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RESEARCH ARTICLE

Characterization of Different Parts of *Erigeron Sp* Extracts and its Essential Oil by FTIR Analysis and Testing its Antioxidant Activity

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ABSTRACT

The *Erigeron* species have a history of their use as folk medicines. A large number of *Erigeron* species yield essential oils rich in biologically active polyacetylenic compounds/terpenoids and are reported to possess diverse biological activity, viz antimicrobial, antioxidants and nontoxic. The present study is aimed to analyze the FTIR spectroscopic studies revealed different characteristic peak values with various functional compounds in the extracts of *Erigeron sp* confirmed the presence of alkanes, alkenes, alkynes, aldehyde, amines, aromatics and sulfoxide, which shows major peaks. The FTIR method was performed on a spectrophotometer system, which was used to detect the characteristic peak values and their functional groups. The essential oils of this plant were also analyzed for their antioxidant properties. The antioxidant capacity of the plant extracts was measured by their ability to scavenge free radicals such as DPPH (2,2-diphenyl-1-picrylhydrazyl). The methanolic crude extracts of *Erigeron sp* were screened for their free radical scavenging properties using ascorbic acid as standard antioxidant. Hence the free radical scavenging capacity was confirmed.

KEYWORDS

Erigeron Sp, FTIR, Antioxidant, Essential Oil, DPPH

INTRODUCTION

Many medicinal plants contain large amounts of antioxidants other than vitamin C, E and carotenoids. Antioxidants are molecules that can delay or prevent an oxidative reaction catalysed by free radicals. This antioxidant effect is mainly due to the presence of phenolic components such as flavonoids, phenolic acids and phenolic diterpenes.[1] Medicinal plants contain some organic compounds which produce definite physiological action on the human body and these bioactive substances include tannins, alkaloids, carbohydrates, terpenoids, steroids and flavonoids.

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They are of great importance to the health of individuals and communities. Many of these indigenous medicinal plants are used as spices and food plants. Phenolics have been known to possess a capacity to scavenge free radicals.

The antioxidant activity of phenolics is principally due to their redox properties, which allow them to act as reducing agents, hydrogen donors. Phenolics are especially common in leaves, flowering tissues and woody parts, such as stems and barks. Studies have shown that they play an important preventive role in the development of cancer, heart diseases and ageing related diseases.[2]

Antioxidants reduce the oxidative stress in cells and are therefore useful in the treatment of many human diseases, including cancer, cardiovascular diseases and inflammatory diseases. This activity

is due to the ability of antioxidants to reduce oxidative stress by neutralizing or scavenging of reactive species by hydrogen donation.

Antioxidants such as BHA (Butylated Hydroxy-Anisol), BHT (Butylated Hydroxy-Toluene) protect plants against oxidative assault either by binding to metallic ions, eliminating free radicals or by decomposing peroxides. Despite the availability of synthetic antioxidants, present research seeks at discovering new natural antioxidant compounds that may play a role in oxidative stress related disorders.[3]

Antioxidants as compounds that - when present in low concentration in relation to the oxidant - prevent or delay the oxidation of the substrate. Their importance in the safeguarding of health, and the protection from coronary heart disease and cancer, has recently been established, thus constituting them as functional food preservatives.[4]

Free radicals are chemical species which contains one or more unpaired electrons due to which they are highly unstable and cause damage to other molecules by extracting electrons from them in order to attain stability. Free radicals are continuously produced in the human body, as they are essential for energy supply, detoxification, chemical signaling and immune function. Ultraviolet light, ionizing radiation, chemical reactions and metabolic processes can induce the production of reactive oxygen species (ROS) in the cells. Free radicals can initiate the oxidation of bio molecules, such as protein, lipid, amino acids and DNA which will lead to cell injury and can induce numerous diseases.

Phytochemicals have been recognized as the basis for traditional herbal medicine practiced in the past and currently in vogue parts of the world. In the search for phytochemicals that may be of benefit to the pharmaceutical industry, researchers sometimes follow leads provided by local healers in a region. Following such leads, plant parts are usually screened for phytochemicals that may be present. The presence of a phytochemical of interest may lead to its further isolation, purification and characterization.

MATERIAL AND METHODS

Collection of Plant for Analysis

Erigeron sp were collected from KR market (flower shop) Bangalore, Karnataka state.

Preparation of Extracts

10g of plant powder was taken for each 100ml of methanol, aqueous, ethanol, and chloroform and kept in shaker for 24 hours. After 24 hours, plant extracts were filtered by whatman No: 1 filter paper. The extracts of flower, leaf, branch, and stem were extracted and stored at 4°C until further use.

Essential Oil Extraction

250g of air dried flower parts were used for the oil extraction using Clevenger apparatus hydrodistillation was done for 3 hours. The flower extract was dried over anhydrous sodium sulphate and solvent hexane. Using separating funnel oil was extracted and preserved in a sealed vial at 4°C for further analysis.

Test for Phytochemical Analysis

Preliminary Screening

Phytochemical analysis for tannins, phlobatannins, saponins, flavonoids, steroids, alkaloids, quinones, coumarin, terpenoids, cardiac glycosides were analyzed using the extracts of flower, leaf, branch, stem of *Erigeron sp*.

Antioxidant Activity Test (DPPH Radical Scavenging Activity)

Qualitative Analysis

The methanol extract was applied on a TLC plate as a spot (100 µg/ml) for chromatographic separation of the extract using the mobile phase methanol : chloroform (95:5, v/v). It was allowed to develop the chromatogram for 30 minutes. After completion of the chromatogram the whole plate was sprayed with DPPH (0.15 % w/v) solution using an atomizer. The color change (yellowish color development on pinkish background on the TLC plate) was noted as an indicator of the presence of antioxidant substances.

Quantitative Analysis

The free radical scavenging capacity of the extracts was determined using DPPH. DPPH solution (0.004% w/v) was prepared in 95% methanol. Methanol extract of *Erigeron* was mixed with 95 % methanol to prepare the stock solution (5 mg/mL). Freshly prepared DPPH solution (0.004% w/v) was taken in test tubes and extracts were added followed by serial dilutions (1 µg to 500 µg) to every test tube so that the final volume was 3 mL and after 10 min, the absorbance was read at 515 nm using a spectrophotometer (TU- 1901 model UV – visible double beam spectrophotometer). Ascorbic acid was used as a reference standard and dissolve in distilled water to make the stock solution with the same concentration (5 mg/mL). Control sample was prepared containing the same volume without any extract and reference ascorbic acid. 95 % methanol was served as blank. % scavenging of the DPPH free radical was measured and plotted. (Equation: $S_{DPPH} = (A_{sample} - A_{DPPH}/A_{DPPH}) \times 100$)

FTIR Spectral Analysis

FTIR spectra were performed and recorded with a Fourier-transform infrared spectrophotometer was shown in table 3, 4 and graph 2, 3.

RESULTS AND DISCUSSION

The essential oil and extracts of *Erigeron sp* might be a valuable food additive. However, if plant oils and extracts are to be used for food preservation or medicinal purposes, issues of safety and toxicity will always need to be addressed.

Historically, many plant oils and extracts have been reported to have antimicrobial properties. Also, the renewal of interest in food industry and increasing consumer demands for effective, safe and natural products means that quantitative data on plant oils and extracts are required.[5]

The extracts of *Erigeron sp* were subjected for phytochemical analysis the results were investigated. Phytochemical screening of the crude extracts shows positive for tannins, saponins, alkaloids and negative for Quinones and shows both positive and negative for phlobatannins, flavonoids, steroids, coumarin, terpenoids, cardiac glycosides.

The methanol extracts of plants were separated by thin layer chromatography and their Rf values were calculated (table 1).The yellowish color development on pinkish background on the TLC plate were noted as an indicator of the presence of antioxidant substances (figure 1).

For the quantitative analysis values obtain from UV-Visible double beam spectrophotometer was calculated and plotted shown in table 2 and graph 1.

The extracted oil and plant extracts were analyzed by the FTIR (Fourier transform infrared spectrophotometer) shown in table3, 4 and graph 2, 3.

In recent years, several researchers have also reported that mono- and sesquiterpene hydrocarbons and their oxygenated derivatives are the major components of essential oils from plant origin, which have enormous potential to inhibit microbial pathogens.[6]

Dr. Dupuy, who made an examination of this plant, found it to contain essential oil, tannic and gallic acids, bitter extractive, etc. The oil is not astringent to the taste, but has a styptic influence upon the system. It is of a colorless, or pale-yellow color, gradually becoming darker-colored, and may be procured from the plant by distillation with water.

Nowadays, many research teams try to find new extraction methods for volatile oils so that they can obtain as much as possible precise results. We tried to make a theoretical comparative study using our results obtained with the most common method for volatile oil isolation, hydrodistillation, which is used in our laboratory and the results from the literature, obtained with other extraction methods.[7]

Antioxidants were increased to use in food preservation in light of fat oxidation process which is the main cause of damage to fats, oils and fatty food. Then, it leads to the loss of nutritional value and appearance of unwanted flavors. The goal of this article was that there are some attempts which have been taken to include

in vivo and *in vitro* methods because of analyzing the frequency of the use of different methods.[8]

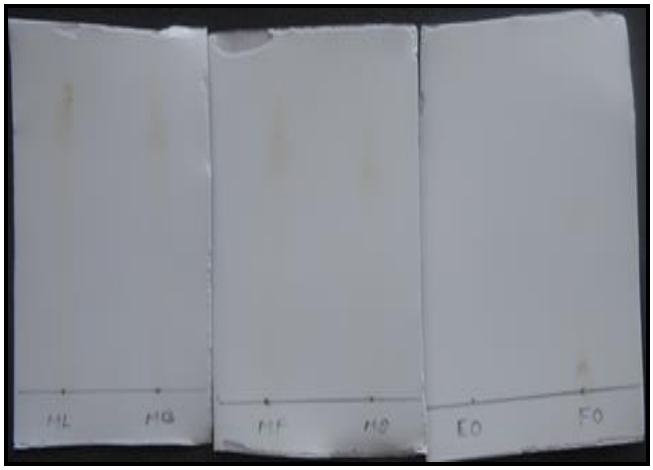


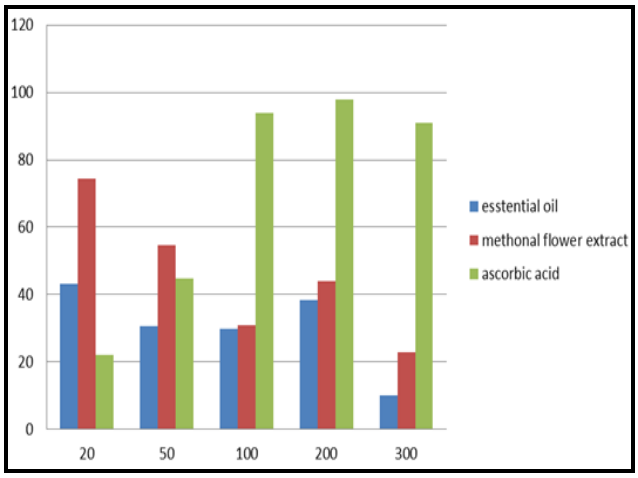
Figure 1: TLC Chromatography

Table 1: TLC Chromatography

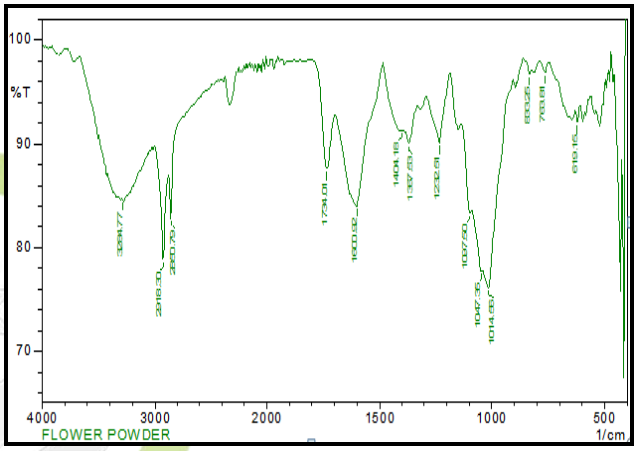
S.No	Extracts	Sample	Rf Value
1	Methanol Extracts	ML	0.8
		MB	0.68
		MF	0.7
		MS	0.6
2	Oil Extracts	EO	0.56
		SO	0.78

Table 2: DPPH Radical Scavenging Activity

Conc^{n} of extracts (µg/µl)	Essential oil	Methanol flower extract	Ascorbic acid
20	±43.19%	±74.47%	±22.00%
50	±30.56%	±54.6%	±44.8%
100	±29.75%	±30.99%	±93.9%
200	±38.50%	±43.90%	±97.8%
300	±10.00%	±22.80%	±90.9%
Blank	0.491	0.066	0.491



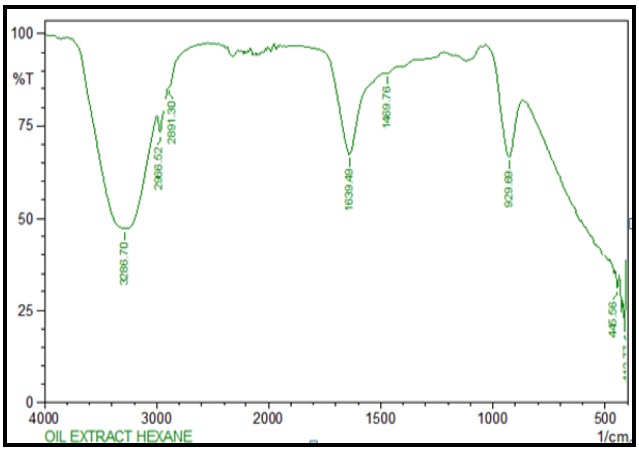
Graph: 1 DPPH Radical Scavenging Activity



Graph 2: FT-IR Analysis

Table 3: Flower Powder

Wave number	Range	Bond	Functional group
3284	3100-3010	=CH stretch	Alkenes
2918	2950-2800	C-H stretch	Alkanes
2850	~2850&~2750	C-H aldehyde stretch	Aldehydes
1600	~1600&~1475	C=C stretch	Aromatics
1014	~1050	S=O stretch	Sulfoxide



Graph 3: FT-IR Analysis

Table 4: Oil Extract Hexane

Wave number	Range	Bond	Functional group
3286	-3020-3000	C-H stretch	Aromatics
2966	-2850& -2750	C-H aldehyde stretch	Aldehyde
1639	-1640-1500	N-H bend	Amines
929	-970	C-H bend (disubstituted-E)	Alkenes
445	-650-600	Acetylenic C-H bend	Alkynes

CONCLUSION

The result of this study have shown that the whole plant extraction and essential oils have a great potential of antioxidant activity. Since most of these medicinal plants are edible, their extracts as food product do not have any side effects with low dosage. Therefore, these products may be very beneficial for human beings. However, much research is needed to be put into these studies, as drug regulatory authorities still have strong regulations against usage of plant extracts as medicines.

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