviral activity [11]. Phenolics are also of interest for their nutritive value and as possible alternatives of synthetic antioxidants [12]. Oyeyemi *et al.* [13] already demonstrated that antioxidative properties defines the hepato protective effects of *N. lotus* in CCl₄-intoxicated rats. Tolerability, antioxidant influence and safe usage of *N. lotus* have been approved by some authors [14-17] and rejected by others [18-20]. The beneficial or harmful effects of the natural medicinal products typically result from combinations of various phytochemical present in the plant [21]. The identification of the doses of substances responsible for the therapeutic effect of *N. lotus* appears thus as an urgent need to enable a safe use of the plant [22]. Effectively, one animal study showed significant antioxidant effects of *N. lotus* in L-NAME-hypertensive rats [15] at the dose of 75 mg/kg/day whereas the dose of 200 mg/kg/day exhibited pro-oxidant effects after 4

weeks administration. This is in line with the results of another animal study, which was based on protective effects of *N. lotus* aqueous extract against chronic unpredictable mild stress [4]. The latter indicated that *N. lotus* aqueous extract administered at the dose of 75 mg/kg/day significantly reduced malondialdehyde levels induced by 14-day exposure to chronic stress, reinforcing thus the antioxidant potential and lipid per oxidation inhibitory effects of this plant particularly at this dose. This aforementioned antioxidant potential of *N. lotus* could play an important role in reproductive function. In fact, oxidative stress is a major factor that affects spermatogenesis [23]. It was found that *N. lotus* administered at the doses of 75 and 150 mg/kg/day during 55 days, increase libido index, improve the relative weight of the androgen dependent organs and all others fertility parameters, as well as the number of offspring related to the increased sperm count, motility and viability, underlying thus aphrodisiac, reproductive and androgenic-like effects of *N. lotus* flowers extract in Wistar rats [17]. Contrarily the report of Sowemimo et al. [18] disagreed these results. They observed that hydro-ethanol extract of *N. lotus* induced chromosomal aberration in rat lymphocytes. Oyeyemi et al. [20] also found that both aqueous (200, 400, 800 and 1600 mg/kg) and hydro-methanol extracts (50, 100, 200 and 400 mg/kg) of *N. lotus* induced an increase in aberrant sperm cells in the mouse. Additionally, it was reported that the extracts of *N. lotus* have the potential to induce somatic genotoxicity in the mouse. Others pharmacological studies on *Nymphaea lotus* attested its antiparasitic, antibacterial, and antiulcer effects. One experimental study on trypanocidal activity of *N. lotus* methanol extract against *Trypanosoma brucei brucei* demonstrated the potency of its crude extract in treating experimental trypanosomiasis at the dose of 100 mg/kg/day [24]. In 2016, an animal study was conducted to evaluate the effects the antidiarrhoeal activity of the methanol rhizome extract of *N. lotus* plant in laboratory animals [25]. Results of this study revealed that the extract at the doses of 200, 400 and 800 mg/kg produced significant reduction in the frequency of diarrhea. The extract at 800 mg/kg produced a significant delay in onset of diarrhea in *N. lotus* treated groups, showing that the methanol rhizome extract have antidiarrhoeal properties. In another study, John-Africa et al. [26] demonstrated that the administration of *N. lotus* at the doses of 250, 500, 1000 mg/kg significantly, dose-dependently, prevented the induction of acute gastric mucosal injury induced by absolute ethanol. Bioactive metabolites in *N. lotus* such as flavonoids, saponins and tannins were suggested to act synergistically to protect gastric mucosa against the ulcerogenic. Some of these compounds are mentioned to inhibit lipid oxidation, resist aging, prevent tumor growth, cardiovascular disease, and restrain bacterial growth [27]. *Nymphaea lotus* has many therapeutic effects and could be recommended as an encouraging factor for safe usage as a traditional antioxidant medicine. However, *N. lotus* may also be toxic, especially when used for a long period of time and at higher doses.

Conclusion

This paper summarized the pharmacological effects of *Nymphaea lotus* to determine the importance of its usages as one of the promising safety profile therapeutically herbs. *N. lotus* and its secondary metabolites possess a number of different functions, including aphrodisiac, androgenic, antioxidant, trypanocidal and antidiarrhoeal properties but caution should be applied in the use of this plant as herbal medicines.

Conflict of interest

We declare that we have no conflict of interest.

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