REVIEW ARTICLE

Vernonanthura polyanthes (Assa-peixe): A comprehensive review of its phytochemical revelations and pharmacological spectrum

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Abstract

The efficacy of medicinal plants has gained significant recognition, leading to a surge in demand for these holistic treatments. Among them, *Vernonanthura polyanthes,* commonly known as "Assa-peixe," is an ethnomedicinally important plant native to Brazil, recognized for its therapeutic use in treating respiratory disorders, fever, inflammation, ulcers, and hypertension. Its recognized pharmacological relevance has prompted comprehensive studies into its chemical composition and biological activities. Taxonomically, it belongs to the family Asteraceae, and its botanical description includes characteristics such as an upright shrub with lanceolate leaves and panicle-like inflorescences. The plant's phytochemical profiling uncovers a range of active compounds, including flavonoids, alkaloids, sesquiterpene lactones, terpenes, steroids, and phenolic acids, with notable bioactive compounds like Rutin, Glaucolide A, and Apigenin. These metabolites contribute to various pharmacological activities, such as antioxidant, anti-inflammatory, antiulcerogenic, antibacterial, anti-leishmanicidal, antitrypanosomal, and anticancer properties. Toxicological evaluations showed that high concentrations may elicit cytotoxic and genotoxic effects, underscoring the importance of dose optimization. This review article provides an up-to-date knowledge on the botanical, phytochemical, and pharmacological aspects of *V. polyanthes*, encompassing its traditional ethnomedicine with contemporary scientific evidence. Collectively, these insights emphasize the species' value as a natural source of bioactive compounds, supporting its continued exploration for drug discovery and therapeutic applications.

Keywords: Phytochemical, Sesquiterpene lactones, Antimicrobial, Anti-inflammatory, *Vernonanthura polyanthes.*

Highlights

Vernonanthura polyanthes, popularly referred to as "Assa-peixe," is a medicinal plant frequently utilized in traditional Brazilian remedies.

It is known for treating respiratory ailments, malaria, fever, reducing blood pressure, and acting as an anti-inflammatory and antioxidant.

The plant contains alkaloids, saponins, triterpenes, steroids, flavonoids, phenols, tannins, chlorogenic acids, and sesquiterpene lactones.

Preliminary studies show potential in treating ulcers, bacterial infections, leishmaniasis, and cancer.

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Graphical Abstract

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Introduction

Plants renowned for their therapeutic attributes, commonly referred to as healing plants, have been revered by humanity since ancient times. There is a growing demand for these natural sources of medicine, with their popularity steadily increasing (Jamshidi-kia *et al.,* 2018). According to the World Health Organization (WHO), traditional healing flora refers to natural plant materials utilized for treating diseases either

Fig. 1: Habit and flowers of *V. polyanthes* (Image courtesy: Hyde *et al.*, 2025)

solely or in conjunction with industrial processing on a local or regional level (Tilburt and Kaptchuk, 2008). Due to their therapeutic components, these plants have long served as remedies for various ailments in regions such as India, China, Greece, Egypt, and beyond (Bhat, 2021). Throughout history, people worldwide have been harnessing the power of plants for fundamental preventive and healing healthcare. Furthermore, humanity has extensively explored various plants to manage specific diseases (Singh and Sedha, 2017). In recent years, pharmacologically active plants have gained scientific attention as promising sources of novel bioactive compounds, offering safer alternatives to synthetic drugs (Jamuna *et al.,* 2024). Advances in phytochemistry and pharmacology have enabled the isolation and characterization of these molecules, providing valuable insights into their mechanisms of action and reinforcing their relevance in modern drug discovery, while also emphasizing the need to evaluate their safety and toxicological profiles to ensure proper use (Priya *et al.,* 2024). Moreover, ethnopharmacological studies continue to play a vital role in validating traditional claims, linking ancestral knowledge with contemporary biomedical evidence, and guiding future drug development (Arunkumar *et al.,* 2024).

In this context, *Vernonanthura polyanthes* has attracted particular ethnopharmacological importance in Brazil, where it is officially recognized in the Brazilian Pharmacopoeia for its expectorant properties and included in the RENISUS (National List of Medicinal Plants of Interest to the Unified Health System, SUS). Its recognition at the national level has stimulated systematic pharmacological and phytochemical research, underscoring its importance as a species that bridges folk practices with formal healthcare systems (Nascimento *et al.*, 2020).

Interestingly, certain medicinal plants such as *V. polyanthes* also display remarkable ecological flexibility, enabling them to naturalize and, in some circumstances, act as invasive species outside their original range. Such duality, as both a medicinal resource and an ecological challenger, adds another dimension to their scientific significance, emphasising the necessity of integrative research that considers pharmacological potential alongside ecological consequences. This approach broadens the scope of study by linking ethnomedicine, pharmacognosy, and ecology, reflecting the multifaceted importance of *V. polyanthes* in both human wellness and environmental contexts (Kachena and Shackleton, 2024).

The plant *V. polyanthes* (Synonym: *Vernonia polyanthes* Less and *Vernonanthura phosphorica* (Vell.) H. Rob.), also popularly called "Assa-peixe" (Fig. 1 and Table 1), belongs to the Asteraceae family and is widely recognized for its curative traits. This plant is widely distributed throughout different regions of Brazil and commonly found surrounding the cities, with its leaves frequently employed in indigenous herbal practices, primarily to treat respiratory ailments (Silveira *et al.,* 2003), malaria, and fever (Igual *et al.,* 2013).

Owing to its wide availability and acceptance in traditional medicine, *V. polyanthes* has emerged as both a cornerstone of folk healthcare and a significant target for systematic pharmacological and toxicological research (Rocha *et al.,* 2022). Its versatility as a multipurpose remedy has made it an integral part of local healing systems, further stimulating scientific investigations to clarify its efficacy and safety. Additionally, its properties reduce hypertension (Barbastefano *et al.,* 2007), bruises, ocular inflammation, rheumatism, hemorrhoids, and kidney disorders (Rocha *et al.,* 2022), demonstrate antiprotozoan activity (Jorgetto *et al.,* 2011), and act as an anti-inflammatory (Temponi *et al.,* 2012; Minateli *et al.,* 2017). It also exhibits ulcer-healing effects (Barbastefano *et al.,* 2007), activity against *Leishmania* (Moreira *et al.,* 2017), and antifungal effects (Braga *et al.,* 2007). The pharmacological potential of the leaves is linked to bioactive compounds such as flavonoids, flavonols, flavones, sesquiterpene lactones, chlorogenic acids, and hydroxycinnamic acids (Gallon *et al.,* 2018). The essential oil, mainly composed of monoterpenes, sesquiterpenes, and oxygenated sesquiterpenes, has been reported to exhibit leishmanicidal (Moreira *et al.,* 2017) and antimicrobial properties (Silva *et al.,* 2012). Such chemical diversity not only supports its wide range of pharmacological activities but also positions this plant as a valuable model for bioprospecting and natural product research.

Considering its broad therapeutic applications, systematic reviews of *V. polyanthes* are crucial for bridging traditional knowledge with modern scientific validation and providing a balanced understanding of its benefits and safety considerations. In this sense, the present study provides an overview of *V. polyanthes*, based on accumulated knowledge and research findings, with a primary emphasis on its bioactive compounds and pharmacological applications.

Methodology

We have thoroughly examined numerous published works discussing recent advancements in *V. polyanthes* research, encompassing both primary articles and secondary data retrieved from various sources, including PubMed, ScienceDirect, Crossref, Google Scholar, Harvard Library, Mendeley, Cite Factor, Shodhganga, and the AYUSH Research Portal.

Table 1: Taxonomic position, synonyms, and vernacular names of the *V. polyanthes* [Rocha *et al.,* 2022; Vega and Dematteis, 2010]

Scientific classification	*Synonym names*	*Vernacular names in Brazil and Portuguese*
Kingdom: Plantae	*Chrysocoma phosphorica* Vell.	Assa-peixe
Division: Streptophyta	*Eupatorium polyanthes* Spreng.	Assa-peixe-branco
Class: Equisetopsida	*Vernonia polyanthes* (Spreng.) Less.	Chamarrita
Subclass: Magnoliidae	*Cacalia polyanthes* (Spreng.) Kuntze	Cambará-guaçu
Order: Asterales	*Vernonanthura phosphorica* (Vell.) H. Rob.	White-cambará
Family: Asteraceae	*Cacalia compacta* (Gardner) Kuntze	White assa-peixe
Genus: *Vernonanthura*		
Species: *V. polyanthes* (Spreng.) A.J. Vega & Dematt.		

Taxonomy and Distribution

The genus *Vernonanthura* H. Rob. was established by Robinson (1992), separating species from *Vernonia* sect. *Lepidaploa* into a distinct group characterized by shrubby or tree-like growth forms. Currently, *Vernonanthura* comprises about 70 species, with its center of diversity in southeastern Brazil. Within this genus, *Vernonanthura polyanthes* (Spreng.) A.J. Vega & Dematt., originally described as *Vernonia polyanthes* Spreng. and later synonymized with *Chrysocoma phosphoric7a* Vell., represents a species of considerable ecological and taxonomic interest (Sukhorukov *et al.,* 2017).

This species was introduced in the early 1990s as a bee nectar source in regions around Sussundenga, Mozambique. Since then, it has spread extensively across disturbed lowlands near the Zimbabwe–Mozambique border mountains, including the lower Vumba and Chimanimani ranges. From the early 2000s, its range expanded further to higher altitudes, such as the Vumba Mountains, although with lower density. More recent records from 2023 confirm its occurrence in Harare, documented under entries 119374 and 120420. Ecological modelling also indicates high habitat suitability in the Eastern Highlands of Zimbabwe, underlining the species' adaptability and invasive potential beyond its native South American range (Wursten *et al.,* 2017; Burrows *et al.,* 2018).

Botanical Description

A shrub up to 3 meters tall with striated, tomentose stems. Leaves are petiolate (0.5–1.5 mm), lanceolate (5–15 cm long, 1–3 cm wide), with entire margins, acute apex, and attenuate base, sparsely hairy above and tomentose below. Flower heads are sessile or nearly sessile, in seriate-cymose branches forming a panicle-like structure. The bell-shaped involucre (4.5–5 mm) has 4–6 series of phyllaries, mucronate, and lanceolate to ovate. White florets have 5–5.5 mm corollas with lanceolate lobes (1.5–2 mm). Anthers are 2–3 mm, and styles are 6–7 mm long. Achenes are ribbed, hairy, and glandular. Pollen grains are radially symmetrical, isopolar, oblate- to prolate-spheroidal, with a polar axis of 39.44–44.88 µm and equatorial diameter of 40.08–44.88 µm, featuring a subechinolophate pattern and spines (3.80–5.44 µm) (Vega and Dematteis, 2010).

Phytochemistry

Phytochemical investigations of *V. polyanthes* have identified a wide spectrum of flavonoid subclasses, predominantly flavones such as luteolin and apigenin derivatives, as well as flavonols including quercetin and kaempferol derivatives, together with smaller amounts of flavanones and glycosylated flavonoids. These metabolites are considered key contributors to the plant's pharmacological profile, particularly its antioxidant, anti-inflammatory, and anticancer activities (Jaisankar *et al.,* 2014). In addition to flavonoids, *V. polyanthes* is notably abundant in sesquiterpene lactones, a distinctive group of terpenoids in the Asteraceae family, recognized for their broad bioactivity. These components have been connected to diverse biological properties, such as anti-inflammatory, antimicrobial, and cytotoxic properties, further supporting the pharmacological importance of the species (Olesinska, 2018). Phenolic acids, specifically chlorogenic and hydroxycinnamic acids, constitute another prominent class of metabolites in *V. polyanthes*. These bioactive molecules are well known for their antioxidant and free radical scavenging properties, and contribute to anti-inflammatory and plant disease preventive effects (Sehrawat *et al.,* 2022). Beyond these major groups, phytochemical screenings have also reported the presence of various secondary metabolites in *V. polyanthes*, including alkaloids, saponins, coumarins, anthraquinones (Waltrich *et al.,* 2015), triterpenes (Barbastefano *et al.,* 2007), steroids (Minateli *et al.,* 2017), phenols and tannins (Gitirana de Santana *et al.,* 2023; Feleti *et al.,* 2020), and caffeoylquinic acid (de Aguiar *et al.,* 2024). This extensive chemical diversity underscores the species' pharmacological significance and supports its wide-ranging traditional medicinal applications. Fig 2 illustrates the major chemical compounds identified in different parts of *V. polyanthes*, which are largely responsible for its diverse pharmacological activities. Table 2 provides a detailed summary of these metabolites along with their associated biological effects.

Further chemical analyses using UHPLC-MS-QTOF unveiled the identification of ten distinct components. Among them, Glaucolide A and Apigenin were singled out as some of the most prominent compounds. They were separated from the extract through chromatographic separation techniques and further confirmed by comparing their ^{1}H- and ^{13}C-NMR data analysis with existing literature. The HPLC-DAD profile at 210 nm revealed six prominent peaks of significant intensity. The isolated glaucolide A exhibited a peak of high purity when analyzed under the same chromatographic conditions (Gitirana

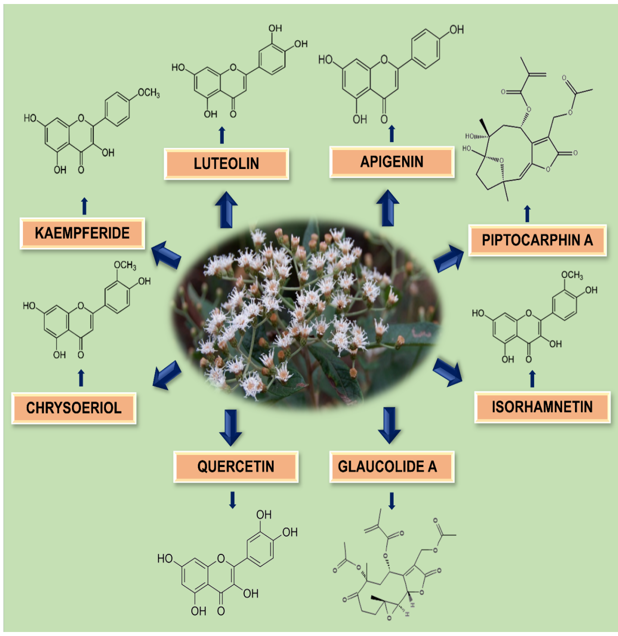

Fig. 2: Major bioactive compounds isolated from *V. polyanthes*

de Santana *et al.,* 2023). The GC-MS profiling of "Assa-peixe" leaf essential oil identified 35 compounds, with monoterpenes, myrcene, sesquiterpenes, zerumbone, bicyclo germacrene, alpha-humulene, and germacrene D as the primary components (Moreira *et al.,* 2017).

Toxicological Profile

In-vitro testing of *V. polyanthes* leaf extracts has revealed significant safety concerns. While the aqueous extract and its fractions did not cause hemolysis, they actually altered the morphology of erythrocytes, leading to echinocyte formation. Moreover, human lymphocytes exhibited cytotoxic and genotoxic responses across all tested concentrations, in some cases surpassing the toxicity of the standard chemotherapeutic drug doxorubicin. Interestingly, co-treatment with doxorubicin enhanced cytotoxicity while slightly decreasing genotoxicity, demonstrating a modulatory yet complex interaction. *In vivo* studies further supported these findings by demonstrating systemic toxicity and mutagenicity at high dosages (Rocha, da Silva Ferreira *et al*., 2022).

Pharmacological Features

Anti-oxidant properties

Reactive oxygen species (ROS) encompass a diverse set of highly reactive molecules produced through oxygen metabolism. These molecules have the potential to cause considerable cellular and tissue damage, especially during infections and various degenerative conditions such as cardiovascular disease, the aging process, neurodegenerative disorders like dementia, tumors, and genetic mutations (Pooja *et al.,* 2025).

The antioxidant activity of *V. polyanthes* branches using DPPH radical scavenging, ferric reducing ability, and beta-carotene bleaching assays. The ethyl acetate and butanol fractions were found to exhibit potent scavenging effects on DPPH radicals, with EC_{50} values ranging from 58.56 ± 0.34 to 215.47 ± 1.70 µg/ml. These fractions also demonstrated significant antioxidant activity in the FRAP assay, with EC_{50} values ranging from 123.91 ± 0.44 and 467.94 ± 2.47 µg/ml. Correlation analysis revealed strong associations between total phenolic and flavonoid contents with DPPH radical inhibition and FRAP assays. Moreover, the hexane fraction demonstrated the highest ability to inhibit lipid peroxidation in the β-carotene test (Minateli *et al.,* 2017).

Anti-inflammatory activity

Inflammation is a complex, natural defense response of tissues to injury or damaging stimuli like microbes, toxins, or injured cells, characterized by increased blood vessel permeability, protein denaturation, and membrane changes, often causing pain; it can be acute or chronic, with the latter involving a gradual shift in cellular composition characterized by continuous tissue damage and repair processes (Feleti *et al.,* 2020).

Hexane and Ethyl Acetate Leaf Extracts in Croton-Oil-Induced Inflammation

A study revealed that *V. polyanthes* possesses strong inflammation-moderating potential, as shown by the hexane and ethyl acetate extracts' effectiveness in reducing Croton-oil-induced ear swelling. When applied topically, the hexane

Table 2: Major metabolites identified in different parts of V. polyanthes and their biological activities

Plant part	*Major constituents*	*Linked pharmacological activities*	*References*
Leaves	Flavonoids (flavones, flavonols, flavanones), Sequiterpene lactones, alkaloids, chlorogenic acid, hydroxycinnamic acids, coumarins	Antioxidant, Anti-inflammatory, Antimicrobial, Anticancer	Temponi *et al.,* 2012; Igual *et al.,* 2013; Rodrigues *et al.,* 2016; Minateli *et al.,* 2017; Gitirana de Santana *et al.,* 2023; de Aguiar et al, 2024
Flowers	Sesquiterpene lactones, Tannin, Flavonoids, Alkaloids	Antimicrobial, Antioxidant, Anti-inflammatory	Waltrich *et al.,* 2015
Stem bark	Phenolic compounds, Tannins	Astringent, Antimicrobial, Antioxidant	Braga et al., 2007
Roots	Terpenes, Phenoic derivatives	Antileishmanial, Antifungal activity	Lorenzi and Matos, 2002; Braga et al., 2007
Essential oil	Monoterpenes, Sesquiterpenes, Oxygenated sesquiterpenes, Phenolics	Leishmanicidal, Antimicrobial, Anti-inflammatory	Silva *et al.,* 2012; Moreira *et al.,* 2017

extracts significantly lowered ear edema across all tested doses (0.1, 0.5, or 1.0 mg/ear). Dexamethasone, used as a positive control (0.1 mg/ear), demonstrated even greater efficacy than any dose of the hexane extract (Rodrigues *et al.,* 2016). Notably, the anti-inflammatory response from the hexane extract was not dose-dependent, suggesting a potential antagonistic interaction among its components with increasing dosage (Mukherjee *et al.,* 1997; Gomes *et al.,* 2003; Chibli *et al.,* 2014).

Carrageenan-Induced Pleurisy

Another assessment involved carrageenan-induced pleurisy in mice. Groups were administered indomethacin, 1% dimethyl sulfoxide, or ethanolic extract at different doses 60 minutes before carrageenan injection into the pleural cavity. After four hours of injecting carrageenan, the mice were humanely euthanized, and the fluid from the injection site was gathered for leukocyte assessment. The 200 mg/kg dose demonstrated a 17.87% inhibition of leukocyte count and a 13.83% reduction in exudate volume relative to the control. Similarly, a 400 mg/kg dose inhibited leukocyte count by 28.39% and reduced exudate volume by 43.08. Further testing confirmed that the ethanol leaf extract of *V. polyanthes* exhibited notable anti-nociceptive properties. In experimental models, the extract reduced pain responses in a dose-dependent manner, supporting its traditional use in folk medicine for the management of pain and inflammatory conditions (Temponi *et al.,* 2012).

Topical Anti-inflammatory properties of branches

The ethanol and ethyl acetate fractions of *V. polyanthes* branches were evaluated against ear swelling induced by Croton oil, arachidonic acid, and phenol. Ethanol extracts inhibited inflammation by 45.79% to 61.81% for Croton oil, 35.40% to 46.29% for arachidonic acid, and 39.12% to 63.43% for phenol. The ethyl acetate extracts reduced edema by 28.27% to 41.52% for Croton oil, 37.62% for arachidonic acid, and 22.81% to 44.17% for phenol. Both extracts effectively diminished ear swelling caused by three inflammatory agents (Minateli *et al.,* 2017).

Anti-leishmanicidal activity

Leishmaniasis is a vector-transmitted protozoan infection caused by species of the genus *Leishmania* (Sharma and Singh, 2008). These parasites trigger a range of symptoms and present a major global health threat. Despite being one of the most neglected diseases worldwide, leishmaniasis causes approximately 50,000 deaths annually, primarily due to its visceral form. The AIDS epidemic primarily fuels the increasing prevalence of leishmaniasis, the absence of effective vaccines, climate change, difficulties in vector control, and escalating drug resistance (Ferrero-Miliani *et al.,* 2007).

The leishmanicidal properties of *V. polyanthes* essential oil and zerumbone revealed that the essential oil effectively targets *Leishmania infantum*, with an IC_{50} value of 19.3 µg/ml. Zerumbone demonstrated an IC_{50} value of 9.0 µg/ml, indicating that a significant portion of the essential oil's activity can be attributed to this compound. This observation is consistent with the findings of (Singh *et al*., 2014), who reported zerumbone's potency against *L. donovani* (IC_{50} < 1.5 µg/ml and IC_{90} = 5.0 µg/ml). The essential oil's effectiveness may also be influenced by trace components and potential synergistic interactions (Igual *et al.,* 2013).

In another study, sixteen endophytes were isolated and cultured, with ethanol extracts tested for antileishmanial activity. The most active extract came from the P2-F3 strain, identified as *Cochliobolus sativus*. Bioassay-guided fractionation led to the isolation of cochlioquinone A, isocochlioquinone A, and anhydrocochlioquinone A, all of which demonstrated effective inhibition of the parasite (Do Nascimento *et al.,* 2015).

Antiulcerogenic property

Ulcers stem from a disruption in the delicate balance between internal factors that promote and defend against stomach acidity, including acid-pepsin secretion, mucosal barrier integrity, mucus production, blood circulation, cell renewal, prostaglandins, and growth factors (Freitas *et al.,* 2008). Medications are administered to alleviate pain, promote healing, and reduce the likelihood of ulcer recurrence. These encompass antibiotics (Yuan *et al.,* 2006), antacids, and proton pump inhibitors (Tepperman and Jacobson, 1994). While various medications exist for gastric ulcer treatment, many are linked to undesirable side effects (Shirode *et al.,* 2008).

To assess the ulcer-reducing properties of methanol and chloroform extracts derived from the aerial parts of *V. polyanthes*. The study used male Wistar rats and Swiss mice as animal models. Treatment with methanol and chloroform extract notably reduced gastric mucosal damage caused by ethanol. Both extracts showed dose-dependent protective effects against gastric lesions induced by ethanol and NSAIDs, although their effectiveness diminished in the animal models. The chloroform extract exhibited superior efficacy compared to the methanol extract. Mechanistic investigations revealed the involvement of endogenous nitric oxide and sulfhydryl compounds in chloroform extract-induced gastroprotection. Treatment with chloroform extract in pylorus ligature-induced lesions increased mucus production without altering gastric pH. Statistical analysis confirmed the significant antiulcer effects of both extracts, with chloroform being the most potent, likely due to its high terpenoid content (Barbastefano *et al.,* 2007).

Antimicrobial activity

The pervasive occurrence of bacterial infections globally represents a critical issue in public health (Zhang *et al.,* 2006). The rise in antibiotic resistance and associated toxicity concerns restricts the utility of antimicrobial drugs (Eggleston *et al.,* 2010), prompting renewed interest in researching the antimicrobial properties of plants. This is driven by their potential for safety and efficacy comparable to conventional treatments (Alviano and Alviano, 2009).

Disk diffusion assay of flower extracts

Various techniques exist to evaluate antibacterial properties, encompassing agar well diffusion, disk diffusion, and broth diffusion. In one study, the disk diffusion method was employed to assess the antibacterial potential of crude, hexane, dichloromethane, ethyl acetate, and aqueous flower extracts of *V. polyanthes* against *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*. Broth cultures, including Mueller-Hinton agar, were used, and antibiotic disks (amoxicillin, vancomycin, tetracycline, ceftriaxone, and penicillin G) served as standards. The findings revealed that only the ethyl acetate extract inhibited *S. aureus*, while the other extracts showed no antimicrobial effect (Waltrich *et al.,* 2015).

Hydroalcoholic extracts against multiple bacterial strains

The hydroalcoholic extract of *V. polyanthes* has shown significant *in vitro* antimicrobial activity against several bacterial strains. Clear inhibitory zones were recorded against *Bacillus cereus*, *E. coli*, *Proteus mirabilis*, *S. aureus*, *Streptococcus pyogenes*, and *Salmonella typhimurium*. Among these, bacteriostatic effects were quantified for *B. cereus* (180.1 mg/mL), *E. coli* (72.04 mg/mL), and *P. mirabilis* (144.08 mg/mL), confirming the extract's capacity to suppress bacterial proliferation (Jorgetto *et al.,* 2011).

In-Vitro Antimicrobial Activity of Leaf Extract and Glaucolide A

Most recently, Gitirana de Santana *et al*., (2023) evaluated the *in vitro* antibacterial activity of a *V. polyanthes* leaf rinse extract, assessed by minimal inhibitory concentration (MIC) assays. The extract effectively inhibited several bacterial strains, including *S. aureus*, *E. coli*, and certain methicillin-resistant *S. aureus* (MRSA). However, it showed no effect on eight other bacterial strains at higher concentrations. Interestingly, Glaucolide A, a sesquiterpene lactone isolated from the species, demonstrated inhibitory effects against certain strains of *S. aureus* but not others or any *Salmonella* strains. The leaf rinse extract exhibited bacteriostatic properties against various bacterial strains, with varying MBC values. Glaucolide A did not show MBC values for the two *S. aureus* reference strains, likely due to the highest tested concentration being too low. Collectively, these findings provide the scientific validation for the traditional use of this species in the management of infectious diseases.

Anti-cancer activity

Cancer is one of the most feared neoplastic diseases, often seen as a consequence of modern lifestyles and socio-economic patterns shaped by Western medicine (Nair *et al.,* 2010). Plant-derived natural products have been invaluable sources for discovering anticancer drugs (Schwartsmann *et al.,* 2002). Multidisciplinary scientific research is tirelessly striving to combat cancer, yet a definitive cure remains elusive in modern medicine. The emerging integrative approach to cancer treatment acknowledges the vital role of botanical medicine (Nair *et al.,* 2010). Despite the development of numerous plant-derived anticancer agents, creating a safe, cost-effective, and targeted anticancer drug remains a significant challenge (Bos *et al.,* 2005).

V. polyanthes has been reported as a promising anticancer plant, with its bioactive compound quercetin-3-*O*-rutinoside (Rutin) showing potential antineoplastic, antimutagenic, and cancer-preventive activities in computational studies (de Aguiar et al., 2024). The cytotoxic effects of *V. polyanthes* and *G. parviflora* extracts were evaluated on Sarcoma-180 (S-180) cells, human gastric adenocarcinoma (AGS) cells, and human lymphocytes, with IC_{50} values determined. *V. polyanthes* exhibited lower IC_{50} values against both S-180 and AGS cells compared to *G. parviflora*. Both extracts exhibited comparable anticancer effects on S-180 cells, with *V. polyanthes* showing enhanced cytotoxicity in subsequent treatment stages. Pearson Correlation Analysis (PCA) indicated a relationship between the chemical composition, antioxidant properties, and cytotoxic effects. These results highlight the potential of *V. polyanthes* and *G. parviflora* as promising candidates for cancer treatment in medicinal and nutraceutical applications (Feleti *et al.,* 2020).

Anti-cytogenotoxic activity

The study evaluated the cytogenotoxic and anti-cytogenotoxic effects of *V. polyanthes* leaf aqueous extract and its n-butanol fraction in mice treated with or without doxorubicin (DXR) for 24 or 120 hours. The chemical analysis identified phenolic compounds in the leaf aqueous and n-butanol fraction extract. Both extracts showed a protective effect against DXR-induced cytogenotoxicity, particularly pre- and post-treatment. Computational analysis predicted antioxidant and chemoprotective properties for the identified metabolites. Overall, *V. polyanthes* demonstrates the potential to mitigate toxic effects induced by DXR (Rocha *et al.,* 2022).

Antihypertensive activity

Hypertension is a major risk factor for cardiovascular diseases, and the spontaneously hypertensive rat (SHR) model is the most widely used experimental system to investigate human essential hypertension (Tata *et al.,* 2019). Increasing evidence highlights that plant-derived phenolic and flavonoid compounds play a protective role, contributing to the regulation of blood pressure and cardiovascular health (Caiati and Jirillo, 2025).

Studies on the hydroalcoholic extract of *V. polyanthes* leaves reduced arterial blood pressure in normotensive rats in a dose-dependent manner. This hypotensive effect was associated with enhanced creatinine clearance and alterations in renal sodium excretion, suggesting that the underlying mechanism involves both vasodilatory and renal processes. Such evidence lends pharmacological support to its traditional use of the species in hypertension treatment and underscores its potential as a natural antihypertensive agent (Silveira *et al.,* 2003).

Antitrypanosomal activity

Investigations of the ethanol extract of *V. polyanthes* aerial parts have demonstrated significant *in vitro* activity against *Trypanosoma cruzi* trypomastigotes, the etiological agent of Chagas disease. Bioassay-guided fractionation led to the identification of phenylpropanoids, including ferulic acid, isoeugenol, and homovanillyl alcohol, along with flavonoids such as luteolin, velutin, and 3-O-methylquercetin. Among these, homovanillyl alcohol established the most potent trypanocidal effect (EC_{50} = 6.3 μg/mL), comparable to the reference drug benznidazole but with a higher selectivity index. Importantly, none of the tested compounds exhibited cytotoxicity toward murine fibroblasts, underscoring their safety profile and therapeutic potential. These results position *V. polyanthes* as a valuable source of bioactive molecules with promising applications in the development of novel antitrypanosomal agents (Sales *et al.,* 2025).

Conclusion

V. polyanthes, commonly known as "Assa-peixe," exhibits significant therapeutic potential, with traditional use targeting respiratory ailments, malaria, fever, and hypertension. Pharmacological studies have demonstrated its efficacy against inflammation, ulcers, leishmaniasis, fungal infections, oxidative stress, and cancer, attributable to its diverse phytochemical profile, including alkaloids, flavonoids, sesquiterpene lactones, phenols, and terpenoids. However, most investigations remain preliminary, predominantly conducted in animal models, and there is a notable lack of clinical trials to validate their safety and efficacy in humans. Additionally, comprehensive studies on its pharmacokinetics, dosage optimization, and long-term toxicity are scarce. Further exploration of alternative bioactive metabolites could facilitate the development of novel therapeutic and industrial applications. Considering the growing interest in herbal medicines for their cost-effectiveness and environmental sustainability, researchers, farmers, conservationists, and policymakers must collaborate to ensure the responsible utilization and conservation of this valuable plant species. This review highlights both the therapeutic promise and the critical knowledge gaps of *V. polyanthes*, emphasizing the need for future research.

Author Contribution

Arunkumar R gathered relevant literature and created the first draft. Abdul Kaffoor H offered editorial advice and critically reviewed the article. All authors read and approved the final manuscript.

Conflict of Interests

The authors declare no conflicts of interest related to this article.

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