

Review Article

Phyto-chemical profile and pharmacological activities of *Banafsha* (*Viola odorata* Linn): An important herb of Unani Medicine

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Abstract

Background: Herbal medicine is the source of primary health care due to its cultural acceptability and better compatibility with the human body and lesser side effects. *Banafsha* (*Viola odorata* Linn) is an important medicinal plant in the Unani system of medicine (USM) due to its multiple therapeutic properties.

Objectives: Present review is aimed at exploring the existing data of the drug on its conventional uses especially in USM, its phytochemical constituents and pharmacological actions.

Materials and Methods: Various authentic data base including classical text, indexed journals have been reviewed and analysis.

Observations and results: The plant is known to treat different systemic ailments due to the presence of volatile oil, glycosides, flavonoids, saponins, phenolic compounds, triterpenes, sterols, resins, tannins and anthocyanins. In USM, the pharmacological actions of *Banafsha* are *Sual Yabis* (Dry cough), *Mushil-i-Balgham* (Purgative of Phlegm) *Mulattif* (Demulcent), *Muhallil-i-Waram* (Resolvent), *Mushil wa Muaddil Safra* (Purgative of yellow bile), *Musakkin-i-Atash* (Thirst Quenching), *Mulayyan* (Laxative) etc. *Banafsha* is reported for its anti-asthmatic, antipyretic, anti-inflammatory, antioxidant, antimicrobial, hepato-protective, and hypnotic activity etc.

Conclusion: Present study explores the pharmacological, phytochemical and therapeutic properties of *Viola odorata* Linn. Many pharmacological activity mentioned in Unani medicine is validated and many activity needs further exploration owing to immense therapeutic scope in this drug.

Keywords: *Banafsha*, Unani system of medicine, *Viola odorata* Linn

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Introduction

Recent studies reveal that more than 80 per cent of the world's population relies on herbal medicine for its therapeutic effects. [1] In India, the treatment of various diseases by native plants has provided a lot of remedy to cure many ailments of humanity.[2] As per WHO, 'any plant or its components containing substance that can be used conventionally or can be used for pharmaceutical synthesis is classified as a drug'.[3] In the current scenario, around 300 species of aromatic and medicinal plants are used worldwide in the pharmaceutical, cosmetics, food and fragrance industries.[4] One of the medicinally important plant used for the purposes of obtaining drugs is *Banafsha*.

The drug has been in use in India since very old times and is therapeutically been used by Unani and Ayurveda system of medicine. *Banafsha* is available in market in three varieties, dried aerial parts of the herb (flowers, stems, and leaves), dried flowers (*Gul-e-Banafsha*), [5] and dried aerial parts without flowers (*Berg-e-Banafsha*). Leaves are broadly ovate-cordate, tufted and crenate. [6] In Indian commercial drug market, the genuine *Banafsha* is available in two forms, the first is violet flowers (*Gul-e-Banafsha*) and the other is whole plant (*Kashmiri Banafsha*). Flowers and whole plant is used as a drug.[7]

Material & Methods

Present review has been prepared to analyse the existing data about the drug *Banafsha* (*Viola odorata* Linn) through thorough detailed information on conventional uses especially in USM, with its phytochemical constituents and reported pharmacological actions. Various authentic data bases including classical and contemporary text, indexed journals have been reviewed and conclusions have been drawn.

Observations

Historical background: has been described by old Hindu Physicians.[7] The violet flowers were used in olden times for various diseases especially for eyes and fever with shivering.[8]

Scientific classification

Kingdom:	Plantae ^[9]
Subkingdom:	Traceobionta
Superdivision:	Spermatophyta
Division:	Mangoliophyta
Class:	Mangoliopsida
Subclass:	Dilleniidae
Order:	Violales
Family:	Violaceae

Genus:	<i>Viola</i> L
Species:	<i>Viola odorata</i> L.
Botanical name:	<i>Viola odorata</i> Linn.

Vernacular names

Unani: *Abru*^[10], *Banafsha*, *Banafsaj*, *Kakosh*, *Fareer*^[11]; **Arabic:** *Banafsaj*, *Farfer*^[10]; **Persian:** *Kokash*^[10], *Gul-e-Banafsha*^[5]; **Hindi:** *Banafsha*^[10]; **English:** Violet, Sweet violet^[6]; **Sanskrit:** *Banaphasha*^[12]; **Bengali:** *Banafshah*, *Banosal*^[6]; **Siryani:** *Makenaas*^[10]

Habit and Habitat: Hilly areas of Kashmir and Nepal [13] Kangra and Chamba, at altitudes of 1500-1800 meters.[6] North temperate zones^[7] Pakistan (real habitat)^[10] Iran, Iraq, Afghanistan, Mediterranean region and Caucasiav areas. It is represented by 1 genus (*Viola*) and 17 species in Pakistan. [14]

Botanical description: The plant of *Viola odorata* Linn. is a creeping weed with no stem. Plant is rarely more than 15 cm in height. In north India, plant grows only in winters. Cool and moist climate is very helpful for growing the plant. The whole plant is bitter in taste, hot and pungent. [8] It is a herb which arises from a root stock having a height of rarely more than 15 cm.[6]

Flower: Flowering occurs from April - May. Flowers are nodding and deep violet in colour with a bluish white base.[6] It can be yellow, white, purplish, blue or pink in colour.[12] Flowers have long filiform stalks. These are solitary axillary, pedicelate, hermaphrodite, zygomorphic, hypogynous and sweet scented. Flowers are 3-4 mm in length and 1.5-2.00 mm broad. They are tasteless and are mostly persistent and appendiculate (produced at the base). Corolla consists of 5 deep violet coloured petals. The anterior petal forms the base for landing the insects at the time of pollination and holds the honey secreted by the processes spurs of the connectives of the two lower petals. Androecium is consisting of five stamens which alternate with the petals and form a ring like structure around the ovary and style. Filaments are short with introse anthers. Gynaecium is syncarpous with three carpels, unilocular ovary and parietal placentation. Pollen grains are spherical in shape, smooth; thin walled and have a single germ pore. Size of pollen grains is approximately 28.40µ.[6]

Root: Root is dry, knotty and as thick as quill. Propagation occurs by seeds.[12]

Substitutes: *V. cinerea*, *V. boiss* and *V. sylvestris* are used as substitutes for *V. odorata* Linn.[7]

Description of

Drug in Unani: Plant grows in shady areas. Flowers are violet in colour and have strong fragrance (Dioscoroides).^[10] Height is of one Balisht (Hand) to one half Balisht. Branches are very thin. Flowers have a good fragrance. Branches are thin and all the branches arise from a single root. Each branch bears a single flower. There are many types of flowers but the most common are blue or sky blue in colour. The flower of *Kashmiri Banafsha* is smaller in size. Flowering occurs in winter season. Flower of the plant *Banafsha* which is blue in colour and have fragrance, is used generally.^[13] The whole plant is used as drug.^[15] It is of two types one is *Bustani* and the other is wild.^[13] Every branch of the plant bears flowers.^[16] Plant grows over the surface of the ground.^[17]

Hissa mustamela (Part used): *Gul* (Flowers) ^[6, 10]

Mizaj (Temprament): *Barid* (cold)¹⁰⁻ *Ratab* (moist)²⁰ ^[10] *Haar* (Hot 1⁰) - *Yabis* (Dry 1⁰)^[6, 18]

Afa'al (Pharmacological actions in Unani medicine): *Sual Yabis* (Dry cough), *Mushil-i-Balgham* (Purgative of Phlegm) *Mulattif* (Demulcent),^[13] *Muhallil-i-Waram*, (Resolvent) *Munaqqi Maida*. *Mudirr al-Bawl* (Diuretic),^[10] *Mushil* (Purgative), *Munawwim*, (Hypnotic),^{[10],[13]} *Jazib*, (Absorbent) *Muzliq*, (Lubricant) *Mushil wa Muaddil Safra* (Purgative of yellow bile), *Muaddil-i-Dam Tiryag* (Antidote), *Muhallil-i-Riyah-i-Qulanj* (Resolvent of gaseous Colic), *Musakkin-i-Atash* (Thirst Quenching), *Muarriq* (Diaphoretic), *Mulayyan* (Laxative). ^{[10],[13]}

Istemaal (Uses as per Unani literature): *Zukam* (Catarrh), *Khushunat-i-Halaq* (Sore throat), *Buhha al-Sawt* (Hoarseness of voice) *Sual harr* (Hot cough),^{[10],[13]} *Ehtibas-i-Bawl* (Anuria), *Suda-i-Humma Muharriqa*, *Suzash-i-Ain* (Irritation of eye), *Waram-i-Ama*, (Enteritis) *Suzash-i-Mida* (Irritation of Stomach), *Humma* (Fever), ^[13] *Suzash-i-Mida* (Irritation of Stomach),^[10] *Dhat al-riya* (Pneumonia), *Dhat al-janb* (Pleurisy), *Dard-i-Gurdah* (Renal colic),^[13] *Nar-i-Farsi*, (Eczema) *Amrad-i-Itfal*, (Ailments of Infants), *Suzish-i-Mathana* (Irritation of Urinary Bladder),^[10] *Suzash wa Waram-i-Halaq* (Pharyngitis)^[13], *Zukam*, (Catarrh) *Nazla* (Coryza)^[13] *Khumaq* (Ludwig's angina), *Umm al-Sabyaan*, *Suda-harr* (Headache due to excessive heat), *Ishal-i-Safrawi* (Bilious Diarrhoea).^[10]

Miqdare Khurag (Dose): Powder- 10.50- 22.50 *Masha* (gm)¹³ 10 - 20 gm,^[6] *Joshandah*- 3.75 *Tola*,^[13] 6 *Masha*.^[18]

Muzir (Adverse effects): *Murkhi Meda* (Stomach relaxant), *Zofe ishteha* (weakens of appetite), for *Qalb* (heart), *Khafqan* (Palpitation), ^{[10], [13]} *Mukarrib* (produce restlessness). ^[15]

Musleh (Corrective): *Aneesoon*, *Marzanjosh* ^[13]

Badal (Substitute): *Aslussoos*, *Gule Neelofer*, *Gaozaban*, ^{[10], [13]} *Berge Khubbazi* ^[13]

Murakkabat (Compound Formulations): *Khameerah Banafsha*, *Sharbat Banafsha*, *Habbe Banafsha*^[17], *Itrifal-e-Sana*, *Itrifal-e-Zamani*,^[19] *Roghan-e-Banafsha*,^[20] *Habb-e-Sil*, *Majoon-e-Antaki*, *Mufarreh-Motadil*, *Mufarreh Yaqooti Barid*, *Sharbat Eijaz*, *Dayaqooza*, *Habb-e-Ghariqoon*, *Zimad-e-Waram-e-Unsayain Muzmin*, *Qairooti Muhallil*, *Qarooti Bazar-e-Qatan*,^[5] *Habb-e-Nuzul-ul-Ma*, *Qurs-e-Zat-ul-Janb*, *Burood-e-Banafsaji*, *Qairooti-e-Akhzar*, *Qairooti-e-Arad-e-Baqala*, *Qairooti-e-Babuna Wali*, *Qairooti-e-Karnab*, *Qairooti-e-Mamool*,^[21] *Yashbi*, *Mufeed Joshanda*, *Sadri*, *Raughan-e-Benazeer*, *Sharbat Nazla*, *Habb-e-Yarqan*.^[22]

Reported Pharmacological activity

Cough suppression activity: In a clinical trial, the effect of *Viola odorata* flower syrup on cough of children with asthma was evaluated. 182 children aged 2 to 12 years suffering with intermittent asthma were randomly given 1:1 violet syrup or placebo along with the common standard treatments (short-acting b-agonist) in both groups evaluated in terms of the duration until cough suppression was achieved. This study displayed that the violet syrup as an adjuvant with short-acting b-agonist can enhance the cough suppression in children with intermittent asthma.^[23]

Antipyretic Activity: *Viola odorata* showed antipyretic activity in rabbits at the doses of 3% suspension prepared in 0.25% agar when administered at a constant dose volume of 5ml / kg (150 mg/kg).^[24]

Anti-inflammatory activity: Aqueous extract of *V. odorata* tested for anti-inflammatory properties as compared with hydrocortisone in rats by induction of lung injury by formalin via nebulisation, In this study it was found that *V. odorata* extract given prophylactic ally was effective partially in preventing lung damage and could possibly be used as an alternative for corticosteroids in management of inflammatory conditions of the lung.^[25]

Antioxidant activity: extracts of 4 medicinal and aromatic plants for antioxidant potency employing six various established *in vitro* system including *H. officinalis* L. var. *angustifolius* aerial parts, *C. speciosum* flowers, *V. odorata* and *B. hircana* leaves.

With regard to IC₅₀ values (µg/ml), the order in DPPH radical-scavenging were CS (585.6) > HO (311) > VO (245.1) > and BH (113.1).^[26]

Inhibitory potential of the dichloromethane, ethyl acetate, ethanol, and aqueous extracts of *V. odorata* was investigated against tyrosinase (TYR) and cholinesterases by microplate assays. Ethanol extract inhibited TYR (80.23 ± 0.87% at 100 µg mL⁻¹), and none of them were able to inhibit cholinesterases. Extracts were able to scavenge no radical more (31.98 ± 0.53–56.68 ± 1.10%) than other radicals tested, and displayed low to moderate activity. HPLC reveal substantial amount of vitexin rutin and vitexin, three flavonoids (rutin, isovitexin, and kaempferol-6-glucoside) were also isolated from the ethanol extract. This is the preliminary report on TYR inhibitory activity of VO ^[27]

Antimicrobial activity / Antibacterial activity:

Cyclotides isolated from the Iranian *V. odorata* plant was evaluated for its antimicrobial activities, radial diffusion assays, minimal inhibitory concentration (MIC) and minimal bactericidal concentration. Data analysis showed that MIC of semi purified cyclotides as 1.6mg ml⁻¹ against *Staphylococcus aureus*, gram-positive bacteria.^[28] In another study, dried aerial plant part extracted in petroleum ether, acetone, methanol and water by Soxhlet apparatus was evaluated for its antibacterial activity by agar well diffusion method and the minimum inhibitory concentration (MIC) (two fold serial dilution method) and Erythromycin as a positive control. Methanol extract displayed more activity than other extracts, zone of inhibition exhibited against tested microorganisms was 16 mm to 24 mm respectively and MIC values were recorded between 3.12 mg/ml to 12.5 mg/ml for all the organisms. Aerial parts of *V. odorata* displayed potent antibacterial activity against respiratory bacterial pathogens *Haemophilus influenza* MTCC 3826, MTCC 2474, *Staphylococcus aureus*, MTCC 1144, *Streptococcus pneumonia*, MTCC 655 and *Streptococcus pyogenes*, MTCC 442, *Pseudomonas aeruginosa*.^[29]

Potent bactericidal activity against gram negative bacteria was found in a study. Cycloviolacin O2 also displayed bactericidal activity against the Gram-negative species *Klebsiella pneumonia* and *Pseudomonas aeruginosa*.^[30]

Methanolic and aqueous extract of *V. odorata* flower showed moderate activity against salmonella typhi, salmonella typhi murium and salmonella paratyphi A. Aqueous extract was found to be more bactericidal than methanolic extract.^[31]

Anti-tubercular activity: pure constituent's extract of *V. odorata* was evaluated against Mycobacterium tuberculosis H37Rv and clinically isolated MDR-TB (*M. avium*, ATCC 25291). Results suggested *V. odorata* contained active compounds against *M. tuberculosis* H37Rv and *M. avium*, which can be used as a lead for developing anti-TB drug.^[32]

Hepato-protective study: *V. odorata* aqueous and methanolic extract (250 mg/kg and 500 mg/kg) was given to mice with paracetamol induced toxicity. Results displayed that extract significantly (p<0.01-0.001) reduced increased levels of serum hepatic enzymes and total bilirubin. Histopathological studies also suggested that it attenuated the hepatocellular necrosis and inflammation. HPLC on the extract displayed presence of hepatoprotective flavonoids (isorhamnetin and luteolin).^[33]

Sweet violet blossoms powder (SVBP) was also found effective in protecting against CCl₄-induced liver toxicity. phytochemicals of plants were able to prevent or inhibit CCl₄ hepatotoxicity displayed by liver serum enzymes-lowering activity and decreasing rate of the formation of MDA in serum.^[34]

Diuretic activity: diuretic activity of n-hexane, butanolic, methanolic and aqueous extract of *V. odorata* aerial parts at dose level of 200 and 400 mg/kg body weight, displayed diuretic activity and urine output was more for aqueous extract at a dose level of 400 mg/kg as compared to control group of animals. The study suggests that the diuretic activity of *V. odorata* may be due to presence of flavanoids glycosides in test extracts.^[35]

Anti-hypertensive and dyslipidemic activity:

an *in vivo* and *in vitro* assay indicates vasodilator effect of the plant extract of *V. odorata*. It may be mediated through multiple pathways like inhibition of Ca⁺⁺ influx via membranous Ca⁺⁺ channels, its release from intracellular stores and NO-mediated pathways, which possibly explain the fall in BP. The plant also showed dyslipidemic effect.^[36]

Hypnotic activity: clinically the efficacy of *V. odorata* was evaluated in chronic insomnia. The study displayed that *V. odorata* can have significantly positive effect on inducing sleep. Improvements in sleep and Insomnia Severity Index (ISI) scores were also significantly greater in patients receiving VO drop after a month. ^[37]

Anti-HIV activity: attempts to investigate and isolate several bio-actives from *V. odorata* such as beta sitosterol, stigmasterol and lupeol showed that it is a potential source of anti HIV agents. VO can have a role in future in this regard as drug or therapeutic targets.^[38]

Pancreatic lipase inhibitors activity:

V. odorata harbors endophytic community, and these endophytes extracts were evaluated for the lipase inhibitory activities. Seven endophytes extract exhibited lipase inhibitory activity with $IC_{50} < 10 \mu\text{g/mL}$. The VOLF4 endophyte (*Aspergillus* sp.) extract displayed promising lipase inhibitory activity ($IC_{50} 3.8 \mu\text{g/mL}$) and can be used to develop a potential anti obesity drug.^[39]

Acute toxicity studies: the aerial parts of *V. odorata* were studied for its toxicity. Crude methanolic extract and its *n*-hexane fraction were proved safe at the doses of 500, 1000 and 2000 mg/kg in BALAB/c mice. This genus may be concluded safe at higher doses for clinical uses.^[14]

Discussion

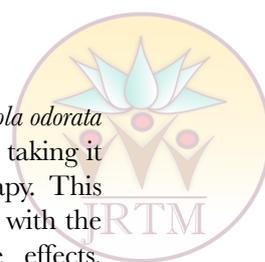
The multidimensional approach of the herb *Viola odorata* can help in treating various chronic diseases by taking it therapeutically and also as an adjuvant therapy. This drug has better acceptability and compatibility with the physical body and also has lesser adverse effects. Detailed review suggests that, based upon the capable pharmacological activity of the drug its indication has been detailed in the classical texts of USM. Several other pharmacological actions mentioned in Unani text have been validated. Reported Pharmacological activity on *Banafsha* are Anti- asthmatic activity, Antipyretic Activity, Anti-inflammatory activity, Antioxidant activity, Antimicrobial activity / Antibacterial activity, Anti-tubercular activity, Hepato-protective study, Diuretic activity, Antihypertensive and dyslipidemic activity , Hypnotic activity, Anti-HIV activity, Pancreatic lipase inhibitors activity, Acute toxicity studies. Findings also suggest several new pharmacological activities. These validations of classical claim and reported pharmacological activity suggest that *Banafsha* is a very potent pharmacologically active herb and future research work should be directed in analysing these properties clinically in a structured scientific method.

Conclusion

Based on these findings, it can be understood that the drug *Banafsha* (*Viola odorata* Linn) is effective in treatments of various ailments and recommend that further phytochemical, clinical and advance research should be done on this very promising traditional medicinal plant for the welfare of mankind.

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