

Proximate Analysis and Organoleptic Properties of Herbal Kadha Tablet for Upper Respiratory Tract Infection

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Abstract- All age groups are affected by upper respiratory tract infections, which are extremely prevalent health issues. Traditionally, many people have utilized herbal kadhās to treat respiratory issues. However, people—especially children—consume less kadha due to its strong flavor and low palatability. The goal of this study was to create a new herbal kadha tablet formulation as a substitute for conventional kadha.

Selected herbal compounds like Giloy, Amla, Mulethi, Tulsi, and other immunomodulatory plant components that have historically been utilized to treat respiratory infections are included in this formulation. To get the right texture and stability, the tablets were made with an ideal ratio of sugar, jaggery, and herbal extract. Moisture, ash, protein, and texture profile were among the physicochemical parameters that were assessed. Key bioactive components are confirmed to be present in the tablets by preliminary phytochemical screening. Semi-trained panel members performed sensory evaluation to evaluate taste, scent, color, and general acceptability.

The tablets showed better palatability, acceptable physicochemical properties and satisfactory sensory scores than the conventional decoction. The research shows that herbal gummies may be an effective and convenient way to deliver traditional Kadha preparations for the purpose of supporting breathing. Further clinical studies are recommended to establish the therapeutic efficacy and long-term safety.

Keywords: Kadha tablets, Herbal decoction, upper respiratory health, functional confectionery, herbal formulation.

I. INTRODUCTION

Upper respiratory tract infections (URTIs) are among the most common infectious diseases worldwide. URTIs affect people of all ages, but are most common in children, the elderly, and in immunocompromised people. URTIs are mostly caused by viral infections, such as rhinoviruses, coronaviruses and influenza

viruses, and include illnesses such as the common cold, pharyngitis, sinusitis and influenza (1,2). Such infections impose a heavy burden on healthcare systems and markedly contribute to global morbidity (3).

In the traditional management of URTIs, symptomatic treatments are used, such as antihistamines, decongestants, analgesics and antibiotics in the case of bacteria. Antimicrobial resistance (AMR) is a significant global health issue worsened by the inappropriate and excessive use of antibiotics (4).

Herbal and traditional remedies are becoming more popular today as safer and more environmentally friendly alternatives. In Ayurveda, India's traditional system of medicine, herbs have been used for centuries to prevent and treat respiratory ailments. Kadha, a herbal decoction prepared by boiling medicinal herbs and spices in water, is one such often used preparation. The antibacterial, anti-inflammatory, antioxidant and immunomodulatory properties of Kadha are well known (6,7).

Common herbs used in kadha preparations include Tulsi (*Ocimum sanctum*), Mulethi (*Glycyrrhiza glabra*), Ginger (*Zingiber officinale*), Clove (*Syzygium aromaticum*), Cinnamon (*Cinnamomum verum*) and Black Pepper (*Piper nigrum*). Tulsi is reported to have immunomodulatory and antiviral properties (8). Mulethi has got demulcent and anti-inflammatory properties (9). Clove and cinnamon are powerful antibacterial agents (11) and ginger is known for its anti-inflammatory and antioxidant properties (10). Black pepper contains piperine, which makes other herbal substances more bioavailable (12).

Traditional kadha, despite its therapeutic efficacy, has a number of drawbacks. The long preparation process requires precise measurement of ingredients. Moreover, the decoction has a strong bitter flavor

which makes patients less compliant. Besides, kadha is also susceptible to microbial contamination and has a short shelf life [13].

To address these challenges, it becomes important to transform traditional herbal preparations into forms that are more convenient, stable, and easy to use. Among the various pharmaceutical dosage forms, tablets are widely preferred because they are simple to consume, provide accurate dosing, are easy to carry, and have a longer shelf life. Converting herbal kadha into tablet form can therefore make it more acceptable to users while maintaining its therapeutic effectiveness.

In this context, the present study focuses on the development and preparation of herbal kadha tablets for the management of upper respiratory tract infections. This formulation is expected to improve patient compliance, enhance stability, and ensure uniform dosing, while still preserving the medicinal properties of the traditional kadha.

Therapeutic Role of Individual Ingredients

Mulethi (*Glycyrrhiza glabra*)

Mulethi is one of the most important herbs used in respiratory formulations due to its soothing and healing effects on the mucous membranes of the throat and respiratory tract. It acts as a demulcent, forming a protective layer that reduces irritation and dryness in the throat. Mulethi also functions as an expectorant, helping to loosen and expel mucus from the airways, thereby relieving cough. In addition, it exhibits antiviral, antibacterial, and anti-inflammatory properties, making it highly effective in managing infections and reducing inflammation in the respiratory tract [15].

Amla (*Emblica officinalis* / *Phyllanthus emblica*)

Amla, commonly known as Indian gooseberry is one of the most valuable medicinal plants used in Ayurveda due to its powerful antioxidant and immunomodulatory properties. It is an excellent natural source of vitamin C, which plays a crucial role in enhancing the body's immune response and protecting against infections. Amla helps in strengthening the respiratory system by reducing inflammation and supporting the healing of irritated mucous membranes.

In the context of upper respiratory tract infections, Amla is particularly beneficial as it helps in reducing

symptoms such as cough, cold, and sore throat. Its antioxidant properties protect the body from oxidative stress caused by infections, while its anti-inflammatory action helps in relieving swelling and irritation in the respiratory tract. Additionally, Amla supports detoxification and improves overall health, which contributes to faster recovery.

Amla also enhances the absorption and effectiveness of other herbal ingredients present in the formulation, thereby contributing to the overall synergistic action of the kadha tablets. Due to these multiple therapeutic benefits, Amla is considered an important ingredient in herbal formulations aimed at boosting immunity and managing respiratory disorders [16].

Tulsi (*Ocimum sanctum*)

Tulsi, also known as Holy Basil, is considered a powerful immunomodulatory herb in Ayurveda. It enhances the body's resistance against infections by improving immune response. Tulsi contains bioactive compounds that exhibit antiviral, antibacterial, and antifungal activities. It is particularly beneficial in reducing symptoms such as cough, cold, and nasal congestion.

Moreover, its anti-inflammatory properties help in reducing swelling and irritation in the respiratory tract, promoting faster recovery [17].

Pippali (*Piper longum*)

Pippali is widely known for its role in improving respiratory health. It acts as a bronchodilator and helps in clearing mucus from the lungs and airways, thereby easing breathing. One of its key functions is enhancing the bioavailability of other herbal ingredients, meaning it helps the body absorb and utilize the active compounds more effectively. This makes the overall formulation more potent. Additionally, Pippali has mild antimicrobial and anti-inflammatory properties, contributing to its usefulness in treating respiratory disorders [18].

Cinnamon (*Cinnamomum verum*)

Cinnamon is a valuable ingredient due to its strong antimicrobial and antioxidant properties. It helps in inhibiting the growth of harmful microorganisms responsible for respiratory infections. Its anti-inflammatory effects assist in reducing swelling and irritation in the throat and airways. Cinnamon also contributes to improving blood circulation, which may aid in faster healing and recovery from infections [19].

Clove (*Syzygium aromaticum*)

Clove is rich in eugenol, an active compound known for its analgesic, antiseptic, and anti-inflammatory properties. It is particularly effective in relieving throat pain and irritation. Clove also helps in reducing microbial load in the respiratory tract, thereby preventing the progression of infection. Its mild anesthetic effect provides a soothing sensation, which is beneficial in conditions such as sore throat and persistent cough [20].

Dry Ginger (*Zingiber officinale*)

Dry ginger is extensively used in traditional medicine for its warming and therapeutic effects. It helps in reducing inflammation and acts as a natural remedy for cough and cold. Ginger improves blood circulation and promotes sweating, which can help in reducing fever. It also aids in clearing nasal and chest congestion, making breathing easier. Its antioxidant properties further help in protecting the body from oxidative stress during infections [21].

Jaggery

Jaggery is used as a natural sweetening agent and also provides additional health benefits. It is traditionally believed to help in clearing the respiratory tract by removing accumulated mucus. Jaggery also provides a soothing effect on the throat and supplies essential minerals, contributing to overall health. Its inclusion improves the taste of the formulation, thereby increasing patient compliance [22].

Sugar

Sugar is added mainly to enhance the palatability of the formulation. Since herbal preparations often have a bitter or strong taste, sugar helps in masking these flavors, making the final product more acceptable, especially when administered in tablet form [23].

Lemon Juice

Lemon juice is a rich source of vitamin C, which plays a vital role in boosting the immune system. It helps the body fight infections more effectively and reduces the duration and severity of respiratory illnesses. Additionally, its antioxidant properties help in protecting cells from damage and support overall

health during illness [24].

II.MATERIALS AND METHODS

Sample Preparation

All the herbal ingredients used in this study were purchased from a local market and carefully identified based on their physical characteristics. The selected materials included Mulethi (*Glycyrrhiza glabra*), Tulsi (*Ocimum sanctum*), Pippali (*Piper longum*), Cinnamon (*Cinnamomum verum*), Clove (*Syzygium aromaticum*), and Dry Ginger (*Zingiber officinale*), along with supportive ingredients such as jaggery, sugar, and lemon juice.

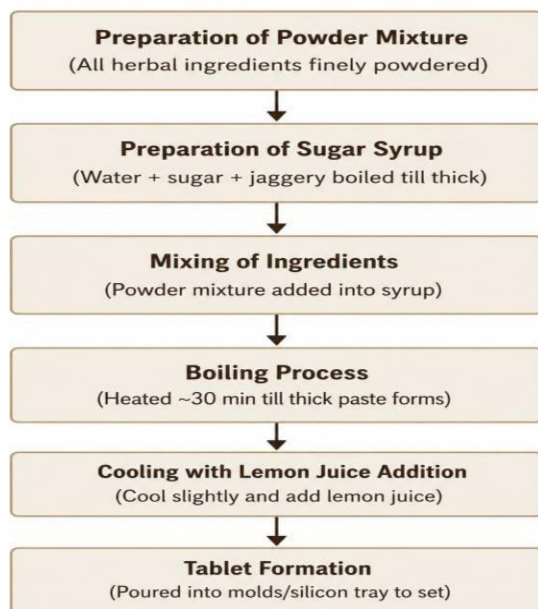
To maintain their medicinal properties, the plant materials were first cleaned to remove dust and impurities, then dried under shade rather than direct sunlight. Once completely dried, they were ground into fine powder using a grinder and stored in airtight containers to prevent moisture absorption and contamination [25].

Preparation of Kadha Tablets

The preparation of kadha tablets began with making a herbal decoction. All the powdered ingredients were added to approximately one liter of water and boiled gently until the volume reduced to about one-fourth. This step helps in extracting the active components from the herbs effectively. The mixture was then filtered to separate the liquid extract from the solid residues.

Next, jaggery and sugar were added to the filtrate and heated until a thick syrup was formed. Continuous stirring was maintained throughout the process to ensure uniform mixing and to avoid burning. The herbal extract and syrup were further heated together until a semi-solid consistency was achieved.

After allowing the mixture to cool slightly, lemon juice was added to improve both the nutritional value and stability of the formulation. The semi-solid mass was then poured into molds or trays and left to set. Once hardened, it was cut into uniformly sized tablets and stored properly for further analysis [26].



Proximate Analysis

The prepared kadha tablets were analyzed to determine their basic nutritional composition, including moisture, fat, protein, ash, and fiber content. Standard laboratory procedures were followed to ensure reliable and reproducible results [27].

Determination of Moisture Content

Moisture content was measured using the oven drying method. A known quantity of the sample was placed in a hot air oven at a temperature of 100–105°C until it reached a constant weight.

The decrease in weight indicated the moisture present in the sample, which was calculated using the formula:

$$\text{Moisture (\%)} = \frac{(\text{Initial Weight} - \text{Final Weight})}{\text{Initial Weight}} \times 100$$
 [28]

Estimation of Fat Content

Fat content was determined using the Soxhlet extraction method. In this process, the dried sample was placed in a thimble and extracted using petroleum ether as a solvent. After several cycles of extraction, the solvent was evaporated, and the remaining residue was weighed to calculate the crude fat content [29].

Estimation of Protein Content

Protein levels were analyzed using the Kjeldahl method. The sample underwent digestion, distillation, and titration to measure its nitrogen content. This value

was then multiplied by a factor of 6.25 to estimate the total protein present in the sample [30].

Organoleptic Evaluation

The sensory characteristics of the prepared kadha tablets, such as color, taste, aroma, texture, and overall acceptability, were evaluated by a panel of trained individuals. A nine-point hedonic scale was used for assessment, and the average scores were calculated to determine the acceptability of the formulation [31].

III.RESULT AND DISCUSSION

Proximate Analysis of Therapeutic Kadha Tablet

The prepared therapeutic Kadha tablet was evaluated for its nutritional and quality parameters, and the results indicated that the formulation possessed satisfactory characteristics. The moisture content of the tablet was found to be 13.5%, which suggests better stability and reduced chances of microbial contamination during storage [32]. The fat content was low (1.02%), indicating that the formulation contains only a small amount of lipid material [32].

Protein content was observed to be 5.11%, showing that the herbal ingredients contribute to the nutritional value of the formulation [32]. The ash value was recorded as 1.44%, which reflects the presence of mineral constituents in the tablet [32]. A high carbohydrate content of 78.93% was observed,

indicating that the formulation may provide a good source of energy [32]. Dietary fiber content was found to be 0.47%, which may help support digestion and improve bowel health [32].

The microbial analysis showed a total plate count of 4.5×10^2 CFU/g, which was within the acceptable limit for herbal preparations, indicating good microbiological quality of the product [32]. Antioxidant activity determined through the DPPH assay was found to be 491.8 mg/g ascorbic acid equivalent, demonstrating strong free radical scavenging potential of the therapeutic Kadha tablet [32].

Parameter	Value (g/50g)
Moisture content (%)	13.5
Fat	1.02
Ash content (%)	1.44
Carbohydrate (%)	78.93
Dietary fiber	0.47
Protein	5.11

Sensory Evaluation

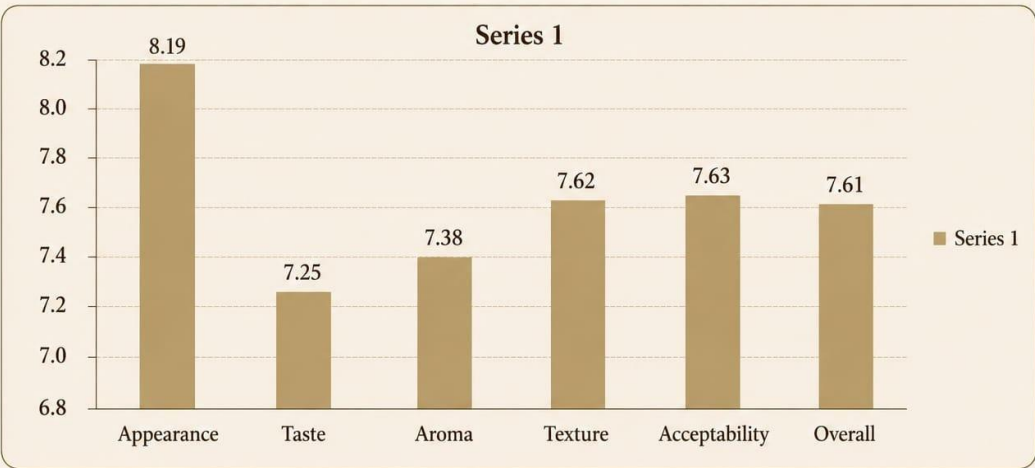
Sensory evaluation was carried out using the nine-point hedonic scale with the help of trained panel members. The prepared Kadha tablet showed good acceptability in terms of appearance, taste, aroma, texture, and overall acceptability [32]. The pleasant aroma and characteristic herbal taste may be due to ingredients such as tulsi, clove, cinnamon, mulethi, and dry ginger used in the formulation [32].

The texture of the tablet was found to be smooth and acceptable for consumption. Overall sensory scores indicated that the formulation was organoleptically acceptable and well tolerated by the panelists [32].

Table 2: Sensory Evaluation of Ayurvedic Kadha Tablets

Organoleptic Parameters	Appearance	Taste	Aroma	Texture	Acceptability	Overall
Sample						
Ayurvedic Kadha Tablets	8.19	7.25	7.38	7.62	7.63	7.61

Sensory Profile of Ayurvedic Kadha Tablets



IV.DISCUSSION

The findings of the present study suggest that the developed herbal Kadha tablet possesses desirable physicochemical and sensory properties. The lower moisture content may help improve shelf life and stability of the formulation, while the carbohydrate and protein contents contribute to its nutritional importance [32].

The significant antioxidant activity observed in the formulation may be associated with the presence of phytoconstituents such as phenols, tannins, flavonoids, and terpenoids naturally present in the herbal ingredients [32]. These bioactive compounds are known for their immunity-enhancing and protective effects against oxidative stress [32].

The sensory evaluation results further confirmed that the formulation was acceptable in terms of flavor, aroma, and texture, which may improve patient compliance and regular consumption [32].

Therefore, the prepared therapeutic Kadha tablet can be considered a promising herbal formulation for supportive management of upper respiratory tract infections [32].

V.CONCLUSION

The present research work focused on the development and evaluation of a herbal Kadha tablet intended for the supportive management of upper respiratory tract infections. The formulation prepared with traditional herbal ingredients such as amla, giloy, mulethi, tulsi, clove, cinnamon, dry ginger, and lemon juice demonstrated satisfactory quality, stability, antioxidant activity, and sensory acceptability. The study findings suggest that the prepared tablet possesses beneficial nutritional and therapeutic properties, along with good patient acceptability due to its suitable taste, aroma, and texture [32].

The antioxidant potential and presence of important phytoconstituents in the formulation may contribute to strengthening immunity and helping in the management of respiratory discomfort. In addition, converting traditional Kadha into tablet form provides a more convenient, portable, and easy-to-consume dosage form compared to conventional liquid preparations. Therefore, the developed herbal Kadha

tablet may serve as a promising herbal supplement for supportive care in upper respiratory tract infections and may be further explored through advanced clinical and pharmacological studies [32].

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REFERENCE

- [1] Eccles R. Understanding the symptoms of the common cold. *Lancet Infect Dis.* 2005;5(11):718–725.
- [2] Heikkinen T, Järvinen A. The common cold. *Lancet.* 2003;361(9351):51–59.
- [3] Fendrick AM, et al. The economic burden of upper respiratory infections. *Arch Intern Med.* 2003;163(4):487–494.
- [4] World Health Organization. Antimicrobial resistance. 2020.
- [5] Ventola CL. The antibiotic resistance crisis. *Pharm Ther.* 2015;40(4):277–283.
- [6] Sharma R, Dash B. *Charaka Samhita.* 2018.
- [7] Balkrishna A, et al. Ayurvedic immunity boosters. *J Ayurveda Integr Med.* 2021;12(3):456–462.
- [8] Cohen MM. Tulsi - *Ocimum sanctum.* *J Ayurveda Integr Med.* 2014;5(4):251–259.
- [9] Pastorino G, et al. Glycyrrhiza glabra review. *Phytother Res.* 2018;32(12):2323–2339.
- [10] Rahmani AH, et al. Ginger health benefits. *Int J Prev Med.* 2014;5(12):1468–1476.
- [11] Prasad S, et al. Antimicrobial properties of spices. *Crit Rev Food Sci Nutr.* 2009;49(3):213–228.
- [12] Srinivasan K. Black pepper bioavailability. *Crit Rev Food Sci Nutr.* 2007;47(8):735–748.
- [13] Patwardhan B, et al. Ayurveda modern relevance.

- Evid Based Complement Altern Med. 2015.
- [14] Aulton ME, Taylor K. *Pharmaceutics*. Elsevier; 2018.
- [15] Asl MN, Hosseinzadeh H. Review of pharmacological effects of *Glycyrrhiza glabra* (Mulethi). *Phytotherapy Research*. 2008;22(6):709–724.
- [16] Prakash P, Gupta N. Therapeutic uses of *Ocimum sanctum* Linn (Tulsi) with a note on eugenol and its pharmacological actions. *Indian Journal of Physiology and Pharmacology*. 2005;49(2):125–131.
- [17] Sharma S, Kulkarni SK, Chopra K. *Piper longum* (Pippali): A review of its pharmacological properties. *Indian Journal of Experimental Biology*. 2011;49:807–816.
- [18] Ranasinghe P, Pigera S, Premakumara GAS, et al. Medicinal properties of *Cinnamomum verum* (Cinnamon): A systematic review. *BMC Complementary and Alternative Medicine*. 2013;13:275.
- [19] Chaieb K, Hajlaoui H, Zmantar T, et al. Chemical composition and antimicrobial activity of clove (*Syzygium aromaticum*). *Phytotherapy Research*. 2007;21(6):501–506.
- [20] Ali BH, Blunden G, Tanira MO, Nemmar A. Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinale*): A review. *Food and Chemical Toxicology*. 2008;46(2):409–420.
- [21] Nayik GA, Nanda V. Nutritional and health benefits of jaggery: A traditional sweetener. *Journal of Food Processing & Technology*. 2015;6(10):1–5.
- [22] Fitch C, Keim KS. Position of the Academy of Nutrition and Dietetics: Use of nutritive and nonnutritive sweeteners. *Journal of the Academy of Nutrition and Dietetics*. 2012;112(5):739–758.
- [23] Carr AC, Maggini S. Vitamin C and immune function. *Nutrients*. 2017;9(11):1211.
- [24] Harborne JB. *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis*. Springer; 1998.
- [25] *Ayurvedic Pharmacopoeia of India*. Ministry of AYUSH, Government of India; 2016.
- [26] AOAC. *Official Methods of Analysis*. 18th ed. Association of Official Analytical Chemists; 2005.
- [27] Ranganna S. *Handbook of Analysis and Quality Control for Fruit and Vegetable Products*. Tata McGraw Hill; 2001.
- [28] Soxhlet F. Die gewichtsanalytische Bestimmung des Milchfettes. *Dingler's Polytechnisches Journal*. 1879;232:461–465.
- [29] Kjeldahl J. A new method for the determination of nitrogen in organic matter. *Zeitschrift für Analytische Chemie*. 1883;22:366–382.
- [30] Stone H, Sidel JL. *Sensory Evaluation Practices*. 3rd ed. Academic Press; 2004.
- [31] Srivastava T, Mishra S. Proximate Analysis and Organoleptic Properties of Therapeutic Kadha Tablet. *Journal of Ayurveda and Integrated Medical Sciences*. 2022;7(6):102–103.