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A Brief Review On Phytoconstituents And Pharrmacological Activities Of Ducrosia Anethifolia

V.Valasa Reddy, M.Doondi, S.jasmine fathima, O.jyothi, R.lavanya

Dept of pharmaceutical chemistry Asst professor

ADARSA COLLEGE OF PHARMACY, G.KOTHAPOLLI

ABSTRACT:

The plant Ducrosia Anethifolia is a rarest medicinal and aromatic plant that is used as a food additive and drug in the areas of natural distribution. It consists of six species, which are mainly native to Asia, specifically to Iran and Iraq. In Iran this plant is used for the extraction essential oil. In India this plant is available in Gujarat, Valsad district. It consist of phytoconstituents of volatile and non-volatile components. It is also used to treat headache, backache and colic pain. It also have analgesic activity, antianxiety, anticonvulsant activity, antimicrobial activity, anti-helmintic activity, anti-mitotic activity, anti-fungal activity, anti-bacterial activity and anti-oxidant activity.

KEYWORDS: Ducrosia genus, folk medicine, phytoconstituents, non-volatile compounds and volatile organic compounds (VOC)

INTRODUCTION

Ducrosia is a genus of flowering medicinal herbs belongs to the family Apiaceae. The Apiaceae family comprising 446 genera and 3820 species, is one of the largest plant families. Ducrosia anethifolia is one of the Ducrosia species that widely distributed in southern Egypt, Iran, Iraq, Afghanistan and Pakistan. In Iran this herb is called as Moshkbu and Moshgak. These are applied as analgesic reliever for backache, headache, cold and colic pain. Moshgak is added to many of food for flavoring. The genus consists of six species: D. ismaelis Asch, D. flabellifolia, D. assadii alava, D. areysiana, D. inaccessa and D. anethifolia. Some traditional uses of ducrosia include treating digestive issues like indigestion, bloating, and flatulence. Releive respiratory problems like bronchitis, asthma, and allergies. Soothe skin conditions like eczema, acne and dermatitis. Reduce fever and pain. It acts as a diuretic and expectorant. Ducrosia is used to treat various diseases including cancer, diabetes and cardiovascular disease.

FIGURE – 1

SCIENTIFIC CLASSIFICATION:

- **KINGDOM : *Plantae***
- **PHYLUM : *Tracheophyta***
- **CLASS : *Magnoliopsida***
- **ORDER : *Apiales***
- **FAMILY : *Apiaceae***
- **SUBFAMILY : *Apioideae***
- **TRIBE : *Tordyliae***
- **GENUS : *Ducrosia***

FIGURE – 1.1

BOTANY:

- Ducrosia is an annual or biennial herb that grows upto 1-2 meters in height.
- Its leaves are tripinnate, with fine sediments, and have a delicate, lacy appearance.
- The plant produces small, white or yellowish flowers in umbrella-shaped clusters (umbels).
- The fruit is a small, dry, schizocarp that splits into two parts, each containing a single seed.

FIGURE – 1.2

CULTIVATION:

- In certain areas, ducrosia is grown for its therapeutic properties.
- It needs full sun to partial shade and well-drained soil.
- It is a low-maintenance plant that can withstand mild drought.

FOOD AND BEVERAGE:

- Ducrosia is used as a flavoring agent in some middle eastern cuisine, particularly in salads, soups, and stews.
- The plant is used to make a tea that is said to have digestive benefits.
- Ducrosia is also used as a garnish, similar to parsley or cilantro.

PHYTOCONSTITUENTS:

1. Non-volatile components
    - Furanocoumarins
    - Flavanoids
    - Terpenoids
    - Alkaloids
    - Lignans
    - Phytosterols
    - Miscellaneous compounds
2. Volatile components

1. NON -VOLATILE COMPONENTS:

Non-volatile components are responsible for medicinal and biological activities of plants. Which are extracted using solvents like water, ethanol or methanol. They are analysed using techniques like HPLC, MS and NMR.

- **FURANOCOUMARINS:**

Furanocoumarin derivatives are considered as the major phytoconstituents of the Apiaceae family. Furanocoumarins like psoralen, bergapten, xanthotoxin, imperatorin, oxypeucedanin are isolated from chloroform extract obtained from stem, leaf and seed of ducrosia anethifolia.

- **FLAVONOIDS:**

Flavonoids have only been identified in ducrosia ismaelis. Two glycosylated quercetin derivatives like quercetin-3 glucoside and quercetin-3 polyglycoside were isolated from the hydroethanolic extracts of the leaves and stems of this species. Four isoflavonglycosides including daidzin, genistin, daidzein-4-O-beta-D-glucopyranoside and prunetrin have been isolated. Moreover, two chalcones, including a new compound ismaeloside A and isobavachalcone have been isolated.

- **TERPENOIDS:**

All the terpenoids have been extracted from the seeds and aerial parts of ducrosia anethifolia. The novel monoterpene and sesquiterpene substances ducrosin A and ducrosin B were extracted from the seeds of dichloromethane extract. A monoterpene glycoside, 8-O-debenzoylpaeonifluorine has been isolated from the chloroform extract of the aerial parts. By applying GC-MS, two oxygenated sesquiterpenes, isoaromadendrene epoxide and aromadendrene oxide have been identified as the major components from the ethylacetate extract of aerial parts.

- **ALKALOIDS:**

The aerial portions of ducrosia anethifolia have been shown to contain two alkaloids. Pseudosolasodin diacetate was identified through GC-MS analysis of the ethyl acetate extract of ducrosia anethifolia. However, harmine a well-known alkaloid was present in its chloroform extract.

- **LIGNANS:**

By using various chromatographic techniques, two lignan glycosides along with an aglycone have been isolated from ducrosia ismaelis. The aqueous extract of its aerial parts has allowed the isolation of 4-hydroxylignane, 5-pentamethoxylignane, 7,9-diepoxylignane as aglycone and liriodendrin, pinoresinol-4-O-beta-D-glucopyranoside as glycosylated lignans.

- **PHYTOSTEROLS:**

The dichloromethane extract of ducrosia anethifolia seeds yielded stigmasterol. In contrast, 3-O-glucopyranosyl-beta-sitosterol was isolated from leaf and stem samples of ethyl acetate extract. The ethyl acetate extract of aerial portions of ducrosia anethifolia was shown to contain ursodeoxycholic acid as a sterol derivative.

- **MISCELLANEOUS COMPOUNDS:**

Two phenolic glycosides including citrucin-C and coniferin were isolated from the aqueous extract of ducrosia ismaelis aerial parts. Vanillic aldehyde, 3-hydroxy-alpha-ionone and 2-C-methyl-erythrytol were isolated from chloroform extract of ducrosia anethifolia's aerial parts.

2. VOLATILE COMPONENTS:

The main volatile constituents were aliphatic hydrocarbons with decanal and dodecanal as the major constituents. Where cis-chrysanthenyl acetate was characterized in ducrosia anethifolia and ducrosia assadii. Alpha-pinene was identified as a monoterpene hydrocarbon in all the species.

The essential oil compositions of different plant parts (aerial part, fruit, flower, leaf and stem) of ducrosia anethifolia, ducrosia assadii, ducrosia flabellifolia, ducrosia ismaelis, collected from Iran, Saudi, Arabia and Jordan have been analyzed. The essential oils have been extracted by hydro distillation (HD), steam distillation (SD), supercritical fluid extraction (SFE) and solid phase micro extraction (SPME) were also applied. The leaves of ducrosia anethifolia was extracted by 3 methods HD, SD, SFE.

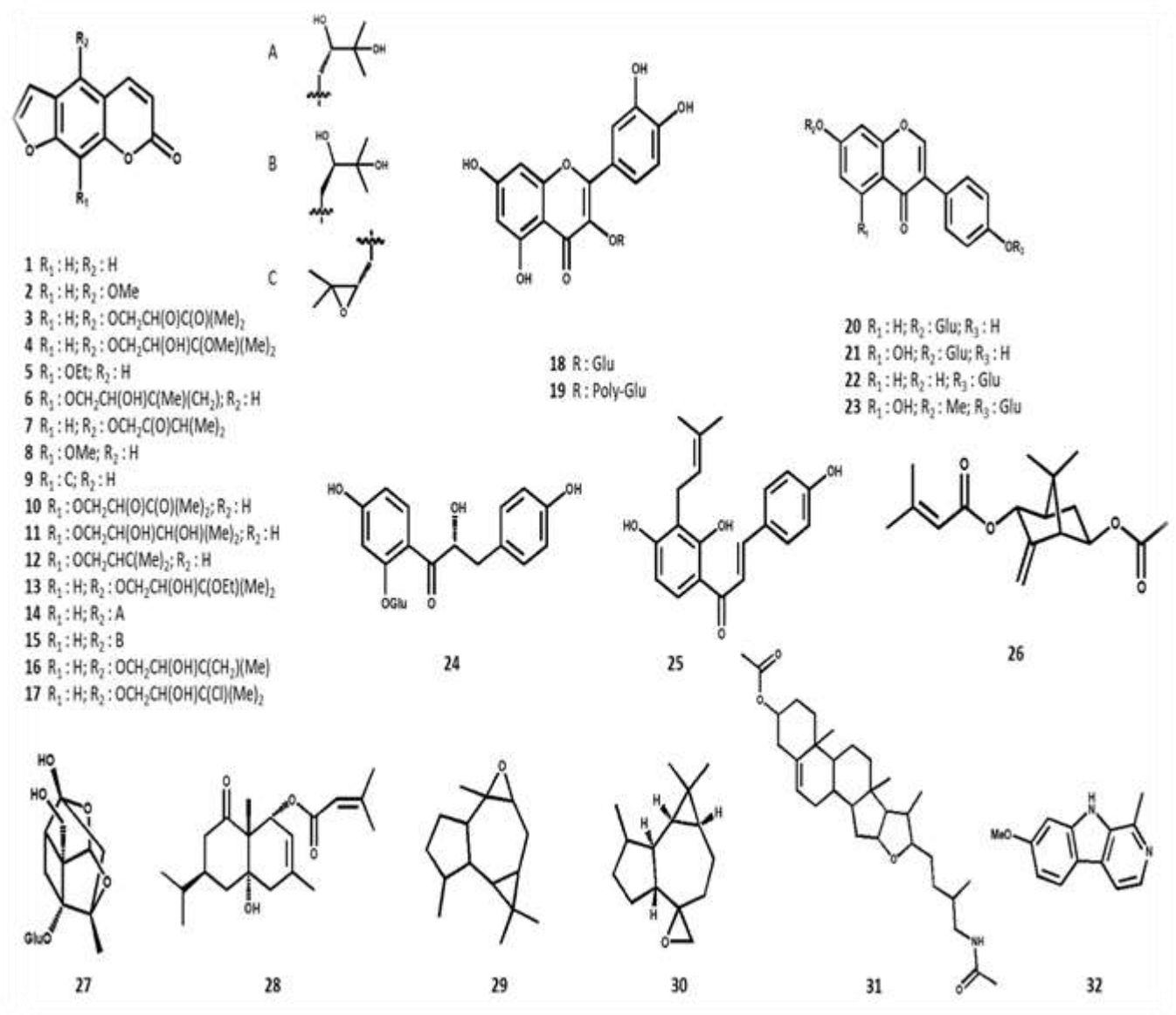

FIGURE – 2

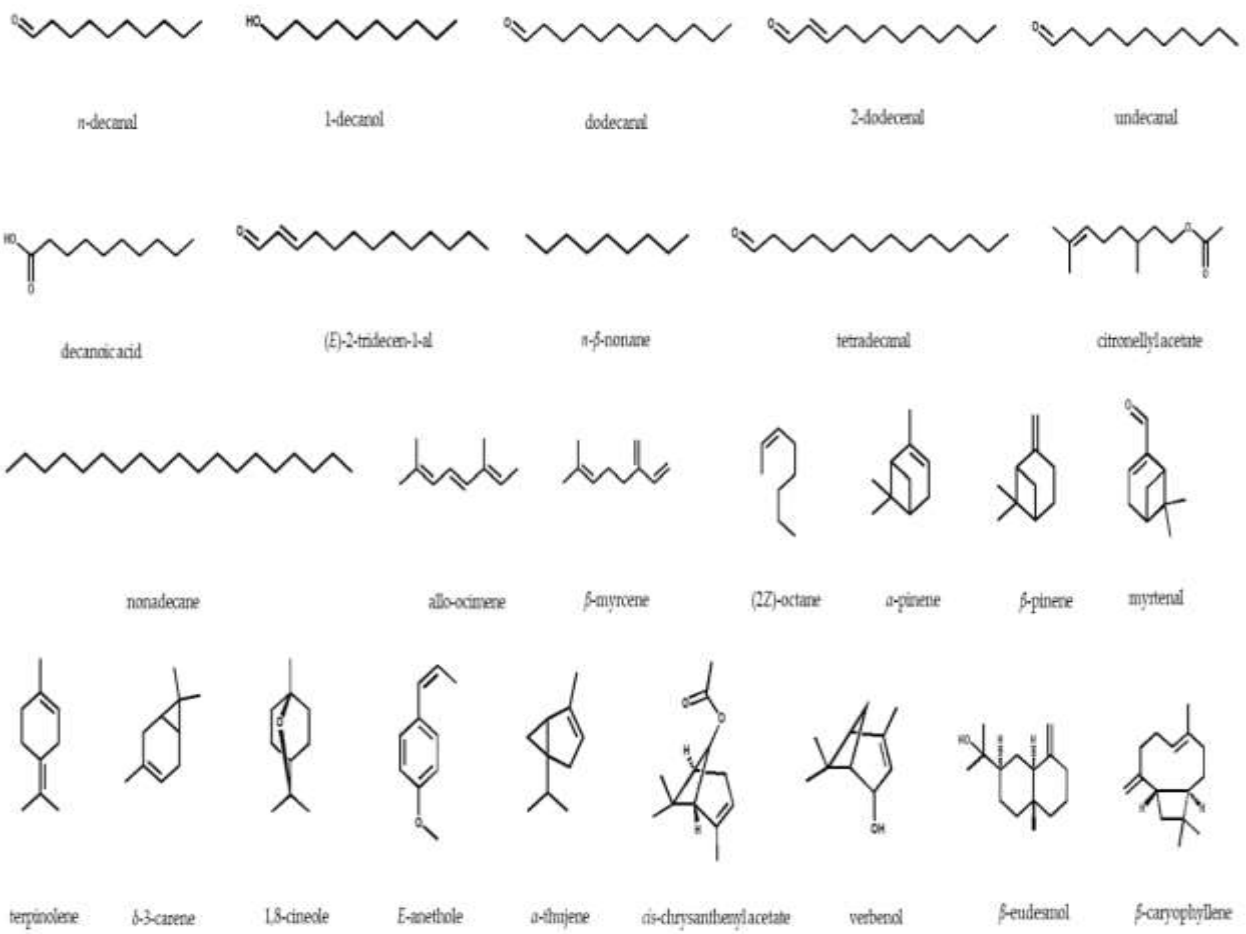

FIGURE - 3

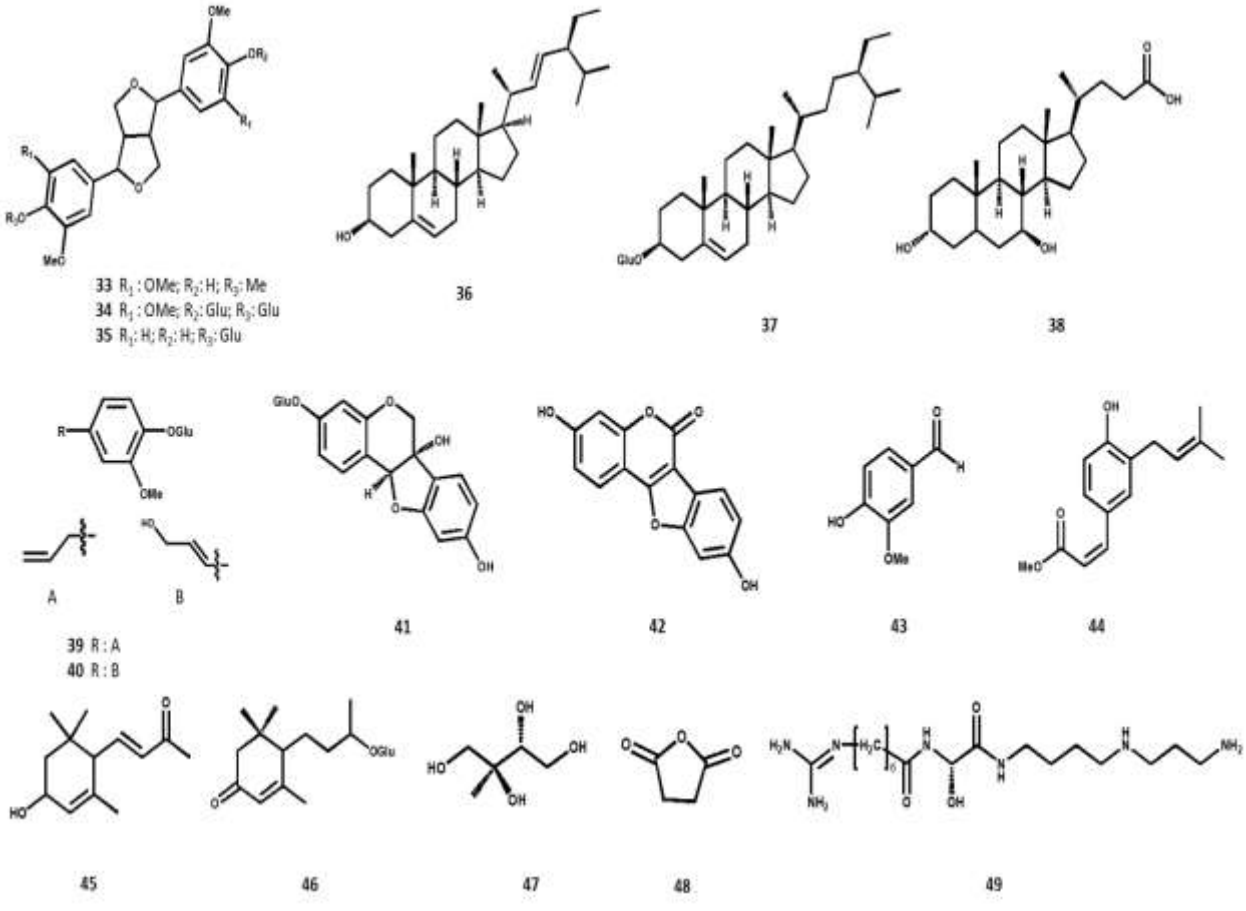

FIGURE – 4

PHARMACOLOGICAL ACTIVITIES:

Ducrosia anethifolia has shown potential as a natural remedy for various health issues including infections, cancer, anxiety, seizures, respiratory and gastrointestinal disorders. Ducrosia anethifolia have several pharmacological activities including antibacterial, immunomodulatory and immunostimulatory, neuroprotective, antiproliferative, antianxiety, sedative, analgesic, anticonvulsant, antioxidant, anti-inflammatory, antiosteoporotic, antiviral, antimicrobial, antiradical, bronchodilatory, gastroprotective, antidiabetic, antinociceptive, antidepressant, cardiovascular, anticancer, antifungal and cytotoxic activities.

➢ ANALGESIC ACTIVITY:

The Analgesic activity of essential oil extracted from ducrosia anethefolia leaves has been evaluated in 84 male mice. Dose dependent effects were observed using three assays, where the plant samples at 300mg/kg had the highest potency, compared to 30 and 100mg/kg in the delayed response of mouse tail- flick (5.8/s), writhing (15 number) and pain sources in acute (0.8 score) and chronic phases (0.7 score), assessed by tail - flick, writhing and formalin methods, compared to morphine (1mg/kg). The abovementioned parameters of 8.0/s, 2.5 number and 0.5 and 0.4 sources, respectively, were applied as positive control.

➢ ANTI ANXIETY ACTIVITY:

The essential oil of ducrosia anethefolia aerial parts was tested in the elevated plus maze test on mice. The percentage of time spent in the open arms within 5 minutes of administration to the animals was investigated. The time spent in the open arm was 29% at 25 in 50mg/kg of the essential oil, while at 400mg/kg the percentage of open arms was 22%. In the study response of spontaneous locomotor activity to the various essential oils doses was also analyzed, during a 15 minutes period at 5 minutes of intervals.

➢ ANTI CONVULSANT ACTIVITY:

The anti-convulsant effect of essential oil obtained from the aerial parts, and alpha - pinene as the major volatile component, of ducrosia anethefolia were tested on Wistar rats suffering pentetrazol (80 mg/kg) induced seizures. The highest protection (100%) was recorded after the administration of the 50mg/kg essential oil, whereas diazepam showed complete protection (100%) at 2 mg/kg. The duration of the toinc seixure was the lowest with the application of in case may be reduced to 0.4 mg/kg of Alpha-pinene,at 8s, compared to essential oil at doses of 50,100 , 150 and 200mg/kg, while diazepam (2mg/kg) was more active, with 4s sei

➢ ANTHELMINTIC ACTIVITY:

Anti Helminthtic activity was performed according to the method of Ghosh on adult Indian earthworm pheritima posthuma. We are performing three. Taking unknown concentrations and add solvent to it until it dissolves completely and then add saline to it and now take the unknown concentrations sample with the help of pipette and transferred into petridish and then place the pheritima posthuman and take stopwatch to observe the time of paralysis and death of earthworm.

3. ANTI-MITOTIC ACTIVITY:

In anti mitotic activity we are performing the test on allium sepa by using water. Initially we have to take the allium sepa and cut the tip of the allium sepa and emerge them in conical flask. Which is filled with water and kept it for 2 days. Now measure the roots of allium sepa with the help of scale. While performing the test, water should be taken in equal amount and kept it for 3 days. Now measure the growth of the roots. Then cut the roots and are allowed for the microscopic examination. Where there is no cell growth, then it shows mitotic activity.

➢ ANTI-FUNGAL ACTIVITY:

- The disc diffusion method was used to examine the antifungal activity produced compounds.
- Fluconazole was the standard medication used for its antifungal properties. It is broad spectrum antifungal drug that is active when taken orally.
- The following species were used to test the antifungal activity produced compounds.

1. Aspergillus niger:

- Plant product (DA) was employed in a solvent solution comprising DMSO at doses of 50µg/ml, 100µg/ml and 150µg/ml. Fluconazole 100ug/ml was the standard used to combine both organisms.
- To screen the antifungal activity disc diffusion method was used.

Materials and Methods:

Media used: Potato Dextros Agar Medium

TABLE - 1

Ingredients	Quantity Taken
peeled potato	200gm
beef extract	3.00gm
sodium chloride	5.00gm
agar	15.00gm
distilled water	Sufficient quantity

Microorganisms used: Aspergillus niger

Media Sterilization: All of the culture medium were autoclaved for 20min. at a pressure of 15 lbs/inch.

Method: Agar streak dilution method

Agar plate preparation with varying test chemical concentrations :

DMSO was used as the solvent to create a stock solution of the test chemicals that contained 1mg/ml. The following concentrations were obtained by aseptically mixing the necessary amounts of drug solutions with the known amounts of 50µg/ml 100µg/ml and 150µg/ml.

Each sterile petri-dish (approximately 10cm in diameter) received roughly 20ml of the drug containing liquid. The media were allowed to get solidified.

Streaking of microorganisms:

Each microorganism was aseptically streaked on the agar plates. Each plate was incubated for 48 hours at 37+ 1°C. The growth of the bacteria on plates was monitored.

Preliminary Screening:

Disc diffusion method:

The synthesized compounds are screened against two selected fungal strains Aspergillus niger and Aspergilius flavus by using diffusion method. The 48 hours old fungal culture inoculated into nutrient broth by following aseptic techniques and incubated for 48 hours at 37.2°C in an incubator. This culture mixed with wellsterilized and cooled media like Potato-dextrose agar media and poured into petriplates. After solidification five discs are made at equal distance by using sterile swattmann filter paper (5 mm in diameter). Into these place different concentrations of standard drug and synthesized compounds along with control (N, N'- Dimethyl Sulphoxide) are introduced. After introduction of standard drug and compounds, these plates are placed in a refrigerator at 8 5°C for 2hrs for proper diffusion after 2hr the petriplates are transferred to incubator and maintained at 37+ 2 C for 24-36 hours. After the incubation period, the plates were observed for zone of inhibition by using vernier scale. By contrasting the synthetic compounds' zone of inhibition with that of a traditional medication, the results are assessed.

- **ANTI BACTERIAL ACTIVITY:**

The following conditions must be accomplished for the determination of proper antibacterial activity.

There should be intimate contact between the test organism and substance to be evaluated.

Microorganism should be provided with the required condition for Measurement of activity should be done correctly. Aseptic environment should be maintained. Condition should be maintained unchanged throughout the study.

Various methods with their own advantages and limitations have been used from time to time to evaluate the antimicrobial activity of the drug. The antimicrobial activity can be evaluated by the following techniques.

- ✓ Agar streak dilution method
- ✓ Serial dilution method

- ✓ Agar diffusion method
- ✓ Cup plate method
- ✓ Cylinder method
- ✓ Paper disc method
- ✓ Turbidimetric method

In the present study, the well diffusion method was used to evaluate the antimicrobial activities of the synthesized compounds in vitro. The well diffusion method is one the methods that may be used for determining the relative effectiveness of the antibacterial activity. The results obtained by this method depend not only on the toxicity of the antimicrobial agent but also on its liability to diffuse through the medium. The standard antibiotics used in the present study were ciprofloxacin.

Sensitive microorganisms are:

- ✓ Gram-negative: E.coli and various species of Salmonella, Shigella, Enterobacter, Campylobacter and Neisseria. Ciprofloxacin is more effective than norfloxacinagainst Pseudo aeroginosa, values of MIC range from 0.5 to 6ug/ml.
- ✓ Gram +ve (less sensitive): Streptococci, Staphyiococci and Histeria speciesIn the present study the following bacteria were used*E.coli.*

The antibacterial activity of compounds (DA) was studied by well diffusion method. Compounds were used in the concentration of 50ug/ml, 100Hg/ml, 150ugmi using a solvent DMSO. Ciprofloxacin 100ug/ml was used as standard.

Media used: Nutrient Agar

Nutrient Agar: (Composition)

TABLE - 2

Ingredients	Quantity Taken
Peptic Digenst of Animal Tissue	5.00
Beef Extract	3.00
Sodium chloride	5.00
Agar	15.00
Distilled water	q.s

The zone of inhibition of various concentrations of the synthesized compounds against gram positive and gram negative bacteria was measured and were tabulated.

Materials and Methods:

Media used: Nutrient Agar 1.5%

Media Sterilization: All the culture media were sterilized by autoclaving at 15 lbs/inch corresponding to 20min.

Method: Agar streak dilution method.

Agar plate preparation with varying test chemical comcentrations:

DMSO was used as the solvent to create a stock solution of the test chemical at a concentration of 1mg/ml. The following concentrations were obtained by aseptically mixing the necessary amounts of drug solutions with the known amounts of molten sterile agar medium from these stock solutions : 50, 100 and 150µg/ml.

Each sterile petri dish, which had a diameter of around 10mm, received roughly 20ml of the drug containing fluid. Then the media were allowed to get solidified.

Streaking of microorganisms:

Microorganisms were then streaked one by one on the agar plates ascptically After streaking, all the plates were incubated in the incubator, set at 37+ 1°C for 24 hrs.

The growth of the bacteria on the plates was then monitored.

Preliminary Screening:

All the compounds possess potent to moderately potent activity against gram-positive and Gram-negative bacteria.

The antibacterial activities are performed by disc plate method (disc diffusiontechnique). The fresh culture of bacteria are obtained by inoculating bacteria nutrientbroth media and incubated at 37 2' C for 18 24 hours. Using aseptic method, this culture was combined with nutritional agar media and then transferred into petri dishes. Following the media's solidification, the plates were refrigerated for 2 hours. After two hours of cold incubation, four discs are made at equal distance by using sterile wattman paper (5 mm diameter).Dip these discs in to different concentratons. Dimethyl sulphoxide was used as a control. After introduction of standard drugs and synthesized compounds, the plates were placed in a refrigerator for 2hrs for proper dipping of drug into the media. After 2hrs the plate were placed in an incubator and maintained at 3712'C for 18-24 hours. After the incubation period, over mean the petri-plates were observed for zone of inhibition by using vernier scale.

- **ANTI-OXIDANT ACTIVITY:**

Free radicals are reactive atom or groups of atoms with one or more unpaired electrons. They can harm cells, proteins and DNA by changing their chemical structure. They are particularly produced by the body's natural biological processes or are introduced from outside (such as in tobacco smoke, toxins or pollutants).

Generally speaking, free radicals are regarded as a fragment of molecules that are highly reactive and short-lived. They are constantly being created in cells, either purposefully during phagocytosis or accidentally as byproducts of metabolism. Three processes can produce free radicals :

- Hemolytic cleavage of a normal molecule's covalent bond, of a normal molecule, in which each fragment keeps one of the paired electrons.
- By adding one electron to a normal molecule.
- By taking one electron away from a normal molecule.

The later, electron transfer, is a far more common process in biological systems, than the other two. Radical derivatives of oxyzen are the most significant free radicals in biological systems. In recent times, studies show that the free radical process known as lipid peroxidation plays a radical and causative role in the pathogenesis of atherosclerosis, cancer, myocardial infarction and also in ageing. Free radical oxidative interactions promote tissue injury in conditions like brain trauma, ischemia, and toxicity and also in neurodegenerative diseases such as parkinsonison's disease, Alzheimer's, dementia, and multiple sclerosis are now well documented. It has been demonstrated that a no. of substances, including ascorbic acid, a-tocopherol, probucol, sylibin and gnaphalin exhibit antioxidant activity. Despite constantly producing free radicals, the human body has a no. of defence mechanisms against them, including enzymes and radical scavengers. Despite its name, the "first line antioxidant defense system" is not entirely effective. The "second-line defense systems" are constituted of repair systems of biomolecules, which are damaged by the attack of free radicals, due to the increased use of antioxidants in therapy.

A chemical that has ability to slow down or stop other molecules from oxidizing is called an antioxidant. A chemical reaction known as oxidation occurs when a substances electrons are transferred to an oxidizing agent. Free radicals are created by an oxidation processes and can initiate cell-damaging chain reactions. Antioxidants interrupt these chain by removing free radical intermediates. They also prevent additional oxidation reactions by becoming oxidized themselves.

Anti-oxidant compounds in food play an important role as a health protecting factor. According to scientific research, antioxidants lowers the chance of developing chronic illnesses including cancer and heart disease. Whole grains, fruits and vegetables are the main natural sources of antioxidants. Plant sourced food antioxidants like vitamin C, vitamin E, carotenes and flavonoids have been recognized as having the potential to reduce disease risk. Plant-based sources account for the majority of antioxidant compounds found in a typical diet. These compounds belongs to several classes and have a wide range of physical and chemical characteristics.

The ability of antioxidants to capture free radicals is one of their primary features. There are many different sources of highly reactive oxyzen species and free radicals in biological systems. These free radicals have the ability to cause degenerative illness by oxidizing proteins, lipids, nuceic acids or DNA. Antioxidant compounds like polyphenols and flavonoids scavenge free radicals such as peroxide, hydrogen peroxide or lipid peroxy. Consequently, prevent the oxidative processes that result in degenerative diseases.

Numerous clinical investigations indicate that the antioxidants found in fruits, vegetables, tea, and red wine are primarily responsible for the foods' demonstrated ability to lower the prevalence of chronic illnesses, such as heart disease and various types of cancer.

Experimental protocol :

Method: HYDROGEN PEROXIDE SCAVENGING METHOD

Reagents:

- Hydrogen peroxide
- DMSO
- Phosphate buffer saline (pH-7.4)

Standard: Ascorbic acid

Procedure:

All the compounds and the standard were dissolved in DMSO as a solvent- stock solution (100ug/100ml) and from stock solution various concentrations (two fold dilutions) of 1, 2, 3, 4 and 5mg/ml were prepared in different volumetric flasks. To each solution 2 ml hydrogen peroxide was added and the volume was made to 10 ml with phosphate buffer saline (pH-7.4).A control solution was prepared with DMSO in phosphate buffer saline without drug. Using a UV spectrophotometer, the absorbance at 230 nm was measured in relation to a blank (phosphate buffer saline).

The % inhibition by hydrogen peroxide scavenging activity was calculated using the following formula:

$$\text{Percent inhibition} = \frac{\text{Absorbance of control} - \text{Absorbance of test sample}}{\text{Absorbance of control}}$$

CONCLUSION:

In this ducrosia anethefolia previously examined many review articles and the plant extracts are collected from aerial parts of the plant. It includes phytochemical studies like non-volatile components such as furoncoumarins , flavonoids, and volatile components such as aliphatic hydrocarbons and miscellaneous compounds are present in previous studies. Pharmacological activities like anti-oxidant, anti-inflammatory, anti-mitotic, ant helmintic, anti-bacterial, anti-fungal activities are examined. As we conclude that, this plant is used to treat various diseases in our country.

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