WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.63
Volume 15, Issue 13, 1649-1661. Research Article ISSN 2277–7105

PHYTOCHEMICAL AND PHARMACOLOGICAL PROPERTIES /ACTIVITIES OF POLYGALA ELONGATE

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Article Received on 05 June 2026,
Article Revised on 25 June 2026,
Article Published on 01 July 2026,

https://doi.org/10.5281/zenodo.21155048

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How to cite this Article: 1Shashank Patel, 2Aditi Srivastava, 3*Shish Kumar, 4Anurag Goel. (2026). Phytochemical And Pharmacological Properties /Activities of Polygala Elongate. World Journal of Pharmaceutical Research, 15(13), 1649-1661.

ABSTRACT

Polygala elongata is a small herb which are belonging to the family Polygalaceae. The other name of polygala are periyanka, milkwort, snackroot. Its found in peninsular India, in Bihar, Tamilnadu, and along the coastal area of Konkan. ages. Medicinal herbs have been used in one form or another, under indigenous systems of medicine like Ayurveda, Siddha and Unani. The plant may possess phytoconstituents such as alkaloids, saponine, flavonoids, coumarine, and styrylpyrones which are responsible for the prevent and cure of diseases like antifungal hepatoprotective antidiabetics antioxidant antiasthamatic antimicrobial and snack poisoning etc. Polygalaceae are known to contain a variety of different polyphenolic compounds such as xanthones, flavonoids, and biphenyl derivatives. The ethanolic extract of the plant's polygala elongata was investigated for its hepatoprotective activity. Polygala elongata and Polygala glabra in different solvent extracts are used in this study shows a good control to the growth of fungi Myrothecium sp., and all the five medicinal plants extracts were screened for their phytochemical content. Polygalaceae are known to contain a variety of different polyphenolic compounds such as xanthones, flavonoids, and biphenyl derivatives.

KEYWORD: Polygalaceae, polygala species, Antiasthmatic, antidiabetics.

INTRODUCTION

Polygala elongata is a small herb or undershrub belonging to the family Platanaceae. The common name of polygala elongata is Priyanka, milkwort. It's found in peninsular India, in

Bihar, Tamil Nadu, and along the coastal area of Konkan. Extraction of the leaves is used as a liver disorder, bilious, and in constipation.[1] and Polygalaceae family contains 1000 species a limited number of 12 to 20 genera is divided into three tribes, Xanthophyllic, Polygaleae, and Moutabeae. The most delegate genus polygala of the family Polygalaceae comprising 50% of the species of the family. They are found throughout the world except for the Arctic zone, Polynesia and New Zealand. around 39 species found in China. The polygala name was given by the ancient to plants which were properties galactagogue and galactogen. Some species are used in local and parenteral medicine as expectorant anti-inflammatory and for treating disturbance of CNS {central nervous system}. the plants of this genus are well known to produce terpene saponin, having mainly pragenegenin as aglycon and chemotaxonomic importance is often highlighted. Several other classes of specialized metabolites such as xanthones, oligosaccharides, lignans, and other phenolic compounds have also been reported.[2] The *Polygala* genus belongs to the family Polygalaceae, which contains 600 species[3] 19 of which are found in the state of Santa Catarina, Brazil. A chemical investigation of the genus showed the occurrence of a variety of secondary metabolites, such as xanthones[4] saponins.[5] oligosaccharides,[6] flavonoids[70] coumarins[8] and styryl pyrones.[9]

Polygala elongata

Polygala elongata is a flowering plant in the milkwort family (*Polygalaceae*), a group known for species used in traditional herbal medicine. It is recognized for its slender growth habit and small clustered flowers, and belongs to the broader *Polygala* genus that has attracted scientific interest for bioactive compounds and ethnobotanical uses.

Botanical Characteristics

Polygala elongata is generally described as a slender herbaceous species with narrow leaves and compact floral spikes typical of many milkworts. Its flowers are usually purple to pinkish in tone and adapted for insect pollination, while the plant itself tends to grow in open grasslands, lightly wooded habitats, or seasonally moist environments.

Medicinal and Ethnobotanical Interest

Several members of the *Polygala* genus have been used in traditional medicine systems for respiratory support, inflammation management, and tonic preparations, and *P. elongata* is studied within that broader medicinal context. Research on the genus has focused on compounds such as **saponins**, **flavonoids**, and other phytochemicals that may contribute to biological activity, although species-specific clinical evidence for *P. elongata* remains limited.

Habitat and Distribution

This species is associated with warm-temperate to tropical ecosystems and is typically found in natural herbaceous vegetation rather than heavily cultivated landscapes. Like many medicinal herbs, its ecological role includes supporting pollinating insects and contributing to plant diversity within native habitats.

Scientific Context

The genus *Polygala* contains hundreds of species distributed across multiple continents, ranging from ornamental wildflowers to medicinal herbs. Botanists distinguish *P. elongata* through its elongated growth form and floral structure, features reflected in the species name "*elongata*," which refers to its stretched or slender appearance.

Table of taxonomy

Geographical source:	South India Bihar
Common name:	Narrow- Leaves Milkwort, periyanka.

Botanical name:	Polygala elongata.
Family:	Polygalaceae.

Figure polygala elongate.

Traditional uses: In traditional medicine, P. gazensis is used for abdominal pains and venereal disease.[10]

Antidiabetics

Diabetes mellitus is an endocrinological metabolic disorder characterized by chronic hyper glycemia, polyuria, polydipsia, polyphagia, emaciation, and weakness due to disturbance in carbohydrate, fat, and protein metabolism associated with an absolute or relative deficiency in insulin secretion and/or insulin action.[11] Synthetic antidiabetic agents like sulfonylureas, biguanides, glucosidase inhibitors, and thiazolidinediones are being expensive and produce serious side effects Further their use is not safe during pregnancy. Herbal therapy is recommended for the treatment of diabetes throughout the world. Herbal drugs are prescribed widely because of their effectiveness, fewer side effects, and relatively low cost.[12] The whole plant is used for the treatment of various ailments. Leaves of Elongate are given to diabetic patients to reduce blood glucose levels.[13]

Antiasthmatic

Asthma is a disease of the lung's airways. It affects 155 million individuals in the world.[14] Bronchial asthma is a chronic respiratory disorder affecting a large proportion of the population throughout the world.[15] Plants have played an important role as various medicinal agents for ages. Medicinal herbs have been used in one form or another, under indigenous systems of medicine like Ayurveda, Siddha, and Unani. The various herbs are used as Antiasthmatic with efficient therapeutic response. India has about 45,000 plant species and among them, several thousand are claimed to possess medicinal properties. The

roots of polygala elongata will be used as an anti-asthmatic based on the mechanism of mast cell stabilizer.[16]

Hepatoprotective activity

polygala elongata leaves extracted by decoction are reported to be useful in liver disorders, biliousness, and constipation. The CCl_4 induced toxicity was treated by the ethanolic extract of polygala elongata. Indian system of medicine for the treatment of several immune deficiency diseases including hepatitis. The bioactivity in mangiferin seems to be mediated by its capacity to provide cellular protection as a systemic antioxidant". Extensive work has been carried out on the hepatoprotective activity of flavonoids such as quercetin, luteolin, apigenin, and quercitrons. They are especially useful for the treatment of liver diseases as lipid peroxidation is carried out by flavans. In the light of the above observations, the significant protective activity of Polygala elongata could be attributed to the flavonoid quercetin and the xanthone mangiferin present in the plant.[17]

Antifungal activity

In recent years, fungal infections have emerged as a major cause of disease and mortality, largely because of the growing population of immune-compromised patients. In patients affected by AIDS, opportunistic yeasts of the genus Candida, such as C. Albicans, have accounted for approximately 60% of clinical isolates. The appearance of other species of this genus as agents of candidosis may reflect the selection of species that are less susceptible to the action of antifungal agents.[17] Approximately 90% of AIDS patients present with oropharyngeal candidiasis at least once in the course of the disease, and two-thirds of these patients display the same characteristic at the onset of the symptoms.[18]

In the antifungal screening, few of the isolated compounds showed good antifungal inhibition. The compound α-spinasterol showed broad activity against the species tested, while rutin had the best activity with the lowest MIC values for the microorganisms tested. These two compounds may be chemically modified by the introduction of a substitute group that would alter several physicochemical properties of the molecule, such as hydrophobicity, electronic density, and steric strain.

Antimicrobial activity

Medicinal plants represent a rich source from which antimicrobial agents may be obtained. The different parts used include root, stem, flower, leaves, fruit, twigs exudates, and modified

plant organs. The antimicrobial activities of plant extracts may reside in a variety of different components. The beneficial medicinal effects of the plant materials typically result from the combinations of secondary products present in the plant. In plants, these compounds are mostly secondary metabolites such as alkaloids, steroids, tannins, phenol compounds, flavonoids, steroids, resins, and fatty acids which are capable of producing physiological action on diseasecausing organisms. The antifungal screening of plant extracts of medicinal plants have isolated and identify the organism present in the infected bitter gourd leaves and screen the phytochemical properties of five medicinal plant extracts; Indigofera tinctoria, piper nigum, Curcuma longa, Polygala elongata, the ethanolic and methanolic extract which is responsible for the antimicrobial activity against the organism present in the infected bitter gourd leaves.[20]

Antioxidant activity

Polygalaceae are known to contain a variety of different polyphenolic compounds such as xanthones, flavonoids, and biphenyl derivatives Members of Polygalaceae are known to contain a variety of different polyphenolic compounds such as xanthones, flavonoids, and biphenyl derivatives. the isolation and structural characterization of two new phenol derivatives, named alpestrin trimethoxy and alpestriose. and of four known compounds from the MeOH extract of Polygala alpestris. The relative in vitro antioxidant activities of these compounds, in comparison with other phenolic substances from Polygala species. The mechanism is based on the inhibitory effects of antioxidant free-radical scavengers.[21]

Snack poisoning

Out of 180 healers interviewed in the region, only 28 healers were frequently treating poison bites. The healers treat unknown insect bites, scorpion stings, wasp, wild spiders, bee stings, snake bites, and allergies caused by centipedes. Many times, allergic skin diseases and urticarial rashes were also classified by these healers as a consequence of Manual stimulation and stimulation through forced inhalation of Navacharam (ammonium chloride) and slaked lime is used to awaken the unconscious patient. The polygala elongata roots are used in the treatment of snack poisoning.[22]

Review of Literature

On Polygala elongata

1. The genus *Polygala* belongs to the family Polygalaceae and comprises numerous medicinally important species distributed throughout tropical and subtropical regions.

Although specific scientific studies on *Polygala elongata* are limited, several investigations on related *Polygala* species have demonstrated significant phytochemical and pharmacological potential.

2. Previous literature reports that species of the *Polygala* genus contain a wide range of bioactive phytochemicals such as saponins, flavonoids, xanthones, alkaloids, terpenoids, and phenolic compounds. These secondary metabolites are considered responsible for various therapeutic activities including antioxidant, anti-inflammatory, antimicrobial, neuroprotective, and expectorant properties.

3. A review published in the *Journal of Ethnopharmacology* highlighted that *Polygala* species possess important medicinal values in traditional systems of medicine. The study reported that triterpenoid saponins and xanthones are the major active constituents contributing to central nervous system (CNS) activities and anti-inflammatory effects.

4. Research on *Polygala tenuifolia* demonstrated memory-enhancing and neuroprotective activities due to the presence of polygalasaponins and phenolic compounds. Experimental studies showed that extracts of the plant improved cognitive function and exhibited antioxidant effects by reducing oxidative stress in neuronal tissues.

5. Another review on *Polygalae Radix* reported significant pharmacological activities such as antibacterial, antidepressant, sedative, anti-anxiety, and immunomodulatory effects. The authors suggested that these activities are mainly associated with saponins and oligosaccharide esters present in the roots of *Polygala* species.

6. Several studies have also focused on the antioxidant potential of *Polygala* extracts. Methanolic and ethanolic extracts were found to possess strong free radical scavenging activity in DPPH and ABTS assays. The antioxidant effect was correlated with high phenolic and flavonoid contents.

7. Traditional medicinal systems in Asia have utilized *Polygala* species for the treatment of respiratory disorders, cough, inflammation, insomnia, and neurological disorders. Modern pharmacological investigations support many of these traditional claims and indicate the therapeutic importance of the genus.

8. However, despite the medicinal significance of the genus, detailed phytochemical and pharmacological studies specifically on *Polygala elongata* remain insufficient. Therefore, further scientific investigation is required to identify its bioactive compounds and validate its therapeutic potential through experimental studies.

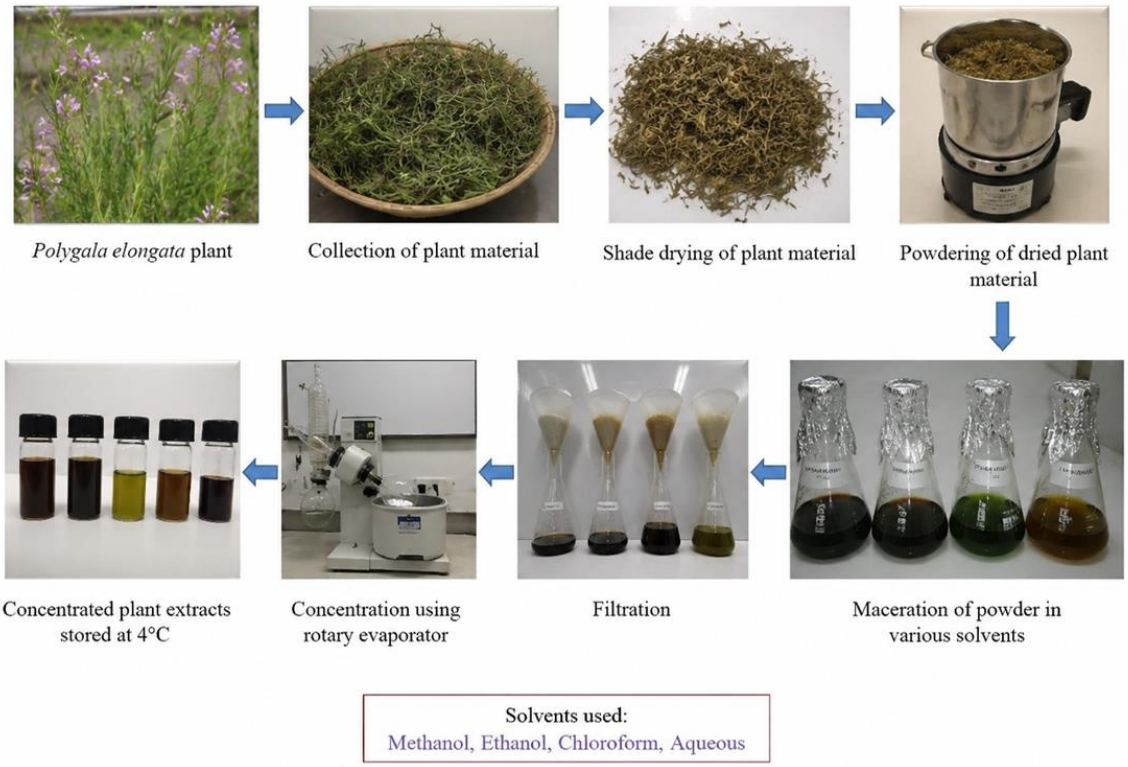
METHODOLOGY

Collection and Authentication of Plant Material

The plant material of *Polygala elongata* will be collected from its natural habitat during the flowering season. Healthy plant parts such as leaves, stems, roots, and flowers will be selected. The collected specimen will be authenticated by a qualified botanist/taxonomist, and a voucher specimen will be deposited in the herbarium for future reference.

Preparation of Plant Extract

- The collected plant material will be washed thoroughly with distilled water to remove dust and contaminants.
- The material will be shade dried at room temperature for 10–15 days.
- The dried material will be powdered using a mechanical grinder.
- The powdered sample will be stored in airtight containers.



Extraction Procedure

Figure- Preparation of Plant Extract

Extraction will be carried out using different solvents such as:

- Methanol
- Ethanol
- Aqueous solvent
- Chloroform

The extraction process will be performed by

- Soxhlet extraction method, or
- Cold maceration method

The obtained extracts will be filtered and concentrated using a rotary evaporator and preserved at 4°C for further studies.

Preliminary Phytochemical Screening

Qualitative phytochemical analysis will be performed to identify the presence of various bioactive constituents.

Phytochemical Constituents	Test Used
Alkaloids	Mayer's Test
Flavonoids	Shinoda Test
Tannins	Ferric Chloride Test
Saponins	Foam Test
Glycosides	Keller-Killiani Test
Phenols	Ferric Chloride Test
Terpenoids	Salkowski Test

Quantitative Phytochemical Analysis

Quantitative estimation of important phytochemicals will be conducted

- Total phenolic content
- Total flavonoid content
- Total saponin content

Standard spectrophotometric methods will be used.

Pharmacological Evaluation

A. Antioxidant Activity

Antioxidant activity will be determined using

- DPPH assay

- ABTS assay
- Hydrogen peroxide scavenging assay.

Ascorbic acid will be used as the standard

B. Antibacterial Activity

The antibacterial activity of plant extracts will be evaluated using:

- Agar well diffusion method
- Disc diffusion method

Test organisms may include

- *Escherichia coli*
- *Staphylococcus aureus*
- *Bacillus subtilis*

C. Anti-inflammatory Activity

Anti-inflammatory activity will be assessed by

- Protein denaturation assay
- Membrane stabilization assay

D. Neuroprotective Activity

Neuroprotective potential may be studied using experimental animal models to evaluate memory-enhancing and CNS protective effects.

Instrumental Analysis

Advanced analytical techniques will be employed for identification of bioactive compounds

- Thin Layer Chromatography (TLC)
- High Performance Liquid Chromatography (HPLC)
- Gas Chromatography–Mass Spectrometry (GC-MS)
- Fourier Transform Infrared Spectroscopy (FTIR)

Statistical Analysis

All experimental results will be expressed as Mean ± Standard Deviation (SD). Statistical analysis will be performed using:

- ANOVA
- Student's t-test

A value of $p < 0.05$ will be considered statistically significant.

Ethical Considerations

If animal experimentation is involved, ethical approval will be obtained from the Institutional Animal Ethics Committee (IAEC) before conducting the study.

CONCLUSION

The present study on Polygala elongata indicates that the plant possesses significant phytochemical and pharmacological potential. Preliminary phytochemical investigations reveal the presence of important bioactive constituents such as flavonoids, saponins, alkaloids, tannins, phenolic compounds, and terpenoids, which are known to contribute to various therapeutic activities.

Pharmacological studies reported in related *Polygala* species suggest that the plant may exhibit antioxidant, anti-inflammatory, antimicrobial, neuroprotective, expectorant, and anxiolytic properties. These biological activities support the traditional medicinal uses of the genus in the treatment of respiratory disorders, inflammation, and nervous system-related conditions.

Although limited scientific data are available specifically for *Polygala elongata*, the findings from the present review indicate that the plant has considerable medicinal importance and may serve as a valuable source of natural therapeutic agents. Further detailed phytochemical isolation, toxicological evaluation, and clinical investigations are required to validate its safety, efficacy, and pharmaceutical applications.

Therefore, *Polygala elongata* can be considered a promising medicinal plant for future research and development of herbal formulations and novel drug compounds.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to my teachers, friends, and family members for their valuable support and encouragement during the completion of this research paper entitled **“Phytochemical and Pharmacological Properties/Activities of Polygala elongata.”**

I am also thankful to all researchers and authors whose published articles and journals helped me in completing this work successfully.

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