International Journal of Life science & Pharma Research

A REVIEW ON HERBAL THERAPY FOR RESPIRATORY AILMENTS

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ABSTRACT

Human beings are dealing with various types of stresses in the modern day's life style and this includes the habit of tobacco smoking also. These stressors cause an imbalance between the antioxidant-oxidant species in the body and leads towards inflammatory conditions. There are various herbs which are already included in Indian diet to deal with such situation and examples are the daily flavours like: turmeric, ginger, and cumin and many more. The present study is an investigation to analyze the antioxidant nature of a specific herb *Adhatoda vasica*, majorly used for respiratory ailments, to neutralize tobacco smoke induced oxidative stress. The results depict that, *Adhatoda vasica* has a beneficial effect on the antioxidant system of the cells and prevents the toxicity caused by tobacco smoke which results in reduction in cell death.

KEYWORDS: Respiratory, turmeric, tulsi, *Adhatoda*, Vasicine

INTRODUCTION

Breathing is one of the essential functions that support our life. Malfunctioning of any of the parts of our respiratory system starting from nose till the lungs leads to disorders that are grouped under respiratory ailments. In today's industrialized and commercialized environment all around us, the incidences of several respiratory disorders are gaining concern day by day. Air pollution is the sixth leading cause of respiratory ailments in South Asia[1]. A survey by the Government of India has reported 2.63 crore Indians suffering from acute respiratory disease due to air pollution - both household and environmental[1]. The Central Pollution Control Board has reported the maximum number of deaths due to respiratory ailments in West Bengal followed by Odisha, Andhra Pradesh and Uttar Pradesh[1]. From ancient times, Ayurvedic science has explored, analyzed and documented the medicinally important plants through assessment of their multiple modes of therapeutic action. Natural products have been an important resource for maintaining life for ages, as evident from Indian Ayurvedic literatures like Charak and Sushrut Samhita. Current synthetic drugs hold no promise in complete healing of these disorders. In contrast to them, many target specific herbal alternatives have been recognized due to properties like bronchodilatory, mast cell stabilization, anti-inflammatory, anti-allergic, immunomodulatory as well as inhibitory action on mediators of inflammation (leukotrienes, cyclooxygenase, cytokines etc.)[2]. In India, the traditional Ayurvedic method of treating the respiratory disorders includes house-hold herbs like turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), cumin (*Cuminum cyminum*), vasaka (*Adhatoda vasica*), yashti-madhu (*Glycyrrhiza blabra*), and tulsi (*Ocimum sanctum*) in the form of decoctions and tinctures or as herbal drink.

Indian herbs used as antioxidant therapy against respiratory disorders

In this current review, to throw light into the importance of home remedies against respiratory ailments and, the various medicinal properties

possessed by them, we have chosen six herbs. The aspects covered include historical background, traditional uses and, research and development details.

• ***Turmeric* (*Curcuma longa*)**

Turmeric (common name – haldi, manjal) is the fleshy orange part of *Curcuma longa* (Family: Zingiberaceae), a rhizomatous herbaceous perennial plant. Its cultivation is high in China, India, Indonesia, Thailand and the tropical regions[3]. The state Erode, in Tamil Nadu is the world's largest producer of turmeric[4]. Indian turmeric holds high content of important bioactive compounds and holds great promise as a house-hold medicine in the treatment of not only respiratory ailments, but also with antiseptic, anti-inflammatory, and anti-ulcer properties. The root yields a volatile oil containing turmerone and sesquiterpenes, and it also possesses coloring agents termed as curcuminoids. Turmeric finds application as an herbal medicine for digestive disorders, jaundice, liver and gallbladder problems, and respiratory ailments like cough, runny nose, asthma, bronchial hyperactivity and allergy[4]. Powdered turmeric is mixed with boiled milk and used to cure cough and cold. It has been reported to possess antioxidant property when consumed by us through food[5]. A teaspoonful of turmeric powder mixed with a pinch of black pepper powder and honey or milk is consumed at night for 3 – 5 days for treating cold and cough[6]. It scavenges free radicals and prevents lipid peroxidation in hydrogen peroxide-induced oxidatively stressed renal cells[4]. Hydro-ethanolic extract of Turmeric has shown inhibitory action against activation of human dendritic cells in response to inflammatory cytokines[4]. Several *in vivo* studies have proved the medicinal importance of Turmeric against oral cancer, stomach cancer, detoxification of carcinogens, and inhibition of tumor growth[4]. In diabetic rats, it is also found to reduce oxidative stress by inhibiting increases in thiobarbituric acid-reactive substances and protein carbonyls, and brought back the antioxidant status to a balanced state. The volatile oil obtained from Turmeric brings about sputum removal, relief from cough and prevents asthma[4].

• ***Ginger* (*Zingiber officinale*)**

Ginger is a tropical plant grown in India, Malaysia, Southern China and Japan, and India is the world's largest producer[3]. It belongs to the family Zingiberaceae, known commonly as adrak, and possesses characteristic aroma and taste. It is a powerful natural expectorant used in treating cold, cough and chronic bronchitis. It contains 1-4% essential oil, sesquiterpene hydrocarbons, and gingerols (responsible for the pungency of ginger)[3]. It possesses anti-inflammatory, anti-viral, antinausea and antiemetic activities[7]. Ginger acts as a carminative, gastrointestinal stimulant and anti-depressant[8]. Traditional application involves intake of 20 ml of ginger juice mixed with betel leaves and honey three times a day for three days to treat cough and cold[6]. *In vivo* studies have shown ginger as hypolipidemic (ethanolic extract of ginger lowered cholesterol level in rabbits), chemoprotective (aqueous or ethanolic ginger extract showed anti-tumour properties in mice), and anti-inflammatory (oral administration of ginger oil to arthritis induced rats showed significant suppression of inflammation) agent[7]. It also showed antioxidant potential in acetaminophen-induced oxidatively stressed rats[9].

• ***Cumin* (*Cuminum cyminum*)**

Cumin is native to northern Egypt and Turkey. It is a tropical plant cultivated as a rabi crop in areas where atmospheric humidity is low in February-March[10]. Cumin is the seed obtained from a small, slender annual herb whose chief constituent of volatile oil is Cuminaldehyde (activates saliva). Its common name is Jeera and is usually the basic spice used in almost all Indian dishes. It is a powerful bronchodilator[11] and possesses antimicrobial, carminative, analgesic, and antispasmodic properties. It reduces abdominal gas and aids in digestion and absorption. It cures common cold (viral infection) by preventing the cough formation in the respiratory system. It contains vitamin C and iron thus, boosts the immune system of the body[12].

• ***Yashti-madhu* (*Glycyrrhiza glabra*)**

Yashti-madhu is the dried roots and rhizomes of Glycyrrhiza glabra and is commonly known as Mulathee[3]. It is an erect, perennial plant grown in sub-tropical and warm temperate regions of Mediterranean countries and China. The major chemical constituents of this plant include triterpene saponins like Glycyrrhizin which occurs as a

mixture of potassium and calcium salts[3] and renders the plant its sweet taste. Traditional application involves its use against sore throats and as an expectorant in treating coughs and bronchial catarrh. It is also a laxative and antiviral drug with remedial properties of kidney stones, heart disease, loss of appetite and snake bite[3]. It also possesses antioxidant and antipyretic properties[13]. The aqueous and ethanolic extracts of this plant have shown nitric oxide-, superoxide- and hydroxyl - radical scavenging activities. The hydro-alcoholic extract of this plant also demonstrated antioxidant property through modulation of respiratory burst of human activated neutrophils[13].

• ***Tulsi* (*Ocimum sanctum*)**

Tulsi is the common name for "Sacred Basil" or "Holy Basil" and belongs to the family Lamiaceae. It is an erect, herbaceous, branched, biennial or triennial plant, 30 – 75 cm high[14]. In India, two types of this species can be seen – the green Sri Tulsi and the purple Krishna Tulsi[14]. The plant is worshipped by Hindus and is a common plant grown in almost all Indian houses. Its use dates back to 5000 BC, wherein traditional benefits from this plant find mention in Charak Samhita and Rigveda. The leaves of this plant contain a bright yellow volatile oil composed of sesquiterpenes (the main one is Eugenol) and monoterpenes. This oil has shown antibacterial and insecticidal properties. Essential oil obtained from this aromatic plant is used as fragrances and, flavors in food industries[15]. It has antifertility, hepatoprotective, antidiabetic, anticancer, and cardioprotective properties[16]. Household remedy involves taking eleven Tulsi leaves with four black pepper seeds to treat Malaria and Periodic fever; juice of leaves mixed with honey and ginger for treating bronchitis, asthma, influenza, cough and cold, by mobilizing mucus[15]. It is also effective in curing ringworm and other skin diseases. Pills prepared from crushed mixture of fresh Tulsi leaves, *Leucas aspera* leaves, *Momordica charantia* leaves and dried fruits of *Piper longum* are advised twice a day for one week for treating asthma[6]. Since, Tulsi is immunomodulatory, antitussive and expectorant in action, it finds wide applications in pharma companies for manufacturing newer drugs and formulations containing this plant against cough, acute and chronic bronchitis, asthma and other respiratory ailments. Immunomodulatory action is carried out by this plant through an increase in Interferon-γ, IL-4, T-helper cells, NK cells, thereby reducing bacterial load through phagocytosis[17]. *In vivo* studies on histamine and acetylcholine-induced pre-convulsive dyspnea in guinea pigs have shown the anti-asthmatic activity of 50% aqueous-ethanolic extract of Tulsi[11]. It has been reported to be a strong antioxidant against oxidative stress, genotoxicity and imbalanced xenobiotic-metabolizing enzymes induced by 7,12-dimethylbenz [a] anthracene in rats[18].

• ***The herb in focus – Adhatoda vasica***

The herb *Adhatoda vasica* is an age old plant known for its promising therapeutic action against respiratory disorders. Its common name is Vasaka. It is a dense shrub growing to a height of 1 to 3 meters. From a distance, the flowers of this plant look like opened jaws of a lion[19]. The juice of leaves is a cure for diarrhea, dysentery and glandular tumor. It has been traditionally used in the management of allergic conditions and bronchial asthma. Research carried out over the last three decades reflects the fact that this plant's alkaloid-rich leaves possess respiratory stimulant activity[20, 21]. It aids in curing common cold, laryngitis, bronchitis, influenza, cramp and dry cough, pertussis, hay-fever, asthma and sinusitis[22]. Dhuley, 1999 have reported that the leaves of this plant contain an essential oil and the quinazoline alkaloids Vasicine, Vasicinone and deoxyvasicine[23]. The most important alkaloid present in this plant is Vasicine (from leaves) which brings about most of its bronchodilatory effect[20]. At low concentrations, this compound induces bronchodilation and relaxation of tracheal muscle[24]. Moreover, Vasicine showed bronchodilatory activity both *in vitro* and *in vivo*[25]. A combination of Vasicine and Vasicinone (1 : 1) showed a bronchodilatory effect as well[25]. Clinical trials carried out with the commercial drug Wintry (contains Vasicine and Vasicinone) did not show any side effects while treating bronchial asthma. The properties of this alkaloid Vasicine have been utilized in developing its derivative - the drug Bisolvon. Intravenous administration of this drug showed clearing of the airways by decreasing mucus secretion and opening of air passages[26]. *In vivo* studies have shown its inhibitory action against antigen-induced mast cell degranulation and histamine release as well as bronchodilatory

activity[27]. *In vitro* studies have shown *Adhatoda vasica* as an antioxidant through its effective induction of Glutathione-S-Transferase and DT-diaphorase in the lungs and fore stomach, and Superoxide dismutase and Catalase enzymes in kidneys[28]. Besides being a potent bronchodilator, it is also a hypotensive[24] and anti-genotoxic agent[29]. Pre-exposure of Swiss albino mice to *Adhatoda vasica* followed by cadmium chloride treatment showed decreased lipid peroxidation and xanthine oxidase levels. It also showed an increase in Glutathione levels, thus proving its antioxidant potential[29]. The active compounds Vasicine and Vasicinone at a dose of 2.5 - 10 mg/kg caused vasoconstriction by histamine-induced anaesthesized guinea pigs[30]. However, several other scientists have reported Vasicine to be bronchodilatory *in vitro* and, *in vivo* it brought about bronchoconstriction[30]. The respiratory stimulant effect of Vasicine has been attributed to its action on the respiratory center and partly through its action on peripheral chemosensory fibers[30].

CONCLUSION AND FUTURE PROSPECTS

This current information on traditional as well as experimental analysis of the above herbs shows them to be promising in treating respiratory ailments. Further studies need to be taken up in order to find a formulation with an optimized combination of these plants and explore their mechanism of action, thus aiming towards reduction as well as gradual eradication of respiratory ailments from our country.

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