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Review Study on Synthesis and Applications of Kapoor Tulsi (*Ocimum Kilimandscharicum*) Leaf Extract

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Abstract

Ocimum kilimandscharicum, commonly known as African basil or camphor basil, is a medicinal plant indigenous to East Africa. This review provides a comprehensive overview of the botanical characteristics, phytochemical composition, and pharmacological properties of Ocimum kilimandscharicum. This review critically evaluates various leaf extraction methods employed to isolate bioactive compounds from Ocimum kilimandscharicum, aiming to optimize both yield and bioactivity. Subsequently, different extraction techniques including conventional methods such as maceration, Sox let extraction and modern techniques such as hydro distillation, ultrasound assisted extraction, microwave-assisted extraction, supercritical fluid extraction, are analyzed. The phytochemical profile of Ocimum kilimandscharicum is analyzed, focusing on its rich array of secondary metabolites such as phenolic compounds, flavonoids, terpenoids, and essential oils. These bioactive constituents contribute to its diverse pharmacological activities, including antioxidant, antimicrobial, anti-inflammatory, analgesic, antidiabetic, and anti-cancer properties. Furthermore, the review explores the mechanisms of action underlying these pharmacological effects, elucidating its potential therapeutic applications in various disease conditions.

Keywords Kapoor Tulsi (Ocimum kilimandscharicum), Leaf, Extract, Biopesticides, Insecticides.

Introduction

Humans and plants have a complex relationship that dates back to their shared evolutionary history. The plant kingdom is an excellent source of potential drug and the recent year there has been increasing awareness about the importance of medicinal plants (Borah,J.et al 2018). The medicinal plant extract has now emerged as a good alternative as they are rich in wide variety of phytochemicals such as alkaloids, flavonoids, phenolic, tannins, etc. (Edoga, H.O.et al 2005). Herbal medicine is rational medicine and several of them clinical trials have shown efficacy. Contemporary science has acknowledged the active action of medicinal plants, and it has included in modern pharmacotherapy arrange of drugs of plants origin. (Agarwal, R. 2017).

One of the plant genus which has been traditionally used for its medicinal and therapeutic property is Ocimum. The genus Ocimum, member of Lamiacae family consist of almost 200 species of herbs and shrubs. The leaves accommodate aromatic oils, which is the essence of the plant. One seeded fruits are indehiscent type which are found in cluster, tap roots are deep and soft wooded. (Kashyap,C.P. et al 2011).

Ocimum Genus is widely distributed over tropical and sub-tropical regions. Some non-species like Ocimum sanctum, O. gratisscum, O. canum, O. basilicum, O. kilimandscharicum, O. ammericanum, O. camphora and Ocimum micrathum. O. kilimandscharicum has a long history of traditional medicinal. The leaves of Ocimum kilimandscharicum are acride, thermogenic, aromatic, anti-bacterial, insecticidal, anti-viral, appetizing and ophthalmic. It is commonly known as “kapoori tulsi” in hindi and attracts attention majorly as a source of camphor (Gill,D. et al 2012).

Ocimum kilimandscharicum is native of kenya and cultivated on a small scale specially in West Bengal, Assam, Tamil Naidu, Karnataka, Kerala and Dehradun. The leaves of Ocimum kilimandscharicum are known to be useful in cough, bronchitis, viral infection, foul ulcers, anorexia and wounds (Singh, V. et al 2014)). Kapoor Tulsi is easy to grow and self-sows readily, making it a welcome addition to any garden.

Objective of study

The aim of this review study was to explore the synthesis methods of kapoor tulsi (*Ocimum kilimandscharicum*) leaf extract as well as its applications.

Review of Literature

This is the review based paper so various literature has been reviewed through out the paper.

Analysis

1. Methos of Kapoor Tulsi (*Ocimum kilimandscharicum*) Leaf Extract Synthesis

There are several methods for extracting compounds from leaves of a plant depending on the type of extract you need. Common methods include Steam distillation, Cold pressing, Supercritical fluid extraction, maceration, grinding. Powder extract is obtained by air drying the leaves under shaded conditions at room temperature and then crushed to powder using grinding machine and collect the smooth powder obtained. (Naik, L.S. et al 2015) Sox let apparatus can also be used to prepare the leaf extract of high purity. For extraction by it dried powder of leaves is placed within the thimble and distilled water is used as a solvent. The extraction is continued till a clear solvent is seen in the thimble which is later concentrated using Rota vapor. The extract obtained is dried then in a digital water bath till a residue is left behind (Ghode P.et al 2020).

Hydro distillation is another method to prepare leaf extract in which plant leaves are immersed in specific amount of water and then submitted to hydro distillation with a Clevenger type apparatus for a required time limit. The extract obtained is dried and stored under cool conditions until used. (Chenni,M. et al 2016}.

Maceration is also one of the common method through which leaf extract is prepared. A mixture is prepared in which a powder extract is taken and then soaked in water (aqueous solution), ethanol or methanol (solvent solution) for around 24 to 72 hr. at room temperature. The extract obtained is then filtered using a filter paper and concentrated using a rotatory vacuum evaporator. The residue obtained is dried in a vacuum oven at 40 C (Utispan,K. et al 2020).

Crude extract can also be prepared for many phytochemicals analysis by crushing the leaves of the plant with the help of pestel and mortal and mix it with double distilled water.Keep this mixture for boiling for about 5 min and keep this mixture for cooling and then filter through Whatman filter paper (Ramteke,C. et al 2012)

2. Biochemical Components of Kapoor Tulsi (*Ocimum kilimandscharicum*) Leaf Extract

Many studies had revealed the presence of various secondary metabolites such as carbohydrates, tannis,flavonoids,saponins,glycosides,terpenoids,fatty acids and phenol in Kapoor tulsi leaf extract.(bohr 2018). The biochemical constituents such as steroids,flavonoids, alkaloids, phenols, and tannis and other aromatic compounds of this plant serves as a defense mechanism against insects, microorganisms and other herbivore(Bonjar,G.H.S. et al 2004).

Ocimum kilimandscharicum is characterized by the presence of having of camphor in plant. The leaf extract is found to have camphor, 1,8 – cineole, limonene, trans caryophyllene, campene, 4 – terpheneol, myrtenol, α – terpinol, indo- borneol, linalool (Sood,S.et al 2021). The essential oil extracted from the leaves of ocimum kilimandscaricum has the presence of carvacrol and sesquiterpine hydrocarbon caryophyllene (Radhakrushna, A. A. 2022). The major constituents identified from the genus ocimum is the presence of the eugenol and ursolic acid which has a anti-estrogenic effect. The medicinal properties are primarily due to presence of rhymol, xylose and polysaccharides. (Chaudhari, L.Y. et al 2022).

Another constituents which are present in kappor tulsi are like oxygenated monoterpenes(95.8%), camphor (64.9%), limonene (8.7%), camphene (6.4%) and (E)-βOcimene (3.0%) which makes it as a major source of camphor(Joshi,R.K. et al 2017).Out of all major constituents it has been observed that the proportion of Eugenol is maximum which is about 57.82% followed by (Z)-α-Bisabolene (17.19%) and Thymol (9.80%).Most of secondary metabolites and essential oil is found to be in the leaves, stem and roots(Monga, S. et al 2017).

Different chemotypes that are present in ocimum klilimandscharicum collected from different regions are summarized in the table below (Mukhtar, H.M. et al 2020).

3. Applications of Kapoor Tulsi (*Ocimum kilimandscharicum*) Leaf Extract

Tulsi is considered one of the chief sources of large no of drugs and medicines. It is readily available to everyone and is safe, effective and inexpensive. (Kumar,V. et al 2011).Osimum kilimandscharicum is an economically important perennial herb which is being extensively used for various purposes like in medicine, agriculture, industrial and ornamental sectors. Traditionally this plant is widely used for the treatment of various kinds of ailments including cough, cold, abdominal pain, diarrhea and malaria. (Mishra,R.C. and Das,G.2015) Ocimum kilimandscharicum also found to have therapeutic potential as an anti-cancer agent which is due to the presence of ursolic acid in crude extract of leaves (Tiwari, D.P.et al 2012). Tulsi is also known as the "the elixir of life " which means longevity. It has been given in Ayurveda and Siddha system of medicine, that different parts of tulsi plant are used for prevention and cure of various illness like colic pain, bronchitis, asthma, hepatic diseases, malaria fever, night blindness flatulence, insomnia and as an antidote for snake bite and scorpion sting (Chandra,S.et al 2016).

Many experimental researches on Ocimum kilimandscharicum convey a huge pharmacological potential of this plant. Some important pharmacological applications of this plant are discussed below in detail.

Anti-stress activity

Leaves extract of Ocimum kilimandscharicum produce protective action against stress as it enhances the serotonin level in the brain by giving a calming effect. It also improves memory power, improve survival time during anoxic stress and reduce hypoxia. (Chaudhari, L.Y. et al 2022).

Pesticidal effect

Powder extract of leaves of Ocimum kilimandscharicum and its essential oil have a protective action against Sitophillus zeamais and causes 100% mortality after 48 hr (Jembere). The major components in combination (camphor, Limonene and 1,8- cineole) had shown maximum toxicity. (Bekele, J.2001).

Mosquito repellent

Studies shows that leaves and seeds of Ocimum kilimandscharicum had a repellency against Anopheles gambiae and Anopheles funestus by thermal expulsion method. (Seyoum , A. 2003).

Antimicrobial Activity

Essential oil from aerial parts of Ocimum kilimandscharicum shows antimicrobial activity against Gram +ve bacteria (Staphylococcus aureus, Enterococcus faecalis), Gram-ve bacteria (Escherichia coli, Pseudomonas aeruginosa) and also against yeast Candida albicans. (Kumar, A. A. Et al 2011).

Antifungal Activity

Ocimum kilimandscharicum is active against aspergillus fumigates, aspergillus niger, candida albicans, Cryptococcus neoformans, microsporum cassis, sporotrichum schenkii. (Prasad, G. et al 1986).

Insecticidal. Activity

O. kilimandscharicum elicited a strong defense response to counteract H. armigera larval infestation. (Singh, P. et al. 2014). Metabolites such as camphor, bcaryophyllene, terpinolene and limonene increased greatly during infestation. This increase might be attributed to the plant's strong insecticidal properties. (Bekele, J. 2001).

Wound healing activity

Aqueous extract of leaves shows wound healing activity in three types of wound models on rats: the excision, the incision and dead space wound model. it was found that enhanced wound healing may be due to free radical scavenging action and the antibacterial property of the phytoconstituents present in it. (Agarwal, R. 2017)

Conclusion

In conclusion, Ocimum kilimandscharicum emerges as a promising natural resource with significant pharmacological potential, offering opportunities for further exploration in drug discovery and development. Moreover, the review explores different extraction methods for isolating bioactive compounds from Ocimum kilimandscharicum leaves, evaluating their efficiency, selectivity, and sustainability. The active compounds in these extracts, such as

eugenol, thymol, and camphor, exhibit pesticidal properties. However, further research is needed to understand its efficacy, mode of action, and potential environmental impacts thoroughly. Overall, O. kilimandscharicum shows promising potential as a natural alternative for pest management. By synthesizing existing knowledge and identifying future research directions, it contributes to the ongoing exploration and utilization of this valuable medicinal plant for the benefit of human health and well-being.

Consent

It is not applicable.

Ethicalapproval

It is not applicable.

Competinginterests

Authors have declared that no competing interests exist.

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Author's Contribution

This work was carried out in collaboration of both authors. The author SG designed and analysed the work. Author HS interpreted the work as well asprepared the manuscript.

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