

BANAFSHA (*VIOLA ODORATA* LINN.) - A REVIEW**A. H. Ayshah Fazeenah^{1*} and Mohamed Aleemuddin Quamri²**¹Senior Lecturer, Institute of Indigenous Medicine, University of Colombo, Sri Lanka.²Associate Professor, National Institute of Unani Medicine, Bangalore, India.Article Received on
13 July 2020,Revised on 03 August 2020,
Accepted on 23 August 2020

DOI: 10.20959/wjpr202010-18534

Corresponding Author*Dr. A. H. Ayshah
Fazeenah**Senior Lecturer, Institute of
Indigenous Medicine,
University of Colombo, Sri
Lanka.**ABSTRACT**

One of the boundless advantages of medicinal plants offers almost completely naturally occurring, plant-derived substances with medicinal properties, often without the alarming side effects. For numerous centuries, medical practitioners have recognized the therapeutic effects of certain plants' have been influenced potent remedies for all kinds of ailments. Herbal medicines are getting significant attention in global health debates too. Eighty per cent of African populations use some form of herbal medicine, and the worldwide annual market for these products approaches US\$ 60 billion. The global demand for herbal medicinal products has increased significantly in recent decades. It is estimated that, the world's

population will be expected to reach 8.5 billion in 2030. *Banafsha* is the flowers of the plant *Viola odorata* Linn. commonly called as "sweet violet" belongs to Violaceae family and has been in use since golden times for treating several diseases both in Unani and in Ayurvedic systems of medicine. The *Banafsha* is available in commerce in three forms as the dried aerial parts of the herb; only the dried flowers; and the aerial parts without flowers. Almost all these parts are used for medicinal purpose, and it has been proven as, sedative, diuretic, anti-asthmatic, laxative, anti-dyslipidemic, antihypertensive, antibacterial, antidiabetic, antimicrobial, anti-inflammatory, antioxidant, antipyretic, hepatoprotective, anticancer, cytotoxic, anti-tubercular, and antifungal properties. It is used as a single drug or as an ingredient in various formulations viz. syrup, decoction, infusion, confection, semisolid preparations, oil and pill. The present review was undertaken to assimilate the effort to explore the knowledge and comprehensively highlight the herb *Viola odorata* possess multidisciplinary actions in human body. Details and facts on therapeutic uses of *Viola*

odorata were gathered from Unani classical texts, research articles, journal and through web search.

KEYWORDS: *Viola odorata*; sweet violet; medicinal properties; boundless advantages; multidisciplinary actions; global demand.

1. INTRODUCTION

Three quarters of the world population rely on herbal and traditional medicine as a basis for primary health care. Herbs and herb-derived medicines have played a crucial role in health and disease management for many centuries. Many ancient civilizations show documented evidence for the use of herbs in the treatment of different ailments; as was seen with Mesopotamian, Indian Ayurveda, ancient traditional Chinese medicine and Greek Unani medicine.^[1]

Herbal medicines are naturally occurring, plant-derived substances with minimal or no industrial processing that have been used to treat illness within local or regional healing practices. Traditional herbal medicines are getting significant attention in global health debates. Eighty per cent of African populations use some form of herbal medicine, and the worldwide annual market for these products approaches US\$ 60 billion. The global demand for herbal medicinal products has increased significantly in recent decades.^[2] It is estimated that, the world's population will be expected to reach 8.5 billion in 2030.^[3]

Many plants have been known to produce biologically active substances, some of which are related to special flavour or taste and others are found to be useful as antioxidants, and/or antimicrobial agents.^[1] It is commonly known as Sweet Violet, English Violet, Common Violet, florist's violet or Garden Violet.^[4] which is belongs to the family *Violaceae*.^[5] The sweet and unmistakable scent of this flower has been used in production of many cosmetic fragrances and perfumes.^[6] This herb is valued as an expectorant, diaphoretic, antipyretic, diuretic^[5,7] and as a laxative in bilious affections. It is used alone or in mixture with other herbs for catarrhal, pulmonary troubles and for calculous affections. The herb shows antimycotic, antibacterial^[5,7] antifungal^[5] activities and is considered quite effective in the treatment of eczema.^[5,7] *V. odorata* appears to be well known in several medicinal systems (Iranian, Greco-Arab, Ayurvedic and Unani) for treatment of whooping cough, headaches, migraine, insomnia, sore throat and epilepsy in children and adults.^[8] This drug is generally prescribed in the form of decoction, jam and syrup.^[7]

2. Description

Viola odorata Linn. is a perennial stock short, but sometimes branched, knotted, with the remains of the old leaf- stalks and stipules, and usually emitting creeping runners or scions.^[9] It is a glabrous or pubescent herb, about 15cm in height. Its root stocks are very stout and stolons are cylindrical. Leaves are dark green, tough, broadly ovate or cordate in shape with crenate margin. They are 1.5 to 5 cm in size. Flowers are solitary, axillary forming central flowering rosettes, and are deep violet in shade with bluish-white base, sweet, scented and hence plant is cultivated in gardens as an ornamental crop.^[5] Fruits are in the form of capsules, round, three angled and often purplish in colour.^[5,10] It is indigenous to India and found in Kashmir (Kangra), Himachal Pradesh (Chamba), and Kumaon hills. The plant blooms in second year.^[5]

Banafsha is commonly called as sweet violet and is well known to India for its medicinal virtues and has been in use since olden times for treating several diseases both in Unani and in Ayurvedic systems of medicine.^[7]

The *Banafsha* is available in commerce in three forms: (1) the dried aerial parts of the herb, viz, the stems, leaves and flowers (*Kashmiri Banafsha*); (2) only the dried flowers (*Gule Banafsha*); and (3) the aerial parts without flowers (*Barge banafsha*)^[5]

2.1 Mizaj

Sard va Tar 1^{o[11,12,13,14,15,16,17]}

Sard va Tar 2^{o[17,18]}

2.2 Vernaculars name

Arabic: Banafsaj,^[13,10,14,15] Firfeer^[13,10,15] Persian: Gule Banafsha.^[13] Banafsha,^[14] Kokash^[6,15]
 English: Sweet violet^[5,11,13,19,10,20] wild violet^[13,15] Hindi: Banafshah^[10,13,19,21] Sanskrit: Banaphsha^[19] Nilapushpa^[21] Urdu: Gule Banafsha^[13] Kannada: Violethoo^[19] Tamil: vialtethoo^[10,13] Vilaettu^[19] Bengali: Banafshah,^[10,13,19,21] Banosa^[10,13,15] Marathi: Bagabanosa^[10] Bugabanosa^[13] Gujarathi: Bahaphsa^[10,13] Telugu: Vialettu^[13] Kashmiri: Banafsha^[13] Unani: Banafshaa^[13,20] Banafsaj^[20] Kakosh^[20] Fareer^[20] Abru^[22] German: Blauoesken, Blauvoegsche, Blauvoelken, Maertzveilchen, Veilotenblau, Veielotenkraut, Veilchen, Viole, Wohlriechende, Veilchen^[23] French: Fleur de Mars, Jacee de printemps, Violet, Violette, Violette cultivee, Violette de mars, Violette odorante, Violette des

quatresaisons, Violiercommun, Violier de Mars^[23] Russian: Packutchaya fialka^[23] Spanish: Violeta, Violeta de olor^[23] Dutch: Tamme viol.^[23]

2.3 Dosage mentioned in Unani literature

Flowers 10gm or 20gm^[10]

5- 7 M^[15,16]

The maximum allowed dose is about 20 grams (about 250 mg/kg) of dry flower per dose in Iranian traditional medicine.^[24]

2.4 Badal (Substitute)

Gule Nilofar,^[10, 17] *Barge Khubbazi*,^[14,15,17] *Asalussoos*,^[10,15,17] *Rube Soos*^[17] *Gauzaban*^[14,15]

2.5 Muzir Asraat (Adverse Effects)

Martoob^[17] *Mukarrab*^[15,17] *Matli*^[17]

Sniffing causes colds and nausea^[14]

Nausea and vomiting are considered as the most common adverse effects in the case of overdose.^[17,24]

2.6 Musleh (Corrective)

Marzanjosh,^[10,14,15] *Gul Surkh*^[17] *Nilofar*^[14,15]

2.7 Murakkabat (Compound formulae)

Sharbate Banafsha,^[13] *Khameere Banafsha*^[13,22] *Roghane Banafsha*^[13] *Habbe Banafsha*^[17]
Itrifale Zamani^[13] *Habbe Sil*^[13] *Majoone antaki*^[13] *Mufarre Motadil*^[13] *Mufarre Yaqooti Barid*^[13]
Zimade Varme Unsayain^[13] *Sharbate Ejaz*^[13] *Dayaqooza*^[13] *Qairooti muhallil*^[13]
Habbe Ghariqoon.^[13]

3. Actions mentioned in Unani medicine

Mulayyan^[10,17,18] *Mulayyin shikam*,^[15] *Mulayyin halq va seenah*^[15] *Mushil*^[17] *Mushil Safra*^[14]
Latafat^[17] *Lazoojat*^[17] *Jazib*^[17] *Muzliq*^[17] *Islahe khoon*^[17] *Munaffise Balgham*^[10]
Muhallile Varm^[10,14,17] *Muaddile Safra*,^[15] *Musakkine Khoon*^[15] *Murattib*^[15] *Munavvim*^[15,18]
Daaf e atsh^[6,17]

The action of root is identical to that of the whole plant of *Banafsaj*^[11]

4. Medicinal uses mentioned in Unani medicine

The whole plant; petals, flowers, leaves, seeds and roots of the *Viola odorata* are used for medicinal purpose. The plant is used internally as well as externally. Commonly used in *Zukam*,^[15] *Nazla*,^[15] *Qabz*,^[15] *Zatul jenb*,^[15] *Sudae Haar*,^[15] *Saher*,^[15] *Aashoobe cheshm*,^[15] *Zaturriya*,^[15] *Suaal*,^[15] *Mukharije Safra*,^[16] *Ie'tidale Safra*,^[17] *Tahleele Lateef aur Sakht Varm*,^[17] *Ta'deeludda*,^[17] *Humma*,^[15] *Taskeen atash*,^[15] *Amraze Haara Med'da va Jigar*,^[17] *Darde Kulliya*,^[17]

Neutralize the bile and relieve fevers^[15] quench thirst and reduce blood pressure.^[15,19] Softens the chest and relieves heartburn.^[16]

Smelling and application of *zimad* is effect in *saudavi* headache, dry cough and *Aashoob cheshm*^[16] Reduces burning sensation of eyes.^[17]

It can be used as a *Khaishanda* (infusion) or *Joshanda* (decoction) in *Nazla va Zukam*, *Zatul jenb*, *Zatur riya*, *Kaansi*, *Aashoob cheshm* and hot diseases of *Me'idda va Jigar*.^[15]

Smell fresh *Banafsha* relieve headaches by increased heat. To relieve *Qabz* (constipation), eat powder of flowers or *Gulqand*.^[15]

Oil of fresh *Banafsha* flowers and oil extracted from *Magz Badam* are mostly use in *Qabz*, *Nazla va Zukam* and fevers.^[15]

An experiment was conducted on rats, the extract of herb containing an emetine- like alkaloid was found to be effective against induced inflammation and the ipecac extract showed similar effects.^[7]

4.1 The flowers are credited with emollient^[5,9,25] and demulcent^[5,9,25] properties^[7] and are used in the treatment of biliousness^[26,27] and lung troubles^[26,27] Petals^[26] and flowers^[7] are used for the preparation of *Sharbat* (syrup)^[7] which is used as a home remedy for cough, sore throat, hoarseness, ailment of infants^[7] and also beneficial in mucus discharge from nose^[22] Internal use of infusion of fresh flowers is beneficial in insomnia^[14,17] and it cures tonsillitis, pharyngitis, laryngitis and in coryza^[17] Fresh flowers have antidote property.^[14] The fresh flowering herb is used in homeopathy for the treatment of diseases of skin and eyes, and for relief from pain in the ear.^[7] Flowers have great reputation in respiratory diseases, and are usually used as *Sharbat*.^[17] An essential oil from the flowers is used in aromatherapy in the

treatment of bronchial complaints, exhaustion and skin complaints^[26] Violet flowers possess slightly laxative properties, but they are very rarely used at the present day. The best form of administration is syrup of violets, which may be given as a laxative to infants, in doses of ½ a teaspoonful to 1 teaspoonful or more, with an equal quantity of oil of almonds. Syrup of violets has also been used to give colour and flavour to other medicines.^[27]

4.2 Leaves are said to relieve pain due to cancerous growths, particularly in the mouth and throat.^[7] Leaves are beneficial in pruritus of biliary or sanguineous origin^[22] In large doses the leaves and roots are cathartic, and seeds are poisonous.^[7]

4.3 Root is much stronger expectorant than other parts of the plant^[19,26] laxative, good febrifuge, tonic, diuretic; it alleviates thirst, relieves inflammation^[19] The roots are emetic^[7, 25] and are employed as an adulterant or substitute of ipecac.^[7] The roots are at higher doses is strongly purgative.^[26]

An *in vitro* study was conducted to evaluate the antimicrobial effect of violet on three microbial species (*S. aureus*, *E. coli*, and *Pseudomonas aeruginosa*); the maximum antimicrobial effect was on *S. aureus* and the least effect on *P. aeruginosa*. The antimicrobial effect of *V. odorata* was found to be high in flowers compared with leaves and roots.^[28]

4.4 Seeds are diuretic and purgative.^[7] They have been used in the treatment of urinary complaints are considered to be a good remedy for gravel.^[26]

4.5 Syrup of petals is good for cough, hoarseness of voice. The syrup when mixed with almond oil is a gentle laxative for children and also helps to soothe irritative cough and to relieve sore throat^[19] Syrup and used in the treatment of infantile disorders.^[25,26]

Syrup of *Banafsha* (*Sharbat Banafsha*) has diuretic^[4] laxative^[4] and anti-inflammatory properties^[17] Therefore, it helps in renal colic, burning micturition and inflammatory conditions of gastrointestinal tract^[17] *Sharbat Banafsha* is used to treat pneumonia and pleurisy.^[11]

Sharbat Banafsha with *Babuna* (*Matricaria chamomilla*) treat all types of fevers except those associated with diarrhea^[17] *Sharbat* is useful in *Zatul jenb*, *Zatul riya* and *dard gurdah* (renal pain)^[16]

Internal uses of mixture of equal quantities of powder of *Banafsha* flower and sugar with warm water help to remove excess phlegm from the body^[16,17] If the same is taken with cold water which removes excess bile and if it is taken with *Sheer khisht*, *Turanjbeen*, *Maghaz Amaltas* and almond oil will cause loose motion easily^[16,17] *Murabba Banafsha* reduces appetite^[22] removes thirst^[14] and is beneficial in cough.^[22]

4.6 Externally

- a) Inhalation of fresh flowers and leaves cures headache especially produced by heat or bile^[14,17,29] and also headache due to high blood pressure.^[17]
- b) Local application of paste of leaves and flowers or irrigation with decoction of *Banafsha* to treat headache due to fever^[17] Headache in children is cured by infusion of *Gule Banafsha*^[17]
- c) Application of oil of fresh flower along with sesame and almond is good for sleeplessness.^[17] Inhalation of fresh flowers is beneficial in insomnia^[14,17]
- d) *Banafsha* oil (*Roghan Banafsha*) liquify the impacted wax in the ear and it is effective in cough by apply over the chest, especially in children.^[17]
- e) Oil can be applied to treat hair fall, cures skin wounds and is also helpful to treat dryness of skin^[17]
- f) *Roghan Banafsha* alone^[11] or with *Mastagi*^[22] is very useful in scabies.
- g) *Roghan Banafsha* is used for abdominal pain, it relieves cough and acts as a sedative^[19]
- h) *Roghan Banafsha* is effectively used to treat cephalagia and insomnia.^[26]
- i) Local application of paste of *Banafsha* and barley flour or from its leaves alone dissolve hot inflammation.^[11]
- j) Plaster of *Banafsha* and Barly flour or *Banafsha* leaves alone dissolves hot inflammation like pimples.^[11]

5. In traditional medicine

Viola odorata L. is another well-known medicinal plant which has been used traditionally in different forms for curing different medical conditions. In Iranian traditional medicine, it is known as a plant with cold and wet temperament and has been used in hot and dry temperament diseases like fever, excessive thirst, and uremic pruritus; and widely recommended for cough, pneumonia, and pleurisy. In children it is very effective in febrile convulsion, rectal prolapse, and cough^[24] It is used for warm catarrh, inflammatory lung and gastrointestinal diseases, inflammations of the head and neck, headache, and

insomnia. Further, it is also an important medicinal plant that is used to treat bronchitis and common cold.^[28]

Viola odorata is used as a poultice for treatment of headache, cough, colds, bronchitis, and fever in different Traditional medicines^[8] It is commonly used as a remedy for coughs and sore throat, hoarseness and tonsillitis. The herb is valued as an expectorant, diaphoretic, antipyretic, diuretic and as a laxative in bilious affections.^[4]

In traditional Iranian folk medicine, it has been used to treat depression, respiratory ailments, congestion, sore throat, insomnia^[30,31] anxiety, high blood pressure, coughs^[30,31] fever, common cold as well as headache^[31] Based on recent studies, the main compounds in the Violet's leaves are glycoside of salicylic acid that has been used for to treat body pains and headaches.^[30]

6. Medicinal uses in ethno medicine

Expectorant, anti-inflammatory, diaphoretic, antipyretic, diuretic. Used for catarrhal and pulmonary affections, also for diseases of liver and intestine.^[20] Biliousness,^[7,13] lung troubles,^[7] catarrhal and pulmonary affections.^[7] Externally it is used to treat mouth and throat infections.^[26]

7. Chemical composition

Salicylic acid^[7] violin^[7,5,19] volatile oil^[19] rutin, cyanin^[7,5] a colourless chromogen, glycoside of methyl salicylate^[7] sugar^[7] essential oil^[7,5] an alkaloid^[7,5,24] colouring matter^[7,5] friedelin^[20,7] β - sitosterol^[20,7] and straight- chain alcohol^[7] saponins^[7,5,19,10,25,24] alkaloid odoratine^[5] ionone^[19] ionine^[19] glucoside^[19] methyl salicylic esters^[19] flavonoids^[10] glycosides^[10,24] Phenolic compounds^[10] tannins^[10,24] Resins^[10] sterols^[10] triterpines^[10] anthocyanin^[20] violanin chloride^[20] high content of tocopherol reported from flowers^[20] vitamin C^[24] cycloviolacin^[24] flavonoids^[24] violanthin^[20] methyl salicylate^[20,24,25].
Inorganics are Potassium, Magnesium, Sodium, Iron.^[10]

8. Ethnopharmacological studies

Researchers have reported that different biological activities of *Viola odorata* Linn. in various *in vitro* and *in vivo* test models. These have been highlighted in detail in following headings.

8.1 Benign prostate hyperplasia

Panahi Y. et al. (2017) conducted a two-week, double-blind, placebo-controlled trial of *Viola odorata*, *Echium amoenum* and *Physalis alkekengi* mixture in symptomatic benign prostate hyperplasia (BPH) men showed IPSS score of incomplete urination ($42.3 \pm 2.04\%$), frequency of urination ($20.08 \pm 1.02\%$), intermittency ($40.78 \pm 2.16\%$), urgency ($60.91 \pm 3.14\%$), weak stream ($50.58 \pm 2.14\%$), straining ($55.67 \pm 2.53\%$) and nocturia ($40.14 \pm 1.89\%$) in treatment group were significantly decreased compare to placebo group. Furthermore, the prostate volume ($16.92 \pm 0.89\%$) and extant urine volume ($28.12 \pm 1.36\%$) also significantly decreased in treatment group compared to placebo group. No significant side effects or abnormalities in biochemical tests and urinalysis were observed throughout the study. Based on results, mentioned mixture is safe and effective in improving life quality of patients suffering from BPH.^[32]

8.2. Chronic rhinosinusitis

Mulla I. et al. (2019) investigated a prospective randomized controlled trial to evaluate the efficacy of *Viola odorata* flower decoction in chronic rhinosinusitis. 30 patients with CRS were randomly assigned to receive either test drug (10 g of *V. odorata* flower decoction administered orally on empty stomach in the morning daily) or active control drug (single nasal spray of fluticasone propionate 50 µg/spray in each nostril daily) for 30 days. The primary outcome measure was an improvement in sinonasal symptoms assessed using a 22-item sinonasal outcome questionnaire (SNOT-22). Reduction in absolute eosinophil count (AEC) and improvement in x-ray paranasal sinus were secondary outcome measures. The significance level was kept as 5%. After completing the therapy, the SNOT-22 score was significantly low in the test group compared with the control group and a significant difference was found in AEC between the groups. The SNOT-22 score remained significantly low after completion of the treatment on the 45th and 60th days compared with the control drug. Changes in x-ray paranasal sinuses were not significant between the groups. These results suggested that *V. odorata* flower was effective in reducing the symptoms of CRS.^[33]

Koochek M.H., et al. (2002) investigated anti-inflammatory property of an aqueous extract of *Viola odorata* compared with hydrocortisone. Rats were treated with extract after the introduction of lung injury by administration of formalin via nebulization. Then microscopically quantified the area of hemorrhage, thickness of the alveolar wall, rupture of the alveolar septa and alteration of the epithelial lining of the bronchioles. *Viola odorata*

extract was given prophylactically which was partially effective in preventing lung damage that equal to the effect of hydrocortisone in aiding the resolution of formalin-induced lung damage. The study showed that the aqueous extract of *V. odorata* proved to be as effective anti-inflammatory as hydrocortisone in the treatment of formalin induced inflammation of lung tissues and safer medicinal agent than corticosteroids in treatment of inflammatory conditions of the lung.^[34]

8.2 Sedation

Monadi A., et al. (2013) investigated an in vivo study on evaluation of sedation and pre-anaesthetic effects of *Viola odorata* L. compared with Diazepam in rats. 30 wistar male rats weighting 300 ± 10 g and about 3- month-old were used for the laboratory experiment. The rats were grouped in to six and the extract was injected intra peritoneal as; for the first group 100mg/kg, second group 200 mg/kg, third group 400mg/kg, fourth groups diazepam 1.2 mg/kg, fifth group placebo 1.2 mg/kg (dimethyl sulfoxide) and the sixth group did not receive any drug. Induction time and sleeping time were measured immediately following administration of ketamine. The results demonstrated that the injection of the ethanolic and chloroform extracts of *V. odorata* were found to increase sleeping time and also showed better sedation and pre-anesthetic effects in a dose dependent manner compared with diazepam.^[35] Hejazian M.S., et al. (2018) conducted a randomized clinical trial with two groups as intervention (*Viola odorata* oil) and control (parafin) to evaluate the effect of *Viola odorata* oil on sleep quality of older adults. The data were analyzed by using SPSS V 20 with significance level of $p < 0.05$, showed that the application of *Viola odorata* oil nasal drop is effective in improvement of sleep duration among older adults.^[36]

8.3 Insomnia

Feyzabadi Z., et al. (2014) was conducted an experimental study on efficacy of volatile oil of flowers of *Viola odorata* in chronic insomnia. Intranasal drop of *Viola odorata* in each nostril at night before sleeping for one month showed that improvements in sleep and Insomnia Severity Index scores were significantly ($P < 0.05$) reduced after a month.^[31]

8.4 Diuretic

Vishal A., et al. (2009) investigated the aerial part of *Viola odorata* for various biological activities. The butanolic, aqueous and n-hexane fraction of the aerial parts of *Viola odorata* exhibited good diuretic effect in rats.^[37]

8.5 Asthma

Qasemzadeh M.J., et al. (2015) investigated the effect of violet syrup on cough alleviation in children with intermittent asthma. 182 children aged 2 to 12 years with intermittent asthma were randomly assigned 1:1 to receive violet syrup or placebo along with the common standard treatments in both groups (short-acting β -agonist), and the both groups were evaluated in terms of the duration until cough suppression was achieved. The duration lasting to yield more than 50% cough reduction and 100% cough suppression was significantly less in the violet syrup group compared to placebo ($P = .001$, $P < .001$, respectively). The study was concluded that the adjuvant use of violet syrup with short-acting β -agonist can enhance the cough suppression in children with intermittent asthma.^[28]

8.6 Tonsillitis and peritonsillar abscess

Ali M.Y., et al. (2013) done a randomized single blinded placebo - controlled study to evaluate the effectiveness of decoction of *Viola odorata* flowers in the treatment of tonsillitis or peritonsillar abscess. 400 patients from 20 to 40 years age group were divided in to two groups as test and placebo. Decoction of the plant was administered to test group while the placebo control along with coamoxiclav (625mg) and fexofenadine (60mg) twice a day. During the follow up study frequencies of tonsillitis and peritonsillar abscess were reduced in *Viola odorata* group.^[38]

8.7 Migraine

Kamali M., et al. (2018) investigated a randomized, double blind, placebo-controlled clinical trial on the effectiveness of a combination of *Viola odorata* flowers, *Rosa damascene* flowers and *Coriandrum sativum* fruits on severity, duration and frequency of migraine headaches in 88 diagnosed migraine patients. Patients were randomly divided into the intervention (n=44) or placebo group (n=44). The intervention group received a product of a combination of *Viola odorata* L. flowers, *Rosa damascena* L. flowers and *Coriandrum sativum* L. fruits in 500 mg capsules three times a day and propranolol 20mg tablet twice a day, and the placebo group received placebo capsule (500mg) three times a day and propranolol 20mg tablet twice a day for four weeks. The study findings suggested that the herbal combination showed more effective in improving headaches in patients with migraine than the placebo group.^[39]

8.8 Laxative

Vishal A., et al. (2009) butanolic and aqueous extracts (200 and 400 mg/kg, p.o.) of *Viola odorata* showed good laxative effect in rats.^[37]

8.9 Antidyslipidaemic

Siddiq H.S., et al. (2012) investigated the antidyslipidemic effect of the leaves of *Viola odorata* extract in the anaesthetized rats indicated that reduction in total cholesterol, triglyceride and LDL-C, while its increased HDL-C effect which may be due to the inhibition of synthesis and absorption of lipids and antioxidant activities.^[40]

8.10 Antihypertensive

Siddiq H.S., et al. (2012) investigated the vasodilator effect of the leaves of *Viola odorata* extract in the anaesthetized rats showed that the 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 blood pressure.^[40]

8.11 Reduce body weight

Siddiq H.S., et al. (2012) investigated the plant extract of *Viola odorata* in anesthetized rat showed reduction in body weight suggested the effect which may be due to the inhibition of synthesis and absorption of lipids and antioxidant activities.^[40]

8.12 Against vaginal pathogens

Salehi L., et al. (2014) investigated the effect of different extracts of *Viola odorata* on *Trichomonas vaginalis*. The crude extracts were prepared from fractions (diethyl ether, ethyl acetate, and water) of leaf, flower, and root. The extracts were dried and used for in-vitro anti-trichomonas vaginalis experiments. The crude extract of diethyl ether, ethyl acetate and water fractions of leaf, flower, and root of *Viola odorata* showed 100% growth inhibition during 24 hours.^[41]

8.13 Antidiabetic

Azari Z., et al. (2018) investigated the effect of the aqueous and hydro-alcoholic extracts of *viola odorata* on histologic changes and biochemical parameters of the liver in diabetic adult Wistar rats. The 400 mg/kg dose of the aqueous extract and all used (100, 200, and 400 mg/kg) doses of the hydro-alcoholic extract significantly decreased serum glucose levels in the diabetic rats. The aqueous extract of violet in 100 and 400 mg/kg doses can improve the liver tissue in terms of cell count, inflammation, and congestion. Moreover, they could significantly decrease AST and ALT enzymes.^[42]

8.14 Anticancer

Helli S., et al. (2016) investigated the effect of two different systemic doses of *Viola Odorata* on prevention of 4-Nitroquinoline-1-oxide (4-NQO) induced tongue dysplasia in rats. Forty-eight (48) male Wistar rats were divided into four groups of A, B, C and D. Group A served as the control group. The rats in groups B to D received 30 ppm of 4-NQO in drinking water for 12 weeks. Additionally, the rats in groups B and C received *Viola odorata* syrup at doses of 15 and 5 ml/kg, respectively, 3 times a week. At the end, the rats were euthanized and the tongue was removed. Histological evaluations for carcinogenesis were carried out under a light microscope showed no histological changes of the tongue base epithelia were observed in the control group. The rats in group B show mild to moderate histological changes including hyperplasia and hyperkeratosis. These incidences were significantly more apparent in groups C with moderate to severe changes ($p < 0.05$) and group D with severe dysplastic changes ($p < 0.01$). Almost all rats in group D had hyperplasia and manifested all of the stages of dysplasia. So it was concluded as the *Viola odorata* extract has dose-dependent inhibitory effects on the development of tongue induced dysplasia.^[43]

8.15 Anti-inflammatory

Koochek M., et al. (2002) investigated the aqueous extract of *Viola odorata* for anti-inflammatory properties as compared with hydrocortisone. Rats, treated with extract before and after induction of lung injury by the administration of formalin via nebulization, was microscopically quantified the area of hemorrhage, thickness of the alveolar wall, rupture of the alveolar septa, and alteration of the epithelial lining of the bronchioles. *Viola odorata* extract given prophylactically was partially effective in preventing lung damage, equal to the effect of hydrocortisone in aiding the resolution of formalin-induced lung damage. It was concluded as the *Viola odorata* extract could possibly be used as an alternative and safer medicinal agent than corticosteroids in treatment of inflammatory conditions of the lung.^[34]

Koochek M., et al. (2003) investigated the aqueous extract of *Viola odorata* has been proved a good remedy for inflammatory lungs.^[44]

8.16 Antioxidant

Alipanah H., et al. (2018) investigated the cytotoxic, antioxidant, and anti-metastatic properties of *Viola odorata* hydroalcoholic extract (VOE) in 4T1 breast cancer model. Cell viability was measured by MTT assay. The implanted mice were treated with different concentration of VOE (50, 150 and 250 mg/kg) for 21 days. Levels of lactate dehydrogenase

(LDH), γ -glutamyl transferase (GGT), alkaline phosphatase (ALP), carcinoembryonic antigen (CEA) and cancer antigen 15-3(CA15-3) in serum, catalase (CAT) and superoxide dismutase (SOD) activities in tumor tissue were measured. Metastatic rate was investigated in liver, spleen and lung tissues shows that extract of *V. odorata* can inhibit growth tumor and reduce the metastatic rate in the lungs and liver and also can affect antioxidant enzyme activity and apoptosis in breast cancer.^[45] Stojković D., et al. (2011) investigated the free radical scavenging activity of water extracts of *Viola odorata*. Free radicals cause the oxidation of biomolecules (e.g., protein, amino acids, lipid, and DNA), which leads to cell injury and death. The cytotoxic effect of free radicals is deleterious to mammalian cells. Fresh flowers of *Viola odorata* were collected from two different locations and the flowers were extracted with water and the suspension filtered and lyophilized for 3 days. Then the extracts were evaluated on their antioxidant potential using scavenging of 2,2-diphenyl-1-picrylhydrazyl radical. Results showed that water extracts of flowers from both locations possess concentration dependent free radical scavenging activity and antioxidant potential.^[46] Ebrahimzadeh M.A., et al. (2010) also investigated that the crude methanolic extract of *Viola odorata* for their antioxidant potential at DPPH, reducing power assay, ferric thiocyanate, nitrous, hydrogen peroxide scavenging protocols.^[47]

8.17 Antipyretic

Tafazoli V., et al. (2019) was designed to evaluate complementary therapy with *Viola odorata* L. oil for fever control in febrile neutropenic children. It was a randomized placebo controlled clinical trial with 41 febrile children, who were divided into two groups as active drug group and placebo group. The active drug group received *viola odorata* oil (20 drops) to be rubbed on the peripheral margin of the patient umbilicus. The mean temperature reduced significantly in the viola group after 30 minutes of administration ($p = 0.005$), while there was no significant change in the placebo group ($p = 1.00$). The number of patients who received paracetamol as the rescue treatment was significantly lower in the viola group than that in the placebo group (5 vs. 17, $p = 0.001$). The results of the study showed that the safety and efficacy of complementary therapy with *Viola odorata* L. oil for fever control in febrile neutropenic children.^[48] Khattak S.G., et al. (1985) investigated and found that the antipyretic effect of n-hexane fraction of *Viola odorata*.^[49]

8.18 Hepatoprotective effect

Qadir M.I., et al. (2014) investigated the hepatoprotective activity of aqueous methanolic extract of *Viola odorata* in mice intoxicated with paracetamol. The results demonstrated that the extract significantly ($p < 0.01-0.001$) reduced paracetamol induced increase levels of serum hepatic enzymes and total bilirubin. Histopathological studies showed that the plant attenuated the hepatocellular necrosis and inflammation. HPLC results showed the presence of hepatoprotective flavonoids (isorhamnetin and luteolin) in the extract, and it was concluded that *V. odorata* has hepatoprotective activity against paracetamol-induced liver injury in mice.^[50] Azari Z., et al. (2020) investigated the effect of the aqueous and hydro-alcoholic extracts of violets on histologic changes and biochemical parameters of the liver in diabetic adult Wistar rats. 64 rats were examined in 8 groups of 8 rats (1 control group and 7 diabetic groups treated by streptozotocin). The rats were treated in 6 diabetic groups by different concentrations of the aqueous and hydro-alcoholic extracts of violets (100, 200, and 400 mg/ kg). Biochemical tests were performed to evaluate the liver enzymes, glucose, and serum albumin on the blood of rats. Furthermore, Hematoxylin and Eosin (H & E) and Periodic acid-Schiff (PAS) stains were performed to investigate the number of Kupffer cells, hyper eosinophilia, inflammation, congestion, changes in the perimeter and the central vein area, and glycogenic deposits from the liver tissue of rats. The results suggested a decrease of Kupffer cells in the concentration of 100 in extracts, inflammatory accumulations decreased in the concentrations of 100 and 400 in the aqueous extract and a decrease of congestion in the concentrations of 400 in the aqueous extract and the concentrations of 100 and 200 in the hydro-alcoholic extract; a decrease of AST and ALT of serum in the concentrations of 100 and 400 in the aqueous extract; and a decrease of glucose in the concentrations of 100, 200, and 400 in the hydro-alcoholic extract and the concentration of 400 in the aqueous extracts were observed. The prescription of the extracts of violets can improve the liver tissue in terms of Kupffer cell count, inflammation, and congestion.^[51]

8.19 Cytotoxic

Yousefnia S., et al. (2020) have done a study on the effect of alcoholic extraction of *Viola odorata* on apoptosis and malignant characterization of breast cancer cell lines and breast cancer stem cells. Data suggest that *Viola odorata* extract mostly targets cancerous cells, not normal cells with exception in high concentration. It acts in a cell-dependent manner.^[52]

8.20 Anti-tubercular

Hassan F., et al. (2014) conducted a study to evaluate the antibacterial activity of extracts and pure constituents of *V. odorata* against *Mycobacterium tuberculosis*. Crude ethanol extract of the plant was fractionated with different solvents to yield respective extracts. The n-hexane and Dichloromethane fractions showing good activity against both strains were purified by chromatographic techniques and prep-HPLC to yield several pure compounds characterized by LCMS. Seven isolated pure compounds were assayed against *M. tuberculosis* H37Rv and MDRTB isolate in different concentrations and their MIC's were recorded. Same concentrations were taken in case of MDR-TB isolate. Results suggested that *V. odorata* contained very active compounds against *M. tuberculosis* H37Rv and *M. avium* which can be used as lead for potential anti-TB drug formulations on further clinical trials.^[53]

8.21 Analgesic activity

Antil V., et al. (2011) investigated the crude methanolic extract at the dose of 400 mg/kg of *Viola odorata* was proved analgesic in acetic acid induced writhing and tail immersion animal models.^[54]

8.22 Pancreatic lipase inhibitors

Katoch M., et al. (2017) conducted a study on fungal endophytes associated with *Viola odorata* Linn. as bioresource for pancreatic lipase inhibitors. Obesity is associated with lipid metabolism involving pancreatic lipase enzyme. The inhibition of pancreatic lipase is demonstrated by using the extracts of endophytes isolated from *Viola odorata* Linn. This study was involved the isolation and identification of 27 endophytes from *V. odorata*. All the endophytes were evaluated for lipase inhibitory activities. The extracts of seven endophytes exhibited lipase inhibitory activity with $IC_{50} < 10 \mu\text{g/mL}$. The extract of VOLF4 (*Aspergillus* sp.) displayed promising lipase inhibitory activity ($IC_{50} 3.8 \mu\text{g/mL}$). The present study demonstrates that *V. odorata* harbors endophytic community with potent lipase inhibitory activity. VOLF4 is the potential endophyte. The extract of VOLF4 can be used to develop the potential drug to treat obesity.^[55]

8.23 Antifungal

Pawar V and Thaker V (2006) observed that the essential oils of *Viola odorata* have exhibited moderate activity against the hyphae and spores of *Aspergillus niger*⁵⁶. This is in contrast with the study conducted by Akhbari M., et al. (2012) and detected that the

methanolic and chloroform extract of Iranian *viola odorata* and the essential oils of this plant showed no antifungal activity against *C. albicans*.^[57]

8.24 Antibacterial properties

Gautam S.S., et al. (2012) investigated to evaluate the antibacterial activity of various extracts viz, petroleum ether, acetone, methanol and water of *Viola odorata* against selected respiratory tract pathogens. The antibacterial activity was examined by agar well diffusion method and the minimum inhibitory concentration (MIC) by twofold serial dilution method. Erythromycin was used as positive control to determine the sensitivity of the strains. The results showed that the methanol extract was more active than other extracts in its antibacterial activity.^[58] Ziad D., et al. (2012) investigated the significant antibacterial activity of the aqueous extract of *Viola odorata* against *S. typhi* and *E. coli* has been reported. The crude ethanolic extract and its subsequent solvent fractions (petroleum ether, dichloromethane and ethyl acetate) were proved significant antibacterial against *E. coli* and *K. pneumonia*.^[59] Gautam S.S., et al. (2016) investigated an ionone-like compound known as 3-acrylic acid (compound 1) from the aerial parts of *V. odorata* at 6 mg/disk concentration showed significant antibacterial efficacy against selected respiratory tract pathogens including *H. influenzae*, *P. aeruginosa*, *S. aureus*, *S. pneumoniae* and *S. pyogenes* respectively.^[60]

8.25 Repellant activity

Amer A and Mehlhorn H (2006) observed that the essential oils of *Viola odorata* in combination with essential oils of other plants have been reported with significant repellant activity against various mosquitoes like *Aedes aegypti* *Anopheles stephensi* and *Culex quinquefasciatus*.^[61]

8.26 Nutritional value

Muhammad N., et al. (2012) studied the elemental compositions of the various parts (stem, leaves, petiole and flower) of *Viola odorata* have been investigated for detection of various elements like carbon, oxygen, sodium, calcium, magnesium, aluminum, silicon, chloride and iron. This study proved that *Viola odorata* is a rich source of these elements. The essential oils of the leaves of *Viola odorata* have been reported with 23 volatile components, most of them were aliphatic or shikimic acid derivative.^[62]

8.27 Anti-Depressant

Shafei Z., et al. (2018) done an experimental study on to evaluate the antidepressant effect of hydroalcoholic extract of *Viola Odorata* in mice. 114 male albino mice were randomly divided into 4 groups as control (10ml/kg, i.p), fluoxetine (20mg/kg, i.p), imipramine (30mg/kg, i.p) and, VO extract (50, 100, 200, 400 mg/kg, i.p), respectively. The antidepressant-like activity was performed by behavioral tests as forced swimming test (FST), tail suspension test (TST), and open field test. The *Viola Odorata* extract (100 to 400 mg/kg) reduced immobility time in both FST, TST ($P < 0.01$ and $P < 0.001$, respectively) and the extract increased swimming time ($P < 0.01$ and $P < 0.001$, respectively) without significant change of climbing time ($P > 0.05$) showed that the acute doses of the *Viola odorata* was similar to fluoxetine to cause anti-depressant effects.^[63]

8. Clinical study

A randomized single blinded placebo-controlled study was conducted to evaluate the effects of combined Unani formulations in *Nazla Haar* (allergic rhinitis) with special reference to the eosinophils in nasal smear. Forty subjects diagnosed with allergic rhinitis were selected and randomly divided in to two groups as test group was obtained the decoction of *Cydonia oblonga*, *Zizyphus jujube*, *Cordia dichotoma* with syrup of *viola odorata* and the placebo group was obtained sugar syrup orally. The effect of the study was assessed based on the subjective parameters (rhinorrhoea, sneezing, nasal congestion, itchy nose, mouth or throat, lacrimation, post nasal drip and headache) in three follow ups and the objective parameter nasal smear for eosinophils (NSFE) at baseline and at the end of the treatment. The test group showed a significant improvement in reducing the number of eosinophils in allergic rhinitis patients as compared to the placebo group.^[64,65]

REFERENCES

1. Fazeenah A. H. A., and Quamri M.A. Behidana (*Cydonia Oblonga* Miller.) - A Review. World Journal of Pharmaceutical Research, 2016; 5(11): 79-94.
2. Herbal medicine research and global health: an ethical analysis. <https://www.who.int/bulletin/volumes/86/8/07-042820/en/> (accessed on 20/07/2020).
3. <https://populationmatters.org/the-facts/the-numbers?> (accessed on 20.07.2020).
4. Singh A., Dhariwal S., Navneet. Traditional uses, Antimicrobial potential, Pharmacological properties and Phytochemistry of *Viola odorata*: A Mini Review. The Journal of Phytopharmacology, 2018; 7(1): 103-105.

5. Kokate C.K., Purohit A.P., Gokhale S.B. *Pharmacognosy*, 2009; 43: 11.54, 11.55
6. Mulla I., Roqaiya M., Khanwale I., Alam S., Eqbal K. *Phyto-pharmacological Review of Banafsha (Viola odorata) with Special Reference to Unani Uses*. *Journal of AYUSH: Ayurveda, Yoga, Unani, Siddha and Homeopathy*, 2018; 7(3): 21-29.
7. Anonymous. *The Wealth of India*. Vol. X. New Delhi: Council of Scientific and Industrial Research, 2009; 514-515.
8. Mahboubi M., Kashani L.M.T. A Narrative study about the role of *Viola odorata* as traditional medicinal plant in management of respiratory problems. *Advances in Integrative Medicine*, 2018; 5 (3): 112-118.
9. Kirtikar K.R., Basu B.D. *An ICS. Indian Medicinal Plants with Illustration*. Uttaranchal: Oriental enterprises, 2003; 2: 281-282.
10. Anonymous. *Standardization of Single Drugs of Unani Medicine. Part II*. New Delhi: Central Council for Research in Unani Medicine (CCRUM). Ministry of Health & Family Welfare, Govt. of India, 1992; 149- 152.
11. Ibn Sina. *Al Qanoon fit Tibb (English Translation)*. New Delhi: Jamia Hamdard, 1998; 111: 2.
12. Haleem M.A. *Mufarradate Azeezia*. New Delhi: CCRUM, Dept. of AYUSH, Ministry of Health & Family Welfare, Govt. of India, 2009; 103.
13. Anonymous. *The Unani Pharmacopeia of India*. New Delhi: Ministry of Health and Family Welfare, Govt. of India, 2007; 1(2): 41-42.
14. Hakim H.A. *Bustanul Mufradat*. New Delhi: Kitabulshifa, 2002; 138–139.
15. Kabiruddin M. *Makhzanul Mufradat*. New Delhi: Idara KitabulShifa, 2007; 116-117.
16. Kabeeruddin. *Ilmul Advia Nafisi*. New Delhi: Ejaz Publishing House, 2007; 79.
17. Ghani H.N. *Khazayin-ul-adviyah*. New Delhi: Ejaz Publishing House. YNM, 397-398.
18. Ibne Rushd A.W.M. *Kitab Al Kulliyat*. (Urdu translation by CCRUM). New Delhi: Ministry of Health and Family Welfare, India, 1987; 2: 280.
19. Prajapathi N.D., Purohit S.S., Sharma A.K., Kumar T. *A Handbook of Medicinal Plants a complete source book*. Jodhpur: Agrobios (India), 2009; 2: 540-541.
20. Khare C.P. *Indian Medicinal plants an illustrated dictionary with 215 pictures of crude herbs*. New Delhi, 2007; 706.
21. Anonymous. *The useful plants of India*. New Delhi: National Institute of Science Communication and Information Resources (CSIR), 2006; 679.

22. Ibn Baitar. Al-Jamiul Mufridat Al-Adviawa Al-Aghzia (Urdu translation) New Delhi: CCRUM Ministry of Health and Family Welfare; YNM, 287–289.
23. Kirtikar K.R., Basu B.D. Indian Medicinal Plants. Delhi: Periodical Expert Book Agency, 2012; 2: 207–208.
24. Qasemzadeh M.J., Sharifi H., Hamedanian M., Gharehbeqlou M., Heydari M., Sardari M., Akhlaghdoust M., and Minae M.B. The Effect of *Viola odorata* Flower Syrup on the Cough of Children with Asthma: A Double-Blind, Randomized Controlled Trial. Journal of Evidence-Based Complementary & Alternative Medicine, 2015; 20 (4): 287-291.
25. Chopra R.N., Nayar S.L., Chopra I.C. Glossary of Indian Medicinal plants. New Delhi: National Institute of Science Communication and Information Resources (CSIR), 2002; 255.
26. Asheesh K., Suresh C., Meenakshi P. A brief knowledge of Banafsha (*viola odorata* Linn.) & other viola species. International journal of Ayurveda and Pharma Research, 2017; 5 (4): 73-78.
27. Bentley R., Trimen H. Medicinal plants being description with original figures of the principal plants employed in medicine, 2002; 2: 25.
28. Chooapani R, Sadr S, Kaveh S, Kaveh N, and Dehghan S. Pharmacological treatment of catarrh in Iranian traditional medicine. J Tradit. Complement Med, 2015; 5 (2): 71–74.
29. Bughdadi I.H. Kitabul Mukhtarat fit tib (Urdu Translation by CCRUM). Vol. II. New Delhi: Ministry of Health and Family Welfare; YNM, 73–74.
30. Bakhshaei S. Phyto-Pharmacological Effect of Nine Medicinal Plants as a Traditional Treatment on Depression. Journal of Applied Pharmacy, 2017; 9 (3): 5.
31. Feyzabadi Z., Jafari F., Kamali S.H., Ashayeri H., Aval S.B., Esfahani M.M., Sadeghpour O. Efficacy of *Viola odorata* in Treatment of Chronic Insomnia. Iran Red Crescent Med J., 2014; 16(12): e17511.
32. Beiraghdar F., Einollahi B., Ghadyani A., Panahi Y., Hadjiakhoondi A, Vazirian M, Salarytabar A and Darvishi B. A two-week, double-blind, placebo-controlled trial of *Viola odorata*, *Echium amoenum* and *Physalis alkekengi* mixture in symptomatic benign prostate hyperplasia (BPH) men. Pharmaceutical Biology, 2017; 55(1): 1800–1805.
33. Mulla I., Roqaiya M., Khan M.I., Efficacy of *Viola odorata* flower decoction in chronic rhinosinusitis. Medical Journal of Islamic World Academy of Sciences, 2019; 27(3): 77-84.

34. Koochek M.H., Pipelzadeh M.H., Mardani H. The Effectiveness of *Viola odorata* in the Prevention and Treatment of Formalin-Induced Lung Damage in the Rat. *Journal of Herbs, Spices & Medicinal Plants*, 2002; 10 (2): 95-103.
35. Monadi A., Rezaie A. Evaluation of Sedative and Pre-Anesthetic Effects of *Viola odorata* Linn. Extract Compared with Diazepam in Rats. *Bulletin of Environment, Pharmacology and Life Sciences Bull. Env. Pharmacol. Life Sci.*, 2013; 2 (7): 125-131.
36. Hejazian M.S., Ganjloo J., Ghorat F., Rastaghi S. Effect of *Viola odorata* Nasal Drop on Sleep Quality of Older Adults. *Journal of Research in Medical and Dental Sciences*, 2018; 6(2): 107-111.
37. Vishal A., Parveen K., Pooja S., Kannappan N., Kumar S. Diuretic, Laxative and Toxicity Studies of *Viola odorata* Aerial Parts. *Pharmacology online*, 2009; 1: 739-748.
38. Ali M.Y., Qadir M.I., Rasool S., Abbas G., Ahmed S., Aslam Z., et al. Effectiveness of *Viola odorata* Flower Decoction for Tonsillitis and Peritonsillar Abscess. *Journal of Rashid Latif Medical College*, 2013; 51-53.
39. Kamali M., Seifadini R., Kamali H., Mehrabani M., Jahani Y., Tajadini H. Efficacy of combination of *Viola odorata*, *Rosa damascena* and *Coriandrum sativum* in prevention of migraine attacks: a randomized, double blind, placebo- controlled clinical trial. *Electronic Physician*, 2018; 10 (3): 6430-6438.
40. Siddiqi H.S., Mehmood M.H., Rehman N.U., and Gilani A.H. Studies on the antihypertensive and antidyslipidemic activities of *Viola odorata* leaves extract. *Lipids in Health and Disease*, 2012; 11(6): 12.
41. Salehi L., Asghari G.H., Yousofi H., Darani H.Y. Effects of different extracts of *Viola odorata* on *Trichomonas vaginalis* in culture medium. *Journal of Isfahan medical school*, 2014; 31(266): 2139-2148.
42. Azari Z., Kherullahi Z., Mohammadghasemi F., Nasab M.A., Hoseini F., Gazor R. Effect of the Aqueous and Hydro- Alcoholic Extracts of *Viola odorata* L. on Biochemical and Histologic Liver Parameters in Diabetic Wistar Rats. *Anatomical Sciences*, 2018; 15 (1): 21-32.
43. Helli S., Damghani H., Mohajeri D., Abbasi M.M., Attaran R., Zahed M. Evaluation of the Effect of Two Different Systemic Doses of *Viola odorata* on Prevention of Induced Tongue Dysplasia in Rats. *J Dent Shiraz UnivMed Sci*, 2016; 17(3): 185-192.

44. Koochek M., Pipelzadeh M., and Mardani H. The effectiveness of *Viola odorata* in the prevention and treatment of formalin-induced lung damage in the rat. *Journal of herbs, spices & medicinal plants*, 2003; 10: 95-103.
45. Alipanah H., Bigdeli M.R., and Esmaeili M.A. Inhibitory Effect of *Viola odorata* Extract on Tumor Growth and Metastasis in 4T1 Breast Cancer Model. *Iranian Journal of Pharmaceutical Research*, 2018; 17 (1): 276-291.
46. Stojković D., Glamočlija J., Ćirić A., Šiljegović J., Nikolić M., & Soković M. Free Radical Scavenging Activity of *Viola odorata* Water Extracts. *Journal of Herbs, Spices & Medicinal Plants*, 2011; 17(3): 285-290.
47. Ebrahimzadeh M.A., Nabavi S.M., Nabavi S.F., Bahramian F., and Bekhradnia A.R. Antioxidant and free radical scavenging activity of *H. officinalis* L. var. *angustifolius*, *V. odorata*, *B. hyrcana* and *C. speciosum*. *Pakistan Journal of Pharmaceutical Sciences*, 2010; 23: 29-34.
48. Tafazoli V., Shahriari M., Heydari M., Nikbakht H.A., Zarshenas M.M., Nimrouzi M. The Effect of *Viola Odorata* L. Oil for Fever in Children: A Randomized Triple-blinded Placebo-controlled Clinical Trial. *Current Drug Discovery Technologies*, 2019; 16 (1).
49. Khattak S.G., Gilani S.N., and Ikram M. Antipyretic studies on some indigenous Pakistani medicinal plants. *Journal of ethnopharmacology*, 1985; 14: 45-51.
50. Qadir M.I., Ali M., Ali M., Saleem M., and Hanif M. Hepatoprotective activity of aqueous methanolic extract of *Viola odorata* against paracetamol-induced liver injury in mice. *Bangladesh J Pharmacol*, 2014; 9: 198-202.
51. Azari Z., Kherullahi Z., Mohammadghasemi F., Nasab M.A., Hoseini F., Gazor R. Effect of the Aqueous and Hydro Alcoholic Extracts of *Viola odorata* L. on Biochemical and Histologic Liver Parameters in Diabetic Wistar Rats. *Winter & Spring*, 2020; 17 (1): 21-32.
52. Yousefnia S., Naseri D., Forootan F.S., Tabatabaeian M., Moattar F., Ghafghazi T., Esfahani M. H.N., & Ghaedi K. Suppressing role of *Viola odorata* extract on malignant characters of mammosphere-derived breast cancer stem cells. *Clinical and Translational Oncology*, 2020; 22: 1619–1634.
53. Hassan F., Naeem I. Biological activity of *Viola odorata* Linn. against mycobacterium tuberculosis. *International Journal of Pharma and Bio Sciences*, 2014; 5(3): 61-69.

54. Antil V., Parveen K., Kannappan N., Diwan A., Saini P., Singh S.K. Evaluation of the analgesic activity of *Viola odorata* aerial parts in rats. *Journal of Natural Pharmaceuticals*, 2011; 2 (1): 24-27.
55. Katoch M., Paul A., Singh G., & Sridhar S. N. C. Fungal endophytes associated with *Viola odorata* Linn. as bioresource for pancreatic lipase inhibitors. *BMC Complementary and Alternative Medicine*, 2017; 17: 385.
56. Pawar V., and Thaker V. In vitro efficacy of 75 essential oils against *Aspergillus niger*. *Mycoses*, 2006; 49: 316-323.
57. Akhbari M., Batooli H., and Kashi F.J. Composition of essential oil and biological activity of extracts of *Viola odorata* L. from central Iran. *Natural Product Research*, 2012; 26 (9): 802–809.
58. Gautam S.S., Navneet, Kumar S. The Antibacterial and Phytochemical Aspects of *Viola odorata* Linn. Extracts Against Respiratory Tract Pathogens. *Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci.*, 2012; 82(4): 567–572.
59. Ziad D., Elias A., and Roula A.M. Antibacterial activity of *Rheum rhaponticum*, *Olea europaea*, and *Viola odorata* on esbl producing clinical isolates of *Escherichia coli* and *Klebsiella pneumoniae*. *International Journal of Pharmaceutical Sciences and Research*, 2012; 2: 1669-1678.
60. Gautam S.S., Bithel N., Kumar S., Painuly D., and Singh J. A new derivative of ionone from aerial parts of *Viola odorata* Linn. and its antibacterial role against respiratory pathogens. *Clinical Phyto science. A springer open journal*, 2016; 2: 4.
61. Amer A., and Mehlhorn H. Repellency effect of forty-one essential oils against *Aedes*, *Anopheles*, and *Culex* mosquitoes. *Parasitology research*, 2006; 99: 478-490.
62. Muhammad N., Saeed M., Awan A.A., Khan H. Ethnomedicinal, phytochemical and pharmacological profile of genus *Viola*. *Phytopharmacology*, 2012; 3(1): 214-226.
63. Shafei Z., Maleki S.A., Ghaderi-Pakdel F. Evaluation of the antidepressant like effect of *Viola odorata* hydroalcoholic extract in male mice. *Journal of Birjand University of Medical Sciences*, 2018; 25(4): 286-296.
64. Fazeenah A., Quamri M. A., Renuka B.N. Effects of combined Unani formulations in allergic rhinitis (Nazla Haar) with special reference to Eosinophils in the nasal smear. *Sri Lankan Journal of Indigenous Medicine*, 2013; 147- 151.
65. Fazeenah A., Quamri M.A., Siddiqui M.A. A controlled randomized single blinded clinical study on the effects of Unani formulations in Allergic Rhinitis. *Journal of*

research in Unani Medicine. National Institute of Unani Medicine, Bangalore, 2013; 2(2): 15-22.