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Ornamental Plant, the New Alternative in the Phytotherapy Field

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Abstract

Ornamental plants have been used until now only for the beauty and design of rooms. Nowadays, however, the need to find treatment alternatives for the wide range of existing ailments is on the rise, which has led to the broadening of the spectrum in terms of plants, ornamental plants coming into the view of modern researchers.

This work is a review type that brings to light the ornamental plant from the Agavaceae family, the plant called *Sansevieria trifasciata*.

This review summarizes important information about the *Sansevieria trifasciata* plant, namely its spread, botanical characterization, its history, but also information about the most appropriate methods of formulating the plant extract, its chemical composition and its use in the medical and pharmaceutical fields.
Keywords: Alternative medicine, plant extract, ornamental plant, Sansevieria trifasciata

Introduction

Nowadays, the classic, synthetic treatments available on the current pharmaceutical market, besides the fact that they act to restore health, are also accompanied by harmful actions for the body, namely known or unknown adverse reactions.

Thus, at the moment, research is directed towards the innovation of treatments with the same efficiency as synthetic ones, but which are natural and free of harmful effects on the human body.

The phytocomponents extracted from different plants are therefore in full rise and study in modern laboratories, thus trying to obtain treatments for various pathologies in spheres such as dermatology, metabolic pathologies, cardiology, oxidative stress, oncology, etc. [1,2].

This review-type work brings to the fore the plant *Sansevieria trifasciata*, a plant with enormous therapeutic potential but which until now is very little studied and about which very little is known regarding its chemical composition and possible pharmacotherapeutic applications [3].

The work is original because it combines in an easy way all the theoretical aspects known until now about the studied plant, *Sansevieria trifasciata*.

Various search engines such as Pubmed, ResearchGate, and keywords such as *"Sansevieria trifasciata", "plant extract", "Phytocompounds", "medicinal use"* were used for this review article.

According to **Figure 1**, initially a large number of articles were selected, but later they were sorted and only those most relevant to the topic addressed were considered.

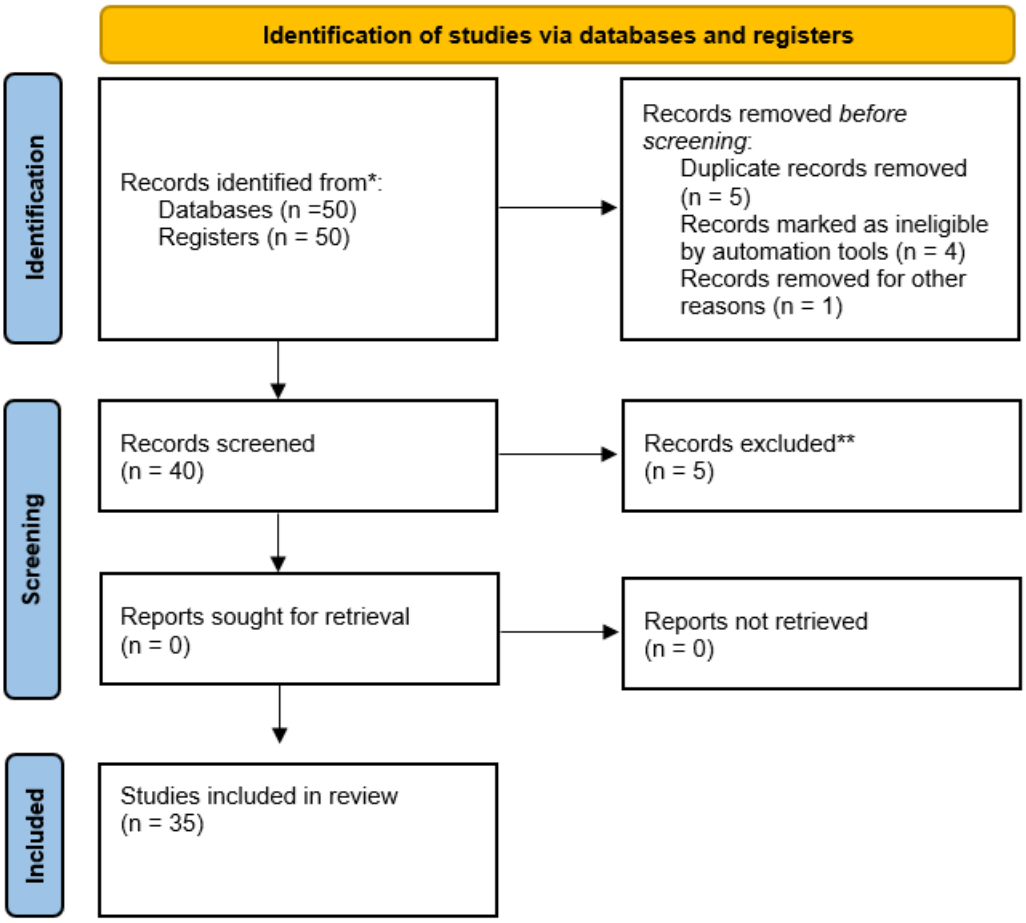

Figure 1. PRISMA flow diagram 2020 for this review.

1. Botanical aspects and propagation of the plant *Sansevieria trifasciata*

Sansevieria trifasciata is a tropical evergreen, considered to be a popular design plant. *Sansevieria trifasciata* is also called sword or mother-in-law's tongue [4].

Like other members of its genus, *Sansevieria trifascianata* can provide a strong plant fiber once used to make rope, but today it is predominantly used as an ornamental plant, outdoors, in warmer climates, and indoors [5,6].

The NASA study found it to be one of the best plants for improving indoor air quality by passively absorbing toxins such as nitrogen oxides and formaldehyde. *Sansevieria trifasciata* is considered by some authorities as a potential weed in Australia, although it is widely used as an ornamental [7]. The plant contains saponins that are mildly toxic to dogs and cats and can lead to gastrointestinal upset if consumed [8,9].

In ancient times, according to traditional medicine, this plant was used for its medicinal properties, the fiber preparation and sometimes its leaves were used for dressings. *Sansevieria trifasciata* has also been traditionally used in Malaysia [5], for the treatment of ear pain, edema, boils and fever [10].

Sansevieria trifasciata (Figure 2) can be systematically classified as follows [11]:

• Kingdom: Plantae

• Subdivision: Spermatophyta

• Subkingdom: Angiosperms

• Class: Monocotyledons

• Order: Liliales

• Family: Agavaceae

• Genus Sansevieria

• Species: Sansevieria trifasciata

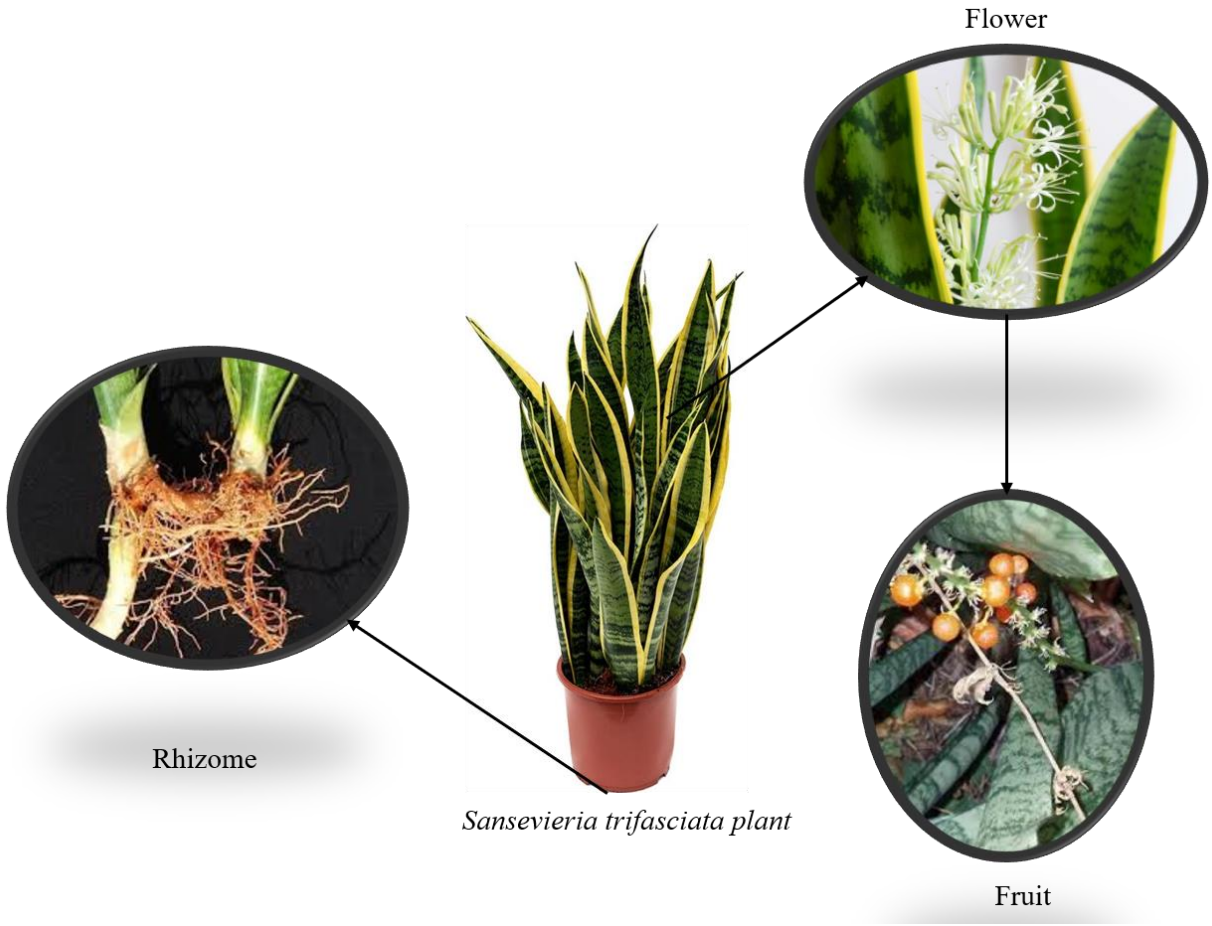

Figure 2. *Sansevieria trifasciata* plant, appearance and description.

While many botanists have adopted the APG III (Angiosperm Phylogenetic Group III) system of classification for the orders and families of flowering plants, which places Sansevieria in the Asparagaceae family, some research continues to use the Cronquist system which places the plant as from the Agavaceae family. The notes below describe how Sansevieria is placed in the APG system. Some nomenclatures place Sansevieria in the subfamily Nolinoideae belonging to the family Asparagaceae, but note that the genus is sometimes also placed in Agavaceae, Convallariaceae, Dracaenaceae, Liliaceae or Ruscaceae [7,12].

The family Asparagales includes about 153 genera and 2480 species that are distributed worldwide. This family is divided into seven subfamilies: Aphyllanthoideae, Agavoideae, Brodiaeoideae, Scilloideae, Lomandroideae, Asparagoideae and Nolinoideae. For some authors, the classification of this family is very unsatisfactory.

There are no specific features that characterize this family, and some of the subfamilies are difficult to recognize, while others are very distinctive. Sansevieria is a genus of xerophytic perennial herbs that includes about 60 species distributed in tropical and southern Africa, Madagascar and Arabia. In addition, there are many hybrids and horticultural variants, and as a result, classifying plants within this genus is often very difficult. Within the genus Sansevieria, the species *S. trifasciata* is the most traded species in the nursery and landscape trade [12].

Species in the genus Sansevieria have a number of adaptations for surviving dry and arid regions, such as thick, succulent leaves to store water and thick leaf cuticles to reduce moisture loss. Additionally, like other succulents, Sansevieria species use crassulacean acid metabolism (CAM) as part of photosynthesis, which reduces water loss through night transpiration and allows for improved drought and heat tolerance. *S. trifasciata* has a high level of salt tolerance and low nutrient requirements [11].

S. trifasciata is a succulent plant with strong creeping rhizomes. 1 or 2 leaves together, linear-oblanceolate, rigidly erect, 30-100cm high and about 3cm wide, tip tapering to a stiff green point; blades are transversely banded with contrasting green and whitish areas; the edges are green (**Figure 2**) [13].

The inflorescence is pedunculate, 30-75 cm long. Flowers are solitary or in clusters of 2 or 3, pedicels up to 5 mm long; perianth tube 1 cm long or less, linear lobes up to 2 cm long, white or greenish white. Fruits are subglobose to oblong-ellipsoid, 7-9 mm long and 5-8 mm wide, bright orange (**Figure 2**).

S. trifasciata can be confused with *Sansevieria hyacinthoides*, but they can be distinguished based on leaf features. While in S. hyacinthoides the leaf margin has a red-brown line, in S. *trifasciata* the leaf margins are green or white, lacking the reddish line.

S. trifasciata is widely distributed naturally and spontaneously in countries such as Africa and has been deliberately introduced to countries such as America, Asia, Australia and other locations for ornamental purposes.

The plant's current distribution is highlighted in **Figure 3**. This species can be found growing in tropical, subtropical and warmer temperate regions in a wide variety of light conditions, from open areas in full sun to shaded areas under forests with tree. It is a common weed of roadsides, abandoned gardens, waste areas, disturbed areas, coastal forests, secondary moist forests, mesic forests and dry forests [14].

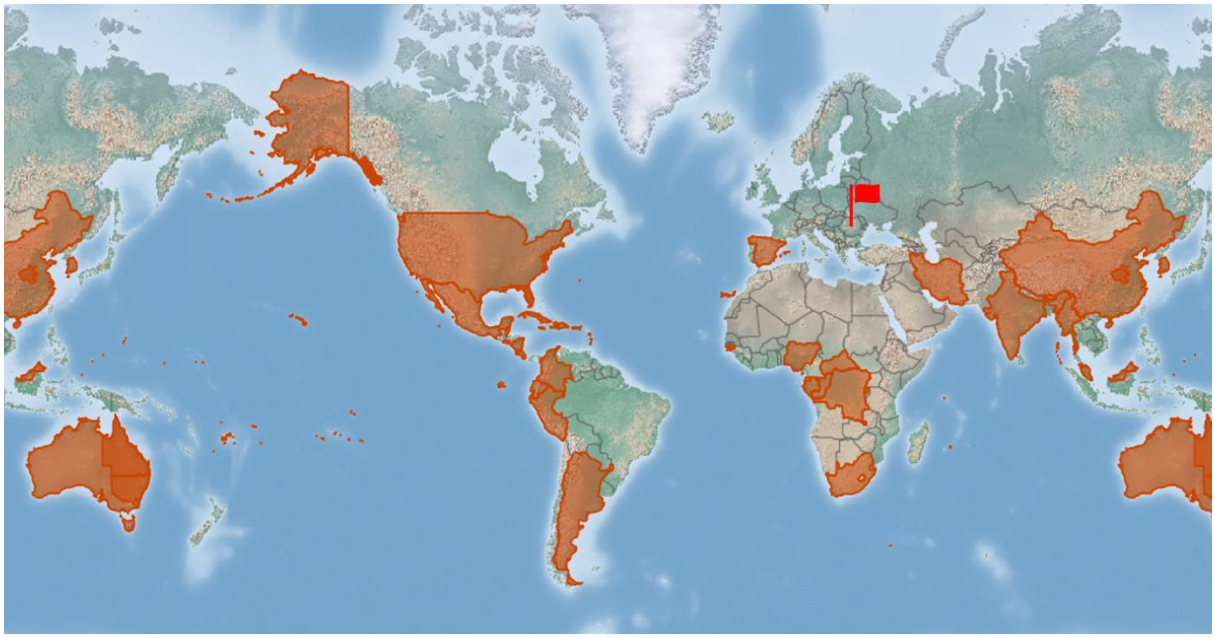

Figure 3. The distribution map of the *S. trifasciata* plant spontaneously and deliberately, noting in red the distribution areas including Romania.

2. History of the plant *Sansevieria trifasciata*

Sansevieria species were probably introduced to Florida during a period of Spanish colonization between 1765 and 1820. In 1891, C.R. Dodge wrote a report on fiber investigations for the US Department of Agriculture and there reported the species Sansevieria zeylanica (now *S. trifasciata*) growing in several localities in southern Florida. Between 1910 and 1940, several attempts were made to cultivate *S. trifasciata* to produce fiber in Mexico, Cuba, Puerto Rico, the Bahamas, and the British West Indies where it probably spread vegetatively from its range.

In 1918, N.L. Britton reported this species as "common in gardens" in Bermuda and also noted that it was cultivated at the Agricultural Station in 1913 [15–17].

In Florida in the 1920s, *S. trifasciata* was commercialized as a houseplant and later exported to Europe, Central and South America, and the Caribbean. For Puerto Rico, *S. trifasciata* was first collected in 1914 on Vieques Island (Smithsonian Herbarium), and by 1924 N.L. Britton reported this species as "spontaneous after cultivation" and also noted that this species was cultivated commercially at Sabana Llana between 1929. In Australia, *S. trifasciata* was classified as a potential weed until 1998, however is widely used as an ornamental plant [10,18].

Until 2000, *S. trifasciata* was classified as "invasive" in Florida, and trade and marketing of the plants were restricted due to their actual or potential invasiveness. This species is also classified as invasive in Cuba, Puerto Rico and the US Virgin Islands, Hawaii, the Galapagos Islands, Juan Fernández Island, the Cook Islands, Fiji, French Polynesia, Niue, Palau and Western Samoa [19,20].

3. Obtaining optimal extracts of the *S. trifasciata* plant

According to the recent literature, the extracts of the *S. trifasciata* plant are obtained using their leaves, which in the first phase are dried to a constant weight [21]. After drying and removing the water to a constant weight, it is crushed and brought to powder form from which the compounds of interest are extracted first by several methods or using different solvents [22,23].

In some cases, the extraction was also carried out on the fresh plant.

The extraction methods identified from the literature, respectively the solvents used for extraction can be found in **Table 1**.

Table 1. Extraction methods of phytocompounds from the *S. trifasciata* plant identified in the literature.

Extraction methods of phytochemical compounds from the plant *S. trifasciata*			
Extraction method	**Solvent**	**Type of plant**	**Extracted compounds**
Maceration	Methanol	Fresh	Alkaloids Tannin Flavonoids Saponosides Glycosides Anthraquinone
Maceration	Methanol	Dry/powder	
	Ethanol	Dry/powder	
Soxlet method	Ethanol 96%	Dry/powder	

According to the data presented in the literature up to this point, the extraction method and the extraction parameters used are decisive in terms of the class of extracted compounds, respectively their quantity [24,25].

Thus, by maceration the compounds mentioned in **Table 1** are extracted with the mention that in the fresh form the alkaloids and glycoside compounds are extracted and in the dry form all the classes mentioned in the **table 1** are extracted with the mention that the alkaloids and glycosides are extracted less than in the fresh form [23].

Also, the use of ethanol or methanol as an extraction solvent is an important aspect, ethanolic extraction being more efficient [23,24,26].

Until now there are data that refer to the qualitative analysis of the classes of existing compounds in the extract of the plant *S trifasciata*. The qualitative analyzes performed are for the identification of distinct leaves, so for alkaloids the analysis with the Dragendorff reagent was used, for flavonoids the reactions with magnesium metals, the sodium hydroxide test, for tannins the iron chloride test, for glycosides the Lieberman test were performed [23]. Quantitative analyzes represent a first step in the characterization of the extract, so that later, for the detailed description, the quantitative test of the HPLC type, or gas chromatograph, is recommended [15,27].

The compounds identified in the extract of the *S. trifasciata* plant and reported by the authors Oomariyah et al., 2022 are part of the classes indicated above, but using GC-MS they could be identified especially: phytol, stigmasterol, linoleic acid, oleic acid, stearic acid, and palmitic acid [15].

4. Medical uses of the *Sansevieria trifasciata* plant extract

S. trifasciata is an economically important species used as an ornamental and fiber crop. More than 20 cultivars are marketed in nurseries and the landscape trade, mainly due to their multi-colored and mottled leaves and the interesting wide variation in leaf shapes.

S. trifasciata is commonly used as an indoor houseplant and is very popular in the nursery trade as this species has been found to be one of the most effective plants for cleaning the air by removing toxins such as formaldehyde that are present in homes. and offices.

S. trifasciata is also used as a source of fiber and in traditional medicine in Africa and Southeast Asia.

4.1 Antibacterial activity of *Sansevieria trifasciata* plant extract

The antibacterial activity of *S. trifasciata* was tested on the alcoholic extract obtained from the leaves of the plant on gram-positive and gram-negative bacterial strains such as *Streptococcus aureus* and *Echerichia coli* [10].

The study by Rachmaniyah et al. 2023 demonstrated inhibitory activity on gram-negative strains of E. coli the plant extract achieving inhibition diameters of 6.63 mm, 5.42 mm and 6.55 mm at concentrations of 5%, 10% and 40% applied compared to the standard used (ciprofloxacin) [14].

The antibacterial activity was also studied by the authors Kasmawati et al., 2023 for the methanolic extract of the *S. trifasciata* plant on *E. coli* and *Streptococcus aureus*, highlighting the compound with high inhibitory activity, namely 5-methyl-11-(2- oxopyridin-1(2H)-yl) undecanperoxoica, an alkaloid derivative found in the leaves of the plant. The minimum inhibitory concentration (MIC) values for Escherichia coli were 1.95 ppm, 3.9 ppm, 15.62 ppm and 7.81 ppm, respectively, while the MIC values for Streptococcus aureus were 1.95 ppm, 1.95 ppm, 15.62 ppm and 7.81 ppm respectively. The same authors also demonstrated that the elements isolated from the *S. trifasciata* plant extract react directly at the level of the active site of -ketoacyl-ACP synthase from *Escherichia coli* and TyrRS from *Streptococcus aureus* [10].

4.2 The cicatrizing activity of the *Sansevieria trifasciata* plant extract

The authors Yuniarsih et al., 2023 formulated a hydrogel with a variable content of hydro-alcoholic extract of the plant *S. trifasciata*, which was later tested on wounds produced in Winstar mice [2]. The percentages of extract included in the hydrogel network were 10%, 15% and 25%, showing the healing ability to be higher as the percentage of embedded extract increases, the testing was carried out for 14 days. Also, the same authors tested the antioxidant properties, the total of polyphenols, flavonoids, saponosites, alkaloids and tannins, the results obtained being remarkable so that they were also attributed the role in the process of "closing" the caused wound [2,11].

4.3 The antiulcerative activity of the *Sansevieria trifasciata* plant extract

The authors Macdonald Ighodaro et al., 2017 tested the antiulcerative capacity of *S. trifasciata* extract showing positive effects on mice induced gastric ulcer by oral administration of indomethacin [28]. Administration of the extract resulted in positive effects regarding the ulcerative wound. Thus, the gastric volume was reduced by 36.1%, the free acidity decreased by 55.3%, the total acidity changed favorably by 35.6% while minimizing the pH increase by 13.3%. Moreover, the extract showed 17.92% and 14.96% stomach ulcer protective capacity at 200 and 400 mg/kg extract administered, respectively. The tests were performed for 7 days [28].

4.4 The use of *Sansevieria trifasciata* plant extract in the treatment of androgenetic alopecia

Androgenetic alopecia occurs due to excessive response to androgens causing scalp hair loss and this condition requires the development of new and effective drugs to treat it [29].

Thus, the authors Kasmawati et al., 2022 isolated from the *S. trifasciata* plant extract 7 compounds that were tested compared to minoxidil regarding the binding capacity, types of bonds and their stability on androgen receptors. These compounds studied were: methyl pyropheophorbide A, oliveramine, (2S)-30, 40-methylenedioxy-5,7-dimethoxyflavan, 1-acetyl-carboline, digiprolactone, trichosanic acid and methyl gallate. The first four of these having greater binding capacity and thus treatment of androgenic alopecia than minoxidil (substance taken as reference/standard) [10,16].

4.5 Antioxidant, anti-inflammatory and analgesic activity of *Sansevieria trifasciata* plant extract

Sing Pinky et al., 2020 tested the antioxidant, anti-inflammatory, analgesic capacity and identified the main classes of compounds in the ethanolic extract obtained from the leaves of *S. trifasciata* [4]. They highlighted the existence of a wide variety of compounds belonging to the classes: polyphenols, alkaloids, tannins, gums, flavonoids, steroids, glycosides, these vast compounds showing proven antioxidant, anti-inflammatory and analgesic properties. The antioxidant activity was demonstrated by classic methods such as DPPH, FRAP, TEAC, CUPRAC, the total polyphenols were determined by the Folin-Ciocîlteu method (31.99 ± 0.001 mg EAG/g lyophilized extract). The analgesic activity was tested compared to diclofenac, and at 500 mg/kg body the plant extract had a statistically significant analgesic effect compared to the standard used [4,30–32].

4.6 Anti-anaphylactic and anti-allergic activity of *Sansevieria trifasciata* plant extract

Tests were carried out on the anti-anaphylactic and anti-allergic activity of the *S. trifasciata* leaf extract and the results were somewhat promising. The tests were carried out on an animal model and demonstrated that the oral administration of 100 mg/kg body and 200 mg/kg body lyophilized extract leads to the inhibition of the triggering factors of inflammation produced in anaphylactic shock and prevents the occurrence of allergic skin reactions, edemas of anaphylaxis [33].

4.7 Heeling wound repair and callus removal activity of *Sansevieria trifasciata* plant extract

Afrasiabian et al., 2017 used *S. trifasciata* plant extract at 5%, 10% and 20% incorporated in fatty ointment that was applied to a group of 116 patients who had lesions and calluses on the heel [30]. The tests were carried out for 4 weeks and the patients tested had a 100% cure rate. The fastest results were found for those who applied the ointment containing 20% plant extract (after 10 days), then those who applied the ointment with 10% extract (after 14 days), followed by the group who applied the ointment with 5% extract included (after 25 days). The tests were compared to the application of standard salicylic acid ointment where the success rate was only 83%. Application of higher concentrations of the extract in ointment form has been shown to be beneficial, being non-irritating and thus reducing healing time [30].

4.8 Antidiabetic, hypocholesterolemic, antiobesity activity of *Sansevieria trifasciata* plant extract

Phytol, for example, is a compound known to have a hypoglycemic effect, intervening in glucose metabolism and reducing insulin resistance [15]. The linoleic acid present in the *S. trifasciata* plant extract is also involved in maintaining blood glucose homeostasis [34].

Stigmasterol is directly involved in lowering cholesterol in the blood vessels, thus reducing the risk of atherosclerosis, acting at the molecular level through the direct connection with sterol-reductase [35].

Conclusions

In conclusion, the ornamental plant *Sansevieria trifasciata* has a huge therapeutic potential that has been very little exploited until now. The plant from the Agavaceae family remains one that arouses major interest in the field of research with the aim of developing an alternative treatment in dermatological conditions, diabetology, cardiology, antibacterial, or to combat oxidative stress.

Bibliography

[1] Abdul-Hafeez, E.; Orabi, M.; Ibrahim, O.; Ilinskaya, O.; Karamova, N. In Vitro Cytotoxic Activity of Certain Succulent Plants against Human Colon, Breast and Liver Cancer Cell Lines. *South African Journal of Botany* **2020**, *131*, 295–301, doi:10.1016/j.sajb.2020.02.023.

[2] Yuniarsih, N.; Hidayah, H.; Gunarti, N.S.; Kusumawati, A.H.; Farhamzah, F.; Sadino, A.; Alkandahri, M.Y. Evaluation of Wound-Healing Activity of Hydrogel Extract of Sansevieria Trifasciata Leaves (Asparagaceae). *Adv Pharmacol Pharm Sci* **2023**, *2023*, 7680518, doi:10.1155/2023/7680518.

[3] Mohd Aref, Y.; Othaman, R.; Anuar, F.H.; Ku Ahmad, K.Z.; Baharum, A. Superhydrophobic Modification of Sansevieria Trifasciata Natural Fibres: A Promising Reinforcement for Wood Plastic Composites. *Polymers (Basel)* **2023**, *15*, 594, doi:10.3390/polym15030594.

[4] Pinky, S.; Monira, S.; Hossain, M.; Hossain, A. Antioxidant, Anti-Inflammatory, Cytotoxic and Analgesic Activities of Sensevieria Trifasciata. *Bangladesh Pharmaceutical Journal* **2020**, *23*, 195–200, doi:10.3329/bpj.v23i2.48341.

[5] Nin-Valencia, A.; Tomás-Pérez, M.; Bartolomé Zavala, B. Allergic Rhinitis Due to the Ornamental Plant Sansevieria Trifasciata. *J Investig Allergol Clin Immunol* **2021**, *32*, 62–64, doi:10.18176/jiaci.0704.

[6] Golenberg, E.M.; Popadić, A.; Hao, W. Transcriptome Analyses of Leaf Architecture in Sansevieria Support a Common Genetic Toolkit in the Parallel Evolution of Unifacial Leaves in Monocots. *Plant Direct* **2023**, *7*, e511, doi:10.1002/pld3.511.

[7] Kee, Y.J.; Zakaria, L.; Mohd, M.H. Identification, Pathogenicity and Histopathology of Colletotrichum Sansevieriae Causing Anthracnose of Sansevieria Trifasciata in Malaysia. *J Appl Microbiol* **2020**, *129*, 626–636, doi:10.1111/jam.14640.

[8] Li, X.; Yang, Y. Preliminary Study on Cd Accumulation Characteristics in Sansevieria Trifasciata Prain. *Plant Divers* **2020**, *42*, 351–355, doi:10.1016/j.pld.2020.05.001.

[9] Permana, B.H.; Thiravetyan, P.; Treesubsuntorn, C. Effect of Airflow Pattern and Distance on Removal of Particulate Matters and Volatile Organic Compounds from Cigarette Smoke Using Sansevieria Trifasciata Botanical Biofilter. *Chemosphere* **2022**, *295*, 133919, doi:10.1016/j.chemosphere.2022.133919.

[10] Kasmawati, H.; Mustarichie, R.; Halimah, E.; Ruslin, R.; Arfan, A.; Sida, N.A. Unrevealing the Potential of Sansevieria Trifasciata Prain Fraction for the Treatment of Androgenetic Alopecia by Inhibiting Androgen Receptors Based on LC-MS/MS Analysis, and In-Silico Studies. *Molecules* **2022**, *27*, 4358, doi:10.3390/molecules27144358.

[11] Ansari, K.; Chandra, G. A REVIEW ON PHYTOCONSTITUENTS AND PHARMACOLOGICAL PROPERTIES OF SANSEVIERIA TRIFASCIATA (Snake Plant). *International Journal of Pharmaceutical Sciences and Medicine* **2023**, *8*, 33–42, doi:10.47760/ijpsm.2023.v08i06.003.

[12] Febriani, Y.; Mierza, V.; Handayani, N.P.; Surismayanti, S.; Ginting, I. Antibacterial Activity of Lidah Mertua (Sansevieria Trifasciata Prain.) Leaves Extract on Escherichia Coli and Staphylococcus Aureus. *Open Access Maced J Med Sci* **2019**, *7*, 3882–3886, doi:10.3889/oamjms.2019.525.

[13] Permana, B.H.; Thiravetyan, P.; Treesubsuntorn, C. Effect of Airflow Pattern and Distance on Removal of Particulate Matters and Volatile Organic Compounds from Cigarette Smoke Using Sansevieria Trifasciata Botanical Biofilter. *Chemosphere* **2022**, *295*, 133919, doi:10.1016/j.chemosphere.2022.133919.

[14] Rachmaniyah, R.; Rusmiati Sansevieria Trifasciata Extract Effectively Inhibit the Growth of Escherichia Coli Bacteria, in Vitro. *International Journal of Public Health Science (IJPHS)* **2023**, *12*, 1119, doi:10.11591/ijphs.v12i3.23172.

[15] Oomariyah, N.; Dijk, G. The Bioavailability Prediction and Screening Phytochemicals of Sansevieria Trifasciata Leaves Extract. *MATEC Web of Conferences* **2022**, *372*, 02003, doi:10.1051/matecconf/202237202003.

[16] Li, X.; Yang, Y. Preliminary Study on Cd Accumulation Characteristics in Sansevieria Trifasciata Prain. *Plant Divers* **2020**, *42*, 351–355, doi:10.1016/j.pld.2020.05.001.

[17] Humphries, R.; Bobenchik, A.M.; Hindler, J.A.; Schuetz, A.N. Overview of Changes to the Clinical and Laboratory Standards Institute Performance Standards for Antimicrobial Susceptibility Testing, M100, 31st Edition. *J Clin Microbiol* **2021**, *59*, e0021321, doi:10.1128/JCM.00213-21.

[18] Nin-Valencia, A.; Tomás-Pérez, M.; Bartolomé Zavala, B. Allergic Rhinitis Due to the Ornamental Plant Sansevieria Trifasciata. *J Investig Allergol Clin Immunol* **2021**, *32*, 62–64, doi:10.18176/jiaci.0704.

[19] Dewatisari, W.F.; Nugroho, L.H.; Retnaningrum, E.; Purwestri, Y.A. The Potency of Sansevieria Trifasciata and S. Cylindrica Leaves Extracts as an Antibacterial against Pseudomonas Aeruginosa. *Biodiversitas Journal of Biological Diversity* **2021**, *22*, doi:10.13057/biodiv/d220150.

[20] Kee, Y.J.; Zakaria, L.; Mohd, M.H. Identification, Pathogenicity and Histopathology of Colletotrichum Sansevieriae Causing Anthracnose of Sansevieria Trifasciata in Malaysia. *J Appl Microbiol* **2020**, *129*, 626–636, doi:10.1111/jam.14640.

[21] Septiani, G.; Susanti, S.; Sucitra, F. Effect of Different Extraction Method on Total Flavonoid Contents of Sansevieria Trifasciata P. Leaves Extract: Pengaruh Perbedaan Metode Ekstraksi Terhadap Kadar Flavonoid Total Ekstrak Daun Lidah Mertua (Sansevieria Trifasciata P. *Jurnal Farmasi Galenika (Galenika Journal of Pharmacy) (e-Journal)* **2021**, *7*, 143–151, doi:10.22487/j24428744.2021.v7.i2.15573.

[22] Oboho, D.; Asuquo, E.; Edeke, A.; Nelson, A.; Udoukpo, F. Anti-Inflammatory Effect of Ethanolic Leaves Extract of Sansevieria Trifasciata and Sansevieria Liberica in Swiss Mice, (Mus Musculus). *Dutse Journal of Pure and Applied Sciences* **2024**, *10*, 303–311.

[23] Umoh, O.; Edet, V.; Uyoh, V. Comparative Analysis of the Phytochemical Contents of Dry and Fresh Leaves of Sansevieria Trifasciata Prain. **2020**, 41–47.
[24] Septiani, G.; Susanti, S.; Sucitra, F. Effect of Different Extraction Method on Total Flavonoid Contents of Sansevieria Trifasciata P. Leaves Extract: Pengaruh Perbedaan Metode Ekstraksi Terhadap Kadar Flavonoid Total Ekstrak Daun Lidah Mertua (Sansevieria Trifasciata P. *Jurnal Farmasi Galenika (Galenika Journal of Pharmacy) (e-Journal)* **2021**, *7*, 143–151, doi:10.22487/j24428744.2021.v7.i2.15573.
[25] Teponno, R.B.; Tanaka, C.; Jie, B.; Tapondjou, L.A.; Miyamoto, T. Trifasciatosides A-J, Steroidal Saponins from Sansevieria Trifasciata. *Chem Pharm Bull (Tokyo)* **2016**, *64*, 1347–1355, doi:10.1248/cpb.c16-00337.
[26] Ads, E.N.; Abouzied, A.S.; Alshammari, M.K. Evaluation of Cytotoxic Effects of Methanolic Extract of Pergularia Tomentosa L Growing Wild in KSA. *Asian Pac J Cancer Prev* **2021**, *22*, 67–72, doi:10.31557/APJCP.2021.22.S1.67.
[27] Kurt, D.; Yalçin, E.; Çavuşoğlu, K. GC-MS and HPLC Supported Phytochemical Analysis of Watercress and the Protective Role against Paraben Toxicity. *Environ Sci Pollut Res Int* **2023**, *30*, 6033–6046, doi:10.1007/s11356-022-22380-7.
[28] Ighodaro, O.M.; Adeosun, A.M.; Ojiko, B.F.; Akorede, A.T.; Fuyi-Williams, O. Toxicity Status and Antiulcerative Potential of Sansevieria Trifasciata Leaf Extract in Wistar Rats. *J Intercult Ethnopharmacol* **2017**, *6*, 234–239, doi:10.5455/jice.20170421103553.
[29] Kasmawati, H.; Mustarichie, R.; Halimah, E.; Ruslin, R.; Arfan, A.; Sida, N.A. Unrevealing the Potential of Sansevieria Trifasciata Prain Fraction for the Treatment of Androgenetic Alopecia by Inhibiting Androgen Receptors Based on LC-MS/MS Analysis, and In-Silico Studies. *Molecules* **2022**, *27*, 4358, doi:10.3390/molecules27144358.
[30] Afrasiabian, H.; Hododi, R.; Imanieh, M.H.; Salehi, A. Therapeutic Effects of Sansevieria Trifasciata Ointment in Callosities of Toes. *Global Journal of Health Science* **2016**, *9*, 264, doi:10.5539/gjhs.v9n2p264.
[31] Gulcin, İ. Antioxidants and Antioxidant Methods: An Updated Overview. *Arch Toxicol* **2020**, *94*, 651–715, doi:10.1007/s00204-020-02689-3.
[32] Givol, O.; Kornhaber, R.; Visentin, D.; Cleary, M.; Haik, J.; Harats, M. A Systematic Review of Calendula Officinalis Extract for Wound Healing. *Wound Repair Regen* **2019**, *27*, 548–561, doi:10.1111/wrr.12737.
[33] Andhare, R.N.; Raut, M.K.; Naik, S.R. Evaluation of Antiallergic and Anti-Anaphylactic Activity of Ethanolic Extract of Sanseveiria Trifasciata Leaves (EEST) in Rodents. *J Ethnopharmacol* **2012**, *142*, 627–633, doi:10.1016/j.jep.2012.05.007.
[34] Liang, H.; Mu, H.-B.; Zhang, F.-H.; Li, W.-Q.; Li, G.-C.; Li, W.-D.; Liang, M.; He, Z.-L. Causal Relationship between Linoleic Acid and Type 2 Diabetes and Glycemic Traits: A Bidirectional Mendelian Randomization Study. *Front Endocrinol (Lausanne)* **2023**, *14*, 1277153, doi:10.3389/fendo.2023.1277153.
[35] Bakrim, S.; Benkhaira, N.; Bourais, I.; Benali, T.; Lee, L.-H.; El Omari, N.; Sheikh, R.A.; Goh, K.W.; Ming, L.C.; Bouyahya, A. Health Benefits and Pharmacological Properties of Stigmasterol. *Antioxidants (Basel)* **2022**, *11*, 1912, doi:10.3390/antiox11101912.