**Review Article**

**Snake Plant: An effective home based Air Purifier**

Abstract

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| *Dracaena trifasciata* Prain Mabb. (Asparagaceae) is a perennial herb commonly referred to as mother-in-law’s tongue and is cultivated as an ornamental plant in residential and public gardens, originally from tropical West Africa. It is most widely recognized as the snake plant or viper's bowstring hemp. Until 2017, it was categorized under the synonym *Sansevieria trifasciata* Prain. This plant is frequently kept indoors due to its low-maintenance requirements; it thrives with minimal water and sunlight. In various regions, the leaves and rhizomes are traditionally utilized to treat acne, fungal infections, skin irritations, allergies, ulcers, parasitic infections, earaches, pharyngitis, urinary disorders, jaundice, pain relief, fever reduction, diarrhea, wound healing, and snakebites. This species is known for its ornamental value, ability to absorb pollutants, and use as a textile material. The roots and leaves contain various bioactive compounds, such as alkaloids, tannins, terpenoids, saponins, steroids, phenols, methyl glucuronate acid, glycosides, cardenolides, polyphenols and carbohydrates. It also investigates its role in traditional medicine and the potential for further development to enhance its wider application. |

Keywords: *Dracaena trifasciata* Prain, Viper’s bowstring hemp, air purification, snake plant, Indoor plant.

1. INTRODUCTION

Medicinal plants have been shown in various studies to be beneficial for a wide range of ailments. Approximately 25% of all prescription medications are derived from plants, and over three-quarters of the population relies on medicines that come from these medicinal plants (Hoareau et al., 1999). The *Dracaena trifasciata* Prain, characterized by its snake-like, sharp-edged leaves, is also referred to as "viper's bowstring hemp" because it serves as a source of plant fibers used in making bowstrings (Alam et al., 2016). Native to the tropical regions of West Africa, extending from Nigeria to the Congo, *Dracaena trifasciata* is a flowering plant belonging to the Asparagaceae family. Commonly known as the snake plant, Saint George's sword, mother-in-law's tongue, and viper's bowstring hemp, it has several popular names (Hasson et al., 2010). This plant is highly adaptable and can withstand both arid conditions and low levels of light. In Africa, the latex from this plant can function as a repellent for insects and snakes (Dewatisari et al., 2022, Berame et al., 2017). According to a study by NASA, *Dracaena trifasciata* Prain ranks among the top plants for enhancing indoor air quality by effectively absorbing various airborne pollutants, making it an excellent choice for purifying the air (Csurhes et al., 2006, Julie et al., 2017).

2. Plant Description

The *Dracaena trifasciata* Prain has two to six elongated, oblong leaves that emerge from fleshy underground rhizomes, each ending in a pointed tip. These leaves are typically grouped in visually appealing clusters due to their upright, rigid, and striped appearance. The leaves, measuring between 40-90 cm in length and 5-7 cm in width, are sword-shaped and mimic the pattern of a zebra’s skin, displaying a range of dark to light green shades with yellow borders. Additionally, they produce ribbon-like structures that can span from 0.3 to 1 m long, featuring flowers that are whitish-green or grayish-white and grow on upright stems, which are shorter than the leaves, generally about 30-75 cm high. The plant flowers in the spring and summer months, specifically from September to February. Its rhizomatous or creeping stem, which is relatively thick, typically develops beneath the soil. The rhizomes are characterized by a vibrant orange exterior and a pale inner section, often extending horizontally either on the surface or underground. The wild roots are fibrous and emerge from the base of the stem, while the typical roots exhibit a white pattern and appear robust. The small, round fruits, measuring 7-9 mm in diameter and containing two seeds, usually ripen to a bright orange color. The seeds themselves are elongated, pale brown, and measure approximately 6-7 mm in length and about 5 mm in width (Dewatisari W et al., 2024).

**Taxonomy (**Mabberlyet al., 2017)

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| **Item** | **Name** |
| **Taxonomic classification** |  |
| Kingdom | Plantae |
| Phylum | Tracheophyta |
| Division | Angiosperms |
| Class | Monocots |
| Order | Asparagales |
| Family | Asparagaceae |
| Subfamily | Nolinoideae |
| Genus | Dracaena |
| Species | Trifasciata |

**Pictures of Snake plant**

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**3. Air Purification Capabilities**

Numerous studies have explored the air-purifying capabilities of *Dracaena trifasciata* Prain. A notable investigation conducted by Wolverton, B. C., and Johnson as part of a NASA study revealed the plant's effectiveness in eliminating toxins such as formaldehyde, xylene, and toluene from the atmosphere. Further research by Orwell corroborated these results, indicating that Snake Plants can significantly diminish the levels of volatile organic compounds (VOCs) in indoor settings (Wolverton et al., 1989, Orwell et al., 2004). Additionally, research has shown that extracts from *D. trifasciata* Prain leaves can lower carbon monoxide levels in cigarette smoke (Gendis et al., 2019).

**4. Mechanisms of Air Purification**

The process of air purification entails the uptake of contaminants via the leaves and roots, where they are subsequently metabolized by soil microorganisms. This mutually beneficial interaction makes the plant a good choice for enhancing indoor air quality because it increases its capacity to purify the air (Sagaya et al., 2024, Sriprapat et al., 2013).

**5. SIGNIFICANCE**

**5.1. Indoor Air Pollutant Ozone Reduction**

The impact of lowering ozone concentrations in a simulated interior environment was assessed for common indoor houseplant: *D. trifasciata* Prain. The ozone depletion rates were higher in plant-filled rooms than in plant-free control chambers (Heather et al., 2009).

**5.2. Health Benefits**

The decrease in indoor air contaminants yields significant health advantages, including a reduction in respiratory problems and an enhancement of general well-being. Additionally, the incorporation of indoor plants has been linked to psychological benefits, including lower stress levels and heightened productivity (Fjeld et al., 2000).

**5.3. Low Maintenance**

*D. trifasciata* Prain is recognized for its durability and minimal care needs. It flourishes in low-light settings and does not necessitate regular watering, rendering it an excellent option for indoor spaces (Chen et al., 2002).

**5.4. Aesthetic Appeal**

*Dracaena trifasciata* Prain not only offers practical advantages but also serves as an attractive addition to indoor settings, infusing a sense of greenery. This enhancement can elevate the visual charm of both residential and commercial spaces, fostering a more enjoyable atmosphere for living and working (Lohr et al., 2000).

**5.5. Insecticide**

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

**5.6. Potential to Inhibit Algae Bloom**

Malaysia is one of the countries affected by harmful algal blooms that lead to health problems like food poisoning and adversely impact the aquaculture sector. The research investigated how well crude extracts from both fresh and dried materials could inhibit the growth of the HAB species A. tamiyavanichi and A. tamarense. The findings showed effectiveness in elimination, indicating that *D. trifasciata* may have the potential to mitigate it (Mohd et al., 2014).

**6. PHYTOCHEMICAL CONSTITUENTS**

*Dracaena trifasciata* Prain is reported to be rich in phytochemicals like phenolic compounds, amino acids, alkaloids, cyanogenic glycosides and organic acids. These bioactive compounds are found in leaves, stems, flowers, fruits and roots of the plants (Yumna et al. 2018; Nur et al., 2022). The leaves of *Dracaena trifasciata* Prain have shown following chemical constituents Methyl-14- methyl pentadecanoate, Palmitic Acid, Methyl Linolenate, Phytol, Linoleic Acid, Oleic Acid, Stearic Acid and Stigmasterol (Ansari et al., 2023).

**7. PHARMACOLOGICAL ACTIVITY**

**7.1. Anticancer activity:**

The cytotoxic and anticancer properties of *Dracaena trifasciata* Prain are linked to its phytochemical constituents. The leaves of *Dracaena trifasciata* Prain have been used in anticancer studies. One of the compounds found in *Dracaena trifasciata* Prain is a derivative of 5,7-Dimethoxyflavone. Studies indicate that this compound can suppress the growth of liver cancer cells by causing cell cycle arrest through the generation of reactive oxygen species (ROS), impacting the Sub-G1 phase of the cell cycle (Dewatisari et al., 2024).

**7.2. Anti-Diabetic**

In a research investigation, the influence of *Dracaena trifasciata* Prain leaf infusion on pancreatic ß-cells and blood sugar levels in hyperglycemic rats induced by alloxan was assessed. The study's results indicated that all administered doses of the leaf infusion lowered blood glucose levels and increased granule density in the ß-cells of the islets of Langerhans in rats with alloxan-induced diabetes (Nur et al. 2012).

**7.3. Antibacterial activity:**

The antibacterial properties of *Dracaena trifasciata* Prain are attributed to various bioactive compounds, such as alkaloids, tannins, anthraquinones, terpenoids, saponins, flavonoids, steroids, polyphenols, and phenols. These compounds, present in the roots and leaves of the plant, demonstrate antiseptic and antibacterial effects by inhibiting the growth of S. aureus, E. coli, and P. aeruginosa (Ahamad et al., 2017).

**7.4. Antioxidant activity:**

*Dracaena trifasciata* Prain extracts have demonstrated notable antioxidant properties, which can be attributed to the presence of polyphenols, flavonoids, and various other bioactive compounds. The antioxidant activity of *Dracaena trifasciata* Prain is frequently evaluated using the 2,2-diphenyl-1-picrylhydrazylmethod, a widely accepted technique in scientific research. This method entails measuring the capacity of a sample to neutralize or diminish the 2,2-diphenyl-1-picrylhydrazyl radical, a stable free radical. It is likely that these compounds play a significant role in scavenging free radicals and providing protection against oxidative stress (Huang et al., 2024).

**7.5. Antifungal activity:**

There are currently very few studies documenting *Dracaena trifasciata* Prain's antifungal activity. Research suggests that *Dracaena trifasciata* Prain. may be able to stop Candida albicans from growing. Fungal growth can be inhibited with an inhibition zone of around 21 mm when 90% of the ethanol extract of S. trifasciata Prain is administered; this is nearly as effective as the positive control (Komala et al., 2012).

**7.6. Antiulcer**

We looked on the leaf extract from *Dracaena trifasciata* Prain has anti ulcerative properties. In an indomethacin-induced ulcer model, the anti-ulcerative effect was compared to that of the reference medication, cimetidine, using a single dose were evaluated (Osasenaga et al. 2017).

**7.7. Antimalarial**

*Dracaena trifasciata*Prain has antimalarial activity. A study conducting antiplasmodial assay of the extracts revealed that the ethyl acetate extract exhibited stronger suppression against Plasmodium falciparum. It is suspected that the compound phytol plays a role in this antimalarial activity (Lestari E et al. 2023).

**7.8. Treatment of Callosities of Fingers and Toes**

The study evaluated how well *Dracaena trifasciata* Prain ointment works for treating corns. Findings suggest that the use of *Dracaena trifasciata* Prain extract can enhance the treatment of calluses on fingers and toes. Increased attention sped up recovery time without causing irritation (Hamidollah et al. 2017).

**8. CONCLUSION**

*Dracaena trifasciata* Prain offers a range of benefits as an indoor plant, particularly in its role as a natural air purifier. While it may not be a comprehensive solution for indoor air pollution, it contributes to healthier and more aesthetically pleasing indoor spaces. Future research should focus on optimizing the air-purifying capabilities of indoor plants and addressing the drawbacks associated with their use. Use in interior of house, at present days some individuals and offices use this plant in the interior of the places for purifying the air. Where, some of the present generation people give importance for oxygen concept. The awareness of the plant by the people are making them to adopt the requirements appropriately.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, Gemini, etc) and text-to image generators have been used during writing or editing of this manuscript.

**REFERENCES**

1. Hoareau, L. and DaSilva, E.J. (1999). Medicinal plantsa reemerging health aid. Electron J.Biotech. 2, 3-4. <https://api.semanticscholar.org/CorpusID:86385321>
2. Alam MI, Alam MA, Alam O, Nargotra A, Taneja SC, Koul S. (2016). Molecular modeling and snake venom phospholipase A2 inhibition by phenolic compounds: Structure-activity relationship. Eur J Med Chem. 23;114:209-219. doi:10.1016/j.ejmech.2016.03.008. PMID: 26986086
3. Hasson SS, Al-Jabri AA, Sallam TA, Al-Balushi MS, Mothana RA.(2010). Antisnake Venom Activity of Hibiscus aethiopicus L. against Echis ocellatus and Naja n. nigricollis. J Toxicology. doi:10.1155/2010/837864. PMID: 20628507; PMCID: PMC2902021.
4. Dewatisari W, Nugroho LH, Retnaningrum E, Urwestri YAP. (2022). Antibacterial and anti-biofilm-forming activity of secondary metabolites from Sansevieria trifasciata-leaves against Pseudomonas aeruginosa. Indones J Pharm. 33(1): 100-109. [doi: 10.22146/ijp.2815](https://doi.org/10.22146/ijp.2815)
5. Berame JS, Cuenca SM, Cabilin DRP, Manaban ML (2017).Preliminary phytochemical screening and toxicity test of leaf and root parts of the snake plant (Sansevieria trifasciata). J Phylogenetics Evol Biol.5(3). <http://dx.doi.org/10.4172/2329-9002.1000187>
6. Csurhes S, Edwards R. (2006). Potential environmental weeds in Australia: Candidate species for preventative control. Queensland Department of Natural Resources.
7. Julie B, Sheena ME, Cuenca, Diana Rose P, Cabilin, Marycris L, Manaban. (2017). Preliminary phytochemical screening and toxicity test of leaf and root parts of the snake plant (Sansevieria trifasciata). Journal of Phylogenetics & Evolutionary Biology.5(3):1000187. DOI: 10.4172/2329-9002.1000187
8. Dewatisari WF, To’bungan N. (2024). Review on Phytochemistry and ethnopharmacology of Dracaena trifasciata. Nusantara Bioscience.16(2): 169-184.
9. Mabberly DJ. (2017). Mabberley's Plant-book: A Portable Dictionary of Plants, their Classification and Uses. 4th Edition, Cambridge University Press.
10. Wolverton, B. C., Johnson, A., & Bounds, K. (1989). Interior landscape plants for indoor air pollution abatement. NASA Stennis Space Center.
11. Orwell, R. L., Wood, R. L., Burchett, M. D., Tarran, J., & Torpy, F. (2004). Removal of benzene by the indoor plant/susbstrate microcosm and implications for air quality. Water, Air, and Soil Pollution, 157(1-4), 193-207.
12. Gendis Siti Rahmawati, RestiNuraeni, Lu’lu RobiatulFajrin, SistianaWindyarianni. (2019). Effectiveness of Sansavieria trifasciata Extract Bracelet in Absorbing Carbon Monoxide (Co) in Cigarette Smoke Jurnal Biota. 5(2), 96-103.
13. Sagaya Mary B, Munnu Prasad V. (2024). A Review Study on Dracaena trifasciata (Snake Plant): Use for Interior Air Pollution, Benefits, and Associated Drawbacks, Journal on Materials and its Characterization. 3(3), 5-6
14. Sriprapat, W., &Thiravetyan, P. (2013). Phytoremediation of BTEX from indoor air by Dracaena sanderiana: Effect of light and temperature. Journal of Hazardous Materials, 263(1), 870-876.
15. Heather L. Papinchak, E. Jay Holcomb, Teodora Orendovici Best and Dennis R. Decoteau. (2009). Effectiveness of Houseplants in Reducing the Indoor Air Pollutant Ozone. HortTechnology,19(2), 286-290.https://doi.org/10.21273/HORTTECH.19.2.286
16. Fjeld, T. (2000). The effect of interior planting on health and discomfort among workers and school children. HortTechnology. American Society for Horticultural Science. <https://doi.org/10.21273/horttech.10.1.46>
17. Chen, H. S., Tsao, H. F., Tsai, Y. P., & Wu, Y. T. (2002). Studies on indoor air pollution and the role of plants. Indoor Air, 12(3), 167-173.
18. Lohr, Virginia I. and Caroline H. Pearson-Mims. (2000). “Physical Discomfort May Be Reduced in the Presence of InteriorPlants.” Horttechnology 10, 53-58
19. Solita Evangeline S. Banez, Liza A. (2013). The Effects of Sansevieria Insecticide on the Growth of String Beans (Phaseolus vulgaris). IAMURE International Journal of Terrestrial Ecology. 1(1),Doi:10.7718/iamure.ijte.v1i1.357
20. Fitria, L., Putri Gunawan, I. C., Tina Sanjaya, W. B., &Meidianing, M. I. (2022). Single-dose Acute Oral Toxicity Study of Chloroform Extract of Snake Plant (Sansevieria trifasciata Prain.) Leaf in Wistar Rats. Journal of Tropical Biodiversity and Biotechnology, 7(1). <https://doi.org/10.22146/jtbb.69389>
21. Mohd Suberi, Ima Amirah and Mohammad Noor, Normawaty and Darnis, Deny Susanti and Mukai, Yukinori and Usup, Gires. (2014). The potential of ornamental plant, Sansevieria trifasciata to inhibit the growth of harmful algal bloom species. International Conference on Applied Life Sciences.
22. Yumna, M., Arbianti R., Utami T.S., Hermansyah, H. (2018) Effect of mother-in-law’s tongue leaves (Sansevieria trifasciata) extract’s solvent polarity on anti-diabetic activity through in vitro α-glucosidase enzyme inhibition test. In: E3S Web of Conferences on Proceedings, pp. 03003. EDP Sciences.
23. Nur Oomariyah and Gertian van Dijk.(2022). The Bioavailability Prediction and Screening Phytochemicals of Sansevieria Trifasciata Leaves Extract. MATEC Web of Conferences 372, 02003. Conferences on Proceedings, pp. 03003. EDP Sciences.
24. Kyamuddin Ansari, Gulab Chandra. (2023). Int. Journal of Pharmaceutical Sciences and Medicine (IJPSM), 8(6), 33-42.
25. Dewatisari WF, To’bungan N. (2024). Review: Phytochemistry and ethnopharmacology of Dracaena trifasciata. Nusantara Bioscience 16(2): 169-184.
26. Qomariyah N, Sarto M, Pratiwi R. (2012). Antidiabetic effects of a decoction of leaves of Sansevieria trifasciata in streptozotocin-induced diabetic white rats (Rattus norvegicus L.), ITB J Sci. 44(4), 308–316.
27. Ahamad T, Negi DS, Khan MF. (2017). Phytochemical analysis, total phenolic content, antioxidant and antidiabetic activity of Sansevieria cylindrica leaves extract. Journal of Natural Products and Resources. 3,(2), 134-136. DOI:10.21767/2472-0151.100026
28. Huang X, Arjsri P, Srisawad K, Yodkeeree S, Dejkriengkraikul P. (2024).Exploring the anticancer potential of traditional Thai medicinal plants: A focus on Dracaena loureiri and its effects on non-small-cell lung cancer. Plants 13 (2): 290. DOI: 10.3390/plants1302029
29. Komala O, Yulia I, Pebrianti R, Program, Biologi S, Farmasi S. (2012). UJI EFEKTIVITAS EKSTRAK ETANOL DAUN LIDAH MERTUA (Sansevieria trifasciata Prain) TERHADAP KHAMIR Candida albicans. FITOFARMAKA J Ilm Farm. 2(2):146–52. <https://journal.unpak.ac.id/index.php/fitofarmaka/article/view/169>
30. Ighodaro OM, Adeosun AM, Ojiko BF, Akorede AT, Fuyi-Williams O. (2017). Toxicity status and antiulcerative potential of  Sansevieria trifasciata leaf extract in Wistar rats. J IntercultEthnopharmacol.6(2):234-239. doi: 10.5455/jice.20170421103553. PMID: 28512605; PMCID: PMC5429084.
31. Lestari, E., Setyaningrum, E., Wahyuningsih, S., Rosa, E., Nurcahyani, N. &Kanedi, M. (2024). Antimalarial activity test and GC-MS analysis of ethanol and ethyl acetate extract of snake plant (Sansevieria trifasciata Prain). World Journal of Biology Pharmacy and Health Sciences, 15, 091–097. doi: 10.30574/wjbphs.2023.15.2.0337
32. HamidollahAfrasiabian& Reza Hododi& Mohammad Imanieh& Alireza Salehi. (2017). "[Therapeutic Effects of SansevieriaTrifasciata Ointment in Callosities of Toes](https://ideas.repec.org/a/ibn/gjhsjl/v9y2017i2p264.html)," [Global Journal of Health Science](https://ideas.repec.org/s/ibn/gjhsjl.html), Canadian Center of Science and Education. 9(2),264-264.DOI:[10.5539/gjhs.v9n2p264](https://doi.org/10.5539/gjhs.v9n2p264)