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Ethanolic *Murraya keonigii* leaf extract: Phytochemical and spectroscopic profiling by UV, FTIR

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Abstract

One significant therapeutic herb is *Murraya keonigii*. The plant is referred to locally as "curry pata" in Bangladesh. Since ancient times, the herb has been used to spice and flavor meals. The current study focuses on ethanolic leaf extract from this plant, phytochemical screening, and UV and FT-IR spectroscopy. The plant has anti-inflammatory, anti-cancer, anti-malarial, antidiabetic, and antioxidant qualities. Flavonoids, glycosides, phytosterols, terpenoids, phenolic compounds, carbohydrates, proteins, tannins, gum and mucilage, alkaloids, saponins, and anthoquinone are all present in the extract according to phytochemical screening. This plant's ethanolic leaf extract, as determined by UV and FT-IR spectroscopy, contains a carbonyl group (ketone), lactam and α-β unsaturated amide, aromatic compounds, sulfur and nitro compounds, flavones, fistin, quercetin, NaQSA (Sodium Salts of Quercetin 5' Sulfonic Acid), myricetin, chalcones, and anthocyanin types of flavonoids. The bioactive compounds mentioned here are primarily responsible for the plant's therapeutic benefits.

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Introduction

"Curry pata" is the local term for *Murraya keonigii* (*M. keonigii*) in Bangladesh. The Rutaceae family includes this plant. Native to Bangladesh, Sri Lanka, India, and other South Asian nations, the plant are used medicinally (Harish *et al.*, 2012). The plant is prized for its leaves, which are used to season and flavor food. Many therapeutic properties, including anti-diabetic, anti-oxidant, antibacterial, anti-inflammatory, anticarcinogenic, and hepato-protective qualities, are said to be present in curry leaf (Kirupa *et al.*, 2015). There are many medical uses for *M. keonigii*. With a height of 4-6 meters and a trunk up to 40 cm in diameter, it is a little tree. With 11–21 leaflets, each measuring 2-4 cm in length and 1-2 cm in width, the leaves are pinnate.

They have a strong scent. As a highly prized condiment, the leaves of the *M. keonigii* plant are typically fried with chopped onion in the initial step of preparation. They have a limited shelf life while fresh and do not keep well in the refrigerator. They are also sold dried, albeit the scent is much weaker. Curry leaves can be used to many different foods to provide a little spiciness, but they are most frequently used in curries. In Ayurvedic medicine, the plant's leaves are also utilized. Their qualities include effectiveness against colon carcinogenesis (Arulsevan *et al.*, 2007). Hepatoprotective (Yadev *et al.,* 2004), antihypercholesterolemic (Achyut *et al.,* 2005), antimicrobial (Singh *et al.,* 1978), anti-inflammatory (Goutam *et al.,* 1974), antioxidant (Deshmukh *et al.,* 1986), and antidiabetic (Baliga *et al.,* 2003), Curry patties are renowned for being delicious.

The current study's objective was to analyze the *Murraya keonigii* (Curry pata) leaf ethanolic extract using UV and FT-IR in conjunction with phytochemical screening in order to learn more about the functional groups found in the plant's numerous secondary metabolites. This will contribute to our understanding of the rationale behind the plant's leaf therapeutic applications (Fig. 1).

Fig. 1. Leaves of *Murraya keonigii*

Materials and methods

M. keonigii leaf collection with identification

In May 2018, the taxonomist at the Bangladesh National Herbarium in Dhaka recognized fresh leaves of *M. keonigii* that had been collected from the campus of Dhaka University in Bangladesh. A voucher specimen (No.= 46310) had been deposited there.

M. keonigii leaf materials preparation

After washing the plant leaf portion to get rid of any dirt, it was allowed to air dry. After that, it was oven-dried at a lower temperature—less than 45°C—to prepare it for grinding. After screening, the 20 mesh powder was placed in an airtight container with a label for identification and stored for later use in a dry, cool, and dark environment.

Solvents and chemicals

In these investigations, analytical or laboratory-grade chemicals and solvents were utilized. Every solvent and regent used in the tests was purchased from BDH (England) and E. Merck (Germany).

Preparation of ethanolic seed extract

The extracted leaf material (80 g) is placed in an airtight separating funnel and left at room temperature for five days, shaking and stirring occasionally, in appropriate solvents, i.e., ethanol. The major portion of the extractable compounds of *M. keonigii* leaf material will be dissolved in the solvent during this same time and thus a solution was extracted. After that, the prepared extracts from ethanol were dried in a rotary evaporator to get two grams. Preliminary phytochemical screening was then performed on the resulting extract in order to identify different plant ingredients using techniques recommended by established methodologies (Pande *et al.,* 2009; Iyer *et al.,* 1990; Khan *et al.,* 1996; Neeta *et al.,* 2007). The extract's flavonoids, chemical, and functional groups were identified using spectral analyses using Infra-Red and Ultra-Violet Spectroscopy (Somasundram *et al.,* 1986; Gayar *et al.,* 1968; Harish *et al.,* 2011).

Results and discussion

Phytochemical screening of M. keonigii leaf ethanolic extract

The leaf of *M. keonigii* contains alkaloids, flavonoids, glycosides, phytosterols, terpenoids, phenolic compounds, carbohydrates, fixed oil and lipids, proteins, tannins, gum, and mucilage, according to the ethanolic extract. The findings are shown in Table 1.

M. keonigii leaf extract: Ultra violet spectroscopy

M. keonigii leaf extract from ethanol was measured for its UV spectrum, which fell between 273-292 nm. The modest absorption bands at 292.28 nm in the UV spectrum are caused by aldehydes and chemicals with an aromatic character. The flavonoid and fistein kinds are shown by these weak bands. The 3° amine and polyene (β-carotene) are responsible for the absorption band at 289.66 nm and 288.80 nm, which denote quercetin. At 287.80 nm, a distinctive broad peak signifies protein amide group presence. The existence of an amino group (aniline) is shown by a band at 285.60 nm. This distinctive band at 284.20 and 283.42 nm is caused by the aldehyde and ketones groups. These distinctive bands identify the flavonoid types Fistein and Flavone.

Table 1. *M. keonigii* leaf ethanolic extract: Phytochemical screening

Test and reagents	Observations	Test and reagents	Observations
Alkaloids		Carbohydrates	
Reagents			
Mayer's	Positive	Glucose	Negative
Wagner's	Positive	Fructose	Negative
Hager's	Positive	Galactose	Negative
Carbohydrates		Lactose	Positive
Molisch's test	Positive	Starch	Positive
Benedict's reagents	Positive	Glycosides	
Fehling solution	Positive	Keller killiani test	Positive
Terpenoids	Positive	Phytosterols	
Salkowski test	Positive	Liebermsnn's test	Positive
Fixed oil & fats		Saponins	
Spot test	Positive	Foam test	Negative
Phenolic compounds		Tannins	Positive
Ferric choloride solution	Positive	Lead acetate solution	
Proteins	Positive	Amino acids	
Xanthoprotic test	Positive	Ninhydrine reagents	Positive
Biuret test	Positive	Flavonoids	
Gums & Mucilages		Con H_2SO_4+ Mg ribbon	Positive
Alcoholic precipitation	Positive	Anthraquinones	
Molisch's test	Positive	Borntrager's test	Negative

Table 2. *M. keonigii* leaf ethanolic extract: UV spectroscopy

Wavelength in nm	Abs.	Chromophoric groups	T flavonoids
292.28	0.068	-CHO	Flavone , Fistein
289.66	0.070	3°amine, Polyene(β-Carotain,)	Quercetin
288.80	0.071	3°amine, Polyene(β-Carotain,)	Quercetin
287.80	0.070	Amide group (protein).	
285.60	0.066	Amino group (Aniline)	
284.20	0.021	=C=O & -CHO	Flavone , Fistein
283.42	0.055	=C=O & -CHO	Flavone , Fistein
282.20	0.005	-CHO	Flavone , Fistein
281.84	0.015	-CHO	Flavone , Fistein
281.10	0.115	-CHO	Flavone , Fistein
280.26	0.017	=C=O	Flavone , Fistein
278.20	0.393	=C=O	Flavone , Fistein
277.84	0.402	=C=O	Flavone , Fistein
274.82	0.646	Alkenegroup (Naphthalene).	Flavone , Fistein
273.30	0.255	Alkenegroup. (Naphthalene).	-

The band at 282.2, 281.84, 281.10 nm proofs the existence of aldehyde groups. At 280.26, 278.20, and 277.84 nm, the sharp band signifies the ketones group. The alkene group is visible in the band at 274.82 nm and 273.30 nm.

Flavone, fisetin, and quercetin are the three forms of flavonoids that are detected by UV spectroscopy (Fig. 2, Table 2).

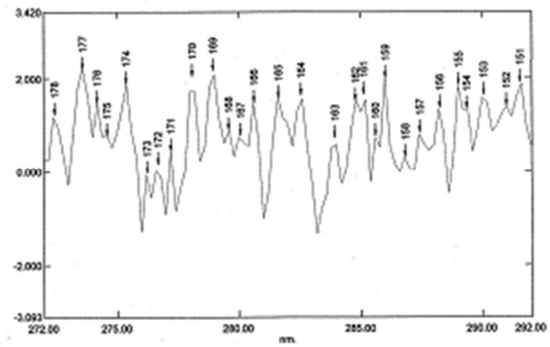

Fig. 2. *M. keonigii* leaf ethanolic extract: UV spectrum

M. keonigii leaf extract: FTIR spectroscopy

Absorption band at 720.56 cm^{-1} in the FT-IR spectra of the ethanolic extract of *M. keonigii* leaves suggests the existence of quercetin, alkyne, and C-H bending vibration, amides. C-H bending vibrations, gem disubsituted olefinic group, and aromatic substitution are the causes of the strong peak at 867.17 cm^{-1}. This peak reaffirms quercertin's presence. Sulfur compounds, and S=O stretching vibrations, thiocarbonyl group, sulfoxides, and NaQSA [Sodium Salts of Quercetin 5' Sulfonic Acid] are present in the very sharp peak at 1034.50 cm^{-1}. Significantly active against microorganisms, the sulfur compound, thiocarbonyl group, and NaQSA [Sodium Salts of Quercetin 5' Sulfonic Acid] are further substantiated by the high peak at 1059.00 cm^{-1}.

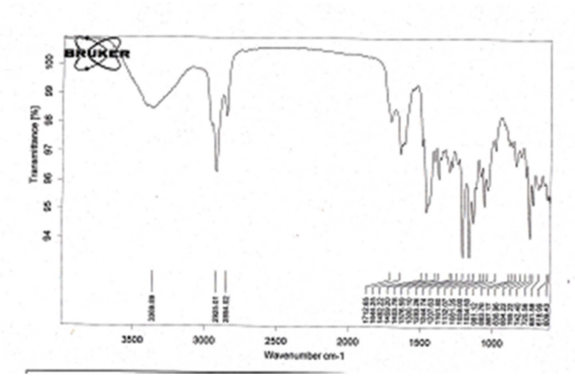

Fig. 3. *M. keonigii* Leaf ethanolic extract: FT-IR Spectrum

The peak at 1283.26 cm^{-1} in the FT-IR spectra denotes the existence of the functional group aliphatic amine and the C-N stretch. The peak at 1376.59 cm^{-1} suggests that the chemical is aromatic, that it contains sulphonamides, gem dimethyl groups, nitro compounds, and flavonoids of the myricetin type. Myricetin, the nitro/sulfur molecule, the gem dimethyl group, and C-CH_3 bending are all confirmed by the distinctive peak at 1459.20 cm^{-1}. Peak appearance at 2854.02 cm^{-1} indicates the appearence of aldehydes, alkanes, and C-H stretching vibrations. This C-H stretch corresponds to the peak at 2925.01 cm^{-1}. The N-H stretching vibrations, amines, amides,

and 1° and 2° amines are all represented by the distinct hump at 3369.89 cm^{-1}. *M. keonigii* leaf ethanolic extract's FT-IR spectrum shows the presence of three different types of flavonoids: myricetin, quercetin, and NaQSA [Sodium Salts of Quercetin 5' Sulfonic Acid] (Fig. 3 and Table 3).

Table 3. *M. keonigii* leaf ethanolic extract: FT-IR spectroscopy

Peak (cm^{-1})	Bonding type	Functional groups	Flavonoids
720.56	C-H bending	Alkyne	Quercetin
867.17 sharp	C-H bending vibration	Aromatic substitution, gem-distributed, olefinic group	Quercetin
1034.50	S=O stretching vibration	Sulfur compounds, sulfoxides, Thiocorbonyl group	NaQSA
1059.00	S=O stretching vibration	Sulfur compounds, Thio corbonyl group	NaQSA
1283.26	C-N stretching vibration	Aliphatic amine	
1366.08 strong	C-N stretching vibration	Aromatic, sulphonamide, gem-dimethyl group & Nitro compounds.	Myricetin
1376.59	C-H bend vibration	Alkanes	
1459.20	-C=C- Stretch	Alkenes	
2854.02	C-H stretching vibration	Aldehydes	
2925.01	C-H stretching vibration	Alkanes	
3369.89	N-H stretching vibration	1°, 2° amines, Amides	

Conclusion

The results of present study provide initial data for identifying the chemical makeup of *M. keonigii* leaves. Plants' therapeutic value is mostly attributed to the existance of chromophoric and functional groups such as flavonoid, alkaloid, glycoside, fixed oil, lipid, phytosterol, terpenoid, phenolic compounds, and tannins. Due to the presence of these bioactive components in *M. keonigii* extract, it is confirmed that this plant is used correctly in traditional medicine. The same is true for creating new medications that isolate a certain component.

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