

Therapeutic Potential of *Murraya Koenigii* (Curry Leaves) In Dyslipidemia: A Review

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Abstract

Dyslipidemia is a high level of lipids (cholesterol, triglycerides or both) carried by lipoproteins in the blood. The condition is rapidly spreading globally and has even riven the age bar. It is now swaying in young people too. The persistent dyslipidemias are often associated with many complexities. The most available and accessible therapies for dyslipidemias include Statins, the long use of which may be detrimental to human health. Natural plants have always been used to prevent and treat various diseases for thousands of years. India is a home to innumerable medicinal plants, many of which remain underutilized. *Murraya Koenigii* (curry leaf) a medicinal plant native to India, Sri Lanka and other South Asian countries, is one such plant. The therapeutic potential of the plant is one beyond measure and thus it can truly be called 'The Indian Panacea'. A screening of research reviews on curry leaves highlights its importance as a potent hypocholesterolemic herbal alternative. Dehydrated leaf powder and crude extracts of *Murraya Koenigii* supports its role in food processing industry and as value addition component in health and nutrition. The present stands on vintage pillars. The review covers contemporary as well as established data on therapeutic potential of *Murraya Koenigii* in Dyslipidemia.

Keywords: *Effect, Murraya Koenigii, Curry Leaves, Dyslipidemia, Review*

1. Introduction

Dyslipidemia is defined as an abnormality in or an abnormal amount of serum lipids or lipoproteins in the blood (Saunders, 2007). As per NCEP-ATP III Guidelines Serum Cholesterol >200mg/dl, LDL-C >100mg/dl, Triglycerides >150mg/dl and HDL-C <40mg/dl are characterized as dyslipidemia. Dyslipidemia is an independent and modifiable risk factor of cardiovascular disease (Fred et al, 2000). To combat dyslipidemias, patients have several treatment options that include drugs, diet, and lifestyle changes. Drugs are effective but produce adverse effects in a significant proportion of patients.

Statins are the most widely prescribed lipid-lowering drugs worldwide, but not all patients respond sufficiently to this. They produce adverse effects in upto 33% of patients (Bays, 2005). On the other hand, therapies based on dietary and lifestyle changes produce little or no adverse events and are the cornerstone of recommendations by the US national cholesterol education programme. Dyslipidemia is the most important atherosclerotic risk factor. A review of population based studies in India has shown increasing mean Serum Total Cholesterol levels. Recent studies have reported that high cholesterol is present in almost 25 to 30% of urban and 15 to 20% of rural subjects. The most common dyslipidemias prevalent in India are borderline high LDL cholesterol, low HDL cholesterol and high triglycerides. Focus on dyslipidemia management is urgently required in India to hold the rising tide of coronary heart disease (Gupta, 2017).

Since human's existence on planet, man has been dependent on nature for curing various diseases. Natural plants and herbs are a rich source of lead compounds many of which are useful drugs in themselves. Herbal medicine has proved virtuous and persuasive in the treatment of many chronic diseases that conventional medicine cannot cure. Plants also have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions. The use of herbs to treat disease is almost ubiquitous among non industrialized societies and is often more affordable than purchasing expensive modern pharmaceuticals (Salomi and Manimekalai, 2016). Plant phytonutrients are a rich source of important drugs used in degenerative diseases. Today we are witnessing a great deal of public interest in the use of herbal remedies. Ethnopharmacological studies of medicinally important plants have attracted the investigators throughout the world. One such plant *Murraya Koenigii* has invited the attention of researches worldwide for its biological activities. A very common member of our household gardens, commonly known as "Meetha Neem" it is an

aromatic, more or less deciduous shrub or a small tree upto 6 meters in height, found throughout India upto an altitude of 1500 meters and cultivated mostly for its aromatic leaves(The wealth of India,1998).

2. Materials and Methods

Literature data was collected from very well reputed scientific databases PubMed and Google Scholar. The search was conducted using *Murraya Koenigii* or curry leaf as a keyword. The review title was also used to access relevant articles. Only explicit reviews or interventional impact studies were critically analyzed for inclusion in this review. The analysis focused on the therapy, subjects, protocol, modus operandi and biochemical outcomes.

3. Literature Review

The present review incorporates the origin and distribution of *Murraya Koenigii*, its ethnobotany and various pharmacological scientific data on remedial plausibility of leaf formulations.

3.1. Botanical description

3.1.1. Origin and Distribution

Murraya Koenigii is a native of India, Sri Lanka and other south Asian countries. It is distributed throughout India and is abundantly found from Sikkim to Garhwal, Bengal, Assam, Western Ghats and Kerala. It has reached to Malaysia, South Africa and Reunion Island from India along with South Indian immigrants (Gahlawat et al, 2014). Of the 14 Global species belonging to the genus *Murraya*, only two are available in India, namely *Murraya koenigii* (L.) Spreng. and *Murraya paniculata* (L.) Jack (M. exotica(L)(Botanical survey of India, 1997). Of the two, the former is more popular due to its large spectrum of medicinal properties and also because of the use of its leaves for centuries as a natural flavoring agent in various curries and food items.

3.1.2. Taxonomy

Kingdom: Plantae
Subkingdom: Tracheobionta
Super division: Spermatophyta
Division: Magnoliophyta
Class: Magnoliopsida
Subclass: Rosidae
Order: Spindales
Family: Rutaceae
Genus: *Murraya* J.Koenig ex L.
Species: *Murraya Koenigii* (L.)Spreng
Source: (Kumar et al, 2013)

3.1.3. Synonyms

English: Curry leaves

Kannada: karibevu

Hindi: Curry patta, Meetha Neem, Kathnim

Tamil: Karivempu, Karuveppilei, Karivepila

Malayalam: Kariveppilei, Kareapela

Marathi: Karipat, Karhipatta, Karhinimb

Sanskrit: Girinimba, Suravi

Telugu: Karepaku, Karuvepaku

Gujrati: Mitho Limdo

Bengali: Barsunga

Source:(Chauhan et al, 2017)

3.2. Traditional uses

The leaves of *Murraya Koenigii* are generally used fresh or as dried leaf powder, for flavoring soups, curries, fish and meat dishes, egg dishes, traditional curry powder blends, seasoning and ready to use other food preparations. The essential oil of the leaves is used by the aromatherapy industry in making of soaps and cosmetics (Rao et al, 2011). Curry leaves are also known to be good for hair, for keeping it healthy and long. It is widely used in Indian cookery for centuries and has a versatile role to play in traditional medicine. The plant is credited with tonic and stomachic properties. Bark and roots are used as stimulant and externally to cure eruptions and bites of poisonous animals. Green leaves are eaten raw for cure of dysentery, diarrhea and for checking vomiting. Leaves and roots are also used traditionally as bitter, anthelmintic, analgesic, curing piles, inflammation, itching and are useful in leucoderma and blood disorders (Nadkarni, 1976).

3.3. Phytonutrients present in *M. koenigii* leaves

Though every part of the plant can be eaten but leaves are the 'storehouse of nutrients'. 100 gms of fresh leaves contain moisture(65.33g), proteins(7.41g), carbohydrates(4.51g), fibre(16.83g) 266 KJ of energy and only 1.06 g of total fat .Low fat and high fibre ascertains its role as strong hypocholesterolemic agent. An appreciable amount of mineral content is also found in curry leaves. It contains 182 mg of magnesium, 584 mg potassium, 17.25 mg of Selenium, 18.66 mg sodium, 659 mg of calcium and 8.67 milligrams of iron per 100 grams of fresh curry leaves. It is also a very good source of essential amino acids which is a strong evidence to support its role in synthesis of protein in the human body. The strong antioxidant activity displayed by *Murraya Koenigii* can be ascertained, as it contains 23.87 mg of vitamin C and 1.82 mg of Vitamin E in a 100 gram sample. The beta-carotene content of curry leaves is 7663 micrograms. Plant phytosterols in the form of β sitosterol (73.9mg) and 10.47 mg of campesterol were also detected in curry leaves (IFCT, 2017). Curry leaf plant is a rich source of Carbazole alkaloids (Kumar et al,1999). A large number of secondary metabolites such as

alkaloids(murrayastine,murrayaline, pypayafolinecarbazole)triterpenoid (cyclomahanimbine,tetrahydromahanmbine) coumarine (murrayone imperatoxin) and other compounds (mahanimbicine,bicyclomahanimbicine, phebalosin) have been reported from the leaves of *M. Koenigii* (Furukawa, 1986).Mahanimbine is a carbazole alkaloid present in leaves, stem, bark and root of *Murraya Koenigii* (Knolker, 2002). The *Murraya* species has the richest source of carbazole alkaloids which have been reported for their various pharmacological activities (Knolker, 2008). An experimental study by Dinesh Kumar et al, 2010 was carried out to investigate the effect of Mahanimbine on streptozotocin induced diabetic rats in which 50mg and 100 mg per kg body weight of Mahanimbine was administered to adult male Wistar rats by intraperitoneal injections per week for 30 days. A significant reduction in TG, TC, LDL, VLDL and an elevation of HDL level was observed. *M. Koenigii* was reported to contain β -sitosterol (Gupta et al, 2009). These compounds can reduce intestinal uptake of dietary Cholesterol, thereby reducing plasma Cholesterol levels (Lin et al, 2010).

4. Anti Dyslipidemic potential of *Murraya Koenigii*

An exhaustive search was made on the literature available on intervention studies of *Murraya Koenigii* in hyperlipidemia. On delving into the research studies, a very restricted data could be probed using animal models and human subjects. The reflection is cited below in chronological order.

Animal Studies

Late back in 1996, Khan et al, studied the biochemical response of curry leaf supplementation in the diet of Albino rats who were fed for 90 days, a standard laboratory rat diet plus 20% coconut oil with the addition of 10% curry leaf feed. This was offered at a level of 10% body weight. The spice resulted in a fall in total Serum Cholesterol, LDL+VLDL and an increase in HDL levels. Xie et al, in 2006 also observed the hypocholesterolemic activity of *Murraya Koenigii* extract in Diabetic ob/ob mice by administration of intraperitoneal injections of 80 mg/ kg curry leaf extract for 10 consecutive days.

The potency of Curry leaves can be ascertained by the fact that even a short duration of one month oral administration of aqueous extract of leaves in normal and streptozotocin induced diabetic rats at a dose of 300 mg/ kg body weight resulted in a fall of 19.2% and 30.3% in Total Cholesterol and 22.97% and 37.1% of Triglyceride level in case of normal as well as diabetic rats respectively. Feeding the extract

increased HDL-C levels by 16% and 29.4% in normal versus diabetic rats as compared with their initial values (Kesari et al, 2007). In the same year 2007, Vinuthan et al, investigated aqueous and methanol leaf extracts of *Murraya Koenigii*, for hypolipidemic effects on males Sprague dawley rats. The rats were divided into three groups of 6 animals each. The two experimental groups received aqueous extract 600mg/ kg body weight and methanol extract 200mg/ kg body weight respectively for a period of 8 weeks. A significant reduction in plasma cholesterol, triglycerides, phospholipids, and total lipid levels was seen.

Tembhurne and Sakarkar, in 2010 probed the hypocholesterolemic activity in aged mice, which was done by using crude ethanol extract of plant leaves of *Murraya Koenigii*. The experiment was confirmed by observing a decrease in cholesterol level in dose dependent manner. The dose of 500 mg/ kg was found more effective than 300 mg/ kg and was comparable with the standard cholesterol reducing agent Simvastatin. Obesity is a major causative risk factor for cardiovascular diseases (Robert and Yolanda, 2008). Tembhurne and Sakarkar, again in 2012 documented 'anti-obesity' effect of *Murraya Koenigii* leaf extract when rats fed on a high fatty diet underwent time dependent reduction in body weight, cholesterol and Triglycerides.

Human studies

A diligent effort was made to look into research findings on human experimental models. Only two excerpts could be ferreted out. In a study by Ballagalle (1997), 38 subjects were given a preparation of fine ground curry leaves twice daily, at a dose of 3 grams per meal for a period of 5 weeks. The study revealed a significant decline in total cholesterol (P=0.03).Another very recent study (2017), was conducted by Molly et al, on 40 post Menopausal women aged 45-65 years of age with hyperlipidemia, who were on, with or without hypolipidemic drugs, were intervened with dried curry leaf powder (5gms) added to the main side dish during lunch for 45 consecutive days. A drop of about 31.4mg/dl TC, 15.9mg/dl TG, 23.8mg/dl LDL and a rise of 6.5 mg /dl were observed in HDL values at post intervention. The paucity of data on human clinical models, creates an urgent requirement of research studies in this novel area.

5. Conclusions

The screening of literature available on *Murraya Koenigii* depicts the fact that it is a popular remedy among diversified groups for various ailments. Curry leaves are generally used as a spice or seasoning in

Indian recipes wherein the whole of leaf is used as such, which generally is discarded and not eaten. Hence, the nutritional potential of curry leaves remain underutilized. To establish curry leaves as an herbal alternative to be used in a more edible form and larger amounts, novel techniques like dehydration needs to be evolved. This will also ensure shelf stability. The present review also opens new vistas for discovery of cost effective and safe bioactive molecules from *Murraya koenigii*. Herbal medicines are more convenient and cheaper than other system of medicines. Therefore this review article posses a great potential for effective treatment by herbal medicines and has given valuable information for development of newer herbal formulation. Dyslipidemia is a risk factor for cardiovascular diseases. Geographically many of the developing countries are located in tropical and subtropical regions of the world where *Murraya koenigii* grows and cultivated. This plant could be advocated in these and other countries as an inexpensive prophylactic strategy against cardiovascular diseases. The available literature and widespread availability of *Murraya koenigii* in India makes it an attractive candidate for preclinical, clinical trials and formulation development in future research.

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