

## MORINGA OLEIFERA: BIO-INSPIRED APPROACHES TO PLANT BASED NANOMEDICINE, A MINI REVIEW

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### ABSTRACT

Nanotechnology greatly deal with the development of drug delivery system. By significantly changes in solubility, stability, and bioavailability of a drug-molecule. Though some chemically synthesized naomedicine frequently shows a toxic effect. Therefore a new process of synthesis nano-medicine is in due attention. Since past plant is a source of alternative medicine. Nano-medicine using plant material may be the cheapest way to get our goal. Thus our article mainly highlighted the bio-inspired approaches for synthesis plant based Nanomedicine. *Moringa oleifera*, which is cultivated in India specially North and East region, have been used as traditional medicines to treat a wide variety of ailments. Almost all parts of this plant have been used for various diseases in the folk medicine. A recent study have been reported that silver nanoparticle using *Moringa oleifera* leaf extract Shows antibacterial efficacy was dose-dependent and was more pronounced against gram-negative organism than gram positive one. Therefore plant nanomedicine using *Moringa oleifera* have economic viability because of its easy availability and potential method for large scale synthesis.

### INTRODUCTION

Nanotechnology is now creating a growing sense of excitement in life sciences especially biomedical and biotechnology [1]. Nanoparticles exhibit newly improved properties based on specific characteristics such as size, distribution and morphology [2]. Recently bio-inspired approaches for searching a cleaner method of synthesis nanoparticles employing yeast, fungi bacteria or plant materials [3,4].

*Moringa oleifera*, native to asia and spread in most part of Africa, is the sole genus in the flowering plant family *Moringaceae*. *Moringa oleifera lam* is one of the the most economically important species indigenous to dry tropical areas in the north western India [5]. Various parts of the *Moringa oleifera* tree have been used as traditional

medicines to treat a wide variety of ailments in Asia and Africa. It is said that the various parts of the *Moringa* tree can effectively treat ailments such as: headaches, worms, diarrhea, stomach ulcers, skin conditions, anemia, infections, fevers, urinary problems, liver and spleen problems, arthritis and rheumatism [6].

The size and the structure of nanoparticle have specific significance on drug delivery system, more ever the enhanced permeability and retention time (EPR) effect helps them to travel efficiently through cytoplasm [7]. Thus it may show potential benefit to medical application especially for the life threatening diseases like cancer [8]. In spite of advanced development of chemically synthesized pharmaceutical medicine, the most cheap and cost effective alternative medicine can be achieved by using herbs. Thus the “greener” methods of synthesizing nanoparticles with perfect structural properties are an ecofriendly approach which might pave the way for researchers across the globe.

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### Phytopharmacology of *Moringa oleifera*:

An extensive variety of nutritional and medicinal uses have been attributed to its roots, bark, leaves, flowers, fruits and seeds. Almost all parts of this plant have been used for various diseases in the folk medicine of South Asia, including the treatment of inflammation and infectious diseases along with cardiovascular, gastrointestinal, haematological and hepatic and kidney disorders [9]. The number of medicinal properties of the various part of *Moringa oleifera* have been described on the Table 1 [10,11,12].

### Phytochemistry of *Moringa oleifera*:

An examination of the phytochemicals of *Moringa sp.* Show that this plant family is rich in compound containing the simple sugar, rhamnose and fairly unique group of compound called glucosinolate and isothiocyanate [13]. The specific component of *Moringa* include 4-(4'-acetyl- $\alpha$ -L rhamnopyranosyloxy) benzyl isothiocy-anate, 4-( $\alpha$ -L-rhamnopyranosyloxy) benzyl isothiocy-anate, niazimicin, pterygospermin, benzyl isothiocyanate, and 4-( $\alpha$ -Lrhamnopyranosyloxy) benzyl glucosinolate (Figure: 1). It is also rich in a number of Vitamins and minerals, carotenoids (including  $\beta$ -carotene or pro-vitamin A) [10,14].

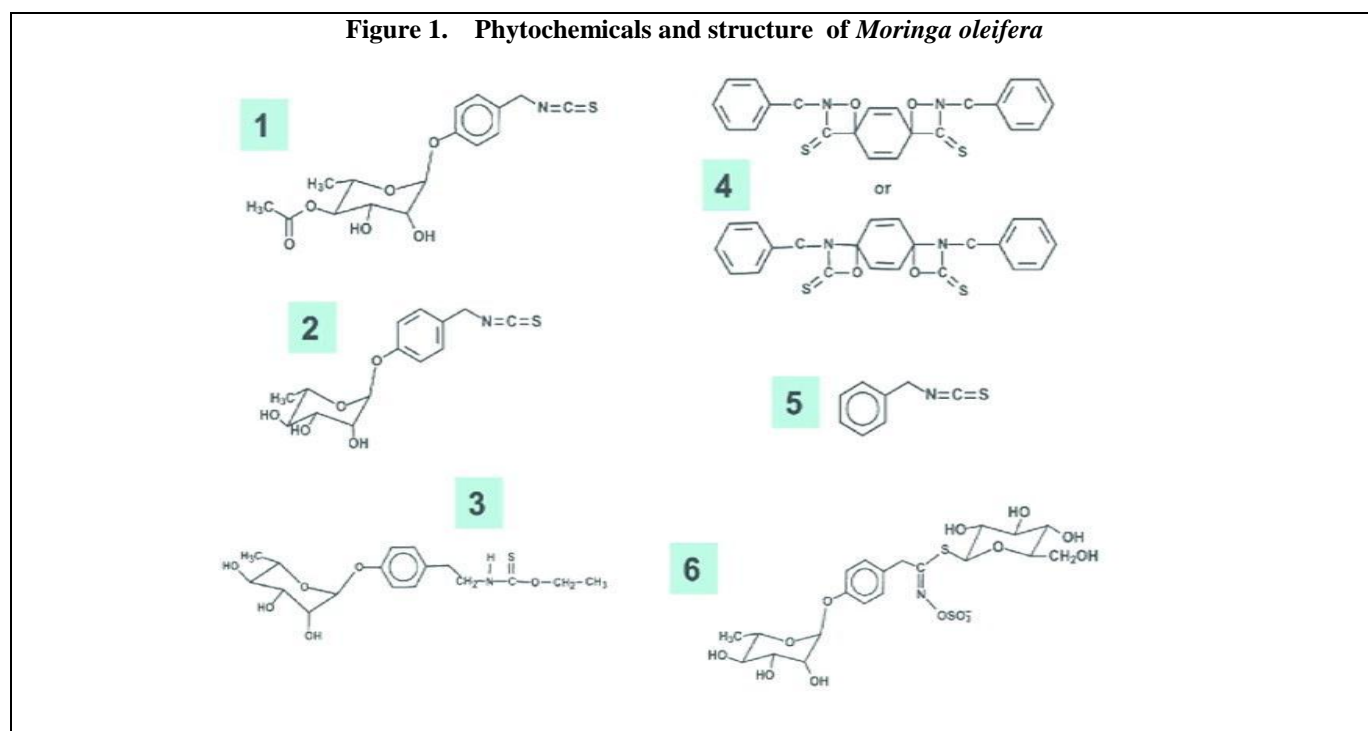
### Nanomedicine using *Moringa oleifera*:

Recently drug delivery system has opened up new potential in a field of Nanotechnology. Nanotechnology based drug delivery system or Nanomedicine shows significant changes in solubility, stability, and bioavailability [15]. Thus it is suitable for the target action therapy. Green synthesis of nanoparticles is an eco-friendly approach to explore the potential of different herbs in order to synthesize nanoparticles [3]. *Moringa oleifera* has been used as an ingredient of Indian diet since centuries [5]. It is reported on Charka Sanhita, Volume VI, that *Moringa oleifera*, a ayurvedic traditional medicine can prevent 300 diseases. Thus nanomedicine using *Moringa oleifera* may indicate a better clinical outcome for the diseases.

It is recently reported that silver nanoparticle using *Moringa oleifera* leaf extract

Shows antibacterial efficacy was dose-dependent and was more pronounced against gram- negative organism than gram positive one [16]. Presently plant based nanomedicine has generated great enthusiasm in recent year due to important discovery in cancer therapy. (Fierascu, 2008). Besides it plant nanomedicine using *Moringa oleifera* shows economic viability because of its easy availability and potential method for large scale synthesis [17].

Figure 1. Phytochemicals and structure of *Moringa oleifera*



[1] 4-(4'-acetyl- $\alpha$ -L rhamnopyranosyloxy) benzyl isothiocy-anate, [2] 4-( $\alpha$ -L-rhamnopyranosyloxy) benzyl isothiocy-anate, [3] Niazimicin, [4] pterygospermin, [5] Benzyl Isothiocyanate, [6] 4-( $\alpha$ -Lrhamnopyranosyloxy) benzyl glucosinolate.



**Table 1. Some common medicinal uses of different parts of *Moringa oleifera***

Plant Part	Medicinal uses
Root	Antilithic, rubefacient, vesicant, carminative, antifertility, anti-inflammatory, stimulant in paralytic afflictions; act as a cardiac/circulatory tonic, used as a laxative, abortifacient, treating rheumatism, inflammations, articular pains, lower back or kidney pain and constipation.
Leaf	Purgative, applied as poultice to sores, rubbed on the temples for headaches, used for piles, fevers, sore throat, bronchitis, eye and ear infections, scurvy and catarrh; leaf juice is believed to control glucose levels, applied to reduce glandular swelling.
Stem bark	Rubefacient, vesicant and used to cure eye diseases and for the treatment of delirious patients, prevent enlargement of the spleen and formation of tuberculous glands of the neck, to destroy tumors and to heal ulcers. The juice from the root bark is put into ears to relieve earaches and also placed in a tooth cavity as a pain killer, and has anti-tubercular activity.
Gum	Used for dental caries, and is astringent and rubefacient; Gum, mixed with sesame oil, is used to relieve headaches, fevers, intestinal complaints, dysentery, asthma and sometimes used as an abortifacient, and to treat syphilis and rheumatism.
Flower	High medicinal value as a stimulant, aphrodisiac, abortifacient, cholagogue; used to cure inflammations, muscle diseases, hysteria, tumors, and enlargement of the spleen; lower the serum cholesterol, phospholipid, triglyceride, VLDL, LDL cholesterol to phospholipid ratio and atherogenic index; decrease lipid profile of liver, heart and aorta in hypercholesterolaemic rabbits and increased the excretion of faecal cholesterol.
Seed	Seed extract exerts its protective effect by decreasing liver lipid peroxides, antihypertensive compounds thiocarbamate and isothiocyanate glycosids have been isolated from the acetate phase of the ethanolic extract of <i>Moringa</i> pods.

## CONCLUSION

Since past plant is a source of medicine and ayurvedic product. Among them *Moringa oleifera* is in due attention because of its diverse nature of potentially treat nearly 300 diseases. Every part of this plant has medicinal value. Presently drug delivery system has opened up with a new challenge in development of nanomedicine. Many chemical routes are known to use toxic chemicals for the synthesis of the nanoparticles. Researchers in this field,

therefore, have been eagerly looking at biological systems as alternative ecofriendly or nontoxic systems. Silver nanomedicine using *Moringa oleifera* thus may show better competentness for the ecofriendly approaches and clinical outcome against the diseases.

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**CONFLICT OF INTEREST: Nil**

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