Medical Benefit of Lallemantia Iberica- A Review

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Abstract

Lallemantia iberica (Family: Lamiaceae) is used traditionally as stimulant, diuretic, expectorant, in the treatment of common cold, coughing, stomach, and abdominal pain. It produced many secondary metabolites such as phenolic acids, flavonoids, tannins, triterpen, mucilage, and oil. It possessed many pharmacological effects included analgesic, antibacterial, and antioxidant effects. The current review discussed the chemical constituents and pharmacological effects of Lallemantia iberica.

Keywords: Constituents, Pharmacology, Lallemantia Iberica.

Introduction

As a result of accumulated experience from the past generations, today, all the world's cultures have an extensive knowledge of herbal medicine. Two-thirds of the new chemicals identified yearly are extracted from higher plants. 75% of the world's population used plants for therapy and prevention. In the US, where chemical synthesis dominates the pharmaceutical industry, 25% of the pharmaceuticals are based on plant-derived chemicals [(1)]. Recent reviews revealed that the medicinal plants possessed a wide range of pharmacological effects [(2-13)]. Lallemantia iberica (Family: Lamiaceae) is used traditionally as stimulant, diuretic, expectorant, in the treatment of common cold, coughing, stomach, and abdominal pain. It produced many secondary metabolites such as phenolic acids, flavonoids, tannins, triterpen, mucilage, and oil. It possessed many pharmacological effects included analgesic, antibacterial, and antioxidant effects. The current review discussed the chemical constituents and pharmacological effects of Lallemantia iberica.

Plant profile:

Synonyms: Dracocephalum aristatum, Dracocephalum ibericum, Lallemantia kopetdaghensis, Lallemantia sulphurea [(14)].

Taxonomic classification:

Kingdom: Plantae, **Phylum**: Spermatophyta, **Subphylum**: Angiospermae, Class: Dicotyledonae, Order: Lamiales, Family: Lamiaceae, **Genus**: Lallemantia, **Species**: Lallemantia iberica [(14-15)].

Common names:

Arabic: Simsim Bari; **English:** Dragon's head; **German:** kaukasischer Ölziest, **Persian:** Balangooshahri; **Swedish:** småblommigazurläpp; **Turkish**: ajdarbaşi[(15-16)].

Distribution:

It is native to Asia; Armenia; Azerbaijan; Russian Federation-Ciscaucasia, Turkmenistan, Iran, Iraq, Palestine, Jordan, Lebanon, Syria, and Turkey. In Europe, it is recorded in Belgium, France, Romania, and Russian Federation (14, 17)

Description:

It is an annual or perennial herb, or dwarf shrub, at maturity stage, the plant high is of 40.8 cm. The leaves are disposed in pairs on each stem node (opposite leaves), the average number of pair leaves on the main stem been 16. The leaf length on the main stem increases from the bottom up to the leaf four then decreases upwards. Each leaf has tow bracts, one on each side of the leaf, each bract having a stalk of 2 mm length and the edge with awns. The branching process takes place at the first six nodes on the main stem, the branches developing from each leaf axils (opposite branches). The inflorescence starts to develop in verticillus from the seventh node upwards the stem, once the seventh pair of leaves is fully unfolded. Calyx presents five triangular teethe, among which two are inferiors, two lateral, and one superior; corolla has white color and presents two lips, the upper lip with two lobes, and the lower lip with three lobes; there are four stamens, two of them longer and two of them shorter[18].

Traditional uses:

Lallemantia iberica seeds are traditionally used as reconstitute, stimulant, diuretic, and expectorant, for the treatment of common cold, coughing, stomach and abdominal pain [19-20]. Its seed contained mucilage which used in the treatment of nervous, hepatic, and renal diseases and as a general tonic [21]. Oil is used for lighting, as a varnish, in paints, and as a lubricant. The oil may also be used for oil-foods and as a tanning agent. It is considered as a linseed substitute in a number of applications including: wood preservative, ingredient of oil-based paints, furniture polishes, printing inks and soap making. It is also used in the manufacture of linoleum [22-23].

Chemical constituents:

Lallemantia iberica produced a number of secondary metabolites such as phenolic acids, flavonoids, tannins and triterpen [19, 24]. The seed of Lallemantia iberica contained up to 30% (even 35-38%) of dryingoil [18, 25]. Lallemantia oil content of fatty acid is the following: 6.5% palmitic acid, 1.8% stearic acid, 10.3% oleic acid, 10.8% linoleic acid, and 68.0% linolenic acid [20].

The lipid composition of the seed oil of three varieties (L-74, VIR-11, and BGR-455) of Lallemantia iberica from Bulgaria is studied. Triacylglycerols (>90%), phospholipids (<3%), sterol esters (~0.2%), with companying compounds [sterols (~0.3%) and tocopherols (336–499 mg/kg)] are determined. Nineteen triacylglycerols species are identified, of these the highly unsaturated trilinolenin, dilinolenyllinoleate and dilinolenylpalmitate comprised 59% of the total triacylglycerols. Phosphatidylcholine, phosphatidylinositol, and phosphatidyl ethanolamine are the main phospholipids. Beta-sitosterol is the main sterol component, followed by campesterol and stigmasterol. Gamma-tocopherol predominated (>90%) in the tocopherol fraction. Palmitic acid is the major fatty acid of the phospholipids and oleic acid dominated in the sterol ester fraction. The three varieties showed similar lipid compositions with BGR-455 being slightly more saturated [26.

The volatile oil analysis of the aerial parts of Lallemantia iberica growing wild in Iran showed that the oil of the aerial parts contained 11 compounds. It mainly consisted of germacrene-D (33.7%), delta-3-carene (19.0%), iso-caryophyllene (12.8%), sabinene (11.1%), alpha-terpinene acetate (6.5%) and limonene (4.4%) [27].

The essential oil analysis of wild-growing Lallemantia iberica in Turkey revealed identifying of 40 components. Germacrene-D (36.0 %), β-caryophyllene (18.3 %) and bicyclogermacrene (9.7 %) represented the main constituents [28].

The chemical components of the essential oils of the arial parts of Lallemantia iberica, collected in 2 stages (flowering and post-flowering) in Hashtgerd of Iran are examined by GC and GC-MS. 36 components are characterized in flowering stage, β-cubeben (19.55%), linalool (18.71%), spathulenol (18.04%), β-caryophyllene (11.11%), geraniol (3.50%) and bicyclogermacrene (3.46%) are the major constituents. Constituents represented monoterpenes (33.85%) and sesquiterpens (63.54%). About 39 components of essential oil of post-flowering

stage are detected, caryophylene oxide (38.77%), linalool (15.15%), Germacrene-D (7.03%), Trans-caryophylene (5.61%), β-bourbonene (4.96%) and Trans-geraniol (4.34%) as the major constituents. Components represented monoterpens (26.51%) and sesquiterpens (69.23%) [29].

The analysis of essential oils of the dried flowering aerial parts of Lallemantia iberica from the suburb of Larijan, north of Iran, showed that the main constituents are, p-cymene (22.1%), isophytol (19.8%), T-cadinol (11.1%), 3-octanol (8.1%), caryophyllene oxide (7.4%) and terpinen-4-ol (5.7%)[30].

The hydrodistillation of Lallemantia iberica callus provided colorless oil with a yield of 0.1% (v/w). The GC-MS analysis of the essential oil revealed nine components representing 97.52% of the oil. The oil mainly consisted of thymol (53.03%), octane (19.90 %), decane (5.73%), and carvacrol (5.63 %). The oil is characterized by oxygenated monoterpenes (58.68%) and hydrocarbones (35.13%) [31].

Two sterols, β-sitosterol acetate, β-sitosterol, one triterpenoicacid, ursolic acid, one polyphenol, rosmarinic acid and six flavonoides: luteolin-7-O-glucoside, 4'-methoxy-luteolin-7-Oglucoside, apigenin-7-O-glucoside, luteolin, diosmetin and apigenin are isolated from the ethyl acetate and methanol extracts of Lallemantia iberica aerial parts [32].

A putrescine bisamide phenolic glycoside, N- (trans-feruloyl)-N′-(para-hydroxybenzoyl) putrescine bisamide-4′-O-α-l-rhamnopyranoside and phenolic glycoside, cucurbitoside D, are isolated from the seeds of Lallemantia iberica [33].

Analysis of Lallemantia ibrica seed gum showed that the seed gum is a high molecular weight polysaccharide (5.74×10^6 g/mol) containing, 89.60% carbohydrate, 2.98% protein, 8.95% ash, 0.2% fat and 6.52% moisture[34].

The dried mucilage of Lallemantia iberica had average 4.93% moisture, 95.06% dry weight and 0.28% ash [22]. It composed of galacturonic acid, galactose, mannose, arabinose, xylose, glucose and rhamnose monosaccharide [25].

Pharmacological effects:

Analgesic effect:

The antinociceptive effect of methanolic extract of (80, 100 and 300 mg/kg, ip) of Lallemantia iberica is evaluated in rats. Lallemantia iberica leaf extract significantly inhibited the number of contractions induced by acetic acid. All doses showed antinociceptive activity in the tail flick model. In formalin test, the highest effect is observed at dose of 300 mg/kg ($p<0.01$)[36].

Antibacterial effect:

The antibacterial effect of Lallemantia iberica seed extracts is studied against Pseudomonas aeruginosa, P. fluorescence, Bacillus subtilis, B. antheracoid, B. coagulanse, B. cereus, B. sphericus, Escherchia coli O157, Salmonella liatica, and S. typhymorium ATCC3598, using disk-diffusion antibiotic sensitivity testing. The seed hydroalcoholic extract of Lallemantia iberica possessed high antibacterial effect against Pseudomonas aeruginosa (18.3±6.5mm), Bacillus subtilis (16.6±4.1mm) and Bacillus sphericus (15.3±3mm). This extract also exerted moderate effect against Salmonella typhymorium ATCC3598(14.6±2.3mm), Bacillus cereus (11.3±2.5mm) and Escherchia coli O157 (9.6±1.5mm). Other bacteria are not affected by Lallemantia iberica seed extract[37].

Antioxidant effect:

The antioxidant activity of the ethyl acetate (IC_{50} 189.95±2.8 µg/ml) and the methanol extracts (IC_{50} 140±1.2 µg/ml) are compared to the standard antioxidant, BHA (IC_{50} 100±1.6 µg/ml) in DPPH method. The reducing

power of the ethyl acetate (300.28 µmol Eq $FeSO_4.7H_2O$/mg DW), and methanol extract (553.14 µmol Eq $FeSO_4.7H_2O$/mg DW) and BHA (558.36 µmol Eq $FeSO_4.7H_2O$/mg of standard) are elucidated in FRAP assay[32].

The essential oils from the arial parts of Lallemantia iberica showed antioxidant activities as calculated by two in vitro assays; DPPH radical scavenging and ferric reducing power assay (FRAP). All samples possessed inhibitory activity, essential oils in post-flowering exhibited the highest radicals scavenging potential (IC_{50}=70µg/ml) following by essential oils in flowering stage (IC_{50}=100µg/ml). The greatest activity is obtained by essential oils in post-flowering stage (IC_{50}=70µg/ml), it is more effective than BHA (IC_{50}=100µg/ml), and less effective than α-tocopherol (IC_{50}=40µg/ml)[21].

Conclusion:

Lallemantia iberica (Family: Lamiaceae) is used traditionally as stimulant, diuretic, expectorant, in the treatment of common cold, coughing, stomach, and abdominal pain. It produced many secondary metabolites and possessed many pharmacological effects. The current review discussed the chemical constituents and pharmacological effects of Lallemantia iberica as a promising therapeutic agent because of its efficacy and safety.

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