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A REVIEW ON NATURAL REMEDIES USED FOR THE TREATMENT OF RESPIRATORY DISORDERS

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ABSTRACT: Respiratory disease is a medical term that refers to the pathological conditions affecting the organs and tissues that make gas exchange possible in higher organisms and includes conditions of the upper respiratory tract, trachea, bronchi, bronchioles, alveoli, pleura, and pleural cavity, and the nerves and muscles of breathing cavity. The common respiratory disorders include COPD, Asthma, Chronic Bronchitis, Emphysema and Pneumonia. Currently available drugs for the therapy of respiratory disorders produce side effects. To overcome this problem, medicinal plants and their isolated phytoconstituents are being used extensively to treat minimum side effects. This article depicts the use of herbal plants and their phytoconstituents for the treatment of respiratory disorders.

INTRODUCTION: Respiratory disorders are among the leading causes of morbidity and mortality affecting people of all ages and are a major global health problem. They involve the air passages like nasal passages, large and small airways (bronchi and bronchioles), and the lungs. Their etiopathology may be inflammatory, allergic, infectious, neoplastic, or traumatic. Both acute and chronic respiratory disorders are one of the most common reasons for hospital admissions or visit to hospitals worldwide. Bronchial asthma, COPD, pulmonary tuberculosis, pneumonia, cystic fibrosis, lung cancer, and pneumoconiosis are the most commonly seen respiratory conditions.

A large variety of pharmacological treatment strategies are widely practiced in these conditions, and they include anti-inflammatory agents, bronchodilators, antibiotics, antiallergies, mucolytics, and antineoplastics. Airway obstruction in asthma is reversible and irreversible in COPD, in which environmental factors like smoke inhalation plays an important role. Asthma is an inflammatory disease, and the symptoms of inflammation start with T helper-2 and dendritic cells, followed by infiltration of eosinophilic cells and mast cell (MC) sensitization, which result in the release of various inflammatory mediators.

COPD is caused by inhalation of toxins and irritants for longer durations, resulting in chronic inflammation of airways and damage of alveolar structures of the lungs. This finally results in conditions like chronic bronchitis, chronic bronchiolitis, and emphysema. A cough is a sudden expulsion of air through the large breathing passages that can help clear them of fluids, foreign



particles, or microbes. Common medicinal plants that have been used as a remedy for respiratory ailments since ancient times include *Adhatoda vasica* (vasaka), *Curcuma longa* (curcumin), *Glycyrrhiza glabra* (liquorice), *Ocimum sanctum* (tulsi), *Piper longum* (pepper), *Zingiber officinale* (ginger).

Medicinal Plants:

***Adhatoda vasica*:** *Adhatoda vasica* (family Acanthaceae) is a shrub used by Asian and European medical practitioners. The plant has been employed in the Indian traditional system of medicine². The leaves, roots, flowers, and bark of this plant have been majorly used in cough, cold, asthma; liquefy sputum, bronchodilator, bronchial catarrh, bronchitis, and tuberculosis. The parts of the herbal plant are commonly used in the form of decoction or powder. The juice extracted from the leaves is additionally of times used. Vasaka syrup and Vasaka liquid extract are mentioned in Indian Pharmacopoeia (1955). Many herbal preparations containing *A. vasica* are being used, such as Khada in India, Salus Tuss in Germany and Kan Jang and spirote in Sweden. Vasicine is an alkaloid, which is one of the major components of the plant and is responsible for most of its antioxidant, anti-inflammatory and bronchodilatory activities. A derivative of vascinone is bromohexine (N-cycloN-methyl - (2 - amino - 3, 5 - dibromo -benzyl) aminehydrochloride) has been shown to have mucus liquefying or expectorant activity.

***Albizia lebeck*:** *Albizia lebeck* (family Mimosaceae) is a large deciduous perennial woody tree that is being used for cold, cough, asthma, and bronchitis³. The aqueous extract of bark of *A. lebeck* showed antiasthmatic and antianaphylactic activity in experimental studies⁴. The flower part of the plant having lupeol, α and β amyryn, benzyl acetate, benzyl benzoate and crocetin, different sterols, triterpene, lebbekanin, saponin, saponin glycosides, crocetin lebbekanin-D, F, G & H as phytoconstituents, used in the herbal treatment of respiratory disorders. The herbal formulation of *A. lebeck*, Asthocalm is mainly used for asthma.

***Bryophyllum pinnatum* or *Kalanchoe integra*:** *Kalanchoe integra* (family Crassulaceae) has shown many pharmacological activities such as antihelminthic, immunosuppressive, wound healing,

hepatoprotective, anti-inflammatory, antidiabetic, nephroprotective, antioxidant, antimicrobial, analgesic, anticonvulsant and antipyretic activities. In respiratory disorders, boiled leaf extracts of the plant are useful in the management of acute and chronic bronchitis, pneumonia, bronchial asthma, and palpitation⁵. Leaves of *K. integra* contain flavonoids and tannins, that are found to possess promising effects in the management of bronchial asthma. Thus, it may be a potential herb with anti-inflammatory activity for the management of airway remodeling in bronchial asthma.

***Curcuma longa*:** Curcumin is a polyphenolic compound obtained from the plant *Curcuma longa* (family Zingiberaceae), known as turmeric, and has been used since age-old. Curcumin has been shown to have antiasthmatic effects in both in vivo and in vitro studies. In an OVA-induced asthma model in guinea pigs, curcumin treatment during OVA sensitization showed significant protective effects through attenuation of bronchial constriction and hyper reactivity⁶. This indicated that curcumin had both preventive and therapeutic effects on asthma that were attributed to the suppression of iNOS and subsequent no production, inhibition of inflammatory cytokine synthesis, and down regulation of eosinophil recruitment to airway.

***Glycyrrhiza glabra*:** *Glycyrrhiza glabra* (family Fabaceae), commonly known as liquorice, an herbaceous perennial and has been used as a flavoring agent in foods and medicinal remedies for thousands of years. Liquorice root has been extensively used around the world to treat cough since ancient times. It contains active compounds, which include glycyrrhizin, glycyrrhetic acid, flavonoids, isoflavonoids, and chalcones. Glycyrrhizin and glycyrrhetic acid are the main active components and are potent inhibitors of cortisol metabolism due to their steroid-like structures. The root of this plant has been used for cough, colds, asthma, and COPD⁷. Glycyrrhizin is a triterpene glycoside, a major active constituent obtained from the plant *G. glabra*. Isoliquiritigenin, a flavonoid isolated from the *G. glabra* roots, relaxed the tracheal smooth muscle of guinea pigs *in-vitro* and *in-vivo*. The effects of glycyrrhetic acid and liquiritigenin (a flavonoid of licorice root) on asthma have been tested both *in-vivo* and *in-vitro*.

Hedychium spicatum: *Hedychium spicatum* (family Zingiberaceae), a small hardy rhizomatous perennial herb and which is mentioned as Shati in the Ayurvedic system of medicine. The extract of rhizome of this herbal plant has been reported to contain essential oils, glycosides and saccharides that are used traditionally to treat cough, asthma, and other respiratory ailments and clinically used for the treatment of asthma⁸.

Ocimum sanctum: *Ocimum sanctum* (family Lamiaceae), commonly known as Tulsi, is an annual herb and has been used in the Indian traditional system of medicine. The leaves of this plant have been traditionally used for cough, colds, asthma, and bronchitis⁹. The active constituents of *O. sanctum* isolated are eugenol, carvacrol, and caryophyllin.

Piper longum: *Piper longum* (family Piperaceae) is used as an important traditional medicine in Asia and the Pacific islands. *P. longum* is known as a good remedy for the treatment of TB and respiratory tract infections¹⁰.

The fruits and roots of this plant have been employed in the treatment of childhood asthma¹¹. Piperine is a major alkaloid isolated from the *P. longum* fruits, and it possesses to inhibit the release of T helper-2-mediated cytokines, eosinophil infiltration, and airway hyper-responsiveness in an OVA-induced asthma model¹².

Tylophora indica: *Tylophora indica* (family Apocynaceae) is a perennial climbing plant and has been used in the Ayurvedic system of medicine.

The leaves and roots of the plant have been extensively used in the treatment of various inflammatory and allergic disorders like bronchial asthma, bronchitis, and whooping cough and as an expectorant¹³. The extracts of the leaves of *T. indica* have shown antiasthmatic and antiallergic potential^{14, 15}. It is considered as the best substitute for Ipecac.

Solanum xanthocarpum: *Solanum xanthocarpum* (family Solanaceae) is an annual herbaceous plant that is commonly known as Kantkari in traditional Indian medicine, having a vast range of medicinal properties. In the Ayurvedic System of Medicine, it has been listed as a drug for the treatment of

bronchitis and asthma. Juice of *S. xanthocarpum* berries has been reported to be useful for sore throat. *S. xanthocarpum* has been widely used for the treatment of respiratory diseases in the Siddha system of medicine, mainly in the southern part of India. It majorly contains alkaloids, sterols, flavonoids, saponins, and glycosides. Apigenin, the flavonoid content of this plant, has shown significant inhibition of all asthmatic allergies.

Zingiber officinale: *Zingiber officinale* (family Zingiberaceae) is a dietary component that is commonly known as ginger. The rhizome of this herbal plant has been extensively used in the treatment of colds, asthma, and bronchitis⁷. The essential oil of ginger is called Gingerol, which can be subdivided into gingerols, shogaols, paradols, zingerones, gingerdiones, and gingerdiols.

Tamarindus indica: The well-known food vegetable and medicinal plant of *Tamarindus indica* Linn (family Fabaceae) used to cure asthma as traditional medicine. The phytoconstituents isolated from the pulp of *T. indica* are flavonoid, tannin, and saponin. The methanolic extract of leaves of *T. indica* shows promising activity towards asthma.

Terminalia arjuna: The fresh bark extract of *Terminalia arjuna* (family Combretaceae) has a potent anti-asthmatic effect by combinational preparation with some of the other medicinal plants as traditional medicine. The phytoconstituents of *Terminalia arjuna* includes arjunic acid, arjungenin, arjunetin and arjunoglucoside and oleanane-type triterpene glycosides.

Cinnamomum tamala: *Cinnamomum* (tejpatra) (family Lauraceae) has been used medicinally since ancient times and was a major medicinal plant in medieval times. It is employed for many conditions such as cough and cold, diabetes, arthritis, heart and liver health. The leaves have essential oil, which contains eugenol and phellandrene, alpha-pinene, camphene, myrcene, limonene, etc.

Alpinia galangal: *Alpinia galanga* (family Scitamineae) rhizome has been widely used as herbal medicine since ancient times. It is very similar to the health benefits of ginger. It is a good source of fibre and rich in iron, sodium, vit A, vit C and consists of phytoconstituents that include

flavonoids, emodin, quercetin, galangol, galangin, gingerol, camphor and eugenol.

Phyllanthus emblica: *Phyllanthus emblica* (family Phyllanthaceae) is a fruit, highly nutritious and an important source of vit C. The isolated components of this plant include phenolic compounds, tannins, phyllembelic acid, phyllembelin, rutin, curcuminoids and emblicol. It helps to eradicate the problems of cough, cold and asthma.

Essential Oils:

Anise Oil: Anise oil (*Anisi aetheroleum*) is obtained by steam distillation from the dry ripe fruits of *Pimpinella anisum* L., and star anise oil from *Illicium verum* Hook. The fruits contain 2-6% of essential oil. The major components of anise oil are trans-anethole (80-95%) and anisaldehyde and trans-anethole and methyl-cavicol in the star anise oil¹⁷. Anise oil can be used for the treatment of respiratory ailments mainly as an expectorant in cough associated with cold¹⁸.

Bitter Fennel Fruit Oil: Bitter fennel fruit oil (*Foeniculi amari fructus aetheroleum*) is obtained by steam distillation from the ripe fruits of *Foeniculum vulgare* Miller, ssp. *vulgare* var. *vulgare*. The main constituents of the oil are fenchone (12.0-25.0%) and trans-anethole (55.0-75.0%). The traditional herbal medicinal products of bitter fennel fruit oil are used as an expectorant in cough associated with cold¹⁶.

Eucalyptus Oil: Eucalyptus oil (*Eucalypti aetheroleum*) is obtained by steam distillation and rectification from the fresh leaves or the fresh terminal branchlets of various species of Eucalyptus rich in 1, 8-cineole. The most frequently used species are *Eucalyptus globulus* Labill., *E. polybractea* R. T. Baker and *E. smithii* R.T. Baker. Eucalyptus oil is majorly employed in the treatment of cough, cold, bronchitis and symptomatic relief of colds and catarrh of the upper respiratory tract¹⁸.

Peppermint Oil: Peppermint oil (*Menthae piperitae aetheroleum*) is obtained by steam distillation from the fresh aerial parts of the flowering plant of *Mentha x Piperita*. The essential oil yield of peppermint is 1.2-3% and contains menthol (30-55%), menthon (14-32%), isomenthone (1.5-10%), menthyl acetate (2.8-10%), mentho-

furan (1-9%), 1,8-cineole (3.5-14%), limonene (1-5%), not more than 3% of pulegone and not more than 1% of carvone, with a higher ratio of cineole compared to that of limonene. The therapeutic use of peppermint oil includes the symptomatic treatment of digestive disorders (*e.g.* flatulence, irritable bowel syndrome) and the symptomatic treatment of coughs and colds¹⁸.

Tea Tree Oil: Tea tree essential oil (*Melaleuca aetheroleum*) is obtained by steam distillation from the foliage and terminal branchlets of *Melaleuca alternifolia* (Maiden and Betch) Cheel, *M. linariifolia* Smith, *M. dissitiflora* F. Mueller and/or other species of *Melaleuca*. 2% essential oil with the major components of monoterpenes, such as terpinen-4-ol (minimum 30%), gamma-terpinene (10-28%) and 1, 8-cineole (less than 15%). Tea tree oil can be used for the treatment of respiratory infections (*e.g.*, cold, influenza, bronchitis)¹⁸.

Thyme Oil: Thyme oil (*Thymi aetheroleum*) is obtained by steam distillation from the fresh flowering aerial parts of *Thymus vulgaris* L., *T. zygis* Loefl. ex L. or a mixture of both species. The thyme oil contains phenols, mainly thymol and/or carvacrol and terpenoids. The therapeutic application of thyme oil includes respiratory disorders (bronchial catarrh, supportive treatment of pertussis)¹⁸.

Animal Source: Animal-derived natural products still represent the minority of natural sources for products used for respiratory ailments. Many studies describe the use of animal-based products, such as oils, milk, and spleen as a complementary therapy for several diseases, including asthma.

Traditional medicine reports the benefits of consuming some animal parts and animal products once they can be rich in compounds such as lipids, prostaglandins, unsaturated fatty acids, enzymes, and polysaccharides, which are responsible for their pharmacological activities.

Also, animal sources are also widely cited as biocompatible and biodegradable sources, suggesting their safe use. The animal products and compounds cited can be obtained from several sources, such as mammals, amphibians, and crustaceans, demonstrating its wide range of possibilities.

Phytoconstituents: Compounds with different structures but with the same therapeutic activity are isolated from various plant species and used as an active component for the treatment of various diseases. Some of these active components are present in edible plants, and their addition to the diet would be beneficial for respiratory ailments. Various phytoconstituents obtained from several plant sources have been reported in the treatment of respiratory diseases.

Flavonoids: Quercetin is an important dietary flavonoid, which is found in various plants such as onions, apples, tea, berries, and broccoli that has antiasthmatic potential. Quercetin has been reported to have antihistaminic, antiinflammatory, and MC-stabilizing activity^{19, 20}. Quercetin also suppressed lipopolysaccharide (LPS)-induced lung inflammation in experimental studies²¹. Quercetin attenuated mitogen-activated protein kinases (MAPKs) and NF-Kb²². With respect to allergies, they have specific effects on MCs involved in the allergic response²³. Quercetin decreases eosinophil recruitment, reduces IL-5 and IL-4 levels, and inhibits NF-κB activation in BALF in OVA-induced mouse model²⁴. It also regulates Th1/Th2 balance by enhancing IFN-γ and decreasing IL-4 levels in a mouse asthma model²⁵.

Alkaloids: Colchicine is an alkaloid obtained from the plant *Colchicum autumnale* and has been reported in the treatment of pulmonary fibrosis²⁶ and bronchial asthma^{27, 28}. An alkaloid fraction of

the *Peganum harmala* plant is an effective traditional medicinal herb for the treatment of cough and asthma with potent antitussive, expectorant, and bronchodilating effects²⁹. Warifteine is an alkaloid obtained from the plant *Cissampelos sympodialis* that has been reported to inhibit airway hyper-responsiveness, lung remodeling, and eosinophil infiltration in a mouse model of asthma³⁰.

Polyphenols: Resveratrol is a dietary polyphenol found in the skin and seeds of grapes. Resveratrol has been shown to have anti-asthmatic potential. It modulates Th1/Th2 balance and the expression of Th2 regulatory transcription factor GATA-3 and decreased levels of the Th-2 cytokines, IL-4 and IL-5, in bronchoalveolar lavage of sensitized animals³¹. It also acts as a mucolytic agent and inhibits mucus overproduction when administered to mice suffering from allergic airway disease. Resveratrol has been shown to inhibit airway inflammation and hyper-responsiveness in OVA-induced asthma in the mouse by reducing eosinophil/neutrophil infiltration and the levels of IL-4 and IL-5 in plasma and BALF. Naringenin chalcone obtained from tomato is a polyphenol effective in inhibiting eosinophilic recruitment around the airways in a murine model of allergic asthma. Naringenin alleviates airway inflammation and reactivity by decreasing the serum total IgE level and IL-4 and IL-13 levels in BALF and inhibiting NF-KB activity³².

TABLE 1: PLANTS AND OTHER SOURCES USED IN THE TREATMENT OF RESPIRATORY DISORDERS

S. no.	Source	Phytoconstituents	Uses
1	<i>Abutilon indicum</i>	luteolin, chrysoeriol, luteolin 7-O-beta-glucopyranoside, chrysoeriol 7-O-beta-glucopyranoside, apigenin 7-O-beta-glucopyranoside, quercetin 3-O-beta-glucopyranoside and quercetin 3-O alpha-rhamnopyranosyl (1 --> 6)-beta-glucopyranoside ³³ β-sitosterol ³⁴ p-b-D Glucosyl oxybenzoic acid, p-Hydroxybenzoic and caffeic acid 9 alantolactone and Isoalantolactone ³⁵	Expectorant and anti-inflammatory
2	<i>Adhatoda visica</i> <i>Justicia gendarussa</i>	9-acetamido-3,4 dihydropyrido-(3,4-b)-indole 0-ethyl-z-D-galactoside sitosterol P-D-glucoside and deoxyvasicinone ³⁶	Tuberculosis, bronchitis, expectorant
3	<i>Ailanthus excelsa</i>	quassinoid, dehydroexcelsin, glaucarubol sitosterol, 2,6 dimethoxybenzoquinone malanthin, vitexin. glaucarubin and excelsin ailanthinone, glaucarubinone and glaucarubol 15-isovalerate 13,18-dehydroglaucarubol 15-isovalerate alkaloids. 3S,24S,25-trihydroxytirucall-7-ene excelsin, glaucarubine, ailanthinone, glaucarubinone and glaucarubolone, Tetracyclic Triterpenes ³⁷⁻⁴²	Asthma and bronchitis
4	<i>Albizia lebeck</i>	catechins, kaempferol, quercetin, lupeol, α-amyrine, Albizia saponins A, B, and C, triterpenoids, glycoside and albizinin saponins kaempferol and quercetin 3-O+rhamnopyranosyl (1 4 6)-p glucopyranosyl, Galactopyranosides ⁴³⁻⁴⁷	Cough
5	<i>Asystasia gangetica</i>	Terpenoid ⁴⁸	Antiasthmatic

6	<i>Balanites aegyptiaca</i>	Balanin-1 and Balanin-2 saponins ⁴⁹ Gentisic, <i>p</i> -coumaric, caffeic, ferulic and sinapic acids ⁵⁰	Antiasthmatic
7	<i>Benincasa hispida</i>	Astilbin, catechin and naringenin ⁵¹ triterpenes, phenolics, sterols and glycosides	Lung diseases, asthma and cough
8	<i>Citrus grandis</i>	acridone alkaloids, grandisinine, grandisine-I, grandisine-II and 5-methoxyseselin ⁵² flavone, honycitrin, honycudisin and acridone alkaloids ⁵³	Convulsive cough
9	<i>Curcuma longa</i>	Buntanme, prenylated acridone alkaloid and cltrubuntin. Curcumin (diferuloylmethane) and quercetin ⁵⁴	Prevention of asthma, cough and removing sputum
10	<i>Euphorbia hirta</i>	β -Amyrin (Terpenoid) triterpénicos; b-amirina (1), 24 metilencicloartenol; y b-sitosterol and Fueron ⁵⁵	Cough, coryza, bronchitis and asthma
11	<i>Ficus religiosa</i>	Serotonin ⁵⁶	Cough, wheezing and asthma
12	<i>Moringa oleifera</i>	4-(α -L-rhamnopyranosyloxy)benzyl isothiocyanate, Methyl N-4-(α -L-rhamnopyranosyloxy) benzyl carbamate and 4-(β -D-glucopyranosyl-1 \rightarrow 4- α -L-rhamnopyranosyloxy)-benzyl Thiocarboxamide ⁵	Antiasthmatic and protects against bronchial constriction
13	<i>Ocimum sanctum</i>	cirsilineol, cirsimaritin, isothymusin, isothymonin, apigenin and rosmarinic acid ⁵⁸ β -sitosterol-D-glycoside ⁵⁹ eugenol, urosolic acid, carvacrol, linalool, limatrol, caryophyllene, estragol, sitosterol, Orientin and Vicenin ⁶⁰	Antiasthmatic and protects against bronchial constriction
14	<i>Siphonochilus aethiopicus</i>	Furanoterpenoids 1. 9a_-hydroxy- 4a_H-3,5_,8a_-trimethyl-4,4a,8a,9-tetrahydronaphtho-([2,3b]-dihydrofuran-2-one)-8-one, 2. 4a_H-3,5_,8a_-trimethyl-4,4a,8a,9-tetrahydronaphtho-([2,3b] dihydrofuran-2-one)-8-one 3. 4a_H-3,5_,8a_-trimethyl-4, 4a,8a-trihydronaphtho-([2,3b] dihydrofuran-2-one)-8-one ⁶¹	Cold, flu, wheezing of the chest, coughs, influenza, sinus problems and mild asthma
15	<i>Taxus baccata</i>	Taxoid, 10-deacetyltaxezopidine G and Taxezopidine G ⁶² lariciresinol and taxiresinol ⁶³	Cold and cough
16	<i>Viola mandshurica</i>	Rutin ⁶⁴	Antiasthmatic
17	<i>Clerodendron trichotomum</i>	acteoside [\sim -(3_,4_-dihydroxyphenyl)ethyl-O-, -L-rhamnopyranosyl (1 \rightarrow 3)- \sim -d-(4-O-caffeoyl)-glucopyranoside] ⁶⁵	Antiasthmatic and anti inflammatory
18	<i>Abrus precatorius</i>	triterpenoid saponins	Cough
19	<i>Cinnamomum tamala</i>	Eugenol , phellandrene, alpha-pinene, camphene, myrcene, limonene, p-cymene	Cough
20	<i>Alpinia galanga</i>	Emodin, beta-sitosterol, quercetin, galangol, galangin, gingerol, camphor, eugenol	Antiasthmatic
21	<i>Phyllanthus emblica</i>	Phyllembelic acid, phyllembelin, rutin, curcum-inoids and emblicol	Cough , cold and asthma
22	<i>Anisi aetheroleum</i>	Trans anethole, anisaldehyde,	Inflammation in respiratory system and chronic bronchitis
23	<i>Foeniculi amari fructus aetheroleum</i>	Fenchone and trans anethole	Expectorant in cough associated with cold
24	<i>Eucalypti aetheroleum</i>	1,8 cineole	Cough , cold and bronchitis
25	<i>Menthae piperitae aetheroleum</i>	Menthol, menthon, isomenthon, menthyl acetate, menthofura, 1,8 cineole, imonene, pulegone ,carvone	Cough and cold
26	<i>Melaleuca aetheroleum</i>	Terpinen-4-ol , gamma-terpinene, 1, 8-cineole	Cold , influenza , bronchitis
27	<i>Thymi aetheroleum</i>	Thymol, carvacol, terpenoids	Bronchial catarrh, supportive treatment of pertussis

CONCLUSION: Herbal plants play an important role in the prevention and treatment of various respiratory disorders and infections. The traditional systems of medicine are found to be effective in treating respiratory disorders, and their scientific evaluation has proven the efficacy of plants in the management of several such conditions. The use of herbal plants is being practiced since ancient times. Most of the plants and some other sources containing phytoconstituents have been isolated

and checked for their effectiveness towards respiratory disorders. These finds lead to go for further clinical trials against respiratory disorders with less side effects. The above-mentioned plants may produce effectiveness with less adverse effects due to the biological source of constituents. From the above information, phenolic compounds, terpenoids, and sterol are a significant class of phytoconstituents used in the herbal treatment of respiratory ailments.

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