Therapeutic effect of an Ayurvedic drug in the management of Respiratory Allergic Disorders in children - A comprehensive review

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ABSTRACT

Background: Respiratory allergic disorders (RAD) are the most common allergy symptom seen in children. Respiratory allergies are primarily caused by hyper responsiveness of the respiratory mucosa, which results in histamine release and mast cell activation. In Ayurvedic words, this could be viewed as an abnormality of the body’s immune system or Ojus induced by disrupted Vata, Kapha, and Pitta. The prevalence of respiratory allergies in school-aged children in India varies widely, ranging from 5-20%. Methods: This study was completed by gathering the knowledge from classical Ayurvedic literature, research articles, guidelines and PubMed and MedLine databases. Results and Discussion: Dashmoola Katutrayadi drug is mentioned in Sahastra Yogam under Swasa Kasahara Kashaya have Shwas-Kasahar, anti-inflammatory, anti-histaminic and anti-asthmatic effects individually and in combinations. Conclusion: Present review reveals that these drugs have potential to alleviate the severity and frequency of RAD and can be used for the management of the same.

Key words: Dashmoola Katutrayadi Kashaya, Respiratory allergic disorders (RAD), Anti-histaminic, Anti-asthmatic, Shwasa-Kasahar, Immunomodulator.

INTRODUCTION

The term "allergy" is used to describe an excessive reaction to substances in the environment that are typically harmless to most people. However, in individuals with a predisposition, exposure to these substances triggers an immune response leading to various signs and symptoms. Respiratory allergies are characterized by the rapid onset of acute respiratory symptoms due to an exaggerated immune system response to allergens. Allergies can also manifest as hypersensitivity to specific triggers such as foods, environmental irritants, medications, specific weather conditions, and more. When exposed to these compounds, which act as antigens, the body responds by releasing histamine and other chemicals.

Both allergic rhinitis and allergic Asthma fall under the category of respiratory allergies. The prevalence of allergic rhinitis and allergic Asthma is significant, leading to substantial direct and indirect costs. Allergic rhinitis, which includes symptoms like nasal congestion, watery nasal discharge, itchy nose, and sneezing, represents an immunological reaction of the nasal mucosa to airborne allergens. The manifestations of allergic rhinitis can be associated with conditions such as fatigue, headaches, cognitive decline, and sleep...
disturbances, significantly impacting a patient's quality of life.

Modern medicine employs various medications like antibiotics, antipyretics, anti-inflammatory drugs, antihistamines, bronchodilators, mast cell stabilizers, decongestants, and corticosteroids to treat respiratory allergies. However, these medications often come with adverse side effects and do not provide long-lasting relief. According to Ayurveda, respiratory allergies result from immunological dysfunction due to the production of "Ama" and "Kapha Dosha," which are undigested intermediate products. Ayurveda offers potent remedies with immunomodulatory, anti-allergic, anti-inflammatory, and mucolytic effects that can address respiratory allergies at multiple levels, offering immediate symptomatic relief to patients.

Dashmoola Katutrayadi drug is mentioned in Sahastra Yogam under Swasa Kasahara Kashaya and in The Ayurvedic Formulary of India part 1.

The phase 3 International Study of Asthma and Allergy in Children (ISAAC)\(^1\) reported an overall prevalence of current wheeze of 7% in Indian children aged 6–7 years and aged 13–14 years, with a higher prevalence of up to 10–20% in some areas.\(^2\)

There is an urgent need for a drug that improves the respiratory system while not disrupting the body's and mind's normal homeostasis and totally heals the condition. Keeping this in mind, herbal drugs are assessed for their capacity to treat respiratory allergies. Children can receive this Ayurveda treatment without risk, and they can also replace the current anti-allergy drugs.

Table 1: Showing drugs of Dashmoola Katutrayadi drugs

<table>
<thead>
<tr>
<th>Drug</th>
<th>Botanical Name</th>
<th>Family</th>
<th>Part Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilva</td>
<td>Aegle marmelos Corr.</td>
<td>Rutaceae</td>
<td>Root, Stem Bark</td>
</tr>
<tr>
<td>Shyonaka</td>
<td>Oroxylum indicum Vent.</td>
<td>Bignoniaceae</td>
<td>Root, Stem Bark</td>
</tr>
<tr>
<td>Gambahri</td>
<td>Gmelina arborea Roxb.</td>
<td>Verbenaceae</td>
<td>Root, Stem Bark</td>
</tr>
</tbody>
</table>

RESULT

1. Bilva (Aegle marmelos)

Ayurvedic Pharmacological Properties

Bilva (Aegle marmelos) possesses Kashaya Tikta, Rasa, Laghu Ruksha Guna, Ushna Veerya, Katu Vipaka and Kapha-Vata Shamaka property along with Shothhara (anti-inflammatory), Vednasthapan (analgesic), Kaphaghana (Kapha alleviation), Deepana (digestive stimulant), Pachana (digest Asma), Grahi (anti diarrheal) Karma.\(^3\)

Pharmacology

Bilva crude extracts are widely reported to have antiasthmatic properties.\(^4\) The presence of the alkaloid aegeline in the leaves has been shown to be a successful treatment for asthma. Meanwhile, the ethanolic extract derived from the stem bark...
demonstrates antiproliferative effects in vitro on human tumor cell lines, while the methanolic extract from the same stem bark exhibits in vitro antiviral activity against human Coxsackie virus B1-B2.\(^5\)

In South India, it is a common practice to administer leaf juice for treating respiratory spasms and wheezing.

2. **Shyonaka (Oroxylum indicum)**

**Ayurvedic Pharmacological Properties**

*Shyonaka (Oroxylum indicum)* possesses Madhur, Tikta, Kashaya Rasa, Sheet Ruksha Guna, Ushna Veerya, Katu Vipaka and Kapha-Vata Shamaka property along with Shothhara (anti-inflammatory), Vednasthapan (analgesic), Deepana (digestive stimulant), Pachana (digest Ama), Rochana (stimulate appetite), Kaphaghana (Kapha alleviation), Amhara (vitiation of poorly digested food) Karma.\(^6\)

**Pharmacology**

The root possesses properties such as sweetness, astringency, bitterness, anti-inflammatory and expectorant effects. It can be beneficial in addressing various conditions, including inflammations, leprosy, dropsy, sprains, neuralgia, hiccups, cough, asthma, bronchitis, anorexia, and nasal disorders. On the other hand, tender fruits exhibit expectorant, carminative, and stomachic qualities and can provide relief for conditions such as cough, bronchitis, dyspepsia, flatulence, colic, and leucoderma.\(^7\)

It may also be used to treat Sars-Cov-2 (Covid-19) infection in humans. Antioxidant, anti-inflammatory, anticancer, antimicrobial, anti-arithmetic, and other functional properties have been reported in studies.\(^8\)

3. **Gambhari (Gmelina arborea)**

**Ayurvedic Pharmacological Properties**

*Gambhari (Gmelina arborea)* possesses Tikta Kashaya and Madhur Rasa, Guru Guna, Ushna Veerya, Katu Vipaka and Vata Doshahara property along with Vednasthapana (analgesic), Balya (strengthen), Sandhaniya (healing), Deepana (digestive stimulant), Anulomna (carminative), Shothhara (anti-inflammatory) Karma.\(^9\)

**Pharmacology**

Research shows that the methanolic extract and ethyl-acetate fraction of *Gmelina arborea* can elevate the total white blood cell count, which had been reduced by the cytotoxic drug cyclophosphamide. Furthermore, it has the capacity to normalize neutrophil and lymphocyte levels. These study results indicate that the experimental drug can promote bone marrow activity and may offer assistance in cancer treatment by mitigating the toxicity induced by cyclophosphamide.\(^10\) Due to premnazole, it has anti-inflammatory properties.\(^11\)

4. **Patala (Stereospermum suaveolens)**

**Ayurvedic Pharmacological Properties**

*Patala (Stereospermum suaveolens)* possesses Tikta Kashaya Rasa, Laghu Ruksha Guna, Ushna Veerya, Katu Vipaka and Vatapittakapha Doshahara property along with Vednasthapan (analgesic), Kaphaghana (Kapha alleviation), Hikkanaigrhana (anti hiccups), Grahi (anti diarrheal), Shothhara (anti-inflammatory) Karma.\(^12\)

**Pharmacology**

Bark is used to treat inflammatory diseases.\(^13\)

5. **Agnimanth (Premna integrifolia)**

**Ayurvedic Pharmacological Properties**

*Agnimanth (Premna integrifolia)* possesses Madhur Tikta, Rasa, Laghu Ruksha Guna, Ushna Veerya, Katu Vipaka and Kapha-Vata Shamaka property along with Vednasthapan (analgesic), Kaphaghana (Kapha alleviation), Deepana (digestive stimulant), Pachana (digest Ama), Anuloman (carminative), Shothhara (anti-inflammatory) Karma.\(^14\)

**Pharmacology**

There is a significant anti-inflammatory effect.\(^15\) Anti-inflammatory activity of methanolic extract of *Premna integrifolia* bark has been marked.\(^16\)

6. **Shalparni (Desmodium gangeticum)**

**Ayurvedic Pharmacological Properties**

*Shalparni (Desmodium gangeticum)* possesses Madhur Tikta Rasa, Guru Snigdha Guna, Ushana Veerya, Madhur Vipaka and Vatapittakapha Doshahara
property along with Deepana (digestive stimulant), Anuloman (carminative), Shothhara (anti-inflammatory), Angamarda Prashaman (analgesic) Karma.\[17\]

Pharmacology
The root of Desmodium gangeticum is utilized as an astringent and diuretic in the treatment of chronic fever, coughs, diarrhoea, asthma, snake bites, and scorpion stings. Additionally, the anti-inflammatory and analgesic properties of gangetin have been established.\[18\] Water decoction of the Desmodium gangeticum has Anti-inflammatory and anti-nociceptive activity.\[19\]

7. Prishanparni (Ureria picta)
Ayurvedic Pharmacological Properties
Prishanparni (Ureria picta) possesses Madhur Tikta Rasa, Laghu Gunà, Ushana Veerya, Madhur Vipaka and Vatapittakapha Doshahara property along with Deepan (digestive stimulant), Anuloman (carminative), Shothhara (anti-inflammatory), Kaphanisarak (Kapha alleviation), Angamarda prashaman (analgesic) Karma.\[20\]

Pharmacology
The preparation of a decoction from the plant is recommended for the management of chills, fever, and cough.\[21\] Ureria picta have significant anti-inflammatory activity.\[22\]

8. Brahati (Solanum indicum)
Ayurvedic Pharmacological Properties
Brahati (Solanum indicum) possesses Katu and Tikta Rasa, Laghu Ruksha and Tikshana Gunà, Ushha Veerya, Katu Vipaka and also Kaphavatashamaka property along with Deepana (digestive stimulant), Pachana (digest Ama), Grahi (anti diarrheal), Vednasthapana (analgesic), Swashara (anti asthmatic), Kashahara (anti tussive) Karma.\[23\]

Pharmacology
The whole plant including its roots is employed for its carminative and expectorant properties. These attributes are beneficial in addressing conditions such as asthma, cough, chronic fever and flatulence.\[24\]

9. Kantkari (Solanum surattense)
Ayurvedic Pharmacological Properties
Kantkari (Solanum surattense) possesses Tikta, Katu Rasa, Laghu, Ruksha, Sara Gunà, Ushha Veerya, Katu Vipaka and Kaphavata Doshahara property along with Deepan (digestive stimulant ), Pachan (digest Ama), Rechana (strong purgative), Vednasthapana (analgesic), Swashara (anti asthmatic), Kanthya (demulcent), Hikkanigrhana (anti hiccups), Kashahara (anti tussive) Karma.\[25\]

Pharmacology
The extract’s glycoalkaloid and fatty acid components lead to the release of histamines from bronchial lung tissues when it is chopped. It is suggested that the vanishing of histamines from the lung tissue may underlie the drug’s positive impact on bronchial asthma.\[26\]
Solanum xanthocarpum has shown significant improvements in pulmonary function among patients with varying degrees of asthma severity. It is suggested that the relief from bronchial asthma symptoms associated with Solanum xanthocarpum Schrad and Wendl may be attributed to its bronchodilatory effect, reduction in bronchial mucosal swelling, and decreased airway lumen secretions.\[27,28\]
Glycoalkaloid and fatty acid fraction of Solanum xanthocarpum extract can lead to histamine release from chopped lung tissue. The drug’s effect on bronchial asthma may be due to histamine decrement in the bronchial tissues. Because of the inorganic nitrate content, the expectorant action occurs.\[29\]

10. Gokshura (Tribulus terrestris)
Ayurvedic Pharmacological Properties
Gokshura (Tribulus terrestris) possesses Madhur Rasa, Guru Snidha Gunà, Sheet Veerya, Madhur Vipaka and Vatapitta Doshahara property along with Vednasthapana (analgesic), Anuloman (carminative), Kaphanisarak (Kapha alleviation), Shothhara (anti-inflammatory), Mutrivirechniya (diuretic) Karma.\[30\]

Pharmacology
The fruits of the plant’s saponins showed a dose dependent rise in phagocytosis, indicates the
stimulation of an unspecific immune response. Alcoholic extract of the entire plant shows a significant increase in humoral antibody type and delayed type hypersensitivity response indicating increased value of specific immune response.\textsuperscript{[31]} The ethanolic extract inhibited cyclo-oxygenase 2 (cox2) and inducible nitric oxide synthase (inos) expressions in lipo polysaccharide stimulated raw 264.7 cells. It also inhibited the expression of pro-inflammatory cytokines like tumour necrosis factor alpha and interleukin 4 in macrophage cell lines. Thus, the ethanolic extract inhibits inflammatory mediator’s expression and inflammatory cytokine expression which has a good effect on inflammatory conditions.\textsuperscript{[32]}

11. Shunthi (Zingiber officinale)

Ayurvedic Pharmacological Properties

Shunthi (Zingiber officinale) possesses Katu Rasa, Laghu Snidhga Guna, Ushana Veerya, Madhur Vipaka and Kaphavata Dosahara property along with Shothhara (anti-inflammatory), Vedrnasthapak (analgiesic), Deepana (digestive stimulant), Pachana (digest Ama), Anulomana (carminative), Shoolaprashaman (analgiesic), Swashara (anti asthmatic), Triptighana (sense of satisfaction) Karma.\textsuperscript{[33]}

Pharmacology

Shunthi acts as an expectorant and possesses mild anti-inflammatory characteristics. Ginger’s health-enhancing attributes are attributed to its rich composition of volatile and nonvolatile substances, including Sesquiterpene and Monoterpenoid Hydrocarbons that impart ginger’s unique aroma and flavor. Nonvolatile pungent compounds like Gingerols, Shogaols, Paradols and Zingerone are also present in ginger contributing to its anti-inflammatory, antioxidant and antimicrobial properties. Shunthi additionally shows a role in preventing the formation of intermediate products such as lactic acid, uric acid and ketones, which can be used in the treatment of infectious diseases. These properties extend beyond respiratory diseases and have potential benefits in various conditions like heart disease, neurodegenerative diseases, and cancer. Gingerol and related compounds within ginger exert their effects by inhibiting the biosynthesis of prostaglandins and leukotrienes through the inhibition of enzymes like 5 Lipooxygenase and prostaglandin synthetase. Moreover, they can also inhibit the production of pro-inflammatory cytokines like Il-1, TNF-A, and Il-8.\textsuperscript{[34,35]} Zingiber officinalis Is Non-Steroidal Anti inflammatory Drug.\textsuperscript{[36]} Some free radicals generated during the oxidation process are required in biological systems for energy production. Ginger’s anti-oxidative properties undoubtedly protect humans from a variety of chronic diseases. 6-Shagaol has the potent anti-oxidant and anti-inflammatory properties in ginger, which can be showed to the presence of alpha and beta unsaturated ketone moiety.\textsuperscript{[37]}

12. Maricha (Piper nigrum)

Ayurvedic Pharmacological Properties

Maricha (Piper nigrum) possesses Katu Rasa, Laghu Teekshana Guna, Ushana Veerya, Katu Vipaka and Kaphavata Dosahara property along with Lekhana (anti-obesity), Vatanuloman (easy passage to Vata), Kapahanisaraka (Kapha alleviation), Pachan (digest Ama), Deepana (digestive stimulant ) Karma.\textsuperscript{[38]}

Pharmacology

Maricha is a popular spice that has antioxidant and anti-inflammatory properties. it also helps with cholesterol, blood sugar control, and brain and gut health.\textsuperscript{[39]} Piperine demonstrated the ability to inhibit free radicals and reactive oxygen species when tested in vitro, suggesting potential antioxidative properties. Additionally, researchers investigated piperine’s anti-inflammatory, analgesic and anti-arhritic characteristics. They assessed the anti-inflammatory effects on fibroblast-like synoviocytes obtained from rheumatoid arthritis patients stimulated with Interleukin 1 in vitro.\textsuperscript{[40]}

13. Pippali (Piper longum)

Ayurvedic Pharmacological Properties

Pippali (Piper longum) possesses Katu Rasa, Laghu Teekshana Snidhga Guna, Anushana Sheet Veerya, Madhur Vipaka and Vata Dosahara property along
with Deepana (digestive stimulant), Triptighana (sense of satisfaction), Vatanuloman (easy passage to Vata), Shoolaprashamana (analgesic), Hikkanigrhana (anti hiccups), Swashara (anti asthmatic), Kasahara (anti tussive) Karma.[41]

**Pharmacology**

Cough, cold, Asthma, hoarseness, and hiccup relief are provided by powered long pepper and honey.[42] Piper Nigrum contains argenine. The most abundant enzymes in piper nigrum are glucose 6-phosphate dehydrogenase and glutathione peroxidase.

Testing conducted on mice using parameters like Haemagglutination Titre, Macrophage Migration Index and Phagocytic Index has revealed that Piper longum fruits exhibit both specific and nonspecific immunostimulatory effect.[43]

Piperine exhibited central stimulant effects in various animal models, in an experiment with anesthetized dogs; piperine effectively counteracted the respiratory depression caused by morphine or pentobarbitone. A comparative study conducted with Anda fruit extract in petroleum ether, piperine, and nalorphine for their effects against morphine-induced respiratory depression and analgesia revealed that both piperine and nalorphine reversed the respiratory depression.[44]

*Piper longum*’s traditional Ayurvedic claims for antiasthmatic activity have been validated via research. A fruit extract in milk reduces passive cutaneous anaphylaxis in rats and protected Guinea pigs against antigen induced bronchospasm.[45]

Due to its ability to readily distribute and enhance permeability, piperine has demonstrated the potential to enhance the bioavailability of a wide range of structurally and therapeutically diverse drugs. A study conducted with *’Trikatu,’* an Ayurvedic compound that prominently features *Piper longum* as one of its primary components, examined its combination with other medications. According to the findings, *Trikatu* boosted the bioavailability of these drugs through mechanisms that included promoting rapid absorption from the gastrointestinal tract, preventing initial liver metabolism following absorption, or a combination of both of these actions.[46]

14. *Vasa (Adhatoda vasica)*

**Ayurvedic Pharmacological Properties**

*Vasa (Adhatoda vasica)* possesses Tikta, Kashaya Rasa, Laghu Ruksha Guna, Sheet Veerya, Katu Vipaka and Kaphapitta Doshahara property along with Shothhhara (anti-inflammatory), Vednasthapan (analgesic), Kanthya (demulcent), Kasahara (anti tussive), Swasahara (anti asthmatic), Shlesmahara (Kapha alleviation) Karma.[47]

**Pharmacology**

The pyroquinazolone alkaloids vasicine & vasicinone are the main components of *Adhatoda vasica.* Vasicine at low concentrations caused the tracheal muscle to relax. Vasicine provided significant protection against histamine-induced bronchospasm at high concentrations. In vitro and in vivo bronchodilatory effects have been reported to be caused by vasicinone, the auto-oxidation product of vasicine.[48]

Deoxyvasicine retains a slight bronchodiator activity in addition to some uterotonic activity. Bronchodilation necessitates the presence of oxygen at the C3 position, while uterotonic activity does not rely on oxygen in this position. Vasicinone, an oxidative product of vasicine with an additional C-9 position and a C=O functional group, is found to be inactive, suggesting a possible conflict between two oxygen-related functions. To induce bronchodilation, the N-N-O triangle is essential. Deoxyhomo ‘C’ vasicinone has been discovered to be 6 to 10 times more potent than of aminophylline, attributed to its larger ring C size. Vasicine exhibits slight hypotensive effects, noticeable bronchodilation, and robust respiratory stimulant activities, whereas vasicinone induces bronchoconstriction in vivo and relaxation of tracheal muscles in vitro. Vasicinone enhances the bronchodilator effects of vasicine by acting as a substrate for the enzyme responsible for vasicine breakdown, thus protecting it from metabolic degradation. Adhatolic acid, a component of the essential oil found in Vasaka leaves, promotes expectoration.[49]

Vasicine stearate proves to be more effective than vasicine hydrochloride as a bronchodilator. The
physical binding of vasicine stearate by the oil formulation can lead to sustained release, potentially acting as a localized supply depot at the site of administration.\textsuperscript{[50]}

**DISCUSSION**

*Dashmoola Churna* is believed to have the potential for providing relief from inflammation.\textsuperscript{[51] *Bilva* and *Gambhari* were found to possess higher medicinal effect. *Bilva* and *Gambhari* contributed more to the antioxidant and anti-inflammatory properties of *Dashamoola*, they can be considered as a new anti-inflammatory drug.\textsuperscript{[52]} *Dashmoola* also shows *Tridoshagina*, *Amapachana* properties.\textsuperscript{[53]} *Trikatu* (*Shunthi*, *Maricha* and *Pippali*) is having anti-viral, antioxidant, analgesic, antibacterial, thryoxin stimulation, CNS stimulant, adjuvant in absorption and assimilation of drugs. Hence it is concluded that due to the preventive and therapeutic approach and multifunction of *Trikatu* it is beneficial in many body metabolic functions.\textsuperscript{[54]} *Trikatu* has been reported to increase the bio-availability of drugs.\textsuperscript{[55]} *Trikatu Churna* possess higher rate of phytoconstituents and promising antibacterial activity. This spicy product triggers natural immune system to fight against various enteric bacterial infections.\textsuperscript{[56]} *Trikatu* being an herbal formulation can be the best solution for the bioavailability related issues with various Ayurvedic formulations.\textsuperscript{[57]}

**CONCLUSION**

*Dashmoola Katutrayadi* drugs have potential effect to reduce bronchial asthma severity and recurrent attacks. Maximum of its drugs have *Katu Tikta Rasa*, *Laghu Guna*, *Ushna Veerya*, *Katu Vipaka* and *Vata-Kapha Shamak* properties. These statistics shows their excellent effect as *Shwasahar* (Anti allergic), *Kasahar* (Anti allergic) and *Shothahar* (Anti-inflammatory). Various studies included in this review have anti-oxidant, anti-bacterial, anti-viral, CNS stimulant, bronchodilator, expectorant, anticancer, antimicrobial, anti-histaminic, mast cell stabilizing and immunomodulator properties of drugs individually and in combinations. This study suggests that if any formulation made with the combination of these drugs may help in amolination of RAD in children.

**REFERENCES**


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