



Comparative phytochemical screening of leaves culinary plants - *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata*

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Abstract

Plants in the lives of human being have been used in many ways to meet their fundamental requirements such as food, clothing, and shelter and more important for the cure of various ailments from which the human has long suffered. India is a country with a vast reserve of natural resources and has a rich history of traditional medicine. A medicinal plant means it can be used for medicinal purposes or may act as a forerunner for the mixture of useful drugs.

Keywords: Phytochemical, traditional medicine, therapeutic plants, diseases, hindu scriptures

Introduction

Many plants such as Holy Basil (*Ocimum sanctum*) Bel Patra (*Aegle marmelos*) and a lot other plants are mentioned in the Hindu scriptures. Plants supply spices, functional food ingredients, medicinal raw materials, essential oil, flavouring products and in this way they are important source of income and employment to the rural as well as urban communities. The different method of medicinal usage practiced in India for example Ayurveda, Siddha, Unani and other local healthcare traditions utilize large number of plants for treatment of human being illness (Handral *et al.*, 2012). A huge information about the usage of those plants against different types diseases have been gathered in parts and the usage of plants is still of immense importance (Diallo *et al.*, 1999).

The medicinal value of the plants lie in their phytochemicals and these chemicals can be used like medicine which may give protection against illness (Afolabi *et al.*, 2007). Medicinal plants contain numerous biologically active compounds which are helpful in treatment of several diseases and have been utilized by tribal and ethnic communities. They rely on plant based medicines mainly due to non-availability of modern health care system. The advantages asserted for medicinal uses of therapeutic plants in different diseases are safety in addition being economical, useful and their easy availability. Phytochemicals are the type of non-nutritive chemicals from plants which will be protecting or having disease preventing properties. Plants generate such Phytochemicals to protect their own but current researches exhibit that many such phytochemicals also have the ability to protect human being against diseases. There are many phytochemicals in each medicinal plant and each works differently (Kumar *et al.*, 2011).

Murraya koenigii (Rutaceae) commonly known as “curry leaves plant” is broadly used as condiment furthermore used to treat different kinds of diseases in Indian traditional method. This is an important medicinal plant of in India and is grown in almost all houses for its medicinal character and for aromatic leaves. The leaves have a little spicy, bitter and acidic in taste and they preserve their taste even after drying them. It is a native of India, Sri Lanka and other south Asian countries and it is found almost everywhere in the Indian

Subcontinent. Recent researchers have revealed that different plants parts of *M. Koenigii* contain several chemical constituents that may show anti-oxidative, cytotoxic, antimicrobial, antibacterial, and anti-ulcer and cholesterol reducing activities (Gahlawat *et al.*, 2014) [5]. *Murraya koenigii* is furthermore an important product to export from India because of its medicinal significances. It is an antioxidant and the plant has the property of improving cognitive functions and reducing stress levels. It is an anti-diabetic and islet protective. Curry leaf is an important culinary item in Indian food. Curry leaves are broadly used in Indian cooking for flavouring the foodstuffs in Indian and Asian cooking.

Moringa oleifera is generally called as “Drumstick” in India and belongs to Moringaceae family is a well documented world renowned plant herb for its extraordinary nutritional and medicinal properties. It is the most popular tropical crop. All of its components are utilized specifically for their medicinal, dietary and water cleansing qualities. The moringa plant is commonly planted throughout the world because it can withstand both mild frost and intense drought. Due to the tree’s great nutritional value, every part of it can be used for either economic or nutritional purposes. The leaves are abundant in vitamins, minerals and other vital photochemicals. It is a natural anti-helminthic, antibiotic, detoxifier, outstanding immune builder, antibacterial, antifungal, anti-inflammatory, antioxidant, anticancer, and diuretic activities. It is also used in many countries to treat malnutrition and malaria. The high concentration of vital amino acids, proteins, minerals and vitamins available in the *moringa* leaves makes them an excellent dietary supplement. Asthma, pain, arthritis, obesity, diabetes and stomach ulcer diseases all respond favorably to it. Malnutrition can be treated well by using the leaf extracts, which are also used to help breastfeeding mothers needs milk for her baby. Other scientifically verified favorable results of *Moringa* include anti-hypertensive, anti-fertility, anti-tumour, anti-spasmodic, anti-ulcer, analgesic and Cardiac and circulatory system stimulant. The seeds of *M. oleifera* are a natural coagulant and are extensively used in water treatment. This paper looks at how the “Miracle Tree” is used across disciplines

for its medical usefulness and discusses its production, dietary needs, marketability and notable pharmacological traits.

Eryngium foetidum L., belonging to Apiaceae is a biannual herbal plant. The plant is native to the Caribbean islands. Today, it has been introduced to large parts of South East Asia. It is broadly used in various parts of the world as flavouring instruments. The leaves of these plants are used in traditional Indian cuisine to improve the smell and taste of the food. It is an endemic aromatic and medicinal herb found in various, particular geographical areas of India. Its soothing properties are believed to relieve some of the pain and gastrointestinal discomfort and gastric stimulating properties are used to offset the loss of appetite caused by illness. In ethno medicine the plant is used to treat burned wounds, ear aching, fevers, hypertension, constipation, asthma, stomach ache, worms, infertility difficulties, poisonous snake bites, arthritis, diarrhoea and malaria. The leaf decoction is used against gastrointestinal disorders and leaf paste as wound healing agent.

Sesbania grandiflora belongs to the Fabaceae family which is a fast growing tree. Since ancient times, *Sesbania grandiflora* leaves have been employed in regional traditional medicine. This plant's names in India include Agise (Telugu), Agate (Tamil) and Agastya (Kannada). Agastya is used in Ayurveda for many ailments due to its aperients, diuretic, febrifuge, laxative and tonic properties. It is used both internally and externally. Internally, it is given to treat cough, cold, catarrh, fever, weakness, indigestion, jaundice, excessive heat in body etc. Externally it is applied on bite of poisonous insects or animals, rheumatic joint, skin diseases etc. It is Antibiotic, anthelmintic, antitumor and contraceptive. Bark is anti-ulcerogenic, anti-coagulant; Leaves have anxiolytic, antioxidant and anti-urolithiatic activity. Leaves are also chewed to disinfect the mouth and throat. The leaf extract may reduce the development of advanced glycationed products. The extract from the leaves contains linolenic acid and aspartic acid that are found to be the major compounds responsible for the anti-glycation prospective of the leaf extract. The flowers from this plant also has great medicinal value, it possess anti-cancer, anti-microbial, analgesic and anti-pyretic property. The roots are anti-inflammatory. The leaves and the flowers of *Sesbania grandiflora* have cooking uses. The tender leaves, green fruit and flowers from the plant are eaten alone as a vegetable or even mixed with curries or salads.

Mentha spicata commonly known as mint belonging to the Lamiaceae family that has been reputed long for its distinctive aroma and this unique herb is one of chef's favourite culinary ingredients all over the world. Spearmint is pleasingly aromatic herb and filled with several health benefiting vitamins, anti-oxidants and phytonutrients. Its leaves and herbal parts carry important oil in addition to menthol. Most of the parts of spear mint aromatic plant found a place in many traditional as well in modern medicine also. The herb decoction works well for respiratory issues including asthma, bronchitis, and catarrh as well as minor ailments like headaches, nervous tension, weariness and stress. It is very useful to deal with digestive problems, including nausea, flatulence and hiccups as it relaxes the stomach muscles. Menthol essential oil possesses anti-inflammatory, analgesic and local anesthetic effects. Additionally, toothpaste and breath fresheners are made with menthol. It is also used as cream or lotion on the

skin, and helps to relieve itching, dermatitis, and hives. Spearmint oil is used as mixed massage oil, in aromatherapy and to soothe itching as well as to help with headaches, tension, exhaustion and nervous problems. As a garnish, leaves are frequently used in a variety of gastronomic foods and beverages. Teas can also be made with it. A well digestive system will be encouraged by the menthol in spearmint, which has been reported to enhance bile production.

The chemical components available in the plants having a particular physiological effect on the human body are what give them their medicinal importance. Various phytochemicals such as tannin, saponin, protein, carbohydrate, resin, carboxylic acid, quinine, anthraquinone, glycosides, carbonyl group, phenol, flavonoid, terpenoid and steroids have been separated from these plants. Alkaloids, flavonoids, tannins, and phenolic compounds are the most significant of these bioactive plant components (Edeoga *et al.*, 2005). These compounds work in combination with each other and are reasons behind its antimicrobial, anti-pyretic, anti-inflammatory and antioxidant properties.

The present work has been done to investigate the availability of the important phytochemicals present in the leaves of *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* collected from the species found in Andaman and Nicobar Islands and to ascertain the comparative degree of presence of these various phytochemical in their leaves.

Materials and methods

Collection of plant material

The fresh and healthy leaves of *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* were collected from Port Blair. Their taxonomical identity was confirmed by the P.G Department of Botany, JNRM, Port Blair. Fresh leaves were washed gently with tap water for few seconds to avoid loss of water soluble components by leaching, followed by quick rinsing in distilled water and drying with clean absorbent paper.

Preparation of dry leaf powder

Fresh leaves were kept in single layer on the trays in hot air oven at 40°C for 72 hours. After complete drying leaves were powdered by big gun and grinder and dry leaf powder was stored in sterilized polythene bags.

Experimental design

In this paper, phytochemical screening of the *Murraya koenigii* leaves, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* were determined by different biochemical tests.

Screening of phytochemical components

For analysis of phytochemical components available in the leaves of *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* the leaves extract were first prepared in distilled water and methanol separately. Different phytochemicals which were present in the methanolic extracts from the leaves of *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* were qualitatively analyzed by the regular practices explained by Harborne (1973), Trease (1973) and Evans (1989).

1. Test for tannin

In a test tube, 20ml of distilled water was used to boil 0.5g of the dried powder from the leaves of *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata*. It was then filtered. In the filtrate, a few drops of a 0.1% ferric chloride solution were added. The availability of tannin in the provided sample is indicated by the test solution having a brownish green or blue-black color.

2. Test for saponin

Murraya koenigii, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* powdered leaf samples totaling 2 gm were cooked with 20 ml of distilled water and filtered. To create a stable, long-lasting froth, 10ml of the filtrate was combined with 5ml of distilled water and forcefully shaken. The test solution contains saponin, as seen by the foamy lather development.

3. Test for protein

Qualitative test of protein was done by biuret test. In 0.5ml of leaf extract, few drops of biuret reagent (4 drops of 40% NaOH + 2 or 3 drops of 1% CuSO₄) were added. The test solution turns into violet in colour indicates the availability of protein.

4. Test for carbohydrate

The carbohydrates available in the leaf extracts *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* were analyzed by Fehling's test. A similar volume of Fehling's reagent was added to the methanolic leaf extract, and the mixture was heated on a water bath for 10 minutes. The development of red color is a sign that the leaves are carbohydrate-rich.

5. Test for resin

5ml of warm ethanol was added to 0.5g of leaf powder from *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata*. Filtered, then 4ml of 15N HCl was added to the filtrate to dilute it. The presence of resin is indicated by the production of a thick resinous precipitate.

6. Test for carboxylic acid

The 2ml of methanolic leaf extract was mixed with a sprinkle of sodium bicarbonate. The rapid effervescence and carbon dioxide evolution provide proof that the leaves contain carboxylic acid.

7. Test for quinone

5 drops of 40% 1N NaOH were applied to 0.5 milliliters of methanolic leaf extract. The presence of quinone is indicated by the color blue-green.

8. Borntrager's test for anthraquinone

5ml of 10% ammonia were added to two milliliters of methanolic leaf extract from *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora*, and *Mentha spicata*. Anthraquinone is present if pink red or violet color appears at the lower phase.

9. Keller-kiliani test for glycosides

A few drops of glacial acetic acid, a few drops of ferric chloride solution, and 1ml of concentrated sulphuric acid

were added to 2ml of methanolic leaf extract. The presence of glycosides in the test sample is confirmed by the emergence of a brown ring at the interface.

10. Test for carbonyl group

A mixture of two ml of leaf extract and one or two drops of 2, 4 diphenyl hydrazine was used. The existence of a carbonyl group in the leaves is confirmed by the appearance of yellow-colored crystals.

11. Test for phenol

Five milliliters of distilled water were used to dissolve 500mg of dry leaf powder from *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora*, and *Mentha spicata*. A few drops of a 5% ferric chloride solution were then added to this. The test sample's dark green color denotes the presence of phenolic chemicals.

12. Test for flavonoid

Murraya koenigii, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* powdered dried leaf material weighing one gram was cooked in 10ml of distilled water for five minutes before filtering. To 1ml of the cooled filtrate, a few drops of 20% NaOH solution were added. The presence of flavonoids in the leaves is shown by a change in color from green to yellow that turned colorless when acid was added.

13. Test for terpenoids

The Salkowski test was used to determine whether terpenoids were present in the leaves of *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata*. Additionally, leaf H₂SO₄ was introduced from the test tubes' sidewalls. The test solution's reddish brown hue indicates that terpenoids were present in the leaf extract.

14. Test for steroids

To 0.5ml of methanolic leaf extract of *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata*, two ml of acetic anhydride was added. Additionally, 2ml of concentrated H₂SO₄ was introduced from the test tube's sidewalls. Steroids are present in the leaves if the test solution's color changes from violet to blue green.

Result and discussion

Plants have been important resources to fulfill the various needs of human beings from the beginning of the human civilizations who have relied mostly on plants for their nutritional and medicinal needs. The medicinal property of the plant is due to the various phytochemicals- primary as well as secondary metabolites present in them which are produced mainly for their defence during evolution for adaptations. Many such plants by the passing of time have been incorporated as a culinary component and became part and parcel of food. The present plant i.e.; *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* fall under this category. These plants have high nutrition value as well as medicinal properties which can cure many common diseases such as coronary heart disease, diabetes and cancer. (Ishida H, Suzuno H, Sugiyama N, Innami S, Tadokoro T and Maekawa A - 2000) ^[10].

The present study reveals that *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* contain good amount of primary and secondary metabolites.

The phytochemical composition *Murraya koenigii* leaf shown in Table-1 reveals that the tannin content was the highest while leaf of *Sesbania grandiflora* had the least. Saponin was also detected in an appreciable amount in the leaf of *Murraya koenigii* while *Eryngium foetidum* had the least composition, but *Mentha spicata* did not show any traces of saponin. Protein substance of the leaves extract of *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* are shown in Table 1. The highest content of protein was found in *Moringa oleifera* whereas protein content in *Mentha spicata* was found in trace amount and *Sesbania grandiflora* did not revealed any content of protein. The leaves of *Murraya koenigii* contains substantial amount of carbohydrates while *Sesbania grandiflora* showed lower amount, where as it was completely absent in *Mentha spicata*. Resin was found to be the highest in the leaves of *Murraya koenigii* and least in *Moringa oleifera*. The leaves of *Mentha spicata* did not showed any traces of resin. Carboxylic acid content was found in subsequent amount in *Mentha spicata* whereas *Moringa oleifera* showed only traces and it was completely absent in *Murraya koenigii* and *Sesbania grandiflora*. Quinone was detected in appreciable amount in *Eryngium foetidum* whereas *Moringa oleifera* was detected to have the least content. Table 1 gives the anthraquinone content in the leaves of *Murraya koenigii*, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* where *Murraya koenigii* revealed the highest content and *Moringa oleifera* had the least content. The presence of glycosides in the leaves of *Sesbania grandiflora* was the highest while *Murraya koenigii* was found to have the lowest amount. The plant leaves of *Moringa oleifera* was found to have a good content of carbonyl group whereas *Sesbania grandiflora* revealed the least content. Phenol was found to be present in the highest content in the leaves of *Murraya koenigii* while

Sesbania grandiflora and *Eryngium foetidum* also had shown some traces. Leaves of *Moringa oleifera* was found to have significant content of terpenoids whereas the leaves of *Sesbania grandiflora* showed the lowest content. Steroids were detected in an appreciable amount in *Sesbania grandiflora* but *Eryngium foetidum* showed only traces.

The present investigation confirmed the presence of flavonoids extensively in *Murraya koenigii*, *Sesbania grandiflora* and *Eryngium foetidum*. Flavonoids have been possessing anti-fungal and anti-bacterial (Galeoti F, Barile E, Curir P, Dolci M and Lanzotti V, 2008) [7]. Flavonoids have strong anti-oxidant and anti-inflammatory property and have ability to remove hydroxyl radicals, superoxide anions and lipids peroxy radicals. (Allan L, Miller ND, 1996) [1]. The presence of flavonoids in the above mention plants may be reason for its use in treatment of some disease.

Saponin was found in all the plants except *Mentha spicata*. The leaves of *Murraya koenigii* had the highest content while the leaves of *Eryngium foetidum* and *Moringa oleifera* had the least content. The leaf of *Sesbania grandiflora* had also shown good amount of saponin. Saponins are also known as immune booster and plants rich in saponin have been shown to demonstrate anti-inflammatory, cholesterol lowering and anti-cancer property (Sauvauire Y, Baissac Y, Leconte O, and Ribes G, 1996) [18].

Phenol was strongly present in *Murraya koenigii* and *Moringa oleifera*. Its presence was also slightly involved in *Eryngium foetidum* and *Mentha spicata*. Phenols and phenolic have anti-tumour and anti-oxidant effects (Urquiaga I and Leighton F, 2000) [20]. They also have anti-inflammatory and anti-carcinogenic property and plays a great role scavenging H₂O₂.

Other metabolites like carbohydrates, proteins etc. add nutritional value in the leaves of the plants. The secondary metabolites such as resin, tannin, quinone, anthraquinone, terpenoids, glycosides and steroids are responsible for providing medicinal properties to the plant. Defending of this work is also supported by other work (Ritha Thapar and Nitya Rohatgi 2018) [15].

Table 1

SL. No.	Test	<i>Murraya koenigii</i>	<i>Moringa olifera</i>	<i>Eryngium foetidum</i>	<i>Sesbania grandiflora</i>	<i>Mentha spicata</i>
1.	Tannin	+++++	+++	++	+	++++
2.	Saponin	++++	++	+	+++	-
3.	Protein	++	++++	+++	-	+
4.	Carbohydrate	++++	+++	++	+	-
5.	Resin	++++	+	+++	++	-
6.	Carboxylic acid	-	+	++	-	+++
7.	Quinone	++	+	+++++	++++	+++
8.	Anthraquinone	+++++	+	++	+++	++++
9.	Glycosides	+	++	+++	++++	++++
10.	Carbonyl group	++	+++++	+++	+	++++
11.	Phenol	+++++	++++	+	++	+++
12.	Flavonoid	++++	+	+++	+++++	++
13.	Terpenoid	++	+++++	++++	+	+++
14.	Steroid	+++	++	+	+++++	++++

Conclusion

Murraya koenigii, *Moringa oleifera*, *Eryngium foetidum*, *Sesbania grandiflora* and *Mentha spicata* has been screened for various phytochemical constituents such as tannin, saponin, protein, carbohydrate, resin, carboxylic acid, quinone, anthraquinone, glycosides, carbonyl group, phenol, flavonoid, terpenoid and steroid. These are very common

plants which have been used as ingredient in various dishes since long and occupy an important culinary position. The leaves of these plants have high nutritional value and possess many medicinal properties.

The highest nutritional value is due to the presence of good content of carbohydrate, protein and dietary fibre. The medicinal property is the result of presence of secondary

metabolites mainly tannin, saponin, quinone, anthraquinone, glycosides, phenol, flavonoid, terpenoid and steroid. The present study has shown that all these five plants have strong anti-oxidant properties. The presence of flavonoid, phenol, saponin, steroids and other secondary metabolites, some of which are anti-carcinogenic and anti-inflammatory, support the medicinal properties present in these plants.

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