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Research Article

Evaluation of Methanolic Leaf Extract of *Murraya koenigii* Through GC-MS

Amit Kumar, Maneesh Kumar Lomas, Beby Panwar, Ishwar Singh and Vimala Y

Plant Physiology and Biochemistry lab, Department of Botany, Ch. Charan Singh University, Meerut – 250004, Uttar Pradesh, India

Abstract

Murraya koenigii, popularly known as "karipatta" and a member of the Rutaceae family, is regarded as one of the most important medicinal plants in India because of its curative qualities. The present study focused on the phytochemical screening and determining the bioactive compounds in the methanolic leaf extract of *Murrya koenigii* through Gas Chromatography Mass Spectrometry. The methanolic leaf extract of the tested plant was extracted by the soxhlet method. The phytochemical screening revealed the presence of tannins, terpenoids, saponins, steroids, and phenols and GC-MS analysis revealed the sixteen bioactive compounds determined in the metanolic leaf extract of this plant. The identified compounds are 1-Methyl-pyrrolidine-2-carboxylic acid (49.02%); Ethyl à-d-glucopyranoside (11.36%); Vitamin E (10.18%); Beta-Caryophyllene (7.67%); Isolongifolene, 4,5-dehydro (3.68%); ç-Himachalene (2.88%); 1,2-Ethanediol, monoacetate (2.79%); 1,2-Benzenedicarboxylic acid, diisooctyl ester (2.55%); Oleic acid, methyl ester (2.54%); Squalene (1.65%); n-Hexadecanoic acid (0.81%); Phytol (0.72%); 9,12-Octadecadienoic acid (Z,Z) (0.60%); Propane, 1,1,3-triethoxy (0.56%); Pentadecanoic acid, 14-methyl-,methyl ester (0.39%) and Hexadecanoic acid, ethyl ester (0.11%). It is reliable to possess a large number of pharmacological values like antioxidants, anti-inflammatory agents, and cancer preventive agents, which has implications for its pharmaceutical uses.

Keywords: *Murraya koenigii, GC-MS, Methanol extract, Phytochemicals.*

Introduction

Plant chemistry, often known as phytochemistry, is a branch of research that examines the chemical makeup of plants and plant-derived products. Phytotherapy uses the beneficial effects of healing plants as a source for treating and addressing specific illnesses. The bioactive chemical substances that are present in plants are known as phytochemicals. The plant has a diverse range of substances, which are meticulously divided into main and secondary components, or metabolites. Primary constituents include chlorophyll, proteins, sugar and amino acids while secondary metabolites contain terpenoids, Saponins, Tannins, and alkaloids. Because of the presence of these secondary constituent's therapeutic plants show antifungal, antibacterial and against aggravation exercises. Various parts, for example, leaves, bark, seeds, roots, blossoms and cases of plants likewise have different quality and amount of dynamic constituent (Chauhan, *et al*., 2022).

Plant is a rich source of secondary metabolites, which play a crucial role in the development of new drugs. Drugs made from plants are widely utilised in the majority of nations since they are more readily available, safer, and less expensive. Currently, there are more medications that can save lives that are made from plants (Choo, *et al.,* 2020).Plant's therapeutic chemicals were thus discovered to be a cure for the majority of diseases, in addition to being widely known for their

***Corresponding Author:**
Ishwar Singh;

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powerful biological effects including antibacterial, antifungal, and anticancer properties. Researchers have been interested in nature since it is trustworthy, toxic-free, and safe (Deepika and Noorjahan, 2016). More than 80% of people worldwide rely on herbal medications for their basic medical needs. Many of these herbal items have been shown to have medicinal promise, but additional research is required to adequately screen, describe, and potentially even classify their numerous active components (Pande, *et al*., 2016; Shabnashmi, *et al*., 2018).

Murraya koenigii, a member of the family Rutaceae, which includes more than 150 genera and 1600 species, is frequently referred to as curry leaf or karipatta in Indian dialects (Satyavati, *et al*., 1987). South and East Asia to Australia are the distribution centres for *Murraya koenigii* (Balasubramanian, *et al*., 2014). This plant is valuable for its distinctive perfume and therapeutic properties. It has long been a component of Indian cuisine, and developing nations have employed it in their traditional primary healthcare systems. *Murraya koenigii*, a medicinally significant herb used in numerous ancient systems of medicine, has a wide range of therapeutic uses, including treating skin infections, piles, vomiting, and bronchial abnormalities. The therapeutic qualities, particularly for the leaf stem, bark, and oil, have been noted. The herb possesses stomachic and tonic qualities. The roots and bark of *Murraya*can be used as stimulants and to treat animal bites and eruptions. For the treatment of dysentery, diarrhoea, and to prevent vomiting, the delicate green leaves are also important medicinally. In addition to these uses, leaves and roots can be used to treat piles, inflammation, itching, leucoderma, and blood problems (Nadkarni, 1976; Kirtikar and Basu, 1981). Curry leaves are also considered to be beneficial for hair, helping to maintain it long and healthy (Kamat, *et al*., 2015). Leaves of the curry plant contain a significant number of essential phytochemicals with antioxidant capabilities as well as a quantity of nutritional vitamins and minerals, this supports the plant's usage as a spice and flavouring agent for food as well as a medicinal plant (Tomar, *et al*., 2017; Shrestha, 2017). Based on the previous literature data, it is suggested that this plant contains anti-oxidative, antibacterial, anti-ulcer, and cholesterol-reducing properties (Kesari, *et al*., 2005; Shrinivasan, 2005; Shah and Juvekar, 2006; Xie, *et al*., 2006; Vijapur, *et al*., 2019; Goyal, *et al*., 2020). Due to these factors, the main objective of this study was determine the chemical content in the methanolic leaves extract of *Murraya koenigii* through phytochemical screening and GC-MS technique.

Material and Methods

The fresh leaves of *Murraya koenigii* in its flowering stage was collected from the Department of Botany, Ch. Charan Singh University, Meerut, Uttar Pradesh. Collected leaves were washed many times with tap water and air-dried at 25-28 °C temperature. Finally, a fine powder of dried leaf was created and stored in a polybag for future experiments.

The fine powdered leaf samples of test plant was extracted utilizing methanol by soxhlet extraction method. The extract was further concentrated using a rotating evaporator under reduced pressure, then stored at 4 °C in the refrigerator. 2 g of *Murraya* leaf powder, uniformly packed into a thimble, were suspended in 250 ml of methanol to complete the plant material methanol extraction. The extraction procedure must continue for 24 hours or until the liquid in the extractor's syphon container becomes vacuous. The extraction was allowed to stand for 68 hours at room temperature. The extract was first separated using a muslin cloth, and after that, through Whatman filter paper No. 1, before being dried using a rotary evaporator. This was transferred into sterilised containers and kept in the refrigerator until needed.

A stock concentration of 32 mg/ml (W/V) of extract obtained using methanol was prepared. Standard procedures were used to analyse the extract for the presence of active phytochemicals. Different chemical tests were analysed to distinguish addressed of various

phytochemicals alkaloids, tannin, terpenes, saponin, steroids, phenol, Coumarins and flavonoids (Chauhan, *et al*., 2022).

The GCMS-QP2010 Plus (Shimadzu, Japan) equipped with the auto-sampler AOC-20iPlus was used to conduct the GC-MS analysis of the methanolic leaf extract. Sample was injected in a volume of 1.0 µL. The temperature program started at 55 °C for 4 min and then increased up to 250°C and finally 25 min at 280 °C. Helium was used as the carrier gas with a flow rate of 1.2 mL/min. Compounds were identified matching their mass spectra with those in the National Institute of Standards and Technology Mass Spectra Library and Wiley library.

Results and Discussions

Phytochemical screening of methanolic leaf extract of *Murraya koenigii* revealed that presence of Tannins, Terpenoids, Saponins, steroids, Phenols. However Alkaloids, Coumarins and Flavonoids were absent in the present investigation. Several published studies supported this result (Khanum, *et al*., 2000; Tachibana, *et al*., 2001; Gupta, *et al*., 2003; Hema, *et al*., 2011; AzgaguMadhavan, *et al*., 2021). Mostly phytochemicals have antioxidant properties (Priya and Abinaya, 2018; Jelita, *et al*., 2019). The activity of saponin in the leaf extract of the *Murraya* plant has potency for cytotoxicity and antiulcer activity, in addition to acting as an antibacterial and anti-inflammatory agent. However, the steroid and terpenoid content of this plant leaf extract demonstrated antibacterial and antifungal properties (Hema, *et al*., 2011). Tannins possess anti-inflammatory and anticancer agents (Boudjou, *et al*., 2013; Yıldırım and Kutlu, 2015).

From GC-MS analysis, 16 active components were detected from the methanolic leaves extract of *Murraya koenigii*. The identified phytochemical compounds with retention time, peak area, molecular formula and biological activitywere presented in Figure 1 and Table 2. The identified compound and its peak area are 1-Methyl-pyrrolidine-2-carboxylic acid (49.02%); Ethyl à-d-glucopyranoside (11.36%); Vitamin E (10.18%); Beta-Caryophyllene (7.67%); Isolongifolene, 4,5-dehydro (3.68%); ç-Himachalene (2.88%); 1,2-Ethanediol, monoacetate (2.79%); 1,2-Benzenedicarboxylic acid, diisooctyl ester (2.55%); Oleic acid, methyl ester (2.54%); Squalene (1.65%); n-Hexadecanoic acid (0.81%); Phytol (0.72%); 9,12-Octadecadienoic acid (Z,Z) (0.60%); Propane, 1,1,3-triethoxy (0.56%); Pentadecanoic acid, 14-methyl-,methyl ester (0.39%) and Hexadecanoic acid, ethyl ester (0.11%).

Among the identified compounds, 1-Methyl-pyrrolidine-2-carboxylic acid has been reported to have been used in medication detailing via both oral and transdermal routes (Amna, *et al*., 2019). n-Hexadecanoic acid and ethyl ester of hexadecanoic acid must be reported to a cancer prevention agent (Trease and Evans, 1989; Vijapur, *et al*., 2019). Oleic acid, methyl ester have anti-inflammatory activity (Goyal, *et al*., 2020). Phytol has malignancy properties (AzhaguMadhavan, *et al*., 2021). Beta-Caryophyllene is a sesquiterpene compound that has anti-inflammatory and antiarthritic abilities (Vijayalaxmi, *et al*., 2015). Squalene is also found in the methanolic leaf extract of *Murraya*. This compound belongs to the triterpene group and acts as an anticancer and antiaging agent (Ronco and Stefani, 2013).

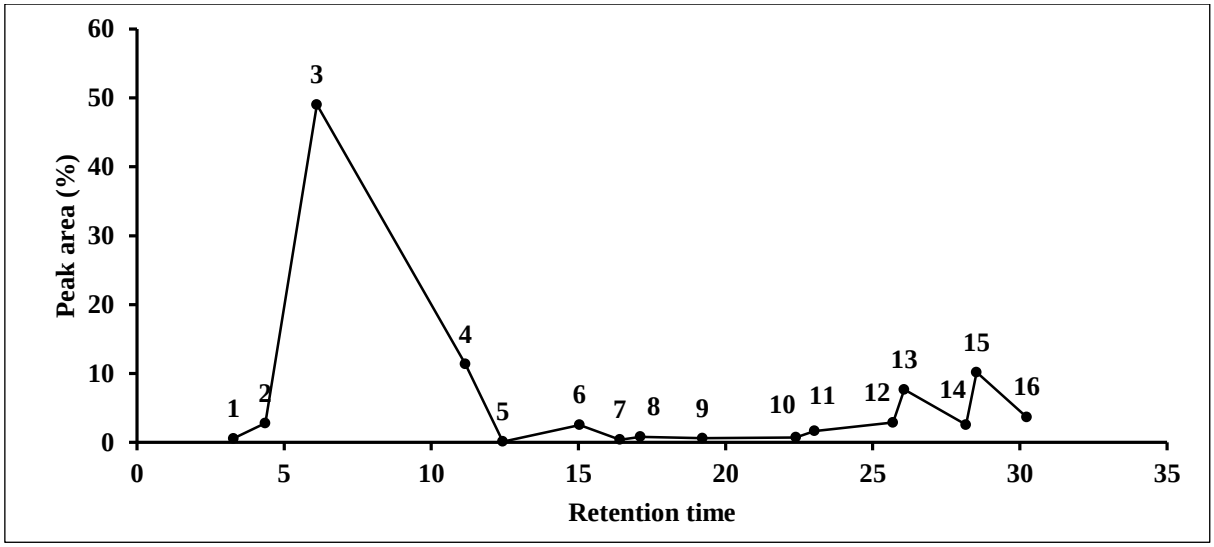

Figure 1: Peak area (%) along with Retention time of methanolic leaf extract of *Murraya koenigii*.

Table 1: Preliminary phytochemical screening of methanolic leaf extract of *Murraya koenigii*

S. No.	Phytochemicals	Methanolic Extract
1.	Alkaloids	Absent
2.	Tannin	Present
3.	Terpenoids	Present
4.	Saponin	Present
5.	Steroids	Present
6.	Phenols	Present
7.	Coumarins	Absent
8.	Flavonoids	Absent

Table 2: GC-MS analysis of bioactive compound in the methanolic leaf extract of *Murraya koenigii*

S. No.	Retention Time	Compound Name	Molecular Formula	Peak Area (%)	Biological activity
1.	3.28	Propane, 1,1,3-triethoxy	$C_9H_{20}O_3$	0.56	-
2.	4.36	1,2-Ethanediol, monoacetate	$C_4H_8O_3$	2.79	-
3.	6.11	1-Methyl-pyrrolidine-2-carboxylic acid	$C_6H_{11}NO_2$	49.02	Utilized in the detailing of medications by both oral and transdermal conveyance (Amna, *et al*., 2019)
4.	11.16	Ethyl à-d-glucopyranoside	$C_8H_{16}O_6$	11.36	Preservative (AzhaguMadhavan, *et al*., 2021)
5.	12.43	Hexadecanoic acid, ethyl ester	$C_{18}H_{36}O_2$	0.11	Cancer prevention agent (Vijapur, *et al*., 2019)
6.	15.04	Oleic acid, methyl ester	$C_{19}H_{36}O_2$	2.54	Anti-inflammatory, hypocholesterolemic (Goyal, *et al*., 2020)

7.	16.41	Pentadecanoic acid, 14-methyl-,methyl ester	$C_{17}H_{34}O_2$	0.39	-
8.	17.11	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	0.81	Cancer prevention agent, hypocholesterolemic, pesticide, hostile to androgenic flavour (Trease and Evans, 1989)
9.	19.21	9,12-Octadecadienoic acid (Z,Z)	$C_{18}H_{32}O_2$	0.60	Hepatoprotective, meaticide, insectifuge, anticoronary (AzhaguMadhavan, *et al*., 2021)
10.	22.39	Phytol	$C_{20}H_{40}O$	0.72	Malignancy preventive (AzhaguMadhavan, *et al*., 2021)
11.	23.02	Squalene	$C_{30}H_{50}$	1.65	Anticancer and antiaging agent (Ronco and Stefani, 2013)
12.	25.69	ç-Himachalene	$C_{15}H_{24}$	2.88	Utilised in enhancing of soul drinks
13.	26.07	Beta-Caryophyllene	$C_{15}H_{24}$	7.67	Anti-inflammatory and antiarthritic abilities (Vijayalaxmi, *et al*., 2015)
14.	28.17	1,2-Benzenedicarboxylic acid, diisooctyl ester	$C_{24}H_{38}O_4$	2.55	Used as softeners, used in preparation of aromas (Tomar, *et al*., 2017)
15.	28.53	Vitamin E	$C_{29}H_{50}O_2$	10.18	Antioxidant (Traberand Atkinson, 2007)
16.	30.23	Isolongifolene, 4,5-dehydro	$C_{15}H_{22}$	3.68	Hostile to proliferative (Balasubramanian, *et al*., 2014)

Conclusion

The preliminary phytochemical and GC-MS analysis of *Murraya koenigii* leaves revealed that the plant contains many bioactive chemicals like terpenoids, saponins, phenolic compounds, steroids, etc. and 16 bioactive compounds. It is reliable to possess a large number of pharmacological values like antioxidants, anti-inflammatory agents, and cancer preventive agents, which has implications for its pharmaceutical uses. The phytoconstituent phytol and vitamin E are the identified vitamin sources that are helpful for

the human body therapeutically. Further research in this species is recommended in order to develop novel durgs.

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