OPEN ACCESS
Scholars Bulletin
Abbreviated Key Title: Sch Bull
ISSN 2412-9771 (Print) |ISSN 2412-897X (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Subject Category: Zoology

Therapeutic Role of *Lallemantia royleana* (Balangu Seeds) and Its Pharmacological Properties: An Overview

Aisha Saleem[1*], Muhammad Waqar[1], Ayesha Aslam[1], Asifa Mobeen[1], Ansa Tariq[1], Farwa Muhammad Ali[1]

[1]M. Phil Researcher, School of Zoology, Minhaj University Lahore, Pakistan

DOI: 10.36348/sb.2022.v08i09.003 | **Received:** 04.09.2022 | **Accepted:** 10.10.2022 | **Published:** 13.10.2022

***Corresponding author:** Aisha Saleem
M. Phil Researcher, School of Zoology, Minhaj University Lahore, Pakistan

Abstract

Balangu *(Lallemantia royleana*) is a member of the *Lamiaceae* or Labiateae family. In Pakistan commonly called Tukhmalanga. This valuable medicinal plant is indigenous to tropical Asia, including India, Afghanistan, and Pakistan. The chemical analysis of Lallemantia royleana seed showed that the seeds contained: protein 25.60%, fat 18.27%, fiber 1.29%, alkaloids, anthraquinones, flavonoids, glycosides, pholobtannin tannins, volatile oils, mixed fatty acids and terpenoids. It exerted many pharmacological effects included antimicrobial, antioxidant, antidepressant, anxiolytic, sedative, antiemetic, hypolipidemic, protective and many other pharmacological effects. The current review discussed the Lallemantia royleana as a beneficial medicinal plant. It can be a good remedy for skin disease. Further screening for phytochemicals should be carried out in search of novel therapeutic compounds.

Keywords: *Lallemantia royleana*, Medicinal plants, chemical constituents, Pharmacology.

INTRODUCTION

Nature has been a source of medicinal agents for thousands of years, and an impressive number of modern drugs have been isolated from natural sources, many based on their use in traditional medicine. Various medicinal plants have been used for years in daily life to treat disease all over the world. Traditional medicine using plant extracts continues to provide health coverage for over 80% of the world's population, especially in the developing world [1]. The plant known as balangu *(Lallemantia royleana*) is a member of the *Lamiaceae* or Labiateae family. In Pakistan commonly called Tukhmalanga. This valuable medicinal plant is indigenous to tropical Asia, including India, Afghanistan, and Pakistan. Its seeds are widely cultivated throughout Pakistan, particularly in the provinces of Chishtian, Attock, and Layyah [2-4]. The plant can also be found in various parts of Middle Eastern and European nations, including Turkey, Iran, and Western Siberia in the Russian Federation. Balangu seeds, which have high mucilage content and can be utilized as a novel source of hydrocolloid in food formulations as well as a variety of traditional or commercial products in Turkey and Iran, quickly absorb water through the hydration process and generate a sticky, turbid, and tasteless liquid [5, 6].

Its seed gum is made up of 8.33% ash, 0.87% protein, 61.74% carbs, and 29.66% crude fiber [7]. The mucilaginous seeds are typically utilised as healing remedies for a variety of illnesses. Coughing is known to be treated by the plant's roots, while boils, abscesses, and inflammations can be treated with moistened seed poultices. *L. royleana* is one of the primary components of an ointment used to treat skin tumours in Chinese medicine. The plant's seeds are also sedatives and are thought to be cephalic astringents, heart tonics, carminatives, and calming agents for stomach warmth and intestinal discomfort [8-10, 21]. Pneumonia is treated using the leaf and root decoctions. In India, the plant is also utilized to make herbal brain tonics [5, 23].

Muslims utilized the seeds of this plant to flavor, chill, soothe, and sedate drinks. A component of herbal combinations used to treat depression and anxiety disorders includes seeds. Mucilage from seeds is also used as a liniment for skin issues [11, 12]. The seeds were employed in traditional medicine as an aphrodisiac, diuretic, tonic, and for the treatment of

numerous neurological, hepatic, and renal conditions as well as an anti-jussive [13, 14].

Figure 1: A) *Lallemantia royleana* plant B) *Lallemantia royleana* seeds [15]

Table 1: Scientific classification

Kingdom	**Plantae**
Division	Magnoliophyta
Class	Magnoliopsida
Order	Lamiales
Family	Lamiaceae
Genus	Lallemantia
Species	royleana
Scientific name	*Lallemantia royleana*

Chemical components

According to a chemical examination of *Lallemantia royleana* seeds, the seeds have the following chemical compositions: dry matter (92.75%), ash (3.63%), crude protein (25.60%), crude fat (18.27%), crude fibre (1.29%), alkaloids, anthraquinones, flavonoids, glycosides, pholobtannin tannins, volatile oils, mixed fatty acids, terpenoids and NDF (insoluble fibre in neutral detergent fluid) [32, 25]. 30.67% for detergent, and 47.80% for ADF (insoluble fibre in acidic detergent) [17]. However, Farahnaky et al. demonstrated that the whole seeds had moisture content of 6.05 and protein content of 2.93 ash 2.98, fibre 24.24, fat 0.30 and total carbohydrates 87.74 The highest percentages of volatile oil, yield per hectar of volatile oil, specific gravity, density, and The *Lallemantia royleana* seed oil's refractive index was 2.75%, 14.24/ha, 0.980 mg/microliter, and 0.941degrees and mg/microliter [24-26].

The oils of the aerial parts of *Lallemantia royleana*, grown in Isfahan Province, Iran were analyzed by GC and GC–MS. Forty-six compounds, constituting 94.5% of the total components were identified [16, 34]. The components of Lallemantia royleana aerial parts oil (%) were: tricyclene 1.0, α-pinene 0.3, 1-octen-3-ol 0.1, 6- methyl-5-hepten-2-one 0.9, 3-octanone 0.5, 2-octanone 0.1, β-myrcene 2.8,3-octanal trace, α-phellandrene 0.3, δ-3-carene 3.1, α-terpinene 2.0, ρ-cymene 1.9, limonene 5.7, benzyl alcohol 1.6, 1,8-cineole 1.8, β-cisocimene 0.8, β-trans-ocimene 7.4, γ-terpinene 1.1, isobutanol 0.9, terpinolene 2.7, butanol 0.2, dehydrosabina ketone 0.5, iso-3-thujanol 0.7, sabina ketone 0.6, 3-thujene-2-one 7.8, myrtenal 1.7, myrtenol 0.2, verbenone 16.4, trans-carveol 9.8, cis-sabinene-hydrate acetate 0.2, cis-carveol 4.8, trans-sabinene-hydrate acetate 0.5, trans-sabinyl acetate 0.5, carvacrol 1.5, iso-dihydrocarvyl acetate trace, α-cubebene 0.8, αlongipinene 0.1, β-bourbonene 2.7, β-cubebene 8.9, α-cis-bergamotene trace, β-caryophyllene 0.6, α-transbergamotene 0.1, β-cis-farnesene trace, β-trans-farnesene trace, spathulenol 0.3 and α-muurolol 0.6%.

Health benefits of *Lallemantia royleana* seed [27]

Pharmacological properties:

Antimicrobial effects:

The antibacterial activity of Lallemantia royleana seeds extracts was assessed against Staphylococcus aureus, Enterobacter cloacae (IARS 7), Pseudomonas aeruginosa (IARS 9) and Escherichia coli at three different doses (100, 50, and 10 mg/ml) (IARS 3) [18-20]. All organic extracts of Lallemantia royleana seeds (methanol, ethanol, and chloroform) showed considerable anti-bacterial efficacy against all the tested bacteria, with the exception of aqueous extracts. Using the Vero cell line CCL-81-ATCC as a test subject, essential oils from Lallemantia royleana were examined for their inhibitory action against herpes simplex virus type 1 (HSV-1) in vitro [35, 16].

Antioxidant Activity:

The antioxidant effect of the methanolic extract of seeds of *Lallemantia royleana* was investigated using in vitro methods. *Lallemantia royleana* seeds have been used in Persian traditional medicine during the ages [31, 32]. The seeds are known as "Balngu" in Iran and still are widely used. The antioxidant activity of Lallemantia royleana seeds hydro- alcoholic extract was estimated by 2,2-diphenyl-1-picrylhydrazyl (DPPH) and ferric reducing antioxidant power (FRAP) assays. *Lallemantia royleana* seeds hydro- alcoholic extract possessed radical scavenging activity with IC50 value of 300 µg /ml [35].

Antidepressant effect:

Using a modified forced swimming test, the antidepressant activity of a methanolic extract of *Lallemantia royleana* seeds (25, 50, and 75mg/kg, orally) was examined in mice with an acute moderate stress model of depression. The methanolic extract of *Lallemantia royleana* seeds significantly reduced immobility in all doses. At 50 mg/kg, however, the percentage of time spent immobile was dramatically decreased [36, 22].

Hypo-lipidemic activity:

Lallemantia royleana was used to induce hypercholesterolemia in rabbits fed diets supplemented with 0.5 percent cholesterol for 12 weeks. For 12 weeks, various doses of entire Lallemantia royleana seeds (0, 5, 10, and 20%) were administered to hypocholesterolemic rabbits. All groups treated with *Lallemantia royleana* seeds saw a decrease in serum total cholesterol and triglycerides however; all groups treated with *Lallemantia royleana* seeds saw an increase in atherogenic index [37].

Mucilage as a food ingredient and in medicinal properties

The use of natural gums and mucilage as thickeners, suspending agents, emulsifying agents, and binders in pharmaceutical excipients has received much research [38]. Because of its high swellability when exposed to water, the mucilage isolated from the seeds of Lallemantia royleana showed a great swelling property and was non-irritating to the mucosal membrane, making it a potential good candidate for various pharmaceutical formulations [39, 30]. Lallemantia royleana seeds were introduced as a gelatin-free yoghurt stabiliser. The usual procedure was used to make the yoghurt [33]. After the milk had been pasteurised, tukhm-e-balangu (Lallemantia royleana) powder in the concentrations of 0.15, 0.2, and 0.25 was added. The yoghurt was kept at 4°C for 20 days, and at predetermined day intervals, it was examined for several physiochemical, microbiological, and sensory characteristics, including pH, titratable acidity, synersis, water holding capacity, total solids, viscosity, hardness, fat, protein, and ash [40].

The use of stabiliser and the pace of its assimilation had an impact on the specified properties. While yoghurt with 0.25% Lallemantia royleana produced the greatest results for physical and chemical metrics, yoghurt with 0.20% Lallemantia royleana received the highest rating for overall sensory acceptance. Super-disintegrant, a thickening agent, or a suspending agent [41].

Anxiolytic and sedative effects:

The anxiolytic and sedative-like effects of methanolic extract of *Lallemantia royleana* seeds. Anxiolytic activity was screened using behavioural tests such the open field, hole-board, raised plus maze, light-dark box, and staircase paradigm. As a benchmark, diazepam (1 mg/kg, ip) was used. At a dose of 250 mg/kg (p0.01), behavioural tests for anxiety showed the greatest increase in anxiolytic parameters without changing [42].

CONCLUSION

Lallemantia royleana possessed many pharmacological effects included antimicrobial, antioxidant, antidepressant, anxiolytic, sedative, antiemetic, hypolipidemic, protective and many other pharmacological Properties. The current review discussed the Lallemantia royleana as a beneficial medicinal plant. The results of this investigation indicated that Balangu had a high potential of antioxidant and antibacterial properties.

REFERENCE

1. Karakoca, K., Ozusaglam, M. A., Cakmak, Y. S., & Karaman, E. S. (2013). Antioxidative, antimicrobial and cytotoxic properties of Isatis floribunda Boiss. ex Bornm. Extracts. *EXCLI J*, 12,150–157.
2. Abbas, M., Mehmood, T., Bashir, A., Zafar, M., & Afzal, A. (2012). Economics of Lallemantia royleana (tukham-e-balangoo) production in the low intensity cropping zone of the Punjab, Pakistan. *Pakistan Journal of Agricultural Research*, *25*(2), 12-14.
3. Hayat, M. Q., Khan, M. A., Ahmad, M., Shaheen, N., Yasmin, G., & Akhter, S. (2008) Ethnotaxonomical Approach in the Identification of Useful Medicinal Flora of Tehsil Pindigheb (District Attock) Pakistan. *Ethnobot Res Appl*, 6, 35-62.
4. Ghannadi, A. R., & Zolfaghari, B. (2003). Compositional Analysis of the Essential Oil of Lallemantia royleana Benth. *J. Flavour Fragr*, 18, 237-239.
5. Morton, J. F. (1990). Mucilaginous plants and their uses in medicine. *J.Ethnopharmacol*, 29(3), 245-66.
6. Razavi, S. M. A., Mohammadi Moghaddam, T., & Mohammad Amini, A. (2008). Physical-mechanical properties and chemical composition of Balangu seed, *International Journal of Food Engineering*, 4(5).
7. Ghannadi, A. R., & Zolfaghari, B. (2003). Compositional Analysis of the Essential Oil of Lallemantia royleana Benth. *J. Flav. Fragr*, 18, 237-239.
8. Samee, H., Li, Z. X., Lin, H., Khalid, J., & Guo, Y. C. (2009) Anti-allergic effects of ethanol extracts from brown seaweeds. *J. Zhejiang Univ Sci*, 10(2), 147-153.
9. Naghibi, F., Mosaddegh, M., Motamed, S. M., & Ghorbani, A. (2005). Labiatae family in folk medicine in Iran: from ethnobotany to pharmacology. *Iran J Pharm Res*, 2, 63-79.
10. Mahmood, S., Hayat, M. Q., Sadiq, A., Ishtiaq, S., Malik, S., & Ashraf, M. (2013). Antibacterial activity of Lallemantia royleana (Benth.) indigenous to Pakistan. Afri *J Microbiol Res*, 7(31), 4006-4009.
11. Bozorgi, M., & Vazirian, M. (2016). Antioxidant activity of Lallemantia royleana (Benth.) seed extract. *Trad Intrgr Med*, 1(4), 147-150.
12. Ghannadi, A., & Zolfaghari, B. (2003). Compositional analysis of the essential oil of Lallemantia royleana (Benth. In Wall.) Benth from Iran. *Flavour Frag J*, 18, 237- 239.
13. Amin, G. R. (2005). Popular medicinal plants of Iran. *Publications of Tehran University of Medical Sciences, Tehran*, 2(3), 66-67.
14. Razavi, S. M. A., Mohammadi-Moghaddam, T., & Mohammad-Amini, A. (2008). Physico-mechanic and chemical properties of balangu seed. *Int J Food Eng*, 4(5), 1-10.
15. Farahnaky, A., Askari, H., & Bakhtiyari, M. (2009). Rheology of balangu Shirazi (*Lallemantia royleana*) seed gum: a high viscosity thickening agent. In: Gums & stabilizers for the food industry 15. Editors: Peter A. Williams and Glyn O. Phillips. RSC press, 190-200.
16. Al-Snafi, A. E. (2016). Antiparasitic, antiprotozoal, molluscicidal and insecticidal activity of medicinal plants (part 2) – plant based review. *Sch Acad J Pharm*, 5(6), 194-207.
17. Al-Snafi A.E. (2015). Therapeutic properties of medicinal plants: a review of their dermatological effects (part 1). *Int J of Pharm Rev & Res*, 5(4), 328-337.
18. Al-Snafi, A. E. (2016). Arabian medicinal plants with dermatological effects- plant based review (part 1), *IOSR Journal of Pharmacy*, 8(10), 44-73.
19. Al-Snafi AE. (2016). Medicinal plants with anticancer effects (part 2)- plant based review. *Sch Acad J Pharm*,5(5), 175-193.
20. Al-Snafi, A. E. (2018). Arabian medicinal plants with antiinflammatory effects- plant based review (part 1). Journal of Pharmacy; 8(7), 55-100.
21. Mishra, S., Bhandari, A., Parvez, N., & Sharma, P. K. (2015). Extraction of *Lallemantia royleana* seed mucilage as pharmaceutical excipient. *World*

Journal of Pharmaceutical Research, 4(4), 1578-1589.

22. Bahramparvar, M., Khodaparast, M. H., & Razavi, S. M. (2009). The effect of *Lallemantia royleana (Balangu)* seed, palmate-tuber salep and carboxymethyl cellulose gums on the physicochemical and sensory properties of typical soft ice cream. *International Journal of Dairy Technology*, 62(4), 571-576.
23. Daneshmandi, M. S., Afshari, R. T., & Haghighi, R. S. (2017). Identification of chemical and biochemical characteristics of balangu seeds (Lallemantia royleana Benth.) Benth.in Wall) under accelerated aging conditions. *Iranian Journal of Seed Science and Technology*, 6(1), 23-37.
24. Sharifi-Rad, J., Hoseini-Alfatemi, S. M., Sharifi-Rad, M., & Setzer, W. N. (2015). Chemical composition, antifungal and antibacterial activities of essential oil from Lallemantia royleana (Benth. in Wall.) Benth. *J Food Safety*, 35(1), 19-25.
25. Behbahani, B. A., & Imani Fooladi, A. A. (2018). Shirazi balangu (Lallemantia royleana) seed mucilage: Chemical composition, molecular weight, biological activity and its evaluation as edible coating on beefs. *Int J Biol Macromol*, 114, 882-889.
26. Razavi, S. M. A., Cui, S. W., & Ding, H. (2016). Structural and physicochemical characteristics of a novel water-soluble gum from Lallemantia royleana seed. *International journal of biological macromolecules*, *83*, 142-151.
27. Farhadi, N. (2017). Structural elucidation of a water-soluble polysaccharide isolated from Balangu shirazi (Lallemantia royleana) seeds. *Food Hydrocolloids*, *72*, 263-270.
28. Iram, F., Massey, S., Iqbal, M. S., & Ward, D. G. (2018). Structural investigation of hemicelluloses from Plantago ovata, Mimosa pudica and Lallemantia royleana by MALDI-ToF mass spectrometry. *Journal of Carbohydrate Chemistry*, *37*(5), 285-301. Doi: 10.1080/07328303.2018.1487973
29. Sharifi-Rad, J., Mnayer, D., Roointan, A., Shahri, F., Ayatollahi, S. A. M., Sharifi-Rad, M., & Molaee, N. (2016). Antibacterial activities of essential oils from Iranian medicinal plants on extended-spectrum Î²-lactamase-producing Escherichia coli. *Cellular and molecular biology*, *62*(9), 75-82.
30. *Lallemantia royleana*, Chapter 4, http://shodhganga .inflibnet.ac.in/ bitstream/ 10603/ 93051 /5/chapter-%204.pdf
31. Sharifi-Rad, J., Salehi, B., Schnitzler, P., Ayatollahi, S. A., Kobarfard, F., Fathi, M., Eisazadeh, M., & Sharifi-Rad, M. (2017). Susceptibility of herpes simplex virus type 1 to monoterpenes thymol, carvacrol, p-cymene and essential oils of Sinapis arvensis L., Lallemantia royleana Benth. and Pulicaria vulgaris Gaertn. *Cell Mol Biol*, 63(8), 42-46.
32. Lallemantia royleana, Chapter-5, http://shodhganga.inflibnet.ac.in/ bitstream/ 10603/ 89777/11/chapter-5.pdf
33. Hyder, N., Naqvi, B. S., Ishaq, H., Usman, S., Naqvi A. A., & Naveed, S. (2016). Effect of *Lallemantia royleana seeds Benth (Lamiaceae*) seeds using acute mild stress model in NMRI male mice of depression. *J Biotech and Biosafety*, 4(2), 378-382.
34. Hyder, N., Musharraf, S. G., & Shyum Naqvi, S. B. (2017). Diazepam-like effects of *Lallementia royleana Benth*. (Lamiaceae) seeds in anxiety disorder. *Journal of the Neurological Sciences*, 381, 607–608.
35. Ghannadi, A., Movahedian, A., & Jannesary, Z. (2015). Hypocholesterolemic effects of balangu (*Lallemantia royleana)* seeds in the rabbits fed on a cholesterol-containing diet. Avicenna *J Phytomed*, 5(3), 167-173.
36. Mohtasheemul, H. M., Salman, A., Ziauddin, A., & Iqbal, A. (2012). Anti-emetic activity of some aromatic plants. *Journal of Pharmaceutical and Scientific Innovation*, 1(1), 47-49.
37. Kareem, A. M. (2016). Possible protective effect of Unani formulation against isoproterenol induced toxicity in SVEC cells. doi: https://doi.org/10.1101/062802
38. Ali, S., Parvez, N., & Sharma, P. K. (2016). Extraction and evaluation of Lallemantia royleana mucilage. *WJPPS*, 5(6), 1056-1066.
39. Abdulrasool, A. A., Naseer, A. A., & Rahi, F. A. (2011) Application of seed mucilage extracted from *Lallemantia royleana* as a suspending agent. *Iraqi J Pharm Sci*, 20(1), 8-13.
40. Atabaki, R., & Hassanpour-Ezatti, M. (2014). Improvement of lidocaine local anesthetic action using *Lallemantia royleana seed* mucilage as an excipient. *Iran J Pharm Res*, 13(4), 1431-1436
41. Al-Snafi, A. E. (2016). Medicinal plants with antimicrobial activities (part 2): Plant based review. *Sch Acad J Pharm*, 5(6), 208-239.
42. Al-Snafi, A. E. (2016). Antimicrobial effects of medicinal plants (part 3): plant based review. *IOSR Journal of Pharmacy*, 6(10), 67-92.