Evaluation of Antioxidant and Phytochemical Content of Tulsi (Ocimum Tenuiflorum) Flower Extract

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Abstract

Many studies have been conducted to determine the effectiveness of the phytochemicals found in plants that prevent disease and promote health, as well as to comprehend the underlying mechanism of their action. In vitro and in vivo research in experimental animals, as well as epidemiological and clinical-case control studies in humans, have been used to identify and isolate the chemical components and prove their biological efficacy. According to study results, phytochemicals may lower the risk of coronary heart disease by enhancing arterial flexibility, lowering the production or absorption of cholesterol and restoring normal blood pressure and coagulation. Chemicals that cause cancer may be detoxified by phytochemicals. They seem to block carcinogen-activating enzymes, neutralise free radicals, and activate carcinogen-detoxifying enzymes. Ocimum sanctum is thought to have anti-aging, immunomodulatory, antibacterial, and anticancer properties, as well as the ability to treat several chronic illnesses. *Ocimum sanctum* aqueous extract: phytochemical analysis. The herb is known to have antiseptic, analgesic, anti-inflammatory, antimicrobial, antistress, immunomodulatory, hypoglycemic, hypertensive and antioxidant qualities, they said.

Keywords: *Ocimum sanctum*, Antioxidant activity, Antimicrobial, Medicinal properties

Introduction

The tulsi flower belongs to the plant Ocimum tenuiflorum, commonly known as Holy Basil or Tulsi. It is a sacred and medicinal herb widely cultivated in India and many Asian countries. Tulsi is highly valued in traditional systems of medicine such as Ayurveda because of its therapeutic, spiritual, and pharmacological importance.

Tulsi is an aromatic perennial shrub belonging to the family Lamiaceae. The flowers are small, purple or white in colour, and arranged in elongated clusters known as racemes. These flowers

possess a characteristic pleasant aroma due to the presence of essential oils and bioactive phytochemicals.

Tulsi flowers contain several important phytoconstituents including flavonoids, tannins, phenolic compounds, alkaloids, and essential oils such as eugenol and linalool. These compounds contribute to various biological activities like antioxidant, antimicrobial, anti-inflammatory, and immune-boosting effects. Figure's show Tulsi Flowers (Figure 1 & 2).



Figures 1 & 2: Shows Tulsi Flowers

India is renowned for being a "Emporium of medicinal plants." With over 12600 species, it accounts for roughly 8% of the world's estimated biodiversity. It is one of the 12 megabiodiversity centers, with two hotspots of biodiversity located in the northeastern area and the Western Ghats (Amuthavalluvan, 2011). It is also rich in ethnic variety, with over 67.37 million tribal people from 537 distinct tribal groups residing in diverse regions and using varied means of sustenance (Shanmugam et al., 2012). These tribal communities, which inhabit rich and varied regions, have extensive knowledge and expertise about the use and preservation of food and medicinal plants (Ranganathan et al., 2013). The World Health Organization (WHO) reports that about 65% of

people worldwide use plants as their major source of medical care. It is frequently said that plants are the source of 25% of all medications administered today (Johnsy et al., 2011). According to this estimate, a sizable portion of medications based on natural products are obtained from plants (Farnsworth et al., 1996).

Men have historically employed plants, particularly Ocimum sanctum, to meet their fundamental requirements. Essentially, the indigenous community's use of medicinal herbs is firmly ingrained in their culture (Farnsworth and Morris, 1996). Medicinal plants have been utilised therapeutically all over the world and are a key component of many traditional medical systems (Raskin and Ripoll, 2013). Even though the many traditional medical systems across the world such as Ayurveda, Chinese traditional medicine, Unani, Tibetan medicine (Hasler and Blumberg, 1996), Amazonian medicine, or African medicine—may have differing theoretical and cultural foundations, they all incorporate phytotherapy within their doctrines (Gibson et al., 1998).
Over 80% of people in underdeveloped nations rely on traditional medicine for their basic medical requirements, according to estimates from the World Health Organization (WHO) (Mathai, 2001). Over 6000 traditional Indian plants are said to be employed in folk and herbal medicine, accounting for over 75% of the medical requirements of third-world nations.

Phytochemistry and medicinal properties

Meagher and Thomson's summary of the findings indicates that genistein inhibits the development of new capillaries, which are essential for tumour growth and metastasis. Few phytochemicals have well-established physiologic characteristics, and many studies have concentrated on their potential to prevent or cure heart disease and cancer. Joseph (2013). Additionally, phytochemicals have been recommended for the treatment and prevention of macular degeneration, high blood pressure, and diabetes. Although phytochemicals are categorised according to their functions, a single component may serve as both an antioxidant and an antibacterial agent. Plants include phytochemicals that are both bioactive and disease-preventive.

Antioxidants and preserving health

The body produces antioxidants in a number of ways to combat oxidative stress. These

antioxidants can be obtained externally through diet (exogenous antioxidants) or spontaneously produced in situ (endogenous antioxidants). Antioxidants have three functions: they neutralise excess free radicals, shield cells from their harmful effects, and help prevent illness [Okunade, 2002].

Constituents of Phytochemicals

Tulsi has a very complex chemical makeup that includes a variety of nutrients and other physiologically active substances, the amounts of which can differ significantly across strains and even between plants in the same area. Furthermore, varying growing, harvesting, processing, and storage conditions all of which are still poorly understood have a substantial impact on the amount of many of these constituents.

The synergistic combination of several active phytochemicals results in the nutritional and pharmacological qualities of the entire plant in its natural state, as it has been used historically. As a result, individual chemicals or extracts cannot completely replicate Tulsi's overall benefits. Tulsi has been difficult for contemporary science to standardise because to its intrinsic botanical and molecular complexity.

Therapeutic Characteristics

Some of the basils are a rich source of key nutrients like Vitamin A, Vitamin C, calcium and phosphorus. Vitamin A's presence aids in improving vision. Additionally, antioxidants like beta carotene found in basils aid in reducing cell damage. The holy basil, or "tulsi," is well-known worldwide for its therapeutic qualities. Its flowers are useful for treating fever and colds, as well as for improving memory. They also aid in blood purification and have anti-stress properties. As a result, cholesterol levels are lowered and the risk of heart attacks is decreased.

Anticancer properties

The anti-melanoma properties of a 50% alcoholic aqueous leaf extract from various Ocimum

species were investigated. When oral leaf extract (200 mg/kg, p.o.) was given to mice, the average body weight, tumour volume, and survival rate all significantly decreased.

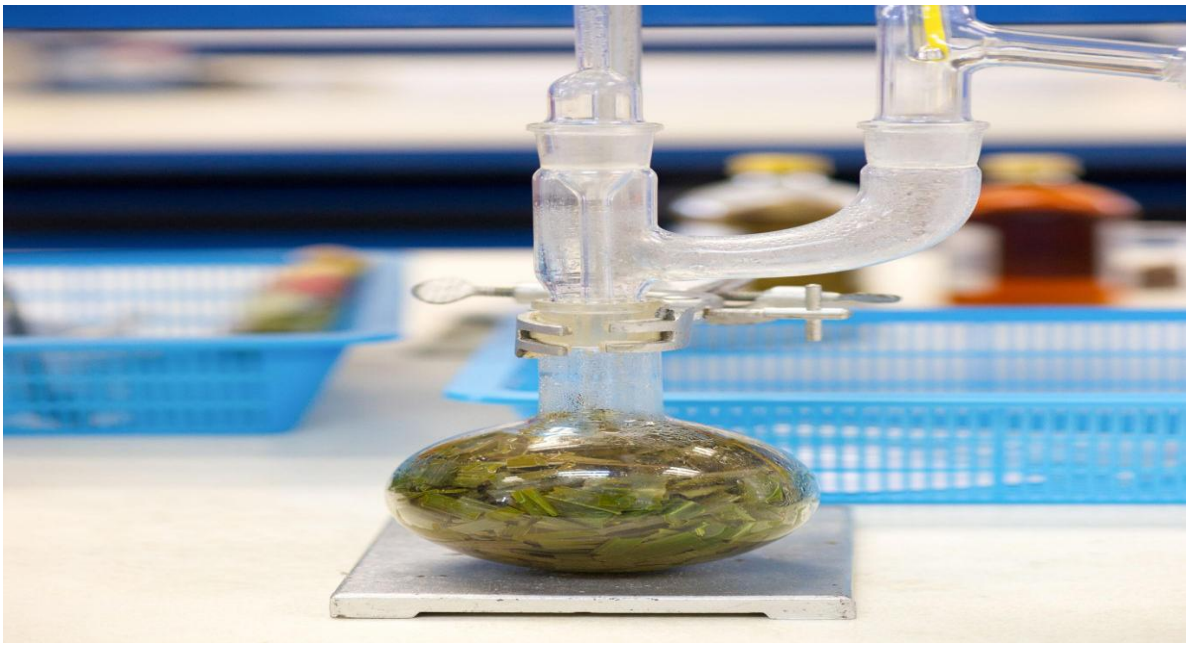
Anti-inflammatory properties

Methanolic extract of Ocimum sanctum (500 mg) demonstrated inflammatory action in rats. Tulsi contains linolenic acid and fixed oil, which can inhibit the cycloxygenase and lipoxygenase processes involved in the metabolism of arachidonic acid. As a result, leukotrines cause oedema in rats and have anti-inflammatory properties against PGE2.In rats with carrageenan-induced paw oedema, Ocimum sanctum aqueous extract (200 mg/kg or 400 mg/kg) shown considerable efficacy ($P<0.05$). This shown that O. sanctum had a greater impact than the STD medication indomethacine.

MATERIALS AND METHODS

We gathered fresh ocimum tenuflurom flower petals from Oriental College of Pharmacy in Bhopal. The flowers were properly cleaned using both sterile distilled water and regular tap water. The flowers were then allowed to dry at room temperature in a shady area. Flowers were allowed to dry at ambient temperature in a shady area. Using a grinding machine, flowers were reduced to powder. Powder was kept in a light-air container bottle at 4°C. The powdered tulsi flowers (in 20 g lots) that had been air-dried were extracted using 200 mL volumes of methanol, acetone, and distilled water, each at 4°C. A vacuum rotary evaporator was used to remove solvent residues from the mixed extracts. A quantity of 20 g of powder mass was put in the extractor for hot extraction in a soxhlet apparatus, and 200 mL of a solvent was utilised for six hours of soxhletion, or until colourless extracts precipitated in the extractor. The rotary evaporator concentrated each extract following filtering. The solid mass was kept in an appropriate volume of 10% dimethyl sulphoxide (DMSO) with a drop of Tween-20 after the resulting sticky mass was dried in a desiccator. Tulasi methanol extracts, both hot and cold, ranged in hue from light green to thick greenish. Following concentration, a solid physical appearance was observed, and the yield levels were 4.2% in the hot extract and 3.7% in the cold extract. A drop of Tween-20 and the necessary volume of 10% DMSO were used to dissolve the solid extract, resulting in a final concentration of 30 mg/ml. Both the cold and hot extracts of acetone and methanol had a greenish hue, looked sticky after

concentration, and had yield values of 4.27% in the hot extract and 3.12% in the cold extract. After concentration, the methanol extracts became green and became sticky. The yield quantities were 7.90% in the hot extract and 6.24% in the cold extract. Following desiccation, the concentrations of green to dark green, solid, sticky methanol extracts were 7.20% in the cold extracts and 8.20% in the hot extracts. After the concentration, the aqueous extracts became green and became sticky. For later usage, each extract's stock concentration was kept at 30 mg/mL.



Figure; Shows Soxhlet Extraction Method

Phytochemical Screening: Sofowara, Trease, Evaans, and Harbone's conventional procedures were used in chemical assays to detect different constituents using an aqueous extract.

Tannin tests: It involves mixing 2 ml of the aqueous extract with 2 ml of distilled water and adding a few drops of $FeCl_2$ solution. The presence of tannins was shown by the formation of green precipitate.

Saponin tests: involves shaking 5 ml of aqueous extract with 5 ml of distilled water in a test tube while it was heated. Stable foam development was considered a sign that saponins were present.

Phlobatannins Tests: Add about two millilitres of aqueous extract to 2 ml of 1% HCL, then boil the mixture. Red precipitate deposition was seen as proof that phlobatannins were present.

Flavonoid tests: 1 ml of a 10% lead acetate solution was added to 1 ml of aqueous extract. When a yellow precipitate formed, the test for flavonoids was considered successful.

Terpenoids Tests: Dissolve 2 ml of the organic extract in two millilitres of chloroform, then evaporate until completely dry. After that, 2 ml of concentrated sulphuric acid were added, and the mixture was heated for around two minutes. Terpenoids are present when a greyish colour develops.

Antimicrobial assay

Using the usual well diffusion technique, antibacterial activity against human pathogenic bacteria (Bacillus subtilis, Escherichia coli, Pseudomonas putida, Klebsiella pneumonia, and Staphylococcus aureus) was measured. The bacteria were cultivated on Nutrient Agar (NA). Nutrient Agar-containing Petri plates were filled with 100 µl of new, overnight-grown bacterial cultures. The medium was punctured with 1 mm holes using a sterile borer. This hole was filled with 100 µl of the leaf extract solution, and the plates were then incubated at 37^0C.

RESULTS AND DISCUSSION

Ocimum tenuflurom fresh flowers were gathered from the Botanical Garden at Oriental College of Pharmacy Bhopal. The flowers were properly cleaned using both sterile distilled water and regular tap water. The flowers were then allowed to dry at room temperature in a shady area. Flowers were allowed to dry at ambient temperature in a shady area. Using a grinding machine, flowers were reduced to powder. For further examination, powder was kept in a light-air container bottle at 4°C.

The findings validate the existence of components known to have both physiological and therapeutic properties (Pandey and Debnath, 2011). Table 1 summarises the phytochemical properties of the ocimum tenuflorum leaf extract under investigation. The findings show that the flowers of Ocimum tenuflorum contain medicinally active components such as tannins, alkaloids,

terpenoids, steroids, flavonoids, phlobatannins, and glycosides. However, these plants lacked saponins.

Alkaloids found in plants are employed as anaesthetics in medicine (Victor and Obhi, 2009). The tonic and stimulating properties of Chinese and Japanese medicinal herbs have been attributed to the presence of saponins in plants. According to the study's findings, the detected phytochemical substances may be the bioactive components that give the plants flowers their effectiveness. It has also been established that several of these substances have antibacterial properties. Therefore, it may be assumed that the plant extracts could be a source for the industrial production of medications that are helpful in the chemotherapy of certain microbial infections.

Table 1: Shows Phytochemical constitute of the Flower extract FromTulsi plant

Chemical constituent	Methanol extract	Acetone extract	Water extract
Tannins	Absent	Absent	Present
Saponins	Present	Present	Absent
Phlobatannins	Present	Present	Present
Flavonoids	Present	Present	Present
Terpeniods	Present	Present	Present
Eugenol	Present	Present	Present
Methyle Eugenol	Present	Present	Present
Carvacrol	Present	Present	Present

Antimicrobial activity: Antimicrobial efficacies of plant extract

Plant extract shown antibacterial efficacy against both Gram positive (Staphylococcus aureus and Bacillus subtilis) and Gram negative (Pseudomonas putida, Klebsiella pneumonia, E. colli) pathogens. Plant extract's zone of inhibition against both Gram positive and Gram negative bacteria was quantified. According to the findings, ocimumtenuiflorum leaf extract exhibited potent antibacterial action against both Gram positive and Gram negative microorganisms. The

well diffusion assay, which is primarily used to assess the sensitivity of bacterial strains towards antibiotics with a clear zone surrounding the well reflecting the bacterial sensitivity towards antibiotics, was performed to investigate the antimicrobial impact of the plant extract. The findings demonstrated that ocimum flower extract effectively inhibited the five bacterial strains under investigation. Plant extract may adhere to the cell membrane's surface, disrupting the cell's permeability and respiration processes, which might account for the reported antibacterial action. Plant extract can hinder the growth of bacteria and yeasts by inhibiting respiratory chain enzymes and interfering with membrane permeability when it interacts with microbial cytoplasmic components and nucleic acids. Additionally, the extract may be able to enter the bacterium and interact with the membrane's surface. It was discovered that different studies had different levels of extract susceptibility for both Gram positive and Gram negative bacteria. Plant extract was shown to be somewhat toxic against E. coli and considerably harmful against gram-positive and fungal microorganisms. According to our findings, floral extract's antibacterial effectiveness against both Gram positive and Gram negative bacteria was almost identical.

CONCLUSION

Ocimum tenuiflorum flowers were gathered, extracted in a solvent including methanol, acetone, and water, and their phytoconstituents were assessed. Alkaloids such as morphine, boldine, tannins, saponin, terpenoid, glycosides, phlobatannins, and steroids are found in these flowers. Ocimum teniflorum methanolic extract has antibacterial properties against both gram positive and gram negative microorganisms. Carvacrol, methyl eugenol, and eugenol are also present. As a result, its efficacy as an antibacterial agent is established. The current study shows that ocimum tenuiflorum solvent extract contains bioactive chemicals with significant medicinal value, which supports the use of plant species in traditional medicine to treat a variety of illnesses.

ACKNOWLEDGMENT

The authors express their sincere gratitude to **Dr. Pankaj Tiwari,** Professor, Oriental College of Pharmacy, Bhopal, for his valuable guidance, continuous encouragement, and constant support throughout the completion of this research work. His insightful suggestions, academic expertise, and motivation greatly contributed to the successful accomplishment of the study. The authors are also thankful to the management and faculty members of Oriental College of Pharmacy Bhopal, for providing the necessary facilities, resources and academic environment required for carrying

out this work successfully. Special thanks are extended to family members, friends, colleagues for their encouragement, cooperation, and moral support during the entire research process.

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