A REVIEW ON FREE RADICAL SCAVANGING AND HEPATO PROTECTIVE ACTIVITY OF SAUROMATUM GUTTATUMN AND LEONOTIS NEPETIFOLIA

Jitendra Singh[1*], Zulphikar Ali[2], Mujeeb Ur Rahman[3], Ranjit Singh[4]

Abstract:
This review article delves into the intricate details of two fascinating plants, Sauromatum venosum and *Leonotis nepetifolia,* exploring their biological activity, cultivation methods, fertilization requirements, and chemical constituents. Both plants boast diverse properties that have garnered attention in various fields, making them subjects of interest for researchers, horticulturists, and pharmacologists.*Sauromatum venosum*, commonly known as the Voodoo Lily, exhibits unique biological activity owing to its rich array of secondary metabolites. The plant's tubers have been traditionally utilized in folk medicine for their antimicrobial, antiinflammatory, and antioxidant properties. Scientific investigations have unveiled the presence of alkaloids, phenolics, and flavonoids, contributing to its pharmacological significance. Cultivation of *Sauromatum venosum* requires specific conditions, including well-drained soil and partial shade. Fertilization practices play a crucial role in optimizing growth and enhancing the plant's medicinal potential.On the other hand, *Leonotis nepetifolia*, commonly known as Lion's Ear or Wild Dagga, has gained prominence for its diverse biological activities. The plant's leaves and flowers are renowned for their analgesic, anti-inflammatory, and anxiolytic effects, attributed to sesquiterpenes and alkaloids present in the plant. Cultivating Leonotis nepetifolia requires a warm climate, well-drained soil, and ample sunlight. Fertilization strategies influence the production of active compounds, enhancing the plant's therapeutic potential.
Understanding the chemical constituents of these plants is imperative for harnessing their medicinal benefits. Chemical analyses have identified specific compounds responsible for the observed biological activities, paving the way for potential pharmaceutical applications. Additionally, insights into cultivation and fertilization practices provide valuable guidance for horticulturists seeking to optimize yield and quality.

Keywords: Sauromatum venosum, Leonotis nepetifolia, biological activity, cultivation, chemical constituents.

[1*]Research scholar Shobhit University Gangoh Saharanpur-247341, U.P., jeet151040@gmail.com [2]Professor Shobhit University Gangoh Saharanpur-247341, U.P.
[3]Professor MESCO Institute of Pharmacy Amroha (U.P.) 446015 [4]Professor
Shobhit University Gangoh Saharanpur-247341, U.P.

***Corresponding Author:** Jitendra Singh
*Research scholar Shobhit University Gangoh Saharanpur-247341, U.P., jeet151040@gmail.com

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Introduction

Throughout history, traditional medicine has played a key role in the maintenance and protection of well-being, as well as in the treatment, mitigation, identification, and management of physical or mental disorders. Traditional medicine is a collection of information, acquaintances, abilities (the capacity to apply gained knowledge), and performances that are based on the ideas, perspectives, and understanding of diverse ethnic groups, regardless of whether or not they are intelligible (1). The majority of nations place a significant amount of reliance on conventional medicine due to its dependability in terms of safety, affordability, and pharmacological efficacy. Since prehistoric times, various parts of medicinal plants have been used to combat various types of diseases. Some plants are used most commonly to treat the disease, such as the neem plant, which has been used primarily for the treatment of injuries. Neem preparations are reportedly effective against a variety of skin diseases, septic sores, and infected

burns (2). Neem plants have been used for centuries to treat injuries. Additionally, the leaves, when used in the form of poultices or decoctions, are advised for the treatment of boils, ulcers, and eczema cases. Some of the skin conditions that can be treated with the oil include ringworm, scrofula, and indolent ulcers. One of the fascinating plants that are found in nature and are utilised in traditional medicine is the voodoo lily. Christmas candlestick is another plant that is used for medicinal purposes and is one of the most widely used medicinal plants. *Sauromatum venosum* and *Leonotis nepetifolia* are two plants that are frequently utilised for the treatment of liver-related conditions. (3)

A member of the *Araceae* family, *Sauromatum venosum*, also known as *Typhonium venosum*, is a species of plant belonging to the arum family. It is said to have originated in Asia and Africa, where it may be found growing in riparian meadows and woods. Plants are used to cultivate it. Names such as "monarch of the East" and "voodoo lily" are among its more prevalent names. (4)

History

During the early 1990s, Dr. Charles Wells, a dedicated educator responsible for teaching genetics, plant anatomy, and physiology at LR, actively engaged in a transformative botany workshop. His return not only marked the acquisition of enriched botanical knowledge but also included a tangible contribution—a voodoo lily corm, accompanied by meticulous cultivation instructions. Driven by his passion for the subject, Dr. Wells, despite a courageous battle with colon cancer, nurtured the voodoo lily for several years before passing on his botanical legacy to Dr. Karen McDougal.Dr. Wells, remembered as a heroic figure in the fight against his illness, entrusted the care of the voodoo lilies to Dr. McDougal, who joined the faculty subsequent to his passing. Dr. McDougal, taking up the mantle, decided to cultivate the lilies outdoors. Under her attentive and skilled care, the voodoo lilies thrived, resulting in a significant accumulation of corms—ranging from the large to the diminutive. (5)

This story of the voodoo lilies not only underscores the botanical legacy initiated by Dr. Wells but also symbolizes the continuity of knowledge and resilience. Dr. Wells' dedication and Dr. McDougal's cultivation prowess together form a narrative that transcends time, emphasizing the enduring spirit of learning, growth, and triumph over challenges within the realm of botanical education. (6)

Description

This species develops from a tuber, which results in the production of an inflorescence that consists of a yellowish spade that is coated in large places of purple and a purple spade. The inflorescence grows first, followed by the appearance of the green leaf. With each leaflet measuring up to forty centimetres in length, it is carried on a petiole that is rather tall. When the blossoms reach maturity, they release an odour that has been compared to decaying flesh and characterised as "putrid." The odour captures the attention of insects like flies, which are responsible for pollinating the plant. The plant is a thermogenic plant, meaning that it generates its own heat, just as certain other aroids. (7)

Cultivation Soil:

Make use of a soil mixture that is rich and has good drainage. It works well to use a mixture of potting soil and either perlite or sand. For best development, the soil pH should be maintained at a slightly acidic to neutral level. (8)

Light:

You should either provide partial shade or filtered sunlight. When possible, try to avoid exposing the plant to prolonged exposure to direct, bright sunlight. The understory of woods is often where it may be found growing in its native environment. (9)

Watering:

Maintain a steady level of moisture in the soil throughout the growth season (spring and summer). Over the course of the dormant period, the soil should be allowed to dry out in between waterings (fall and winter). Because rot can be caused by overwatering, it is essential to find a happy medium between the two. (10)

Dormancy:

There is a phase of dormancy that *Sauromatum venosum* goes through during the fall and winter months. When the plant is in its dormant state, watering should be reduced so that the soil may dry out more in between waterings. You may reduce the amount of fertilisation you perform at this time. (11)

Fertilization:

During the growth season, the plant should be fertilised on a consistent basis using a fertiliser that is both balanced and diluted. Fertilization should not be applied in excessive amounts, especially during the dormant phase. (12)

Container Gardening:
When cultivating in containers, use a container that has enough drainage. Every two to three years, the plant should be repotted in order to add extra space for development and to renew the soil. (13)

Propagation:
The Sauromatum venosum plant may be propagated by the use of corms (underground storage organs). It is recommended that the corms be separated and replanted during the dormant season. (14)

Pests and Diseases:
Aphids and spider mites are two examples of pests that you should keep a look out for. Applying insecticidal soap or neem oil to infestations as soon as possible is recommended. For the prevention of fungal illnesses, ensure that there is enough air circulation. (15)

Odor:
It is important to be aware of the fact that the flowers emit a very potent and unpleasant odour. When choosing the location of the institution, this should be taken into thoughtful account.

Chemical constituent of *Sauromatum venosum*
The following is a list of some of the most common categories of compounds that are frequently found in plants and that may be present in Sauromatum venosum:(16)

Kingdom	**Plantae**
Division	Angiosperms
Class	Monocots

1. Alkaloids:
These alkaloids are found in a wide variety of plants, including those belonging to the Araceae family, which Sauromatum venosum is a part of. The pharmacological effects of these substances are often seen. (17)

2. Phenolic Compounds:
Flavonoids and phenolic acids are two examples of phenolic compounds that are well-known for their capabilities as antioxidants and the possible health advantages they offer. (17)

3. Terpenoids:
There is a wide family of substances known as terpenoids, which are produced from isoprene units. Essential oils and other secondary metabolites that display a wide range of biological actions are included in this category. (18)

4. Glycosides:
Compounds known as glycosides are those in which a sugar molecule is bonded to a molecule that does not contain sugar. There are glycosides that have use in medicine. (17)

5. Proteins and Enzymes:
Generally speaking, plants are composed of proteins and enzymes that are engaged in a variety of physiological activities. (18)

6. Carbohydrates:
Among the many functions that carbohydrates, such as sugars and polysaccharides, perform in plants, are those of energy storage and structural components. (19) **7. Lipids:**
Fatty acids and triglycerides are examples of lipids that are key components of cell membranes and perform roles in the storage of energy besides their other functions. (20)

8. Minerals and Trace Elements: Minerals and trace elements are essential for a variety of physiological activities, and plants are able to extract them from the soil using their own mechanisms. (16)

Order	Alismatales
Family	Araceae
Genus	Sauromatum
Species	Sauromatum venosum
Common Name	Vodoo Lily, *Sauromatum guttatum*

Table 1:- Taxonomic arrangement of Sauromatum venosum

Figure:1. 1 Morphology of *Sauromatum venosum*

Bioactivity and pharmacological properties

Antibacterial activity:

According to the findings, fruit extracts had an inhibitory effect against the majority of the bacteria that were examined, but Escherichia coli was the most susceptible. It was shown that the extracts of methanol and petroleum ether were more effective against E. coli, with a zone of inhibition of 22 and 21 millimetres, respectively (Fig. 1.1). The conventional antimicrobial discs, which are comprised of Cephalaxine 30µg and Amikacine 30µg, exhibited a zone of inhibition of 25mm against Streptococcus faecelis and E. coli, and a zone measuring 22mm against Staphylococcus aureus and Pseudomonas aeruginosa. As can be seen in Table 1, each of the extracts had an inhibitory effect on the bacteria. The minimum inhibitory concentration (MIC) of methanolic extracts indicated a higher level of resistance against Gram-negative bacteria, specifically E. coli, with a value of 1.94 mg/ml. Contrarily, the MIC of methanolic extracts was the lowest against Gram-positive bacteria, specifically Streptococcus faecelis, with a value of 2.12 mg/ml. This indicates that methanolic extract was more effective against Gram-negative bacteria. (2)

Antioxidant activity:

A flat concentration test was performed using two extracts of the fruit of Sauromatum venosum, which were designated as SV1 and SV2, respectively. It was possible to make a direct comparison between the antioxidant activity exhibited by the extracts and that of the standard, which is BHT, thanks to these data. Both of the extracts, SV1 and SV2, exhibited a high level of scavenging activity on the DPPH radical, with a percentage of 37.5 percent and 33 percent, respectively. As a result, they fulfilled the role as antioxidants. (2)

Hepatoprotective activity:

For example, schaftoside, echinocystic acid, and eclalbasaponin II are examples of bioactive chemicals that have been identified from this plant. These compounds have demonstrated promising hepatoprotective potential in a number of animal models. (5)

Leonotis nepetifolia Leonotis nepetifolia, (also known as **klip dagga**, **Christmas candlestick**, or **lion's ear**), is a species of plant in the genus *Leonotis* and the family Lamiaceae (mint), It is native to tropical Africa and southern India. It can also be found growing abundantly in much of Latin America, the West Indies, and the Southeastern United States. (21)

Description

Shrubs that are prickly. Petiole growing to 9 centimetres; leaves measuring 11 centimetres by 8 centimetres, oval, apex sharp, base truncate, deeply crenate, minutely punctuate, hairy, and basally trinerved. Thyrsus axillary and terminal, 5 cm across; flowers red; bracts 1.5 cm, linear, spinescent, pubescent; calyx oblique, tube 1.3 cm long, 7toothed, spinescent; corolla tube 1 cm long,

lower lip 1.5 cm, concave, densely villous; filaments 3
and 4 mm, flattened; ovary 1 mm, style 2 cm. (22)

Cultivation

When grown in a subtropical environment, this flower is quite simple to cultivate. It is still feasible to cultivate *Leonotis nepetifolia* as an annual in places that are better suited to the medium temperature. The way in which the plant is cared for will vary according on the method that is followed. (23)

Light

The *Leonotis nepetifolia* plant thrives in full sun and will produce more flowers than it would if it were grown in a location with partial shade. (24)

Soil

There is no particular preference for the shrub, although lion's tail thrives on sandy, loamy soil that is either neutral or slightly alkaline. (23)

Water

A reasonable amount of irrigation during the winter and spring months will cause the Lion's Tail to grow more quickly and blossom for a longer period of time. The summer months are ideal for providing mature plants with a substantial amount of
water. (25)

Temperature and Humidity

The lion's tail is susceptible to damage at temperatures lower than twenty degrees
Fahrenheit, and it should be regarded as an annual or container plant in areas that suffer temperatures that fall within that range. (25)

Fertilizer

It is not required to use fertiliser when working with Leonotis nepetifolia. It may be found growing as a wildflower in South Africa, and its natural environment is typically characterised by soils that are poor. (26)

Pruning

Following the blooming of perennials, they should be deadheaded, and the period right before this point is an excellent opportunity to collect flowers for the purpose of making herbal tea.In preparation for the first frost, the Lion's Tail should be pruned down to a significant degree. It is anticipated that the subsequent season would bring about active development that will attract hummingbirds and butterflies. (27)

Propagating Lion's Tail

At the beginning of the process of growing lion's tail, it may be challenging to cultivate the plant from any source other than seed because it is quite challenging to get plants in the nursery trade. However, after the plant has established itself, it is also possible to propagate it by using greenwood cuttings. (28)

Chemical Constituents 1.
Diterpenoids:

These are a category of organic compounds that have a particular shape in terms of their chemical architecture. *Leonotis nepetifolia* has been shown to contain diterpenoids, including leonotinin,
according to reports. (29)

2. Flavonoids:

The pigments in question are plant-based and possess antioxidant capabilities. Flavonoids such as luteolin and apigenin are instances of flavonoids that may be discovered in *Leonotis nepetifolia*.(30)

3. Iridoids:

These are a particular kind of monoterpenoids that have a structure that is cyclopentanopyran. It has been determined that this plant contains iridoids, which include compounds such as leonotidin.(29)

4. Alkaloids:

The quantity of alkaloids in Leonotis nepetifolia may vary, and not all sources describe considerable levels of these compounds, despite the fact that they are found in certain other species. (25)

S.no.	Compound	Molecular Formula	Molecular Weight
1.	Hematoporphyrin	$C_{34}H_{38}N_4O_6$	566
2.	Cyclodecasiloxane	$C_{20}H_{60}O_{10}Si_{10}$	740
3.	Decanic acid	$C_{50}H_{82}0_9$	826
4.	2-(5-(5-[Cyano-(9,9-dimethyl-1,4 dixa-7-aza-spiro [4,4] non-7-en-8 y) methylene]-3-3 dimethylprrolidin02ylide	$C_{32}H_{42}N_{602}$	870

Table 2: - Chemical composition of *Leonotis nepetifolia*

Figure:1. 2 Morphology of Leonotis nepetifolia

Figure:1. 3 Morphology of Leonotis nepetifolia

Table 3:- Taxonomic arrangement of *Leonotis nepetifolia*

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Lamiales
Family:	Lamiaceae
Genus:	Leonotis
Species	L. nepetifolia

Bioactivity and pharmacological properties

The therapeutic characteristics of *Leonotis nepetifolia* have provided it with a long history of usage in a variety of different civilizations. With that being said, it is essential to point out that the scientific research on the bioactivity and

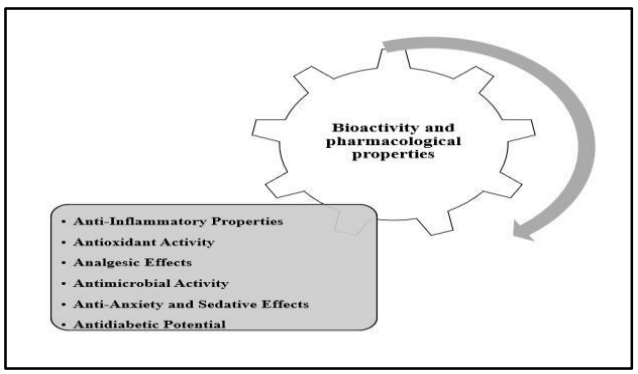

Figure:1.4Bioactivity and pharmacological properties

Anti-Inflammatory Properties: ability to reduce inflammation. It is possible that According to the findings of a few research, this is due to the presence of chemicals such as extracts from *Leonotis nepetifolia* could have the

pharmacological properties of *Leonotis nepetifolia*is still in its infancy, and additional research is required in order to acquire a comprehensive understanding of its potential therapeutic effects. The following is a list of some of the bioactivities and putative pharmacological characteristics that have been related with this plant.(21)
flavonoids and diterpenoids, which are well-known for their ability to reduce inflammation.(22)

Antioxidant Activity:
This plant, *Leonotis nepetifolia*, contains a number of chemicals, including flavonoids, which are known to possess antioxidant qualities.
Antioxidants are substances that possess the ability to neutralise free radicals within the body, which has the potential to reduce oxidative stress and prevent damage to cells.(23)

Analgesic Effects:
In the past, *Leonotis nepetifolia* has been utilised for the purpose of providing pain relief. In spite of the fact that the precise processes are not completely understood, it has been hypothesised that the plant may possess analgesic characteristics.(21)

Antimicrobial Activity:
There have been a few studies that have demonstrated that extracts of *Leonotis nepetifolia* have antibacterial properties against specific types of bacteria and fungus. In the context of traditional medicine, this points to the possibility of a role for the treatment of infections.

Anti-Anxiety and Sedative Effects:
Historically, *Leonotis nepetifolia* has been utilised in traditional medicine due to its soothing qualities. Additionally, there are some animal studies that suggest that it may possess anxiolytic (anti-anxiety) and sedative characteristics. However, there is a need for more study in this field.(30)

Antidiabetic Potential:
In addition, there is some evidence to suggest that extracts of Leonotis nepetifolia could have the ability to reduce the risk of developing diabetes. Some of the compounds that are contained in the plant, such as flavonoids and diterpenoids, may be responsible for the hypoglycemic effects that it has.(29)

Conclusion

In consideration of the aforementioned discussion, a plausible inference can be drawn that *Sauromatum venosum* and *Leonotis nepetifolia*represent natural plant alternatives devoid of adverse effects, in stark contrast to allopathic medicines. These botanical entities emerge as promising resources for treating a diverse array of potentially fatal diseases, with many of their applications only recently unveiled due to their previously obscure nature.
Consequently, the inherent phytochemicals and minerals present in these plants hold the potential for comprehensive realization in the field of medical applications.
It is noteworthy that these plant-derived drugs exhibit a notable absence of toxicities or adverse effects, establishing their safety for both short-term and long-term human exposure. To further enhance their credibility and efficacy, the establishment of robust quality control procedures becomes imperative. These procedures should encompass dependable, specific, and sensitive methodologies, incorporating a blend of conventional and state-ofthe-art instrumental analysis methods. The overarching goal is to ensure seamless coordination in assessing the quality of raw materials, materials in various stages of manufacturing, and the final products, thereby contributing to the production of pharmaceuticals of the highest quality. In conclusion, this review sheds light on the multifaceted aspects of *Sauromatum venosum* and *Leonotis nepetifolia*, encompassing their biological activity, cultivation techniques, fertilization practices, and chemical constituents. The integration of traditional knowledge with contemporary scientific findings underscores the potential of these plants in medicine and horticulture. As researchers continue to unravel their secrets, these botanical wonders hold promise for diverse applications in the realms of health and agriculture.

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