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A REVIEW ON PHYTOCONSTITUENTS AND PHARMACOLOGICAL PROPERTIES OF *SANSEVIERIA TRIFASCIATA* (Snake Plant)

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ABSTRACT

Sansevieria trifasciata belongs to Agavaceae family which is frequently found in Indonesia. It is found in tropical and subtropical regions, stretching from Africa to Southeast Asia and the islands of the Indian Ocean. It is an evergreen, succulent, perennial plant that grows long, narrow, sword-shaped leaves up to 75 cm long that can be upright or slightly spreading from a rhizomatous base. The review was based on the screening of phytoconstituents and pharmacological activities of *Sansevieria trifasciata* plant. It has various chemical constituents i.e., palmitic Acid, methyl linoleate, methyl linolenate, phytol, linoleic acid, oleic acid, stearic acid, stigmasterol etc. According to research, *Sansevieria trifasciata* leaf is frequently used to treat bronchitis, asthma, food poisoning, toxemia coughs, snake bites and insect bites. The LD50 value was found to be 774.60 mg/kg, and oral dosage of 18,000 mg/kg did not result in animal mortality or any unfavourable behavioural effects. It concludes that *S. trifasciata* is the rich source of numerous chemical constituents having multiples of traditional uses. It has been confirmed in previous studies for diverse pharmacological activities including anti-ulcer, antibacterial, antioxidant, antidiabetic, antibacterial, anthelmintic, analgesic, anti-inflammatory, cytotoxic, anticancer, and effective in alopecia.

Keywords: Snake plant, nagdewan, phytoconstituents, pharmacological activities, and acute toxicity.

INTRODUCTION

Sansevieria trifasciata belongs to Agavaceae family which is frequently found in Indonesia. According to Praptosuwiryo *et al.* (2003), it is found in tropical and subtropical regions, stretching from Africa to Southeast Asia and the islands of the Indian Ocean. It is an evergreen, succulent, perennial plant that grows long, narrow, sword-shaped leaves up to 75 cm long that can be upright or slightly spreading from a rhizomatous base. In several tropical nations, the plant is grown for its fibre; it is also taken from the wild for use in traditional medicine (Qomariyah *et al.* 2012). The plant's ability to endure drought is due to the crassulacean acid metabolism mechanism, which exchanges oxygen and carbon dioxide. To stop water from evaporating in the scorching sun during the day, the tiny pores on a plant's leaves known as stomata, which are used to exchange gases, are only opened at night. In some areas of northern Australia, it is a weed. Considering how little maintenance this plant needs, it is frequently kept as a houseplant. They thrive in low light conditions in apartments because they need very little water and sunlight.



Fig 1. *Sansevieria trifasciata* plant



Synonyms

Mother-in-law's tongue

Devil's tongue

St. George's Sword

Snake plant (English)

Nagdewan (Hindi)

It is challenging to induce this plant to bloom outside of its natural habitat. It can recreate its natural surroundings. Its flowers range in colour from greenish white to cream, some are fragrant at night while others aren't at all aromatic (Yumna *et al.* 2018). They also have a sticky texture.

Taxonomy

Kingdom	Plantae
Order	Asparagales
Family	Asparagaceae
Subfamily	Nolinoideae
Genus	<i>Sansevieria</i>
Species	<i>trifasciata</i>

Fibre Extraction

In a study, fibre was extracted from the *S. trifasciata* plant using the water retting method. The results revealed a fibre with minimal elongation and good strength. The findings point to a fibre source that is strong, affordable, renewable, and potentially useful for making sacks, ropes, handicrafts, beds, and other textile items (Rita and Preeti, 2015). A fibre extraction retting process, nearby chemical composition, and physical characteristics including tensile strength, elongation, and diameter are all included in the study, along with the content of fibre, cellulose, lignin, and ash. Observations point to promise as a source of fibre for woven, nonwoven, composite, -cellulose, microcrystalline cellulose, nano-cellulose, and lignin-based products, among another textile and non-textile uses (Abdullah *et al.* 2020).

Chemical Constituents

The leaves of *Sansevieria trifasciata* have shown following chemical constituents (Yumna *et al.* 2018; Nur and Gertian, 2022)-

- 2,3-Dyhidro-3,5-dihydroxy-6- methyl-4H-pyran-4-one
- Methyl-14- methylpentadecanoate
- Palmitic Acid



- Methyl Linoleate
- Methyl Linolenate
- Phytol
- Linoleic Acid
- Oleic Acid
- Stearic Acid
- Stigmasterol

Traditional Uses

According to research, *Sansevieria trifasciata* leaf is frequently used to treat-

- ✚ Bronchitis
- ✚ Asthma
- ✚ food poisoning
- ✚ toxaemia coughs
- ✚ snake bites
- ✚ insect bites.

This is consistent with the widespread usage of the plant in traditional medicine for a long time. The mother-in-law's aloe leaf extract passed the qualitative phytochemical test, revealing the existence of various chemical components that can be used as therapeutic substances, such as alkaloids, flavonoids, phenols, and tannins. Plants contain phytochemicals such flavonoids, alkaloids, and tannins, which can be used in traditional medicine because of their capacity to serve as antioxidants, according to prior studies. suggests that the plant's potential bioactives may be employed to lower blood glucose levels and enhance pancreatic cells' production of pro-insulin (Sunilson et al. 2009).

Pharmacological Activities

Antibacterial

The two main herbs in Indonesia, *Sansevieria trifasciata* and *Sansevieria cylindrica*, contain a number of bioactive components that have antibacterial potential. The objective of this work is to investigate the antibacterial activity of the leaf extract and fraction from *S. trifasciata* and *S. cylindrica* against *Pseudomonas aeruginosa* and to discover the bioactive components. By using the disc diffusion method, the antibacterial activity of crude ethanolic extracts from *S. trifasciata* and *S. cylindrica* leaves was evaluated against *P. aeruginosa*. In comparison to *S. cylindrica*, *S. trifasciata* had high antibacterial activity with an inhibitory zone of 18.3 mm. The minimal inhibitory concentrations (MIC) of extracts at various concentrations, including 4 mg/mL, 8 mg/mL, 16 mg/mL, 32 mg/mL, 64 mg/mL, 128 mg/mL, and 256 mg/mL, were investigated. The *S. trifasciata* extract was able to stop bacterial growth at a concentration of

32 mg/mL, according to the MIC values. Only fraction 3 demonstrated the strongest antibacterial activity at 16 mg/mL, according to the results of vacuum liquid chromatography (VLC) and thin-layer chromatography (TLC). Fraction 3 of the TLC bioautography analysis revealed a distinct zone at Rf 0.93. The phytochemical investigation revealed that *S. trifasciata* extract included terpenoid, phenolic, triterpenoid, and flavonoid components that were linked to antibacterial action (Whika *et al.* 2021).

Antioxidant and Anti-Inflammatory

A typical perennial ornamental plant that grows freely and is commonly seen in residences, parks, and forests is *Sansevieria trifasciata*. This plant has historically been used to treat helminths, fungal infections, acne, and allergies. The ethanolic extract of *Sansevieria trifasciata* leaves (STET) was utilised in the current investigation to examine the phytoconstituents and a number of bioactivities. The DPPH scavenging assay and measurements of the total tannin and phenolic contents were used to investigate the *in vitro* antioxidant activity of STET. Hypotonic solution and heat-induced hemolysis have been used to assess anti-inflammatory activity. Additionally, the acetic acid-induced writhing inhibition method and the brine shrimp fatality assay have been used to measure the cytotoxic and analgesic properties, respectively. Reducing sugar, combined reducing sugar, tannins, flavonoids, glycosides, proteins, and steroids were all confirmed by STET to be present. STET found the IC₅₀ value for the DPPH scavenging assay to be 2.19 g/ml, while the standard value was 1.39 g/ml (Sunilson *et al.* 2009).

Analgesic, Anti-Inflammatory and Cyto-Toxic

Additionally, it was determined that each gramme of dried plant extract contained 10.78 mg of total tannins and 31.99 mg of total phenols, respectively. The plant extract demonstrated 39.27, 37.04, and 33.19% inhibition in the hypotonic solution induced hemolysis test, compared to a reference standard that showed 30.57% inhibition. The STET also showed a 34.25% reduction of hemolysis at 1 mg/ml in heat-induced hemolysis. Additionally, STET demonstrated potential actions in a dose-dependent manner in tests for analgesic and cytotoxic activity. According to the findings of the current investigations, STET exhibits antioxidant, anti-inflammatory, cytotoxic, and analgesic properties (Sagorika *et al.* 2020).

Using the tail-immersion test, an ethanol and water extract of *Sansevieria trifasciata* leaves demonstrated a dose-dependent and substantial increase in pain threshold. Additionally, all extracts (100 - 200 mg/kg) significantly (P 0.001) inhibited both phases of the formalin pain test and showed a dose-dependent suppression of writhing. The yeast-induced fever was significantly (P 0.01) reversed by the ethanol extract (200 mg/kg). The extracts contained alkaloids, flavonoids, saponins, glycosides, terpenoids, tannins, proteins, and carbohydrates, according to preliminary phytochemical analysis (Jeba *et al.* 2009).



Antiulcer

We looked on the leaf extract from *Sansevieria trifasciata*'s (ST) lethal dose 50% (LD50) and antiulcerative properties. Using the Lorke method, the LD50 was calculated for two delivery routes (intraperitoneal and oral). In an indomethacin-induced ulcer model, the antiulcerative effect was compared to that of the reference medication, cimetidine (100 mg/kg BW, p.o.), using a single dose of 40 mg/kg body weight (BW). Two dosages of ST (200 and 400 mg/kg BW, p.o.) were evaluated. Before administering indomethacin, treatments were performed twice daily with an 8-hour gap between them for 7 days. The oral administration of the extract at a dosage of 18,000 mg/kg BW did not result in any unfavourable behavioural changes in the animals, and no death was noted after 24 hours of the experiment. The i.p LD50 was calculated to be 774.60 mg/kg BW. Animals pre-treated with ST displayed some improvement against ulceration caused by indomethacin. The extract minimised the increase in pH by 13.3% and reduced the loss in stomach volume (36.1%), free acidity (55.3%), and total acidity (35.6%) brought on by indomethacin. Additionally, at 200 and 400 mg/kg BW, the extract demonstrated 17.92% and 14.96% ulcer protective efficacy, respectively. The ST extract contained phytoconstituents like glycosides, saponins, flavonoids, terpenoids, alkaloids, tannins, anthraquinone, and glycosides, according to the results of the phytochemical examination. Apparently safe for use in traditional medicine, ST has a promising antiulcerative potential. This beneficial medicinal quality is most likely a result of the variety of significant phytochemicals found in the plant, which were noted in this study. To establish the plant's use as a workable antiulcerative agent, further research incorporating bioassay-guided identification of the primary antiulcerative chemical in ST is necessary (Osasenaga *et al.* 2017).

Air-Purifier

The NASA list of air-purifying plants includes *Sansevieria trifasciata*, which enhances indoor air quality by passively absorbing toxins (such as formaldehyde, formaldehyde, trichlorethylene, xylene, and toluene).

Insecticide

An investigation examined the impact of insecticides on the development of string beans. According to a study (Solita *et al.* 2012), *Sansevieria trifasciata* insecticides are just as effective as commercial ones (Laksmindra *et al.* 2022).

Treatment of Callosities of Fingers and Toes

The effectiveness of using *S. trifasciata* ointment formulation to treat corns was examined. The treatment of finger and toe callosities can be improved, according to the results of a



study on *S. trifasciata* extract. Increased attention sped up recovery time without causing irritation (Hamidollah *et al.* 2017).

Anti-Diabetic

In a study, the effects of *Sansevieria trifasciata* leaf decoction on pancreatic β -cells and blood glucose levels in rats with hyperglycemia brought on by alloxan were examined. According to the findings of the study (Nur *et al.* 2012), all test doses of the leaf's decoction reduced blood glucose levels and enhanced granule density in the β -cells of the islets of Langerhans of alloxan-induced diabetic rats.

Anthelmintic

An experiment tested *Sansevieria trifasciata* leaf extract's *in vitro* anthelmintic effectiveness against *Fasciola hepatica*. varied concentrations of the extract caused the parasites to die at varied mean times, according to an *in-vitro* assay (Wambugu *et al.* 2016).

Indoor Air Pollutant Ozone Reduction

The impact of lowering ozone concentrations in a simulated interior environment was assessed for three common indoor houseplants: *Sansevieria trifasciata* (snake plant), *Chlorophyllum comosum* (spider plant), and *Epipremnum aureum* (golden pothos). There were no variations in plant species, however ozone depletion rates were higher in plant-filled rooms than in plant-free control chambers (Heather *et al.* 2009).

Potential to Inhibit Algae Bloom

One of the nations impacted by the hazardous algae bloom that results in human health issues including food poisoning and losses to the aquaculture industry is Malaysia. The ability of crude extracts from fresh and dried material to prevent the growth of the HAB species *A. tamiyavanichi* and *A. tamarensis* was examined in the study. Results indicated elimination efficiency, which suggests *S. trifasciata* may be able to reduce it (Mohd *et al.* 2014).

Antiallergic and anti-anaphylactic

The antiallergic and anti-anaphylactic effects of *S. trifasciata*'s ethanolic extract were examined in studies using a variety of animal models, including those that cause eosinophilia and leukocytosis in response to milk, mast cell degranulation in response to compound 48/80, active and passive cutaneous anaphylaxis, and pedal edoema in response to histamine. Results indicated that EEST has high antioxidant activity in addition to promising antiallergic and anti-anaphylactic effects. Activity may result from phytoconstituents like steroidal saponins, triterpenoids, and flavonoids inhibiting the release of chemical mediators from mast cells (Andhare *et al.* 2012).



Antiproliferative against HeLa cells

Four new steroidal saponins, trifasciatosides A–D (1-4), three pairs of steroidal saponins, trifasciatosides E–J (5a, b–7a, b), including one acetylated substance, and 12 recognised compounds were identified in a study on the n-butanol soluble fraction of the methanol extract of *S. trifasciata* (Remy *et al.* 2016) found that compounds 2, 4, and 7a,b had a modest antiproliferative effect on HeLa cells.

Anti-Alopecia/ Inhibition of Androgen Receptor

The inhibitory action of bioactive compounds against androgen receptors was determined molecularly utilising docking and dynamic investigations in the study that examined secondary metabolites from *S. trifasciata*. Methyl pyrophaeophorbide A, Oliveramine, (2S)-3', 4'-Methylenedioxy-5, 7-dimethoxyflavane, 1-Acetyl--carboline, Digiprolactone, Trichosanic Acid, and Methyl Gallate were all discovered by LC-MX/MS analysis from a subfraction of leaves. A flavonoid (2) and three alkaloid compounds (1, 3, and 4) demonstrated greater efficacy than minoxidil. Using an insilico method, four substances were predicted to have greater anti-alopecia action than minoxidil in blocking androgen receptors (Henny *et al.* 2022).

Single-Dose Acute Toxicity

Using female Wistar rats, a study examined the toxicity and safety of ingesting a chloroform extract of *S. trifasciata* leaf in the acute phase. Neither mortality nor sublethal toxic effects were noticed during the 14-day investigation. Body weight, metabolic variables, and haematological profiles did not differ between the treatment and control groups. The results demonstrated that a single dose of 2000mg/kg had no detectable side effects (Laksmindra *et al.* 2022).

Anti-ulcerative and LD₅₀ study

S. trifasciata leaf extract was studied for its potential to treat ulcers and determine the lethal dose (LD₅₀). The LD₅₀ value was found to be 774.60 mg/kg, and oral dosage of 18,000 mg/kg did not result in animal mortality or any unfavourable behavioural effects. Indomethacin-induced ulceration was less severe in rats treated with the extract, as shown by changes in stomach volume, free acidity, total acidity, and pH. At 200 and 400 mg/kg, the extract demonstrated 17.92% and 14.96% ulcer protection (Osasenaga *et al.* 2017).

Toxicity

With the aid of a brine shrimp fatality assay and ten-fold serial dilutions of powdered plant material in synthetic seawater, researchers determined the toxicity level of *S. trifasciata* roots



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and leaves. The plant extracts had a higher potential for toxicity than the prescribed LC_{50} value, and there was a positive linear association between extract concentration and the mortality rate when utilising nauplii. The mortality increases with treatment concentration (Julie *et al.* 2017).

CONCLUSION

It concludes that *S. trifasciata* is the rich source of numerous chemical constituents having multiples of traditional uses. It has been confirmed in previous studies for diverse pharmacological activities including anti-ulcer, antibacterial, antioxidant, antidiabetic, antibacterial, anthelmintic, analgesic, anti-inflammatory, cytotoxic, anticancer, and effective in alopecia.

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Nil.

CONFLICT OF INTEREST

'None' conflict of interest was declared by the authors.

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