

Pharmaceutical study of vasa (Adhatoda vasicca Linn) with special reference to its different Dosage forms- Overview

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ABSTRACT: *The rise in adverse medication reactions caused by allopathic pharmaceuticals has prompted academics and medical practitioners to explore natural alternatives. These herbal medications have been used by the traditional system of Medicine and Ayurveda have been practiced for over 1000 years. There are numerous families of There are therapeutic plants that come from the Acanthaceae family, which includes other families, such as the Euphorbiaceae and Meliaceae, are significant. Adhatoda vasica (Vasa) is a well-known Ayurvedic medicine that has been Known to have immense biological potential. In Ayurveda, it is used to heal ailments like Gulma, Raktapitta, Swasa - kasa because of its properties such as Tikta -Kashaya rasa, katu vipaka, and sheeta virya the plant shows strong pharmacological activity particularly on anti-inflammatory, anti-microbial, reproductive disorders, cardiac diseases and many more. This review includes data regarding the systematics, phytochemical and ethnopharmacological studies that demarcate Adhathoda vasica, a versatile native plant of Indian subcontinent with high commercial reputation and thus can be encouraged for its diversified medicinal and other applications.*

KEYWORDS: *Adhatoda vasica(Vasa), Tikta-Kashaya rasa, biological activities, secondary metabolites.*

INTRODUCTION:

In Ayurveda, the bhaishajya is the most important person since a doctor needs to have high-quality

medications and a deep understanding of bhashajya in order to treat a patient appropriately. Bhaishajya Kalpana discusses every facet of medicine, including its foundational ideas. The attributes gained by the samyak prayog of aushadh are discussed by Acharaya Charak in his explanation of Bhashajya in the four limbs of treatment, or chikitsa chatuspad. It ought to be: Bahuta (widely available), Yogytvam (more potent), Aanevidha Kalpana (many medicinal forms or applications), and Sampat (high potency or efficacy) ^[1]. It has been utilized in the Ayurvedic medical system to treat a variety of respiratory tract ailments in both adults and children. Since ancient times, all of the plant's parts have been employed for their therapeutic and beneficial effects ^[2]. The perennial Vasaka plant has an awful odor and a harsh flavor. It is evergreen and extremely branching. The Vasaka plant has stem, leaf, fruit, flower, seeds, roots, and young plants ^[3, 4]. Quinazoline alkaloids such as vasicine, 7-hydroxyvasicine, vasicol, vasicoline, vasicinone, 3-deoxyvasicine, vasicolinone, betaine, steroids, carbohydrates, and alkanes are present in certain sections of the vasaka plant. Triterpenes (aamirine) and flavonoids (apigenin, astragaline, kaempferol, quercetin, and vitexin) are found in a vasica flowers ^[5, 6].



Fig-1: Whole plant of Vasaka (Adhatoda Vasica).

Scientific classification:

- Kingdom: Plantae
- Division: Angiosperms
- Class: Dicotyledonae
- Order: Individuals
- Family: Acanthaceae
- Genus: Adhatoda
- Species: vasica
- Binomial name: Adhatoda vasica Nees.
- Synonym: Malabar nuts ^[7]

Table 1: Vernacular names for Adhatoda vasica

Hindi	Adosa, adalsa, Vasaka
Sanskrit	Shwetavasa, vasa, vasaka, vaidyamata singhee
Bangali	Basak
Tamil	Adatodai
Marathi	Vasuka
Telugu	Adasaram
Malyalam	Ata-lotakam
Gujrati	Aradusi, adusa
Punjabi	Bansa, basuti, bhekkar
English	Malabur nut
China	Ya-Jui-Hua
Manipuri	Nongmangkha-agouba
Kannada	Adusoge
Arebic	Adusha ^[8,11]

Table 2: Botanical classification of adhatoda vasica

Taxonomical Rank	Taxon
kingdom	Plantae
Division	Angiosperms
Class	Eudicots
Order	Lamiales
Family	Acanthaceae
Genus	Justicia
Species	J. adhatoda
Common name	Adulsa ^[12,13]

Etymology of synonyms

1. Vasa-It is a shrub which covers the ground with dense foliage.
2. Atarusha -It is useful drug which alleviates number of diseases.
3. Vajidanta -It has white bilabiate flowers ^[14].
4. Shimhasya -Its flowers are like opened mouth of lion.
5. Vrusha- Its flowers have profuse nectar.
6. Bhishagmata- It cures diseases of various organs and thus called “mother of physician” ^[15].
7. Karkasa.-It has minutely pubescent leaves.
8. Kaphaha -It is useful particularly in respiratory disorders caused by kapha.
9. Kasanotpatana-It is useful for cough.
10. Raktapittaprasadani -It is useful for raktapitta.
11. Raktamutrajita-It is useful for raktamutr.

12. Dantasattvapradayi-It provides strength to teeth ^[16].

PHYTO-CONSTITUENTS:

- Leaf
This plant's leaves and roots contain the primary alkaloids vasicinone (0.027%) and vasicine (0.85%). ^[17] The plant's leaves also include hydroxypeganine, adenosine, adenosineone, anisole, and vaccinine, among other alkaloid constituents. Furthermore, it contains traces of betaine, crystalline acid, alkanes, steroids, and essential oil ^[18,20].
- Flower
Alkanes, 4-dihydrochalcone-4-glucoside, triterpenes (alpha-amyrin), flavonoids (Astragalin,

Kaempferol, Quercetin, Vitexin, Apigenin), and alkanes are all present [21,23].

• Root

Vitamin C (5.2%), lipids (2.5%), carbs, alkanes, alkaloids (vascine (7.5%), vasicinal, vasicinolone, vasicinone 3.5%), fiber (5.2%), and adhatonine are all present in the root portion. The plant's roots also include extracts of deoxyvascine, sitosterol, and B-glucoside-galactose [24].

• Seed

Deep yellow oil, comprising 3.1% glycerides of arachidic acid, 10.7% lignoceric acid, 49.9% oleic acid, cerotic 5%, 12.3% linoleic acid, 11.2% behenic 11.2%, and 2.6% M-sitosterol, is present in 25.8% of seeds.

Ayurvedic Properties:

Rasa – Tikta, Kashaya

Guna –Ruksha, Laghu

Virya – Sheeta

Vipaka – Katu

Dosha karma – Paciefies Kapha dosha and Pitta

Dosha

Dhatu (Tissue) effect – Rasa, Mamsa, Shukra

Organ Effect – Lungs, Throat [25,26]

Medicinal Uses:

The following therapeutic qualities are thought to be responsible for Vasa's medical applications.

1. Antitussive: eases coughing.
2. Antifungal: functions to combat ringworm.
3. Bronchodilator: widens the bronchi.
4. Antibacterial: inhibits the growth of bacteria.
5. Microbiocidal
6. Defense against viruses
7. Anti-inflammatory: lessens airway irritation.
8. Antihemorrhagic: stops bleeding.
9. Antioxidant.
10. Antispasmodic: relieves abdominal spasms and relaxes muscles (the presence of Vasicinone alkaloid in Vasaca confirms the effect of this compound).
11. Mild Sedative: Promotes mental calmness.
12. Anti-allergic: Prevents allergies.
13. Antihelmintic: eliminates worms or acts as an antiparasite.
14. Appetite stimulant: enhances hunger. [25,26]

General Description:

With long leaves and white blossoms in axillary spikes, it is an evergreen shrub growing to a height of 2.2–3.5 meters. The shrub is bushy, bearing many branches and blooms on opposite climbing branches in shades of pink, purple, or white.



Fig-2: Vasaka flowers, leaves and Roots

With secondary and tertiary rootlets, the root is typical. Large, lance-shaped leaves opposing and explicit. panicles or spikes of flowers. thickly flowered inflorescences in axillary spicate cymes; short peduncles; broadly oval, foliaceous bracts Fruit has four seeds and resembles a capsule [27].

Pharmacological activity:

Vasaka extracts in water and alcohol have strong pharmacological effects because they contain active ingredients including vasicine and vasicinone. When compared to their racemic counterparts,

vasicine and vasicinone have significantly greater pharmacological activity. Among the reported activities are:

Antibacterial:

Alcoholic extract of leaves and roots showed antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*, whereas water extract showed activity against *S.aureus only* [28].

Anticholinesterase:

Vasicinone derived from the roots caused transitory hypotention in cats, contraction of isolated gut, and

heart in guinea pigs, indicating excellent anticholinesterase activity^[29].

Wound Healing:

Plant extract-treated buffalo wounds healed faster than pancreatic tissue extracts^[30].

Hypoglycemic:

The ethanolic extract of the leaves had hypoglycemic action in rats^[31]. Modak and Rao discovered that administering the non-nitrogenous component of the leaves in suspension from orally at a dose of 25mg /kg decreased the blood sugar level of rabbits for a short period of time^[32].

Anti-inflammatory:

Using a modified hen's egg chorioallantoic membrane, the anti-inflammatory properties of methanolic extract (a non-alkaloid fraction

containing saponins and alkaloids) were assessed. The results showed that the extract had significant activity at a dose of 50 pellets, which was comparable to hydrocortisone, while the methanolic extract had less activity^[33].

Anti-asthmatic and bronchodilator activity:

The alkaloid constituents mainly Vasicine and vasicinone possess medicinal properties against respiratory disorder. The extracts of leaves and roots showed soothing effects against the throat, to cure bronchitis, bronchiole and lung disorder and act as an expectorant^[34]. The experiment was conducted in anesthetic guinea pigs and rabbits and unaesthetic guinea pigs that showed the antitussive property^[35]. Reported studies revealed the bronchodilator activity of Vasicine when experimented with both in vitro and in vivo^[36].

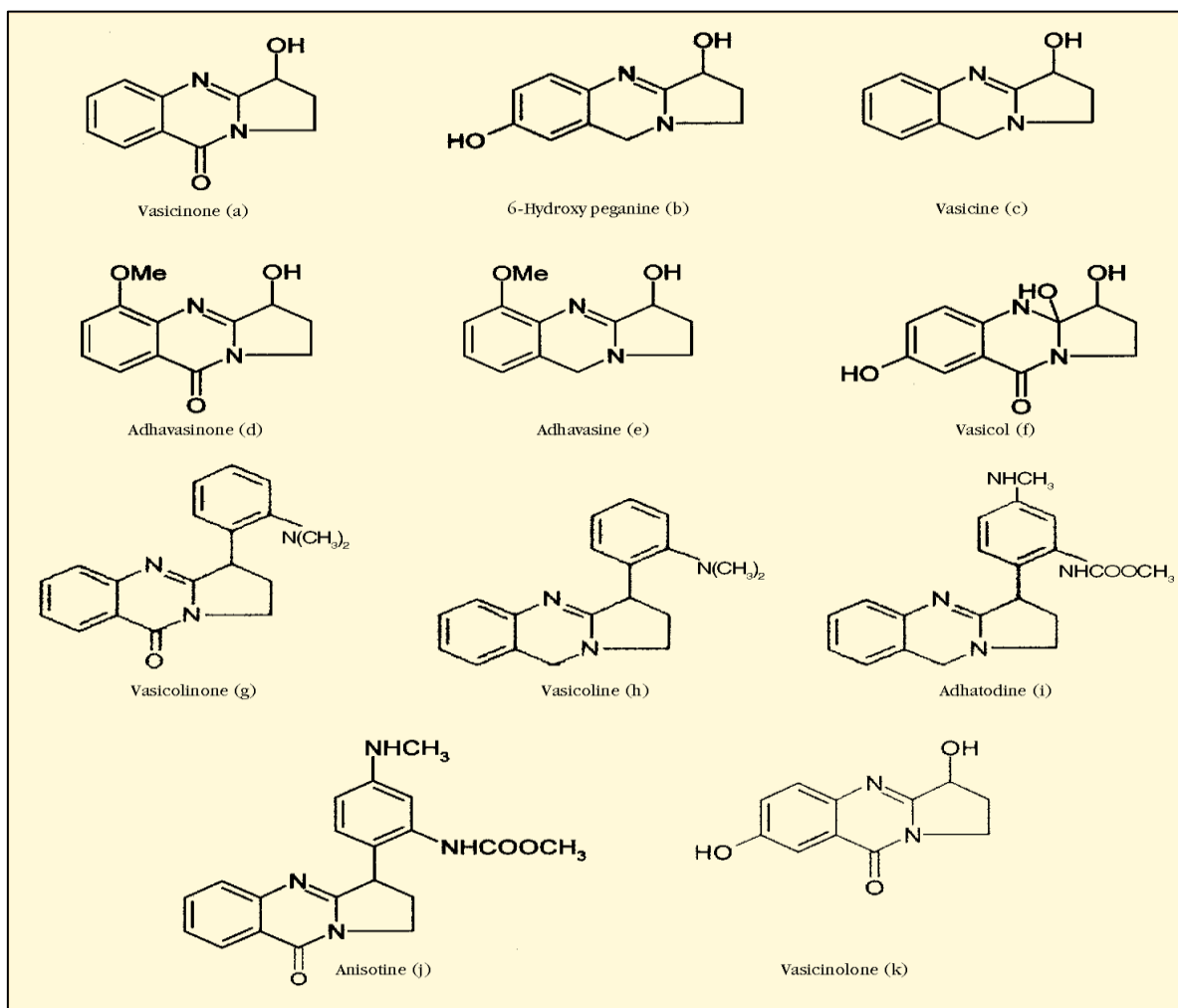


Fig.(a-k): Quinazoline ring containing constituent of *Adhatoda zeylanica*

Growth and Cultivation:

Soil and Climate: Seen in almost all types of climates.^[37] Prefers loamy soils with good

drainage. It can tolerate high temperature and can withstand drought to great extent, but is sensitive to frost.

I) Propagation

Cuttings of 3–4 noded stems, about 15-20 cm in length, are used in the commercial propagation process. Although the terminal end is more suited for planting, lower stem portions are also utilized when extra planting material is needed. Cuttings that are rooted or unrooted can be planted. Cuttings take 4–5 weeks to mature and are suitable for planting. They root readily. For improved establishment during dry spells, use rooted cuttings.

II) Planting

During the beginning of the monsoon season, in April or May. Either as an intercrop in plantation crops or as a pure crop, it is grown. A good tilth is achieved by constantly plowing the field, mixing it with manures, preparing beds of one meter in length, and planting cuttings.

Spacing: 60 by 30 cm; each acre needs roughly 20,000 cuttings.

III) Manuring

Without any particular attention, the plant often grows well. However, applying manures and fertilizers is advised for improved yields in commercial agriculture.

IV) Pest and diseases

Incidence of pests and disease is low. Leaf spot disease: during rainy periods, leaf spots appear on older leaves. Infested leaves turn yellowish and fall down.

V) Gathering and preparing

The entire plant, as well as its leaves and roots, are harvested. Harvesting leaves: starting in the first year, every three to four months. Harvesting roots: two years later. Harvesting roots is best done in December and January when the level of alkaloids is highest. Digging up roots, cutting stems 15 cm above the base, drying, and kept.

Morphology of *Vasa*

It is dense shrub 1.2-2.4 m, sometimes arborescent 6m high with many long opposite ascending branches.³⁸¹

Leaves:

length: 10–13 cm. The leaves are light green in color and have an ovate lanceolate form. It has a distinctive smell. It has a bitter flavor. The leaf has an acuminate apex and an entire to slightly crenate border. A leaf's venation is pinnate, and its base is symmetrical. The leaves are borne on short petioles, have smooth edges, and are placed oppositely. Length of petioles is 1–2.5 cm. They are elliptic-lanceolate, completely black above, paler below, base tapering, minutely puberulous when young, glabrous when grown. They turn a dingy greenish-brown color after drying. Ten to twelve pairs of main nerves with reticulate veins in between.

Stem:

This plant has a tall, opposing stem with ascending branches that have glabrous, yellowish-colored bark.

Flower: 1-2 by 0.5-1.2 cm, elliptic subacute, glabrous or nearly so, 5-7 nerved, closely reticulately veined; bracteoles 1.5-2 by 0.3-0.4 mm, oblong-lanceolate, acute, with ciliolate margins, 1-nerved, reticulately veined; present in short thick axillary peduncles 3- 10 cm, stout, shorter than the leaves. The calyx measures around 1.3 cm in length, is somewhat pubescent or glabrous, and is separated within 2 mm of the base. The sepals are imbricate, oblong-lanceolate, sharp, 3-nerved, and veined reticulately. Corolla: white with a few irregularly shaped pinkish-colored bars in the throat; tube: 1-2 cm long; lower half cylinder, 4 mm diameter; upper half much inflated laterally; upper lip: 2 by 1.3 cm long; ovate-oblong, curved, obtuse, notched; lower lip: equal to upper lip in length; lobes: 1.3 cm deep, along rounded, middle lobe the broadest. Lower anther cells are minutely apiculate at the base of filaments, which are long, thick, curved, and hairy at the base. Ovarian pubescent; style's lowest portion pubescent; capsule measures 1.5–2 by 0.6–0.8 cm. clavate, subacute, pubescent, with a short, blunt tip; firm stem, flattened, 1 cm in length.

Seeds:

5-6mm. long, orbicular- oblong, tubercular – verrucose, glabrous.



Microscopic characters

T.S of stem:

The outline of the stem's transverse portion is waxy. [39] The outermost layer of the stem, known as the epidermis, is composed of tightly packed barrel-shaped cells. The outer cell wall has a lot of cutinization and is extremely thick. There is a multilayered, thick-walled hypodermis underneath the epidermis. There is a multi-layer parenchymatous cortex under the hypodermis. There are many of intercellular gaps in the cortex. Pericycle and endodermis are one and the same. A ring of many conjoint, collateral, and open vascular bundles is found inside the cortex. Phloem is found in the epidermis. Medullary rays are arranged radially and found between vascular bundles in xylem, which is endarch. In the core, multi-layer polygonal cells are compactly packed to form the pith.

T.S. of the leaf:

This leaf is a typical dicot. The leaf has a single layer of epidermis covering both of its surfaces. The single-layered epidermis is composed of tightly packed parenchymatous cells that resemble barrels. The epidermis has cuticles covering its outside surface. Both the upper and lower epidermis contain stomata. In the direction of the top epidermis, the mesophyll tissues develop into palisade tissue, which is composed of double-layered columnar cells densely packed with chloroplasts. Spongy tissue having extensive intercellular gaps and loosely

arranged polygonal cells in the lower epidermis. Every vascular bundle is closed, conjoint, and collateral. Phloem is present in the lower epidermis while xylem is present in the upper epidermis. A parenchymatous bundle sheath encloses the vascular bundles.

Roots of the T.S:

Displays six to fifteen layers of thin-walled, elongated, and slightly tangentially elongated cork cells; a broad secondary cortex made up of thin-walled, polygonal, and mainly rectangular groups of stone cells with distinct pits and striations; a more or less discontinuous, annular band of these cells is followed by secondary phloem, which is made up of fifteen to twenty layers of thin-walled, elongated, and layered cells with the usual elements; secondary xylem is made up of vessels, fibers, parenchyma, and rays; vessels are simple pitted, and xylem rays are primarily uniseriate, though a few four seriate rays are also present; Simple and compound starch grains with 2 to 3 156 components, rounded to oval, and 3 to 6 μ in diameter, including hilum and concentric striations, found in secondary cortex and secondary phloem. Powder: brownish-grey, with pieces of cork cells, simple pitted vessels, primarily grouped stone cells, and simple and compound starch grains with two to three components, oblong to spherical, 3 to 6 μ in diameter, with concentric striations and a hilum.

CONCLUSION

It is evident from numerous published studies that *Adhatoda vasica* is important to the herbal medicine system. This plant has long been employed in the traditional Ayurvedic and Unani medical traditions. In the current study, the traditional and Ayurvedic perspectives on this plant are briefly discussed. Its medicinal qualities and chemical makeup are the subject of extensive research. Vitamin C, vasicine, vasicinone, and other components of alkaloids are abundant in this plant. Numerous experimental investigations have demonstrated the pharmacological capabilities of the *Vasaka* plant, which include antifungal, antitussive, antiulcer, abortifacient, hypoglycemia, anti-tubercular, anti-inflammatory, radiomodulatory, antiviral, and hepatoprotective effects. According to scientific research, this plant's formulations are useful for treating human ailments, particularly those of the respiratory system.

REFERENCES

- [1]. Rathi B, Rathi R. Principals of ethical ayurveda prescription writing in clinical practice: A literature review. *J Datta Meghe Inst Med Sci Univ* 2019;14:S97-102.
- [2]. Atal CK, Chemistry and Pharmacology of Vasicine – A new oxytocic and abortifacient, *Indian Drugs*, 1980, 15(2), 15-18.
- [3]. Claeson UP, Malmfors T, Wikman G, Bruhn JG. 2000. *Adhatoda vasica*: a critical review of ethnopharmacological and toxicological data, *Journal of Ethnopharmacology* Vol. 72 Page No. 1-20.
- [4]. Manjunath BL. 1948. *The wealth of India, A Dictionary of Indian raw materials and industrial products*. CSIR Delhi, page no. 31-32
- [5]. Kumar A, Ram J, Samarth RM, Kumar M. 2005. Modulatory influence of *Adhatoda vasica* Nees leaf extract against gamma irradiation in Swiss albino mice. *Phytomedicine*. 12:285-293
- [6]. Prajapati ND, Purohit SS, Sharma DD, Tarun K. 2003. *A Handbook of Medicinal Plants*. Ist Edn, Agrobios, jodhpur, india 13-14
- [7]. Importance of *Adhatoda Vasica* Nees In Traditional System of Medicines: A Review Poonam Arora, Dept of Pharmacognosy and Phytochemistry, Delhi pharmaceutical sciences and research University Delhi India
- [8]. Baquar SR. 1989. Medicinal and poisonous plants of Pakistan. *Medicinal and poisonous plants of Pakistan*, 515-515.
- [9]. Ahmad S, Garg M, Ali M Singh M, Athar MT, Ansari SH. 2009. A phyto-pharmacological overview on *Adhatoda zeylanica* Medic. Syn. A. *vasica* (Linn.) Nees, 8(5): 549-554.
- [10]. Council OS. 1966. *The wealth of India. A dictionary of Indian raw materials and industrial products*. N- Pe. *The wealth of India. A dictionary of Indian raw materials and industrial products*, 7(7): 330
- [11]. P Singh T, M Singh O, B Singh H. 2011. *Adhatoda vasica* Nees: phytochemical and pharmacological profile. *The Natural Products Journal*, 1(1): 29-39.
- [12]. Hossain MT, Hoq MO. 2016. Therapeutic use of *Adhatoda vasica*. *Asian Journal of Medical and Biological Research*, 2(2): 156-63.
- [13]. Nadkarni KM, Nadkarni AK. 1976. *DF KM Nadkarni's Indian Materia Medica: With Ayurvedic, Unani- Tibbi, Siddha, Allopathic, Homeopathic, Naturopathic and Home Remedies, Appendices and Indexes*. Popular Prakashan, 736-737.
- [14]. Dr krishnachandra Chuneekar, Bhavprakash Nighnatu, *Guduchaydi varga* 34\307-309, Chaukhamba Bharti Academy Varanasi, Chaukhamba Publication, 2018.
- [15]. Shree Bapalal Vaidya, Nighantu Adarsha, *Vasadi Varga, Uttaraartha*, page; 205-213, Chaukhamba Bharti Academy Varanasi, Chaukhamba Publication, 2016.
- [16]. Prof P.V.Sharma: *Namrupvijyanam. Satyapriya Prakashan, Varanasi*. 1st edition, 2000; 17-18.
- [17]. Haq ME, Ikram M, Warsi SA. 1967. Chemical composition of *Adhatoda vasica* (L.) II. *Pak. J. Sci. Ind. Res.*, 10: 224-5
- [18]. Lahiri PK, Pradhan SN. 1964. Pharmacological investigation of Vasicinol-alkaloid from *Adhatoda vasica* Nees. *Indian Journal of Experimental Biology*, 2(4): 219.
- [19]. Bhattacharyya D, Pandit S, Jana U, Sen S, Sur TK. 2005. Hepatoprotective activity of *Adhatoda vasica* aqueous leaf extract on D-galactosamine-induced liver damage in rats. *Fitoterapia*, 76(2): 223-5.

- [20]. Joshi BS, Newton MG, Lee DW, Barber AD, Pelletier SW. 1996. Reversal of absolute stereochemistry of the pyrrolo[2, 1-b]quinazoline alkaloids Vasicine, vasicinone, vasicinol and vasicinolone. *Tetrahedron: Asymmetry*, 7(1): 25-8.
- [21]. Haq ME, Ikram M, Warsi SA. 1967. Chemical composition of *Adhatoda vasica* (L.) II. *Pak. J. Sci. Ind. Res.*, 10: 224-5.
- [22]. Rawat MS, Pant S, Badoni YS. Negi. 1994. Biochemical investigation of some wild fruits of Garhwal Himalayas, *Prog Horticulture*, 26: 1-2
- [23]. Bhartiya HP, Gupta PC. 1982. A chalcone glycoside from the flowers of *Adhatoda vasica*. *Phytochemistry*, 21(1): 247.
- [24]. Jain MP, Koul SK, Dhar KL, Atal CK. 1980. Novel nor-harmal alkaloid from *Adhatoda vasica*. *Phytochemistry*, 19(8): 1880-2.
- [25]. Prof. P.V.Sharma *Dravya guna Vigyan Vol. 2* Chaukhambha Bharati Academy, Varanasi; 242-244
- [26]. Prof. P.V.Sharma, Dhanwantri Nighantu commentry, *Chaukhambha Orientalia*, Varanasi.P.P. 12.
- [27]. Kirtikar KR, Basu BD. *Indian Medicinal Plants. Vol. I. 2nd edn. International Book Distributors, Dehradun, India. 2005; p. 2392-93.*
- [28]. George M, Venkatraman PR and Pandalai KM Investigations on plants on plant antibiotics, part 2, A search for antibiotic substance in some Indian medicinal plant, *J sci Ind Res*, 1947, 6B , 42-46.
- [29]. Lahiri PK and Pradhan SN , Pharmacological investigation of vasicinol – an alkaloid from *Adhatoda vasica* Nees, *Indian J Exp Biol*, 1964, 2, 219-222.
- [30]. Zama MMS, sing HP and kumar a, comparative studies on *adhatoda vasica* and pancreatic tissue extract o wound healing in buffaloes , *indian vet J*, 1991, 68, 864-866.
- [31]. Dhar MI, Dhar MM dhawan BN, Mehrotra BN and Ray C, Screening of Indian plant for biological activity part 1, *Indian J EXP Biol* 1968, 6, 232-247.
- [32]. Modak At and Rao R, Hypoglycemic activity of non-nitrogenous principle from the leaves of *adhatoda vasica* nees, *Indian J Pharm*, 1996, 28, 105-106.
- [33]. Chakraborty A and Brantner AH, Study of Alkaloids from *Adhatoda Vasica* Nees on their anti-inflammatory activity, *phytother Res*, 2001, 15 (6), 532-534.
- [34]. Adalotakam: Medicinal & Aromatic Plants Agrotechnology, Aromatic & Medicinal Plant Research Station KAV Oddakali. Inprsagrotech.nic.in.
- [35]. Dorsch W, Wagner H. New anti-asthmatic drugs from traditional medicine?. *International Archives of Allergy and Immunology* 1991; 94(1-4): 262-5.
- [36]. Dhuley JN. Antitussive effect of *Adhatoda vasica* extract on mechanical or chemical stimulation-induced coughing in animals. *Journal of Ethnopharmacology* 1999 Nov 30; 67(3): 361-5.
- [37]. Lahiri PK, Pradhan SN. Pharmacological investigation of Vasicinol-alkaloid from *Adhatoda vasica* Nees. *Indian Journal of Experimental Biology* 1964 Jan 1; 2(4): 219.
- [38]. Dhale DA, Kalma RK, Pharmacognostic characterization of *Adhatoda vasica* medicine: *International Journal of Pharmaceutical Science and Research*, 2012; 3(11): 4264-4269.
- [39]. Pedro Alevedo-Rodriguer: *Acantheceae : Guide to the Genera of Lianas And Climbing plants* (16th June 2016).
- [40]. Dhale DA, Kalma RK, Pharmacognostic characterization of *Adhatoda vasica* medicine: *International Journal of Pharmaceutical Science and Research*, 2012; 3(11): 4264-4269.