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Review Article

A BRIEF KNOWLEDGE OF *BANAFSHA* (*VIOLA ODORATA* LINN.) & OTHER VIOLA SPECIES

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ABSTRACT

All over the world Viola genus in the Violet family Violaceae is broadly distributed. It is the largest genus in the family containing 500 species. Products isolated from them as are- Essential oils, Glycosides (Iridin, Violaquercitrin, Violutoside), Carbohydrate (Inulin), Ester (Methyl salicylate), Mustard oil (Phenyl ethyl), Colouring matters (Luteolin, Quercetin) etc. Importance of Violaceae family in traditional medicines has been mentioned. Many medicinal herbs used for therapeutic applications such as act as blood purifier, treatment of bruises, ulcers, respiratory infections, renal disorders etc belong to this family. *Viola odorata* also known as sweet violet & it is a rich source of vitamin c. Traditionally is very much effective in jaundice, anti-inflammatory, anti-pyretic, anti bacterial, hepato-protective activity. *Viola odorata* syrup made from flower petals improves cough suppression in children with asthma. Intranasal administration of *Viola odorata* extract oil is sedative to the brain and is helpful in insomnia suffering patients. A Unani medicine named as *"Joshanda"* used in form of decoction for cough & colds contain this valuable herb. In Chinese system of medicine it has been prescribed against Cancerous growth. In France Viola syrup is used as cough remedy. Cultivation of Violets in England occurs largely Startford-upon-Avon for syrup formation, which when mixed with Almond oil used as laxative in children. In olden time it was believed that Viola flowers are beneficial for eyes. Traditional knowledge when tested Pharmacologically & Phyto-chemically it will give us new effective therapeutic agents. This article is compilation of different aspect of *Viola odorata* and other Viola species such as their botanical classification, morphological feature, geographical distribution, chemical constituents, pharmacological properties and ethno-medicinal uses.

KEYWORDS: Viola, Respiratory infections, *"Joshanda"*, Viola odorata, Violaceae.

INTRODUCTION

In *Samhitas Banafsha (Viola odorata)* has not mentioned. only *Adarsh Nighantu, Siddha yoga sangraha* and *Siddha Bhaisjya Manimala* has described it. In *Bhav Prakash Nighantu* it has included in *Parsist* part. People used it as ethno-medicine. The term "Viola" & "Violet" are normally known for having small flowers annually or perennially. They are mostly spring blooming with chasmogamous flowers with well developed petals pollinated by insects. A large number of species are grown in gardens for their ornamental flowers.. Most species are found in temperate northern hemisphere, while some are found in widely divergent areas such as Hawaii, Australasia and Andes.[1]

Flowers colour vary in the Genus, differentiating from violet through various shades of blue, yellow, white, cream while some types are bicoloured. They are dimorphic, some are large petalled while others are small petalled or apetalous. Leaves alternate, stipules persistent, often foliaceous. Sepals sub-equal, produce their inseration at the base. Petals usually spreading at inner side (Lower from the torsion of the pedicels), often the larger, spurred or saccate at the base. Anthers connate, style clavate or variously dilated, sometimes looks straight with a terminal stigma, or more or less curved with a stigma facing the lower petal. Capsule elastically 3 valved. Seeds ovoid or globose. Leaves are emollient and laxative; flowers are used as an emollient, diaphoretic, antispasmodic and stomachi.[2] The root is slightly emetic. One of its chemical components – Cycloviolacin O2 has anti-cancer potential.[3]

Table 1: Showing vernacular name of *Viola odorata*.[4,5]

Sanskrit	*Jvarapaha, Nilapushpa, Sukshmapatra, Vanapsa*
Hindi	Banafshah, Banafsa, Banafsha, Vanafsha
English	Sweet violet, Blue violet, March violet, Appel leaf, Bairn wort, Blaver, English violet
Gujarat	Bagabanosa
Urdu	Banaphsa
Unani	Banafshah
Marathi	Banafashaa, Banafsaj, Kakosh, Fareer
Tamil	Vialettu
Kannada	Vialethoo
Bangali	Banafsha

Table 2: Botanical Classification [1]

Kingdom	Plantae
Order	Malpighiales
Family	Violaceae
Sub-family	Violoideae
Tribe	Violeao
Genus	Viola

Binomial name- *Viola odorata* Linn.

Family- Violaceae

Classical Review

Adarsh Nighantu has mentioned *Banafsha* in *banafshadi varg. Siddha Bhaisjya Manimala* has quoted a therapeutic preparation of *Banafsha* as a paste is prepared of mixture of *Banafsha* and *Yastimadhu* which is applied externally.[6]

Siddha Bhaisjya Manimala has described a story of *banafsha*. Once upon a time a royal lady was suffering from fever. Her lady servant went to a popular *vaidya* of that area. She told *Vaidya* about all illness of her owner lady and also told him that her owner lady was unable to eat pungent, bitter medicines, so what was the cure for her ? After that *Vaidhya* replied *Banafsha sarbat* is sweet in taste and highly worthful in fever, hence she give her owner lady this *Banafsha* sarbat.[7]

Morphology of different species of viola

***Viola serpens* Wall.-** Stoloniferous, glabrous. Stem- long, leafy. Leaves- Ovate, cordate, blunt, acute, crenate-serrate, 3.8-6 cm long, 1.8-3.3cm. wide, hairy beneath. Stipules-toothed. Sepals- acute 5mm. long. Corolla- pale lavender, lower petals streaked darker violet purple, rarely all white, 12mm. long, spur short, rounded. Petals blunt. Capsule 10mm long. Valves blunt.[8]

***Viola odorata* Linn**.- Perennial herb with heart-shaped, simple toothed leaves with basal arrangement, stock short, sometimes branched, knotted with the remains of the old leaves stalks and stipules, and usually emitting creeping runners or scions. Leaves in radical tufts, broadly cordate, rounded at the top, crenate, downy, shortly hairy, with rather long stalks. Stipules narrow-lanceolate or linear or entire. Peduncle about as long as the leaves stalks, with a pair of small bracts about half way up. Flowers nodding, of the bluish purple colour, or white, more or less secented. Sepals obtuse. Spur of the lower petals short. Stigma pointed, horizontal or turned downwards.[8,9]

***Viola cinerea* Boiss-** Annual or perennial herb, erect or ascending, up to 20 cm tall; stems glabrous to densely pubescent. Leaves with lamina narrowly ovate, elliptic-spathulate or narrowly lanceolate, up to 30 x 14 mm, narrowing below into a distinct petiole, acute at the apex, shallowly crenate-serrate, glabrous to densely pubescent; stipules leafy, linear to lanceolate, up to 7 mm long, sometimes laciniate. Flowers solitary in leaf-axils, the upper ones normal, the lower ones often cleistogamous, sometimes all flowers either normal or cleistogamous; normal flowers with pedicels up to 35 mm long, exceeding the leaves; cleistogamous flowers with pedicels much shorter than the leaves. Sepals lanceolate, 2–4 mm long, glabrous or hairy, with hyaline margins. Petals 5–7 mm long, usually blueish with pale yellow or white centre, the lower petal with a short spur. Capsule 3–5 mm long, glabrous or hairy.[10]

***Viola diffusa* Ging.-** Perennial or annual; Leaves ½-3½ by 1-2 cm, smaller on stolons, suborbicular to ovate or elliptic, cordate to cuneate at base, subacute to obtuse or rounded, crenate to serrate-crenate on margin, long-decurrent on petiole; Stipules 5-9 by c. 1 mm, lanceolate or ovate-lanceolate, long-acute, dentate to fimbriate, green or pale brown, free. Flowers up to 9 mm, pale violet to almost white; Sepals 3-6 by 1-1.5 mm, lanceolate to ovate, acute, sparsely hairy, fimbrio-ciliate, green; Petals 10.5-2 times as long as broad, obovate, the basal smaller than the others, the laterals not bearded; Capsule 4-6 mm, ellipsoid, glabrous.[11]

***Viola patrinii* Ging.-** glabrous or pubescent. Stems very short and none. Leaves- tufted, triangular usually narrowly elongate, 3.8-6.3 by 1.3-3.8cm., base cordate or truncate, margins crinate, upper part of stalk usually winged, stipules entire, adnate for more than half their length. Flowers usually dark lilac, often scented. Stigma three lobed, hollowed at the top.[12]

***Viola tricolor* Linn**.- glabrous, stem becoming long and branched. Basal leaves cordate or round cordate, those of the stem becoming ovate, oblong or lanceolate, all stalked and crinate- dentate, stipules large, pinnalely parted toward the base. Flowers large, usually about three colour represented, spur usually twice as long as the appendages of the calyx.[12]

***Viola biflora* Linn.** Glabrous or pubescent. Stem usually erect, 7.5-25 cm. leaves 2-3, kidney shaped, 2-2.5 cm. across, crinate, stipules ovate or oblong. Flowers 1 or 2, on the same stalk, pale yellow, lower petal streaked with black, spur very short, stigma two lobbed.[13]

Geographical distribution

Viola odorata – Native to Europe; cultivated in Kashmir, 5000-6000 fit, planted in many hill stations, north & west asia, north Africa, Europe.[8,14]

Viola serpens- hilly districts through-out india, Uattarakhand, Himanchal Pradesh, Meghalaya, Nagaland, Manipur, Orissa, Ceylon, Burma & Malay peninsula- java, Sumatra, china.[8,15]

***Viola cinerea*-** Punjab,Western Rajasthan, Gujarat, sind, Baluchistan, Punjab, Kathiawar- Afghanistan, Persia, Arabia.[4, 14]

Viola diffusa- Sub tropical Himalaya from Nepal to Mishmi 3000-5000 fit, khasia hills- China.[15]

Viola patrinii- The Himalayas, Eastern and Western Ghats- China and Japan.[14,15]

***Viola tricolor*-** cultivated in india, indigenous in Europe, north asia, and north America.[12, 14]

Viola biflora, Viola canescens- The temperate Himalayas from Kashmir to Sikkim at altitudes of 1800 –,3000 m, Uattarakhand, Himanchal Pradesh.[14,15]

***Viola pilosa* Blume.-** Kashmir to Sikkim and Nilgiri hills at 1,500 –2,100 m.[14]

***Viola sylvestris* Lam.-** Kashmir at 1,200 –2,400 m.[14]

Ayurvedic properties and Pharmacological effect-[16]

Rasa (taste) – *Katu* (pungent), *Tikta* (bitter)
Guna (qualities) – *Laghu* (lightness), *Snigdha* (oiliness, unctuousness)
Vipaka- Katu – Undergoes pungent taste conversion after digestion
Veerya–*Ushna*–Hot potency
Effect on *Tridosha* – *Vata Pittahara* – Balances *Vata* and *Pitta Dosha.*

Chemical constituents

Viola odorata yields Saponins: myrosin and violin, salicylates, alkaloids, flavonoids: rutin and violarutinm, tannins, cyclo violacin o_1, cyclo violacin o_{10}, phenolics, and coumarins. Phenolic glycosides, gaultherin, violutoside (salicylic acid methyl ester), and aodoratine (Salve et al., 2014). 2,2,6,6- Tetramethyl- 4-piperidinone, Violacin A, Vitri peptide A, Vodo peptide M & Vodo peptide N.Miscellaneous; odoratine, an alkaloid, 2-nitroproprionic acid, mucilage.[17]

Essential oil composition of the leaves of *Viola odorata* L. growing wild in Kashan, central Iran, was extracted by hydro distillation–solvent extraction method and analysed using GC–MS technique. The analysis revealed the presence of 25 identified compounds, representing 92.77% of the oil with butyl-2-ethylhexylphthalate (30.10%) and 5,6,7,7a-tetrahydro-4,4,7a-trimethyl-2(4H)-benzofuranone (12.03%) being the two main components. Antioxidant and antibacterial activities of the oil, methanol and chloroform extracts were also evaluated for the first time in this research work.[18]

Formulation and Preparations

Banapasadi kwath, Gojihwadi Kashaya – It is used in the treatment of fever, cough, bronchitis etc.

Mincof syrup – It is used in treatment of cough, sore throat etc.

Biocivas Syrup and capsules – used in the treatment of all types of cough.[19]

One such potent Unani formulation is *Raughan-e-Banafsha* which is an extract of *Viola odorata (Banafsha)* flowers in sesame oil. *Raughan-e-Banafsha*, a sesame oil extract of Viola odorata flowers is effectively used in Unani system of medicine to treat cephalagia and insomnia.[20]

Dose- Powder- 3-6 g.

Decoction- 10-20 ml.

Root: emetic (in larger doses)

Medicinal use of Sweet Violet / *Viola odorata* :[21]

1) Sweet violet has a long and proven history of folk use, especially in the treatment of cancer and whooping cough. It also contains salicylic acid, which is used to make aspirin. It is therefore effective in the treatment of headaches, migraine and insomnia.
2) The whole plant is anti-inflammatory, diaphoretic, diuretic, emollient, expectorant, and laxative. It is taken internally in the treatment of bronchitis, respiratory catarrh, coughs, asthma, and cancer of the breast, lungs or digestive tract. Externally, it is used to treat mouth and throat infections.
3) The flowers are demulcent and emollient. They are used in the treatment of biliousness and lung troubles. The petals are made into a syrup and used in the treatment of infantile disorders
4) The roots is a much stronger expectorant than other parts of the plant but they also contain the alkaloid violine which at higher doses is strongly emetic and purgative. They are gathered in the autumn and dried for later use.
5) The seeds are diuretic and purgative. They have been used in the treatment of urinary complaints are considered to be a good remedy for gravel. A homeopathic remedy is made from the whole fresh plant. It is considered useful in the treatment of spasmodic coughs and rheumatism of the wrist. An essential oil from the flowers is used in aromatherapy in the treatment of bronchial complaints, exhaustion and skin complaints.[21]

Table 3: Viola species - different part uses for medicinal purpose[14,15,22]

Species	Part used	Medicinal uses
Viola serpens	Whole plant	It is one of the most useful medicinal plants and used as antipyretic, demulcent, diaphoretic and diuretic drug. It is useful in asthma, bleeding piles, cancer of throat, constipation, cough, fever, skin diseases and headache.[15]
Viola cinerea	Whole plant	Aphrodisiac[15]
Viola diffusa	Flower	In respiratory disease, Hepatitis –B[15]
Viola patrinii	Whole plant	Purification of blood and the treatment of bruises and ulcers in the Chinese system of medicine it is recommended for use against cancer disorders. The dried flowers are used as a purgative and for cough and cold.[15]
Viola tricolor	Aerial parts	The aerial parts are used as anti-inflammatory, expectorant and diuretic also used in skin conditions, bronchitis, cystitis and rheumatism.[15] Sweet violet's sister is *Viola tricolor* which is better known by her common name: pansy. She is also a native of the Old World and has been widely cultivated and still is. Like her relatives, *V. tricolor* has been used as an expectorant, diuretic, and anti-inflammatory. Used both internally and topically, this violet is helpful for cystitis, rheumatic complaints, eczema, psoriasis, acne, and topically for babies with cradle cap.[22]
Viola canescens	Whole plant	It is mostly used in the traditional medicinal system for cough, cold, flu, fever, malaria and is also given as anti cancerous drug.[15]
Viola sylvestris		Plant—pectoral, bechic; used in chest troubles. Stem, leaf and flower—applied to foul sores and wounds.[14]
Viola biflora	Whole plant	It is antiseptic, antispasmodic, cold, cough, diaphoretic, emetic, fever, laxative,

		leucoderma, psoriasis and skin disease, Fruits paste consumed with water is useful during diaphoretic and intestinal pain.[15]

Research Studies

1- **Studies on the Antihypertensive and Antidyslipidemic activities of *Viola odorata* leavea extract-.-** Vasodilator effect of the plant extract is 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 reduction in body weight and antidyslipidemic effect which may be due to the inhibition of synthesis and absorption of lipids and antioxidant activities. Thus, this study provides a pharmacologic rationale to the medicinal use of *Viola odorata* in hypertension and dyslipidemia.[23]

2- **Experimental study to determine Antimutagenic activity of *Banafshah* (*Viola odorata* Linn).[24]-** Banafshah (Viola odorata Linn.-whole herb) having major class of phyto compounds for screening its anti-mutagenic property on selected strains of Salmonella typhimurium TA97, TA98 and TA100. The bacterial strains were maintained in frozen stocks and grown in broth as described by Maron and Ames. Strains were revived after every 15 days on Master plates supplemented with L- Histidine and D-Biotin. The Salmonella Histidine point mutation assay of Maron and Ames (1983) was used to test the antimutagenic activity by inhibition of mutagenic activity of the sodium azide by the test sample. The results showed a potent Antimutagenic activity of Banafshah which produced 98% inhibition of TA 97 and 96% for TA 98 at 50 µg/0.1ml/plate while 77 % for TA100.

3- **Diuretic, Laxative And Toxicity Studies Of *Viola Odorata* Aerial Parts**.[25]

Acute toxicity studies -Test animal were divided into groups (n=5 per group) which were administered doses of the crude extracts (2000 mg/kg, p.o.), while the control group received only the vehicle (1% Tween 80 in water, p.o.). The general signs and symptoms of toxicity were observed for 5 hr, 72 hr, and 14 days and mortality was recorded for each group at the end of this period.

Laxative activity by metabolic cage method- n-hexane, butanolic, methanolic and aqueous extract were subjected for laxative activity at dose level of 200 and 400 mg/kg body weight and it was found that the butanolic and methanolic extract at a dose level of 200 mg/kg showed good results. Aqueous extract at a dose level of 400 mg/kg showed good laxative activity.

Diuretic activity -n-hexane, butanolic, methanolic and aqueous extract were subjected for diuretic study at dose level of 200 and 400 mg/kg body weight and it was found that all the extracts at a dose level of 400 mg/kg during first 5 hours showed good results and after 24 hours nhexane and Methanolic extracts showed best results. The Preliminary studies showed the presence of flavanoids in different extracts. It is reported previously that the flavanoid glycosides are endowed with diuretic activity.

4. **Study of environment temperature effect on the antibacterial activity of water extract of different organs of viola odorata in the different stages of growth.[26]-** In the experimental-laboratory study, plant after growth in three temperatures (10, 20 and 30 degree) was collected. Extraction was performed by percolation method, and antibacterial activity of extracts was investigated on three bacteria (Staphylococcus aureus E. Coli Pseudomonas aeruginosa with disk-diffusion and macro dilution methods.

Findings: Aqueous extract has antibacterial activity on all three bacteria, so that has maximum effect on Staphylococcus aureus (concentration of 1 mgr/ml) and minimum effect on Pseudomonas aeruginosa (concentration of 8 mgr/ml). Evaluation of antibacterial activity of organs showed that cold treatment has more effect than warm and control treatment. With plant growth, antibacterial activity decreases in leaf and root, but in flowering stage increases in flower organ. Anticancer and chemosensitizing abilities of cycloviolacin o2 from viola odorata[27]- Dried samples of V. odorata and P. leptothyrsa (~20 g each) were ground into a fine powder by hand and then extracted into 400 ml of solvent B (60% AcN and 0.1% formic acid in Millipore water) at room temperature for 24 h with continuous shaking. After collection of the aqueous layer, 200 ml of solvent B was added for overnight extraction.. An extract concentrated with cyclotides was obtained from V. odorata by successively removing tannins and hydrophilic compounds with Solvent C (30% AcN, 0.1% formic acid in Millipore water) Solvent D (0.05M NaCl in 30% AcN, 0.1% formic acid in Millipore water) and finally Solvent E (0.3M NaCl in 30% AcN, 0.1% formic acid in Millipore water). this research is the first to document the cytotoxicity of CyO2 and psyle cyclotides against breast cancer cells.

***Viola odorata* can be presented as a safe, well-tolerated, and effective herbal preparation in patients with chronic insomnia.[28]-** This study was conducted as an experimental pretest-posttest evaluation on VO efficacy in 50 patients with chronic insomnia in Iranian Traditional Medicine Clinic of Mashhad University of Medical Sciences, Mashhad, Iran. Treatment consisted of intranasal drop of VO, two drops containing 66 mg of VO in each nostril nightly before sleeping for one month. All patients were asked to complete an Insomnia Severity Index (ISI) questionnaire before the start of the trial and after one month of treatment. Improvements in sleep and ISI scores were significantly greater in patients after a month receiving VO drop in comparison with before starting treatment ($P < 0.05$). A few patients reported some complications about VO consumption, most of which were mild and no serious adverse event was encountered.

5- **The efficacy of polyherbal formulation of *moringa oleifera, viola odorata, allium sativum* against microbes- synergistic effect.[29]-** Fifty grams (50g) of powdered plant leaves were taken in 250 ml of 95% methanol for 8-9 hours in Soxhlet apparatus. The

extract was subsequently filtered by Whatman No.1 filter paper and allowed to evaporate and concentrate in at 60ºC by using rotary evaporator. The resultant extract was then dissolved in Dimethyl sulfoxide (DMSO) and stored in refrigerator. All these three plants were extracted by methanol and then these methanolic extracts were further used for making different compositions of polyherbal formulations. The methanolic extracts were selected because of high polarity and more extraction capacity of methanol. Due to this methanol extract has more number of quality phytochemicals that shows antimicrobial activity. The different compositions.

6- Phyto-analytical evaluation of rutin in *viola odorata* l., (*banafshan*)-an expectorant.[30]- The proposed, developed and validated HPTLC method was applied for quantitative estimation of rutin in different part of the plant and it was found that corolla of sweet violet flower have higher rutin content than all other parts. This method could also be used to estimate rutin content in different formulation of viola odorata as well.

7- Antioxidant and free radical scavenging activity of viola odorata.[31]- Phenols and polyphenolic compounds, such as flavonoids, are widely found in food products derived from plant sources, and they have been shown to possess significant antioxidant activities. The high amount of phenols and flavonoids in extracts may explain their high antioxidative activities.

8- The cyclotide cycloviolacin o2 from *viola odorata* has potent bactericidal activity against gram-negative bacteria.[32]- CyO2 was the most active cyclotide and efficiently inhibited the growth of S. enterica serovar Typhimurium LT2 and E. coli in RDAs and MIC assays, while the other peptides were less active. In time-kill assays, cyO2 also had bactericidal activity against the Gram-negative species Klebsiella pneumoniae and Pseudomonas aeruginosa. In contrast, none of the cyclotides had high activity against S. aureus. Chemical masking of the charged Glu and Lys residues in cyO2 caused a near total loss of activity against Salmonella, while masking Arg caused a less pronounced activity reduction

CONCLUSION

Above discussion shows that Family Violaceae is an crucial plant family. They were clearly used in traditional practices. In respiratory problems Viola odorata syp. is good medicinal remedy. Its oil having sedative effect. Ethnomedicinal importance of this family is well known. Conservation of this family is major issue as they are under threat according to listing IUCN. Hence step should be taken for their conservation, so that this worthful herb can cure many diseases by their medicinal properties.

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