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Pharmacological activities of potent medicinal plant *Adhatoda zeylanica* medic: A review

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ABSTRACT

Plants are the major source of medicines from ancient times. Nowadays, there is a growing demand of medicines particularly belonging to plant drugs. Medicinal plants have various complex chemical substances as secondary plant metabolites. The plant *Adhatoda zeylanica* Medic. syn. *A. vasica* Nees (Adulsa) is also one of the natural wealth among plants. Adulsa is mostly used against, tumours, leprosy, blood disorders, ear diseases, asthma, fever, thirst, vomiting, loss of memory, leucoderma, bronchitis jaundice, etc. Present paper focus on medicinal property of Adulsa based on collected data through literature review. The review focuses on the phytochemistry and pharmacological actions of the plant.

Keywords: *Adhatoda*, Adulsa, phytochemistry, pharmacology, vasicine, vasicinone

INTRODUCTION

Adhatoda zeylanica Medic. (Adulsa) is an evergreen herb belonging to the family Acanthaceae. It is indigenous to India in Sub-Himalayan tracks up to an altitude of 1000 m. In Maharashtra, it is found in Konkan, Marathwada, Vidarbha and other regions. It is large sized, evergreen, shrub growing up to height of 2.5 m. Leaves are broadly elliptic and lanceolate, entire, tapering up to 20 cm long and 78 cm wide. Inflorescence is large, pedunculate, stout, spike with dense flowers, which are bracteate, decussate, and often thysiform. Flowers are subsessile. Bracts are sessile, 8-25 mm long, ovate, subacute and obscurely 5-7 ribbed. Bracteoles are narrow, falcate and ablong. Calyx is gamosepalous, 8-12 mm long, glabrous, slightly pubescent, deeply five lobed, lanceolate, acute and three nerved. Corolla is whitish, gamopetalous and about 30 cm long and funnel shaped. Stamens are two, attached near the tip of corolla tube with long, stout and curved filament viz. hairy and concealed under the vault of upper lip. Pistil as bicarpellary and syncarpous with superior ovary. Style is filiform, bifid stigma.

The entire plant parts i.e. roots, leaves and fruits are used against various infections and diseases in rural populations of Subcontinent and many centuries because of its medicinal values (Alice and Asha 2007).

MATERIAL METHODS

All the data is gathered from search engines as follows: Science Direct, Google Scholar, Researchgate etc . Keywords like phytochemicals, phytochemistry, Adhatoda were used for searching.

RESULTS & DISCUSSION

This plant is considered as phytochemical factory with several componants which are used along with combination of other plants as herbal drugs.

Phytochemical aspects:
For detection of vasicine and vasicinone in *Adhatoda vasica* (Nees) High Performance Thin Layer Chromatographic (HPTLC) was conducted for which revealed that leaves extracts of *Adhatoda vasica* contains 0.627 % of vasicine and 0.060 % of vasicinone which are important alkaloids with medicinal properties (Chauhan SK et al 1999). Besides, the phytochemical and structural studies showed that *Adhatoda vasica* contains eleven new quinoline, triterpene, cumarin compounds, quinozaline, furanoquinline, pyranoquinoline and substituted carmine (Nighat S 2000). Another study also reports that the leaves contains chemical constituents i.e. pyrroloquinazoline, alkaloids, vasicine, vasicol, adhatonine, vasicinone and vasicinolone (Soni S, et al 2008).

Detail studies carried out on pharmacological investigation i.e. characterization of an Expectorant Herbal Basak Tea prepared with *Adhatoda vasica* leaves at regional research laboratory of Jammu revealed that the alkaloid vasicine reveal bronchodilatory, uterine stimulant (Ashish KS et al 2009).

While studying effect of fungal contamination on vasicine and vasicinone component in Adhatoda. It was noted that these component that are effective against asthma, chronic bronchitis, and other respiratory diseases, deteriorates after contamination (Sutare MS 2019).

Quantitative estimation of vasicine and vasicinone in *Adhatoda vasica* conducted by HPTLC method, focuses on uses of this plant for the treatment of respiratory ailments like cough, bronchitis and asthma because, both the alkaloids vasicine and vasicinone acts as respiratory stimulant, bronchodiatory and hypotensive (Suthar AC et al 2009).

Another screening study was conducted on anti-mycobacterial activity of two natural alkaloids i.e. vasicine acetate and 2-acetyl benzylamine from Indian shrub *Adhatoda vasica* Nees leaves. The powdered leaves of *Adhatoda vasica* were extracted with hexane, ethyl acetate and methanol. It was found that this plant contains i.e. vasicine and 2-acetyl benzylamine. They tested them against *Mycobaterium tuberculosis* and found that these compounds were possessing strongly anti-mycobeacterial activity (Ingnachimuthu S and Shanmugam N 2010).

Pharmacological aspects:
Bronchodilatory activity:
Phytochemical and pharmocological investigations of *Adhatoda zeylanica* reports that medicinal plants have curative properties within secondary plant metabolities due to the presence of various complex chemical substances of different compositions. It was also mentioned that *Adhatoda zeylanica* is used for treating cold, cough, whooping cough, chronic bronchitis, asthma and also used as sedative, expectorant, antispasmodic activities. *Adhatoda zeylanica* is found to contain numerous phytoconstituents like quinazoline alkaloid i.e. vasicine, vasicinone, vasicinol, vasicinine and vasicoline. The alkaloids vasicine and vasicinone showed bronchodialatory action (Khursheed A, et al 2010).

H_1N_1 Flu prevention activity:
Focusing on present scenario of diseases one of the study reports that *Justica adhatoda* have potential to prevent swine Flu. It was observed in H_1N_1 Flu patients suffering from running nose, sneezing, sore throat, Malaise and body ache. The activity of *Jusitca adhatoda*-30 c was investigated by administering 4 globules for 4 times daily as a remedy for 7 days. It was found that 95 % cases were not only cured from their symptoms but also acted remedy as'prevention'. The study concluded that H_1N_1 Flu could be well prevented by *Justica adhatoda* 30 c though it requires more clinical verifications (Krishnendu MP 2010).

HIV protease inhibition activity:

In an another study it was reported that *Adhatoda vasica* Nees. act as a putative HIV-protease inhibitor. As AIDS is one of the most public health challenges in current world's health sector. The evaluation of prescreening programme for anti-HIV agents from natural sources i.e. various crude extract of *Adhatoda vasica in vitro* was conducted. For the experimental purpose, pepsin assay was utilised as a substitute of HIV-protease for screening HIV-protease inhibitor. It was mentioned that pepsin has a quite close resemblance in proteolytic activity with HIV-1protease viz. one of the key enzyme of HIV-1 life cycle and both belong to same family of aspartate enzyme. Found that aqueous extract of *Adhatoda vasica* showed very significant inhibition on enzymatic activity of pepsin. It was also mentioned that structural and functional similarity between pepsin and HIV-protease and plant extracts, which have inhibitory activity of pepsin enzyme, should also inhibit the activity of HIV- protease. Therefore it was indicated that this research needs further consideration of isolation and chemical analysis of active component of plant extract i.e. *Adhatoda vasica (*Singh KP, et al 2010).

Formulation composition activity:

Study conducted on Ayurvedic preparations, revealed that vasaka leaves juice was incorporated in more than 20 formulations including Vasarishta, Mahatiktaka ghirta, Triphata ghirta, Vasavaleha, Vasakasava, Mahatriphata ghirta, Panchatikta ghirta guggulu and Panchatikta ghirta. In these formulations classical method of extraction was used viz. not applicable for large-scale production of leaves juice. It is utilized against several diseases i.e. malarial fever, fever caused by Pitta and Kapha, chronic fever, intrinsic haemorrhage, cough, asthma, leprosy, skin diseases and piles. It is also reported to be an expectorant, abortificient, antimicrobial, antitussive and anticancerous. Hence, in this study different modified methods including traditional i.e., steaming of leaves is used for commercial production (Soni S, e al 2006).

Anti-inflammatory activity:

In case of inflammation study of pyorrhoea it was found that twenty-five patients suffering from pyorrhoea treated with massage of inflamed gums by *Adhatoda vasica* leaf extract showed the reduction and relief in the inflammatory and bleeding conditions of gums (Doshi JJ, et al 1983).

WBC increasing activity:

In another case it was found that *Adhatoda vasica* plant was effective to increase total WBC, blood lymphocytes, splenic lymphocytes and peritoneal macrophages as well as it was significantly protective against *Escherichia coli* that induced abdominal peristomitis (Thaakur SR 2007).

Throat relief and diabetes related ailment activity:

One of the studies reported that the entire parts of Adulsa plant are used as medicine. The leaves, flowers, fruits and roots are used for treating cold, cough, whooping cough, chronic bronchitis and asthma. The plant also has potential anti-diabetic activity in albino rat after administration of extract of *Adhatoda zeylanica* (Meenakshi B, et al 2010). The investigation on phytochemical screening of six medicinal plants showed positive results for all phytochemical constituents' viz. tannins, saponins, flavonoids, carbohydrates, alkaloids, anthroquinones used for HIV treatment. This study provides a new strategy of treatment in createing social awareness among the HIV patients, as compared to antibiotic therapy (Bharathi B, et al 2011).

Anti-allergy activity:

The study conducted on vasicinone activity showed that potency towards allergic reactions on mice and guinea pigs. The activity of alkaloid vasicinone and 20% vasicine was found inhibitory at 5 mg quantity up to 37% (Paliwa JK, et al 2000, Wagner H 1989).

Anti-bacterial activity:

The antibacterial activity of Adhatoda leaves extract was tested by paper disc and dilution method. It was found that alkaloids present in this plant have strong antibacterial activity against *Pseudomonas aeruginosa.* Beside, antibacterial activity against the gram-negative i.e. *E. coli* and Gram-positive bacteria strains i.e. *Streptococcus faecalis*, *Staphylococcus aureus*, *Staph epidermidis* were also noted (Patel VK, Venkatakrishna BH 1984).

CONCLUSION

The literature survey revealed that *Adhatoda zeylanica* plant is widely used for its phytochemical as well as pharmacological activities. It is source of important phytochemicals i.e. vasicine, vasicinone, vasicolone, anthroquinones and other alkaloids. The information mentioned in this review will be helpful in developing

new formulations, which is more effective and have more therapeutic values to treat various ailments. Besides, this review also gives scope line for further research in vaccine or molecular markers production like H1N1 flu and AIDS.

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