RESEARCH PAPER

EXPLORING THE PHARMACODYNAMIC POTENTIAL OF AGASTI MODAK IN PEDIATRIC PRODUCTIVE COUGH

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Received: 25th May, 2026; **Revised:** 6th June, 2026; **Accepted:** 8th June, 2026; **Available Online:** 20th June, 2026

ABSTRACT

Background

Kaphaja Kasa is a Pranavaha Strotodushti Vikara described in Ayurveda. According to contemporary understanding, Kaphaja Kasa can be correlated with Acute Respiratory Infections (ARI) and other respiratory disorders associated with mucus hypersecretion and persistent cough. Pediatric age groups are more susceptible due to anatomical and physiological immaturity, reduced immunity, and Kapha predominance during Balyavastha. Environmental pollution, allergens, smoke, dust, cold exposure, and infections are important contributing factors.

Objective

To evaluate and analyze the pharmacodynamic action of Agasti Modak in respiratory disorders like productive cough (Kaphaja Kasa) in the pediatric age group through Ayurvedic and modern perspectives.

Method

A conceptual and literary review was carried out using classical Ayurvedic texts such as Charaka Samhita, Ashtanga Hridaya, and published modern scientific literature related to respiratory disorders and pharmacological activities of ingredients of Agasti Modak.

Result

The analysis suggests that Agasti Modak possesses significant Kaphahara, Kasahara, Deepana, Pachana, and Rasayana properties. Ingredients such as Shunthi, Pippali, Maricha, Haritaki, and Dalchini may help reduce airway inflammation, liquefy thick mucus, improve mucociliary clearance, facilitate expectoration, and enhance respiratory immunity.

Conclusion

Its pharmacodynamic actions correlate with modern concepts of mucolytic, expectorant, bronchodilator, anti-inflammatory, antioxidant, and immunomodulatory effects.

Keywords: Kaphaja Kasa, Agasti Modak, Pranavaha Srotas, Acute Respiratory Infection, Pharmacodynamics, Mucolytic Activities.

How to cite this article: Yamuna, Agrawal N, Chandravanshi L, Rathia S, Yadav R, Raj D, Sahu M. Exploring the Pharmacodynamic Potential of Agasti Modak in Pediatric Productive Cough. Int J Drug Deliv Technol. 2026;16(62s): 627-637. DOI: 10.25258/ijddt.16.62s.73

Source of support: Nil.

Conflict of interest: None.

INTRODUCTION

Kasa is a *Pranavaha strotodushti vikara,* a respiratory system ailment that affects a significant portion of the global population. *Kapha* and *Vata dusti* predominate in *Kaphaja Kasa*, according to contemporary knowledge, *Kaphaja Kasa* is comparable to Acute respiratory infection. Excessive mucus production and persistent coughing are the hallmarks of this illness [1-3]. The main causes of Acute respiratory infection are smoking, dust, pollution of the environment, vapours, chemical irritants, allergies, and extreme cold. Many Ayurvedic scriptures refer to *Kasa* as a *Swatantra vyadhi* or as *Lakshana* of other diseases. Occasionally, conditions, etc.

Kasa is the most common complaint seen in children. According to Ayurveda, *kasa* is an illness

that causes the majority of respiratory symptoms. The incidence is higher in this age range since *Kapha* is the dominant *Dosha* in *Balyavastha* and the primary cause of *Kasa* formation. Additionally, the paediatric age group is particularly vulnerable because of anatomical and physiological differences, immunological defences in the pathogenesis, *Kasa's* free flow of *Pran Vata* in *Kantha* and *Urm*, which is blocked by vitiated *Kapha*, and recurrent cough, which is a common sign of respiratory tract infections.[4]

Kasa mentioned as a *Swatantra vyadhi* or also mentioned as *Lakshana* of other disease in various Ayurveda texts. *Kaphaja Kasa* sometimes develops as an *Upadrava* of other disease.[5] *Sarvadaihika lakshana* and *Urdvajatrugata lakshana* are symptoms associated with *Kaphaja Kasa*. *Kasahara, Kaphahara, Shwasahara* and *Vata Shamaka* medicines advocated for the management of such types of conditions. *Kaphaja Kasa* being a part of *Pranavaha* strotodushti *vikara* imparts several difficulties in day-to-day living. Pathologically disease involves thickening of bronchial wall due to the anticipatory responses of allergens. Ayurveda considered different approaches for treating *Kaphaja Kasa* which includes *Nidanaparivarjana, Shodhana* and *Shamanoushadhi,* etc.

Modern medical system suggested uses of expectorants, antibiotics and anti-inflammatory agents, etc. In Ayurveda *Pranavaha Sroto-vikaras* includes conditions like; *Kasa, Hikka* and *Shwasa.* These conditions are associated with the symptoms of coughing and breathlessness, etc. Childrens are more prone to these conditions due to the diminished state of immunity. Morbid *Vata* and *Kapha* mainly induce pathogenesis of *Kasa* in *Pranavaha srotas*. *Vimargagamana* of *Pranavayu*, Avarana of *Prana Vayu* by Kapha and *Doshadushti*, etc. are major pathological events associated with *Kasa* or *Kaphaja Kasa*. *Kasa* is the debilitating disease of *pranavaha strotas*, when untreated, it may lead to deadful diseases like *shwasa*(asthma), *shosha*, *rajyakshama* (tuberculosis), *urakshata*, *raktapitta.*

MATERIALS & METHODS

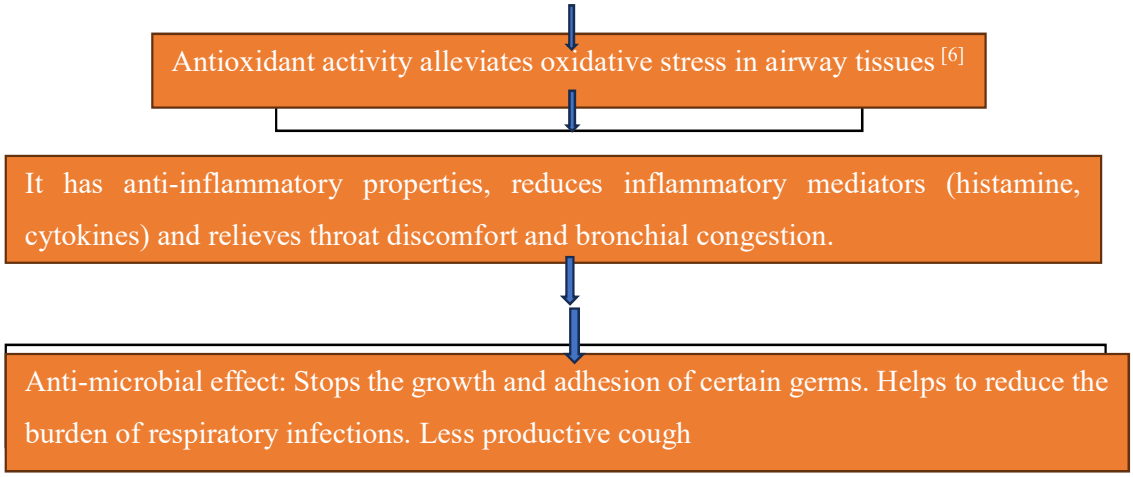
The *Nidanapanchaka* of *Kasaroga* from Ayurvedic texts like Charakasamhitha, Sushruta Samhita, Astanga Hrudaya, Astanga Sangraha, Madhava Nidana, and many more, along with commentary, is the basis for this page. References have been gathered, and pertinent information has been assembled from the body of existing literature. The current era's commentary is also examined. For the debate, all of the collected material has been rearranged, rigorously examined, and an effort has been made to reach some useful conclusions.

PROBABLE PHARMACODYNAMIC ACTION OF AGASTI MODAK

HARITAKI

Chemical Constituents:

Tannine, Chebulagic acid, Chebulanic acid, Corilagin, Gllic acid, Ellagic acid, Neochebulinic acid.



It helps to liquify adhesive kapha in clearing air passage → Easier expectoration

Haritaki exhibits expectorant and mucolytic properties, aiding in the liquefaction and expulsion of thick mucus from the airways, thereby relieving cough (*Kasa*), throat congestion, and breathlessness.

PIPPALI /MARICH

Chemical Constituents:

Piperine, Piplartine, Sesamine, Piplartine

The main active alkaloid found in *pippali* and black pepper is piperine.

Piperine affects mucus, airway inflammation, bronchial muscles, and respiratory clearance through a variety of mechanisms in productive cough (*Kaphaja Kasa*).

Piperine's specific mechanism in productive coughing

A.

Mucolytic action,

Piperine assists by:

lowering the viscosity of mucus, encouraging the production of thinner respiratory fluid, and disrupting the sticky, Kapha-like consistency of mucus

which causes thick sputum to thin

When coughing productively:

Sputum sticks to bronchial walls, mucus thickens and becomes sticky, and mucus proteins and inflammatory debris rise.

B.

Expectorant Action

Clinical effects were less rattle cough, less chest heaviness,

Cilia are tiny hair-like structures in the respiratory tract that push mucus upwards.

In terms of inflammation or infection:

Mucus accumulates, ciliary activity decreases.

Piperine may:

increase mucous transport, improve mucociliary clearance, and increase bronchial secretions. Cilia are tiny hair-like structures in the respiratory tract that push mucus upwards.

and better discharge of sputum.

C.

Bronchodilator Action

The airway lumen constricts, bronchi contract and the the smooth muscles of the airflow become difficult.

Piperine

increase airflow, decrease airway resistance and relax bronchial smooth muscles.

It reduces bronchial spasm, modulates calcium channels and has some beta-adrenergic supporting action.

Bronchodilation, relaxing airway muscles, opening bronchi, breathing easier, airflow Basically. Clinical benefits include less coughing and wheezing, and easier breathing
Kaphahara action of Piperine, *Pippali* (Piper longum) Piperine and *Pippali* have a *Kaphahara* action that reduces thick, sticky *Kapha* Mucus liquefier. Sputum is easily detached Relief from productive coughs Expectorant action promotes respiratory secretions. mucus travels upward Open airways It works by relaxing the smooth muscles in the airways. The airway opens up. Improved breathing Anti-inflammatory properties and decrease of irritation and oedema of the airways Piperine enhances bioavailability, decreases cough reflex and helps absorb other herbal ingredients.*Pippali* (Piper longum) is one such widely used herb with myriad actions on different systems including respiratory and immune system.[7]

SHUNTHI

Chemical Consituents:
Gingerols, Shogaol, Zingiberene, Bisabolene,

A.

Reduce Mucus & Thick Kapha

Thick, sticky mucus is produced by the airway in response to an allergy or infection.
Gingerols encourage the production of thin, watery mucus, reduce the viscosity (thickness) of sputum and help to loosen sticky phlegm that is clinging to the walls of the airways.
Coughing helps to clear mucus from the airways and relieve the tightness in the chest.

B.

Inflammation Reduction

Allergic or infected airways → Sticky mucous production → Gingerols breakdown thick mucus, Mucous loose and mobileMucous → easily expectorated (balgam nikalna)

In a productive cough the lining of the airways becomes irritated and swells.
Gingerols inhibit inflammatory mediators like Prostaglandins, leukotrienes, cytokines
This reduces swelling of the airway, pain and frequent coughings

C.

Bronchodilators Function

Gingerols relax the smooth muscles of the bronchial tubes.Dilation of airways, better ventilation, and relief from chest tightness

D.

Action of Antioxidants

Respiratory infections Free radicals damage the tissues of the airways.

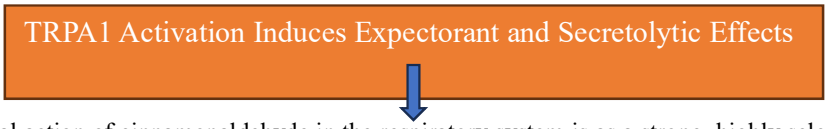
gingerols combat oxidative stress protect respiratory epithelium reduce tissue damage
This encourages the lining of the airways to recover.

Antimicrobial Assistance

Gingerols have mild activity against some viruses and bacteria respiratory infections
Sunthi, has been extensively studied for its anti-inflammatory, antioxidant, immunomodulatory, and digestive-enhancing properties [8-10] with active compounds like gingerols and shogaols demonstrating efficacy in alleviating respiratory congestion These pharmacological actions directly counteract the key clinical features of Kapha aggravation,mucus overproduction, and respiratory discomfort. [11-12]

***DALCHINI* / TEJPATRA**

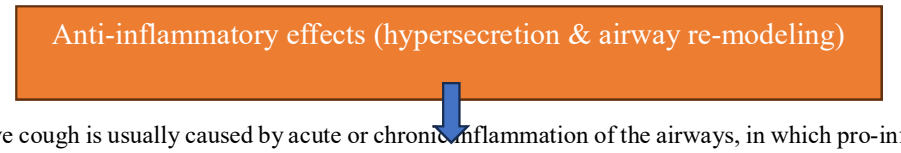
A.



The most unique pharmacological action of cinnamonaldehyde in the respiratory system is as a strong, highly selective agonist of the Transient Receptor Potential Ankyrin 1 (TRPA1) ion channels. These non-selective cation channels are highly expressed on non-neuronal cells such as the bronchial epithelium and on airway sensory nerves (vagal afferents). Cinnamon has anti-inflammatory properties.[18]

- **The Vagorreflexive Expectorant Mechanism**: Cinnamaldehyde interacts with the upper gastrointestinal or respiratory mucosa and activates TRPA1 channels on local sensory nerve terminals in a topical manner. This local irritating effect is an endogenous "trigger" that activates a modest protective vagal reflex arc. The reflex stimulates the central nervous system which stimulates the bronchial glands to secrete more thin, watery serous fluid into the airway surface liquid (ASL).
- **Mucus Rheology Modification:** Cinnamonaldehyde changes the physical properties of mucus by inducing the release of serous fluid. It rehydrates the gel-like viscosity of thick, highly viscous mucin polymers such as MUC5AC and MUC5B. This decreases the viscosity of the secretions (secretolysis), so it is much easier for the respiratory tract to rid itself of stubborn sticky phlegm.

Regulation of the cough reflex. It is known, first, that TRPA1 activation actively induces a therapeutic cough challenge. This transient stimulation of a vigorous cough reflex is a positive clinical outcome in a productive cough, as it helps physically mobilize and move upwards the newly thinned mucus aggregates out of the tracheobronchial tree.



A productive cough is usually caused by acute or chronic inflammation of the airways, in which pro-inflammatory cascades lead to excessive goblet cell hyperplasia (excessive mucus-producing cells) and phlegm production.

Cinnamonaldehyde reduces this hypersecretion at the level of gene transcription by the following mechanisms:

inflammation. It inhibits the movement of NF-kappa B into the cell nucleus and prevents the production of pro-inflammatory cytokines such as Tumor Necrosis Factor-alpha (TNF-alpha), Interleukin-1 beta (IL-1\beta) and Interleukin-6 (IL-6).

Blocks Mitogen-Activated Protein Kinase (MAPK) signaling, in particular the p38 and JNK pathways. This downstream inhibition decreases the inflammatory stimulation that causes the continuous production of mucus by inhibiting the entrance of inflammatory cells (neutrophils and macrophages) into the lung tissue.

C.

Cinnamaldehyde directly targets the pathogens to stop the infectious cycle that creates cellular debris and purulent mucus if the productive cough is caused by a secondary bacterial or viral respiratory tract infection (RTI).

Disruption of Microbe Membranes: Cinnamonaldehyde is a lipophilic molecule, able to easily cross the lipid bilayer of respiratory pathogens such as Staphylococcus aureus, Haemophilus influenzae and Streptococcus pneumoniae. It changes the permeability of the cell membrane resulting in the collapse of proton motive force, depletion of intracellular ATP and the subsequent leakage of essential cytoplasmic contents leading to bacterial cell death.

DISCUSSION

The first line of management in Kaphaj Kasa is Nidana Parivarjan. The youngster had specific viharaj hetu and aharaj (guru, abhishyandi and madhura and snigdha ahar, like dadhi).

Hence, he was told to keep away from these heterotoxins, which help in the breakdown of pathogenesis. Vitiated kapha and vata greatly influence the samprapti of the disease.

Hence, kaphasamana and vatanulomana were included in the treatment plan. Agasti Modak has katu, ruksha, ushnaguna, and kaphaghna karma. Other signs of kaphajakasa are bahala, madhura, snigdha, ghana kaphanisteevana, peenasa, gourava of sareera, utklesha, asyamadhurya, aruci, etc. The Agasti Modak is vatanulomana, vatakaphahara.

Pediatric age groups are more likely to have coughing fits, which could be because they are around other kids who are sick or outside. Boys are more likely to get respiratory infections as kids, and boys did better on the test because they had smaller airways for the same lung capacity.[13] The class family can be seen as a cheap option because of their living conditions, poor personal and social hygiene, and neglect.toward fitness, which leads to infections in the lungs. The study found the equal.

The equal was discovered in the study. Everyone got the right vaccines for their age, which could mean that their family doesn't have a history of the disease or immunisation. Vaccines only protect against certain diseases, so they may not be directly related to stopping common infections anymore.It is hard to tell if someone has Kasa (cough) because it could be a sign of either Pradhan *Vyadhi* or *Updravya* of any illness. To diagnose a condition, you need to know everything about its *Nidana*, *Purvaroopa*, *Roopa*, *Samprapti*, and *Samprapti Ghataka*. The method of diagnosis is mostly based on what you know about *Dosha* and *Dushya*.

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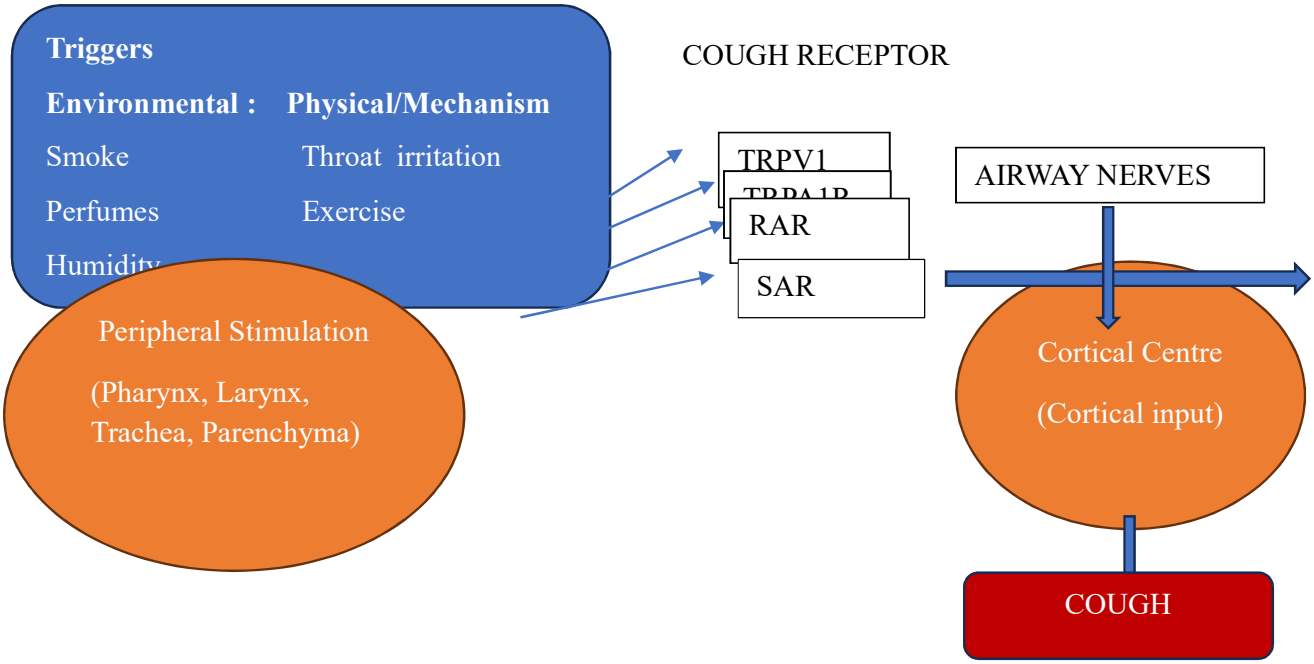
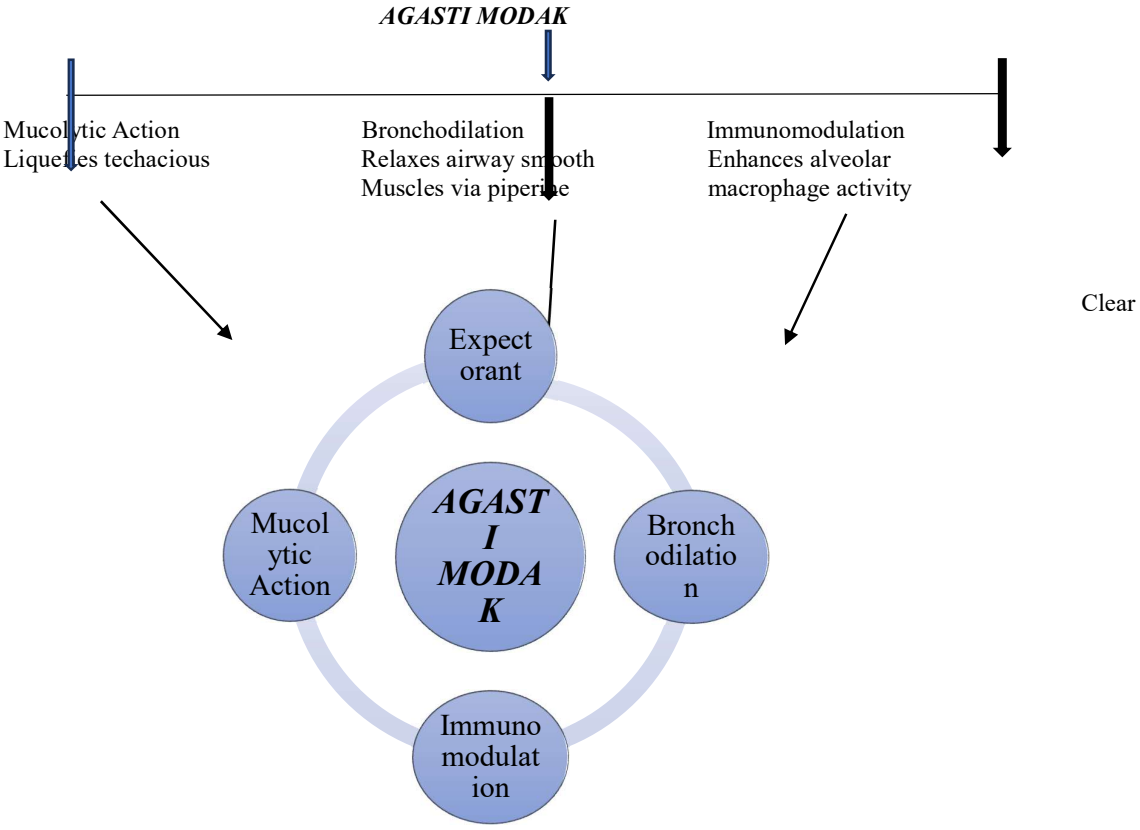


Charaka suggested that Kasa could serve as a *Nidanarthakara Vyadhi*, wherein the illness itself acts as a causative factor for other diseases, leading to *Kshaya*. Consequently, it can be inferred that it may be readily treated in its

FIGURE-01 Pathophysiology of cough TRPV: transient receptor potential vanilloid, TRPA: transient receptor potential ankyrin, RAR: rapidly adapting receptor, SAR: slowly adapting receptor

acute form through *Nidana Parivarjana* and by following Pathya (wholesome practices). But when it goes from being acute to chronic, it can cause *Kshaya*. This can start with the depletion of *Dhatus*, which is the damage or loss of bodily tissues. This happens in the direction of their nourishment, like *Rasa* (plasma), *Rakta* (blood), *Mamsa* (muscle tissue), and so on, until all of the *Dhatus* are gone. After understanding these things, one can try to treat the disease. We can also treat disease by changing eating habits and following *Pathya* (wholesome) and avoiding *Apathya* (unwholesome) in the early stages of the disease.



Mucokinetic and Expectorant: Children usually swallow their sputum or have a bronchial obstruction rather than expectorate. *Agasti modak* has natural surfactant and reduces the surface tension of the thick mucus. This transforms tenacious, viscous secretions to a thin fluid, which enables the immature ciliary system of the pediatric airway to clear the airways.

The activity of the drug *Agasti Modak* may be due to the combined effect of all the medicines. *Kaphachedaka* (scrapping action) and *Kaphanisaraka* (breakdown of *kapha*) qualities help in decreasing *Vatadosha*, which further decreases *Kaphaja Kasa*.

CONCLUSION

Agasti Modak appears to be a useful Ayurvedic medicine for the management of pediatric respiratory diseases with *Kaphaja Kasa* and productive cough. Recurrent respiratory infections, exposure to allergens and pollutants, and under-developed immunity are common causes of mucus hypersecretion, airway inflammation, chest congestion and cough with expectoration in children. The *Kaphahara*, *Kasahara, Deepana*, *Pachana* and *Rasayana* properties of the ingredients of *Agasti Modak* may help to disrupt the

pathophysiology of *Kaphaja Kasa* and restore normal respiratory function.

Pharmacodynamic activity of *Agasti Modak* is due to its mucolytic, expectorant, bronchodilator, anti-inflammatory, antioxidant, antibacterial and immunomodulatory properties. *Shunthi*, *Pippali, Maricha, Haritaki* and *Dalchini* are some of the ingredients which might help in expectoration, improving mucociliary clearance, liquefying thick mucus and reducing airway inflammation. These treatments not only relieve symptoms like chest heaviness, throat irritation and pain on breathing, but may also reduce obstruction of the airways.

The immunomodulatory and antioxidant properties of the formulation can potentially improve the respiratory defence systems in children and help prevent recurrent respiratory infections. Hence *Agasti Modak* may be a useful supportive therapy in children with productive coughs by relieving symptoms and improving the overall respiratory health. However, more clinical and pharmacologic research based on evidence is required to establish safety and effectiveness in treating pediatric respiratory disorders.

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