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Bioactive chemical components analysis of medicinal plant *Coriandrum sativum* L. (leaves) using gas chromatography- mass spectrometry (GC-MS) for kidney related diseases.

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ABSTRACT

Coriandrum sativum L. belonging to the Apiaceae family, is widely recognized for its uses in culinary and traditional medicine. The main objective of this study was to determine the phytochemical composition in the leaves of *Coriandrum sativum*, using methanolic extraction, screened by GC-MS method. 55 bioactive compounds were identified in the methanolic extract of *Coriandrum sativum*. Out of which certain chemical compounds are useful to treat kidney related problems.

Key Words :- *Coriandrum sativum*, GC-MS, Kidney problems, Methanolic extract

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INTRODUCTION

Traditional herbal medicine has been around for a while and is still very popular.1 Coriander (*Coriandrum sativum* L.), a member of the Apiaceae family, is used as a medicinal plant. India leads the world in coriander production, consumption, and exports. Every portion of this herb is used in traditional medicine systems throughout various cultures as a flavouring agent and to cure various ailments.2 Additionally, coriander leaves are rich in chemicals that have been shown to improve health, including luteolin, esculin, tartaric acid, gallic acid, diosmin, dicoumarin, 4-hydro xycoumarin, apigenin, and vicenin. These compounds also have antidepressant, antidiabetic, and antioxidant properties.3

Many therapeutic qualities of coriander leaves can effectively treat kidney-related diseases. There can be many reasons for kidney damage like hypertension, diabetes, infections from some medicines and poisons, renal stone, several cysts in the kidneys, Inflammation etc. Because of their ability to eliminate waste products from the body, kidneys are particularly vulnerable to damage. One such cause of damage is exposure to nephrotoxic substances. However, coriander leaves have antioxidant properties due to their high content of vitamins A, C, flavonoids, terpenoids, tannins, and phenol, all of which support healthy kidney function.4 This work used methanolic extraction and gas chromatography-mass spectrometry (GC-MS) screening to ascertain the phytochemical content of *Coriandrum sativum* leaves.

MATERIALS AND METHODS

Collection and preparation of plant material

The *Coriandrum sativum* leaves were collected from Nagri block of Ranchi district, Jharkhand, which is at 2,140 feet (650 m) above mean sea level. Following a comprehensive cleaning process and the elimination of any foreign elements, the material is dried in open areas away from direct

sunlight. To make the powder from *C. sativum* leaves, the dried sample was crushed in a blender. To prevent humidity from affecting the powder, it was then sealed in an airtight container and kept at room temperature until needed.

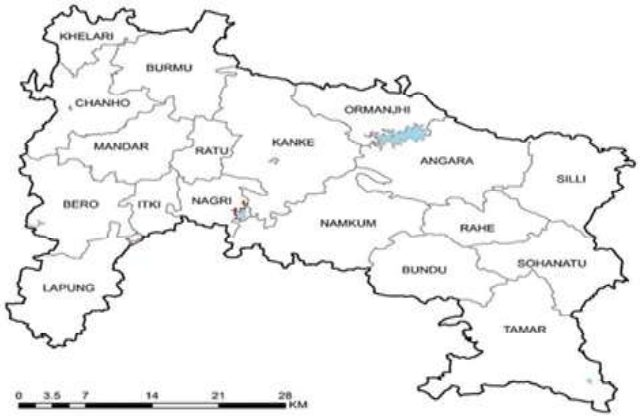

Fig. 1- Showing Nagri block in Ranchi district for collection of plants

Fig. 2- *Coriandrum sativum* plants and collected leaves for preparing sample.

Preparation of sample

Using a weighing machine, 4gm of the powdered plant material were measured and then added to a dry 250ml conical flask. For 72 hours, 40ml of methanol were then added to the flask. Whatman no. 1 filter paper was used to filter the supernatant before pouring it into a measuring cylinder. Following the extraction of the filtrate, it was put into weighted petri plates. By allowing the filtrate to fully evaporate the solvent, the resulting extracts were concentrated until they were completely dry.

Fig. 3- Drying the leaves at the room temperature

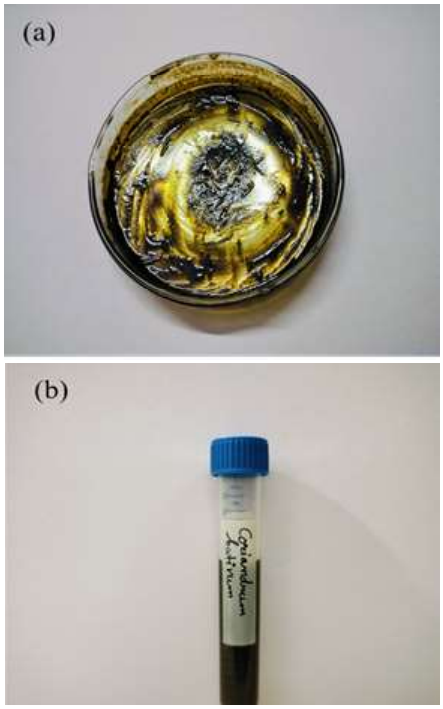

Fig. 4- *Coriandrum sativum* (leaves) - (a) Methanolic evaporated extract, (b) as prepared methanolic leaves sample.

Gas chromatography–mass spectroscopy (GC–MS) analysis

A GC-MS-QP-2010 (Shimadzu business) equipped with an EI and a fused silica column DB-5 (30 m × 0.25 mm id) with a 0.25ìm film thickness was performed on the methanol extracts of *C. sativum.*

Using a micro syringe (R205), about 1 ìL of the methanol extract was injected into the GC-MS.

Helium was used as the carrier gas in the gas chromatography, with an injector operating at 200°C and a flow rate of 1 mL/min. The temperature of the column oven was set to be between 60 and 300°C with a 10°C/min injection mode[5].

The signal produced when a compound eluted from the gas chromatography column into the detector was represented by each peak in the chromatogram. In order to quantify the component in the injected sample, the y-axis monitored the signal strength and the x-axis displayed the retention duration. Following their elution from the gas chromatographic column, individual chemicals were exposed to an electron stream in the electron ionization (mass spectroscopy) detector, which caused them to fragment. The pieces that were extracted were, in fact, mass-specific charged ions. The temperature of the oven, the gas flow rate employed, and the electron gun were first programmed before the extract was analyzed using gas chromatography and mass spectroscopy. Electrons with energy of roughly 70 Ev6 were released by the mass detector's electron cannon. The spectrum of the recognized components kept in the National Institute of Standards and Technology (NIST) library database was used to compare the outcomes[7].

RESULTS & DISCUSSION

55 chemical compounds were found in the methanolic extract of *Coriandrum sativum* by GC-MS analysis. Table-1 lists 14 of these compounds' biological activities. They had previously documented a good drug value for a number of conditions, including kidney disorders. The highest peak is of 2-hexadecen-1-ol, 3,7,11,15-tetramethyl-, [r-[r*,r*-(e)]]- (20.66%) and the lowest peak is of 9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)- (0.12%). Other chemical compounds are Quinoxaline 1,4-dioxides (2.69%), Visnagin (2.16%), 9,12- Octadecadienoic acid(Z,Z)-, methyl ester (0.31%), Stigmasterol (1.59%), Stigmast-5-en-3-ol,(3.beta.,24S)- (1.15%), Vitamin E (1.60%), Tetradecanoic acid (0.26%), 3,7,11,15-Tetramethyl-2-hexadecen-1-ol (0.41%), n-Hexadecanoic acid (4.04%), Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester (6.52%), Octadecanoic acid (1.09%), 1-Heptacosanol (11.84).

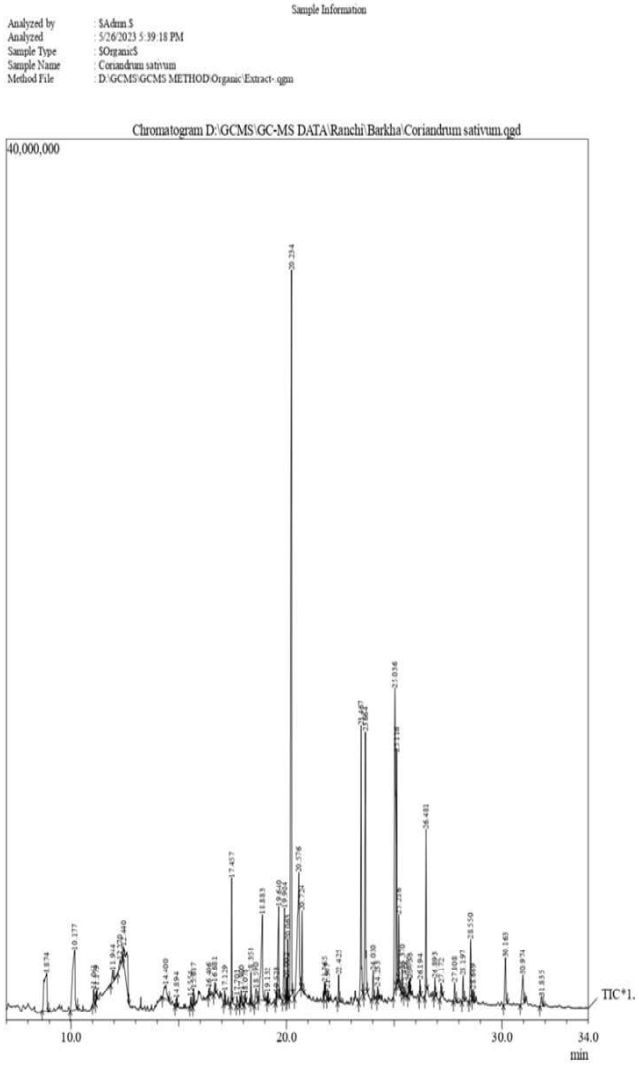

Fig. 5- GC-MS analysis of methanolic extract of *Coriandrum sativum* (leaves)

Table 1- Activities of major phyto-components identified in *Coriandrum sativum* L. by GC-MS analysis in order to retention time.

Sl. No.	Name of compounds	Peak area%	Biological activity
1	Tetradecanoic acid	0.26	Anti-constipation, Protein kinase inhibitor, Used in the treatment of mycosis, neoplastic diseases, inflammatory, immune diseases, Antifungal, Antioxidant, cancer preventive, nematicide, hypercholesterolemic, Lubricant[8,9].
2	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	0.41	Antimicrobial, anticancer, anti-inflammatory, anti-diuretic[9].
3	9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-	0.12	Antiarthritic, antiandrogenic, hepatoprotective, anti-inflammatory, antieczemic, 5-alpha reductase, hypocholesterolemic, antiacne, and antihistaminic effects[9-11].
4	n-Hexadecanoic acid	4.04	Anti – inflammatory and Antimicrobial activity[8].
5	Quinoxaline 1,4-dioxides	2.69	Antibacterial, antimicrobial, used in treatment of tuberculosis, parasitic infections such as malaria, trypanosomiasis, leishmaniasis, amoebiasis, and trichomoniasis[12,13].
6	Visnagin	2.16	Used in treatment of kidney stone, Anti-inflammatory[14].
7	9,12- Octadecadienoic acid(Z,Z)-, methyl ester	0.31	Hepatoprotective, Antihistaminic, hypocholesterolemic, Anti-eczemic, used in the treatment of urinary tract infections, pesticidal properties[8,15].
8	2-hexadecen-1-ol, 3,7,11,15-tetramethyl-, [r-[r*,r*-(e)]]-	20.66	Antidiabetic, cholinesterase inhibitory activity[16,17].
9	Hexadecanoic acid, 2-hydroxy-1-(hydroxy methyl)ethyl ester	6.52	Anti–inflammatory and antimicrobial activity, Antibacterial, Antimicrobial agent, used to increase blood stability, Treating Secondary Hyperparathyroidism[8].
10	1- Heptacosanol	11.84	Antimalarial, antifungal, Antioxidant[9].
11	Octadecanoic acid	1.09	Anti-inflammatory, antiviral, antiaging activity[18].
12	Vitamin E	1.60	Anti-inflammatory, anti-spasmodic, anti-leukemic, anti-microbial, analgesic anti-tumor, hepatoprotective, antioxidant, used in various skin problems and issues related to the growth and development of hairs, antidermatitic, anticancer[9,19].
13	Stigmasterol	1.59	Antidiabetic, antioxidant, antibacterial[9,16,20,21].
14	Stigmast-5-en-3-ol, (3.beta.,24S)-	1.15	Antimicrobial antioxidant, anti-inflammatory antiarthritic antiasthma diuretic[9].

2-Hexadecen-1-ol, 3,7,11,15-tetramethyl-, [r-[r*,r*-(e)]], Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester, n-Hexadecanoic acid, Quinoxaline 1,4-dioxides, and visnagin are confirmed to be present significant amounts by GC-MS analysis.

Upon examining each of these individual compounds in detail, it was found that they possessed a variety of pharmacological properties, including anti-inflammatory, antibacterial, antidiabetic, antioxidant, and treatment for kidney stones.

CONCLUSION

Plant-based medicines have greatly improved human health and served as an inspiration for new pharmacological substances. According to the current study, *Coriandrum sativum* is an ethnomedicinal plant that has been utilized for many therapeutic purposes since ancient times and has a significant amount of bioactive chemicals.

Using GC-MS analysis, the bioactive compounds in *Coriandrum sativum* were identified. The results indicated the presence of 14 compounds that could potentially treat renal issues and other ailments. As a result, the current study provides scientific support for the conventional applications of *Coriandrum sativum* leaves and has also aided in the creation of novel therapeutics.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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