

PHYTOCHEMICAL AND PHARMACOLOGICAL STUDIES OF SOME ORGANIC SOLVENT EXTRACTS OF *JUSTICIA ADHATODA*: A REVIEW

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Abstract: *Justicia adhatoda* eka Adhatoda vasica eka vasaka is used as medicine in Ayurveda, Unani, Homeopathy and many ancient system of medicine. It is a vital and important medicinal herb because its leaf, root, flower and whole plant is used for many drug formulations. *Justicia adhatoda* has been most frequently used for the treatment of respiratory complaints and for cough, asthma and colds. Vasaka or vasaleh is used as an expectorant, bronchodilator and to liquefy sputum. Phytochemical studies and antibacterial analysis check of the crude extracts have been carried out of the leaf of *Justicia adhatoda*, using solvents of varied polarity. The extracts tested showed the presence of alkaloids phenols, tannins, anthraquinones, saponins, flavanoids, amino acids and reducing sugars. Plants have been proven as promising sources of new and biologically active natural products exhibiting higher activity in medicinal applications.

Keywords: *Justicia adhatoda* , vasicolinone, alkaloids, tannins and flavonoid.

Introduction:

Justicia adhatoda generally known as Vasaka, is very important therapeutic plant that has been utilized as Ayurvedic & indigenous pharmaceutical for more than 3K years. Vasa is its Sanskrit name, in hindi it is known as adusa. And english name is Malabar Nut. Adhatoda vasica eka *Justicia adhatoda* eka vasaka is used as medicine in Ayurveda, Unani, Homeopathy and many ancient system of medicine. *Justicia Adhatoda* is a vital multipurpose medicinal plant because its root, flower and leaf are used for many drug formulations. In Ayurveda, *Justicia adhatoda* or vasaka as vasaleh has been used for many disorders including bronchitis, leprosy, blood disorders, fever, vomiting, heart troubles, thirst, asthma, loss of memory, jaundice, tumors, gonorrhea, sore-eye, fever, and mouth troubles. Extract of the leaves of Vasaka may be used to help with cough and other symptoms of colds. The poultice of the leaves of adhatoda vasica is applicable to wounds for its Antibacterial and anti-inflammatory properties. Vasaka is also helpful in relieving rheumatic symptoms when applied to joints. Vasaka also used for control both external bleeding and internal bleeding such as peptic ulcers, piles and bleeding gums. Phytochemicals of this plants shows antispasmodic, expectorant and blood purifying qualities.

Traditional use:-

Justicia adhatoda has been most frequently used for the treatment of respiratory complaints and for cough, asthma and colds. In Ayurveda it has been used as an expectorant, bronchodilator and to liquefy sputum. *Justicia adhatoda* as an antispasmodic agent was described and an alkaloid with a bitter taste was identified and named vasicine¹. vasaka or vasaleh was also used for stomach catarrh with constipation, gout, and urinary stone. When Leaf powder of adusa boiled in sesame oil, it is used to stop bleeding, ear aches, and pus from ears. Root decoction is used for gonorrhea. Leaf is used for urinary trouble. The leaf extract shows stimulative property for liver, lung and forestomach. Vasaka exhibits antispasmodic, expectorant and blood purifying qualities².

Biochemical constituents:-

Biochemical constituents of different extracts from different parts of medicinal plants are subject to alteration and vary in composition and concentration depending on the physicochemical properties of species that directly or indirectly related with environmental factors³. Extracts and fractions with different solvents of the leaves and roots contain the Quinazoline alkaloids vasicine, 7- hydroxyvasicine, vasicinolone, 3-deoxyvasicine, vasicolinone, adhatodine, vasicol, vasicoline, anisotine) betaine alongwith steroids carbohydrate and alkanes. In the extracts of flowers flavonoids (Apigenin, astragaline, kaempferol, quercetin, vitexin) and triterpenes (a-amirine) have been found⁴.

Pharmacological and antimicrobial studies:-

The antibacterial activity of Methanolic extract of *Justicia Adhatoda* was done by disc diffusion method against bacteria causing urinary tract infection in humans. The crude extract showed maximum antibacterial response against *Bacillus subtilis*⁵. This plant has potential activity in petroleum extracts for anti-microbial and ethanolic extracts showed anti-asthmatic, anti-inflammatory and analgesic activity. The results from our earlier clinical study on *adhatoda vasica* suggested that it is effective in reducing the symptoms of bronchial asthma and also improve the lung function parameters of asthmatic subjects, several experimental studies were done on the alcoholic and aqueous extracts of *adhatoda vasica* to reveal the possible mechanism of action of anti-asthmatic activity⁶.

The leaf sample of *Justicia Adhatoda* was subjected to phytochemical analysis. The plant contained antioxidant phytochemicals such as alkaloids, tannin, saponins, phenolics and flavonoids; The methanolic extract of the plant was also analyzed for antioxidant power potentiality. Plant also shows strong antioxidant and reducing power ability. Vasicine induced abortion was analysed in rats, rabbits, and guinea pigs. Vasicine action through release of PGs Synthesized vasicinone and vasicine derivatives in invitro studies were found oxytocic activity⁷.

Phytochemical analysis and antibacterial check were carried out of the crude extracts obtained from the leaf of *Justicia Adhatoda* using solvents of varied polarity.

In its extracts and fractions, presence of alkaloids, phenols, tannins, anthraquinones, saponins, flavanoids, amino acids and reducing sugars was shown by the tests conducted. The effect of ethanol, petroleum ether and water extracts were tested on *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Bacillus subtilis*, *Enterococcus faecalis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Klebsiella pneumoniae* and *Candida albicans*. The minimum inhibitory concentration of the crude extracts was determined for various organisms⁸. High levels of polyphenolic compounds which could be the possible reason behind the antioxidant activity of the plant. In addition extract demonstrated antimicrobial and cytotoxic activity⁹.

Extract of leaf by water have been analysed for their free radical-scavenging activity in different in vitro systems as DPPH radical scavenging activity, hydroxyl radical-scavenging activity in different in vitro systems, as DPPH radical scavenging activity, hydroxyl radical-scavenging activity in Ferric ion / EDTA / Ascorbate / Hydrogen peroxide system, inhibition of lipid peroxidation induced by FeSO₄ in egg yolk, metal chelating activity. The free radical scavenging activities were compared with standard antioxidants like butylated hydroxy toluene (BHT), ascorbic acid and EDTA. The content of total phenolics (expressed as mg of gallic acid equivalents/gm) and total flavonoids (expressed as mg of quercetin equivalent/gm) and ascorbic acid were determined along with antioxidant enzymes¹⁰.

It has been also used for the treatment of various diseases, particularly for the treatment of inflammatory and cardiovascular diseases. However, the scientific rationale and mechanisms by which it functions in these diseases is not known. It was done to explore the inhibitory activity of aqueous and butanolic fractions of *Adhatoda vasica* on arachidonic acid metabolism¹¹. The antitussive activity of its extract was comparable to that of codeine sulphate. Codeine sulphate, as a standard drug for suppression of cough, produced 24.80%, 32.98%, and 45.73% inhibition in cough at a dose of 10 mg/kg, 15 mg/kg and 20 mg/kg respectively, whereas, codeine sulphate (20 mg/kg) showed maximum 45.73% inhibition at 60 min of the experiment¹².

The hepatoprotective activity of Ethyl acetate extract of *Adhatoda vasica* was investigated against CCl₄ induced liver damage in Swiss albino rats. results suggest that Ethyl acetate extract of *Adhatoda vasica* has potent hepatoprotective effect against CCl₄ induced liver damage¹³. The aqueous and methanolic extracts were used for antiviral activity against influenza virus in the noncytotoxic range. Methanolic extract showed 100% reduction in Hemagglutination in the simultaneous and post treatment assays at the concentration of 10mg/ml. The aqueous extracts at concentrations of 10mg/ml and 5mg/ml reduced the Hemagglutination to 33% and 16.67%, respectively, in the simultaneous assay. These results show that extracts have strong anti-influenza virus activity related to inhibition of viral attachment and viral replication, so may be used as viral prophylaxis¹⁴. In one other study, the methanolic fraction showed highest thrombolytic activity (53.23%)¹⁵.

Plants have been proven as promising sources of new and biologically active natural products exhibiting higher activity in medicinal applications.

Conclusion :-

The survey reveals that *Adhatoda vasica* has been studied many times for its phytochemicals and pharmacological activities.

It present in class of traditional herbal drug with very strong conceptual base. *Justicia adhatoda* is an important source of vasicine, vasicolone, vasicinone and many other Alkaloids. In this review some pharmacological studies has been concluded like antibacterial, antifungal, hepatoprotective, antitussive, radiomodulation, anti-inflammatory and antiulcer, abortifacient, antiviral, thrombolytic, antimutagenic, cardiovascular protection, hypoglycaemic, antitubercular, antioxidant and some more studies are done.

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