

Comparative evaluation of *Triphala* mouthwash with three different proportion combination

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Abstract

Oral health is an essential component of overall health and a satisfactory quality of life. The oral disease is termed as *Mukharoga* in Ayurveda. *Gandusha* is mentioned as one of the major therapies in *Ayurveda* medicine for both preventing and treating oral diseases. *Acharya Sharangadara* mentioned *Triphala* as a *Gandusha* and it consists of three myrobalans, which are *Terminalia chebula*, *Terminalia bellerica*, *Phyllanthus emblica*. *Triphala* is used as equal and unequal proportions. In the present study, *Triphala* mouth wash (TM) is prepared in the form of *Kwatha* (Decoctions) according to the Ayurveda Bhaishajyaratnavali. Then the same ingredients were used with different proportions to prepare the decoctions. They were considered as mouth wash based on the comments of Sharangadhara. The prepared decoctions were comparatively analyzed with standardization parameters. Decoctions were prepared in 3 ratios as follows: 1:1:1(TM1), 1:2:3 (TM2) and 1:2:4 (TM3) and assessed the organoleptic, physiochemical and phytochemical. Moreover, pharmacological properties were also evaluated using the authentic text books and the modern research findings. Dichloromethane fractions of *Thriphala* decoction in all three proportions were used to develop TLC and HPTLC fingerprints equivalent to gallic acid and tannic acid under the Toluene: Ethyl acetate: formic acid 2:5:1.5 solvent system. pH values of TM1, TM2 and TM3 were 3.98, 3.92, 3.96 respectively. The Foaming index was found to be less than 100 in all the three proportions. Phytochemical screening shows the presence of tannins, saponins, flavonoids etc. The TLC and HPTLC fingerprints showed the

presence of tannic and gallic acid as active ingredients when visualized under UV at 254 and at 366 nm and the *Triphala* mouth wash prepared in 1:2:3 ratio showed the highest Rf values. Based on the pharmacological properties and actions, all the three proportions of *Thriphala* mouth wash can be used for oral diseases, but the effectiveness of therapeutic action may vary slightly according to the proportions of decoction.

Keywords: Oral diseases, *Gandusha*, Decoction, *Triphala* mouthwash, Different proportions

Introduction

Ayurveda is a science of life which engages with prevention and treatment of various diseases and promoting health in healthy individuals. It is a healing gift to us from the ancient enlightened Vedic culture. Oral health is an important and integrated component of overall health. It is also recognized as an essential part of the quality of life^{1,2}.

Oral illnesses continue to be a serious health issue and a highly prevalent group of pathologies in the world. Oral health refers to the state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal disease, tooth decay, tooth loss, and any other disorders that limit the individual's oral function. According to the World Health Organization (WHO) Global Oral Health Status Report (2022), oral illnesses are the most prevalent non-communicable diseases globally, affecting almost half of the world's population (45% or 3.5 billion people worldwide). Poor oral health can affect the individual's capacity in biting, chewing, smiling, speaking and psychosocial

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wellbeing. Oral diseases disproportionately affect people in developing countries. Some of the oral diseases are cavities, periodontal (gum) diseases, mouth sores, interdental bleeding, bad breath and gingivitis etc³.

The illness of the oral cavity is termed as *Mukharoga* in Ayurveda. *Mukha* is considered as one of the *Nava dwara* and it is the most important part of the body. *Acharya Charaka* has mentioned sixty four *Mukha Roga* which occur at seven locations, such as lips, gums, teeth, tongue, palate, throat and oral cavity. According to *Madhava Nidana*, excessive intake of meat of marshy creatures, milk, curd, fish etc. causes an abnormal increase in the three *Doshas* with the predominance of *Kapha* and productive diseases of the mouth^{4,5,6}.

There are several treatment procedures mentioned in *Ayurveda* classics to avoid and eradicate *Mukharogas*, and *Gandusha* is one among of them explained by *Acharya Charaka* under the *Dinacharya* (daily routine), *Acharya Sustruta* under the *Anagatabadha pratishedha* and *Acharya Vagbhata* under the *Gandushadi Vidhi*. *Gandusha* is the process of holding any decoction, oil, or any medicated liquid in the mouth to its full capacity without moving it. Regular practice of *Gandusha* will help to increase good oral hygiene by keeping the cleansing action and increasing the defense mechanism in the oral cavity. *Acharya Charaka* in *Charaka Samhita* mentioned the benefits of *Gandusha darana* such as strength of the jaws, voice and roots of the teeth, relief from the dry throat, lip cracking, dental caries, pain and discomfort, increased capacity for chewing. Increase the taste and appetite of food.

Mouthwashes are solutions or liquids used to rinse the mouth and they have several benefits, such as to destroy bacteria, to act as an astringent, to deodorize, to prevent dental caries and to reduce or eliminate plaque accumulation.^{7, 8, 9, 10}

In Ayurveda, *Triphala* (*tri* –three, *phala* –fruit) is a well-known polyherbal formulation and it has been used in *Ayurveda* for over 2000 years. It is used extensively in Ayurveda and consists of three myrobalans, such as *Haritaki* (*Aralu*), *Vibhitaki*

(*Bulu*), *Amalaki* (*Nelli*). It provides therapeutic value for several diseases and oral pathologies are one of those. It mainly alleviates *Kapha* and *Pitta* and it is among the most ancient and common of the *Ayurvedic* remedies. *Triphala* contains various powerful antioxidants and bio-active substances which are good for oral health. Also, *Triphala* is claimed to have antibacterial and antiviral effects. Therefore, it is commonly used as a mouthwash (*Gandusha*) in *Ayurveda*.

Aralu– Terminalia chebula

Haritaki is also known as *Harar*, *Harra*, *Hirda* and *Myrobalan* and it belongs to the *Combretaceae* family. *Haritaki* was named as king of medicine. It is mainly used for constipation, respiratory problems, certain skin diseases, eye diseases etc. and *Bhavamishra* mentioned seven different varieties of *Terminalia Chebula*. It has several pharmacological activities, such as Anti-diabetic, Anti-carcinogenic, Anti-viral, Anti-fungal, Anti-oxidant, Anti-inflammatory, Anti-bacterial activity.

Bulu – Terminalia bellerica

Terminallia bellerica is called *Vibhitaki* in Sanskrit, which means fearless and it belongs to the *Combretaceae* family. *Acharya Charaka* mentioned *Vibhitaki* in the *Jvarahara* and *Kasahara* group of drugs and he also indicated it for *Rasa*, *Rakta*, *Mamsa* and *Meda Vikaras*. Its pharmacological activities are Analgesic activity, Anti-diarrhea, Anti – microbial, Anti-oxidant, Anti-cancer, Wound healing and Anti – ulcer activity etc.

Nelli – Phyllanthus emblica

Phyllanthus emblica or Indian gooseberry is commonly known as *Amla* (Sanskrit *Amalaki*) and it is a medium sized deciduous tree of the family *Euphorbiaceae*. *Phyllanthus emblica* is one of the richest sources of natural vitamin c, amino acids and minerals. It consists of Anti-oxidant, Anti-microbial, Anti-cancerous, Anti-diabetic, Anti-ageing, Anti-ulcer, Anti-inflammatory, Antifungal, Anti-viral activities.^{11,12,13,14}

In Ayurveda Bhaishajyaratnavali, the preparation method of *Tripala kvata* was mentioned but the proportions of each ingredient are not given. Therefore, in this study, *Triphala* Decoction as a mouth wash was prepared from different proportions, such as 1:1:1 ratio, 1: 2:3 ratio, and 1:2:4 ratio, and comparatively analysis of different proportions of *Triphala* mouth wash for oral diseases.¹⁵

The present study was aimed on comparatively evaluation of *Triphala* mouthwash with three different proportion combination, and specific objectives is to compare the TLC and HPTLC fingerprinting profiles of *Triphala* mouth wash, which is prepared in 3 ratios.

Materials and Methods

Collection and authentication of plant materials

Herb authentication is a quality assurance that make sure the correct plant species and plant parts are used as raw materials for herbal medicine. The correct process of authentication for herbal raw materials is more important to the safety and efficacy of herbal medicines.

Fruits of *Terminalia chebula* (Combretaceae), *Terminalia belerica* (Combretaceae) and *Phyllanthus emblica* (Euphorbiaceae) were purchased from a local registered Ayurveda shop in Colombo city, Western province, Sri Lanka and authenticated by the Department of *Dravyaguna vignana* and *Swasthavritta* Faculty of Indigenous Medicine, University of Colombo. The contaminants of the raw materials were removed manually, washed with water, and shade dried (Figure 1, 2 and 3).



Fig. 1: Collected and Authenticated Haritaki



Fig. 2: Collected and Authenticated Vibhitaki



Fig. 3: Collected and Authenticated Amalaki

Preparation method of Triphala mouth wash

Seeds of individual fruits were removed and the dried fruit pulp was separately crushed in to small particles using *Ullukala yantra*. Then *Triphala* decoction was prepared according to the traditional decoction preparation method by mixing *Haritaki*, *Vibhitaki*, *Amalaki* in ratio of 1:1:1 (TM1), 1:2:3 (TM2), 1:2:4 (TM3) in separate containers and boiled with 1920ml of water under mild flame to reduce the volume up to 240ml.

Analytical study^{16, 17, 18, 19}

Organoleptic properties

Organoleptic evaluations were tested according to the color, odor, and taste parameters by visual examination (Figure 4).

Physiochemical parameters

The pH values were measured using a bench digital pH meter. A total of 50ml of each sample were inserted in to separate beakers and they proceeded with the analysis. Each sample of *Triphala* mouth wash was measured three times. The final pH was set as the arithmetic mean of the values recorded.

- **Table 1: Ingredients of *Triphala* decoction**

S. No	Ingredients	Botanical name	Part used	Quantity taken		
				1:1:1	1:2:3	1:2:4
1	<i>Haritaki</i>	<i>Terminalia chebula</i>	Fruit	20g	10g	8.6g
2	<i>Vibhitaki</i>	<i>Terminalia bellerica</i>	Fruit	20g	20g	17.14g
3	<i>Amalaki</i>	<i>Phyllanthus emblica</i>	Fruit	20g	30g	25.8g
4	Water			1920ml	1920ml	1920ml

**Fig. 4: Samples of *Triphala* mouthwash in different proportions****Determination of Foaming Index**

Pour the decoction in to 10 stoppered test tube as 1 ml, 2ml, 3ml, etc. up to 10ml and adjust the volume up to 10 ml by adding sufficient quantity of distilled water Shake the test tube for 15 sec in length wise motion (Two shake per second) and keep the test tube to stand for 15 min and measure the height of the foam. This procedure was done for each proportion of dichloromethane fraction

- If the measure of foam height in every tube appears to be less than 1cm, then the foaming index is less than 100.
- If the measure of foam height in every tube appears to be more than 1cm, then the foaming index is over 1000.

Preparation of extraction

Freshly prepared *Triphala* mouthwash of different proportioned forms was added separately (100ml from each) to a separating funnel containing 50 ml of dichloromethane, mixed well and kept for 20 min. After that, the Dichloromethane layer was separated of each proportion separately and put in the hot air oven to evaporate the moisture.

Phytochemical parameters

Dried dichloromethane fractions of each proportioned forms (TM1, TM2, TM3) were again dissolved in dichloromethane separately. The prepared test extracts were analyzed qualitatively for the presence of various phytoconstituents such as tannin, saponins, phenols, Carbohydrates, Flavonoids, alkaloids

Determination of the presence /absence of tannins

Extract was added with a few drops of FeCl₃ (10%) solution. Tannins indicate a solution that is greenish grey or dark blue in color. This procedure was done for each proportion of extract.

Determination of the presence /absence of saponins

Triphala decoction was mixed with 5 ml of distilled water in a test tube and it was shaken vigorously. Stable persistent froth was taken as an indication for the presence of saponins. This procedure was done for each proportion of *Triphala* decoction.

Determination of the presence /absence of Phenols (Vanillin test)

2ml of Extract were added with a few drops 10% vanillin in ethyl alcohol and conc. HCL Appearance of red color indicate the presence of phenols. This procedure was done for each proportion of extract.

Determination of the presence /absence of Carbohydrates (Molisch's test)

2ml of Extract were added with 2 ml of Molisch's test reagent and shaken well. To this another 2ml of concentrated sulphuric acid was added carefully through the sides of the test tube. Appearance of a reddish violet ring at the interphase indicate the presence of carbohydrates. This procedure was done for each proportion of extract.

Determination of the presence/absence of Flavonoids

5ml of dilute ammonia solution was added to 5ml of extract followed by the addition of conc.H₂SO₄. Appearance of yellow color indicates the presence of flavonoids. This procedure was done for each proportion of extract.

Determination of the presence /absence of alkaloids (Mayer's test)

2ml of Extract were added with 2ml of Mayer's reagent (potassium mercuric chloride) and mixed well. Appearance of a yellow colored precipitate indicates the presence of alkaloids. This procedure was done for each proportion of extract.

Development of TLC and HPTLC fingerprints

Preparation of standard solution of Gallic acid

Gallic acid stock solution was prepared by dissolving 7.5mg of accurately measured Gallic acid in methanol and adjust the volume up to 100ml with methanol.

Develop spotted TLC plate

Dried dichloromethane fractions of different proportioned forms (TM1, TM2, and TM3) were again dissolved in 5ml of dichloromethane separately and spotted on a TLC plate along with Gallic acid and Tannic acid as standards. The TLC fingerprint profile was developed for all fractions using toluene, ethyl acetate and formic acid at a ratio of 2:5:1.5 v/v. The plate was visualized under UV radiation and HPTLC fingerprint patterns were observed by using HPTLC scanner (Figure 5).

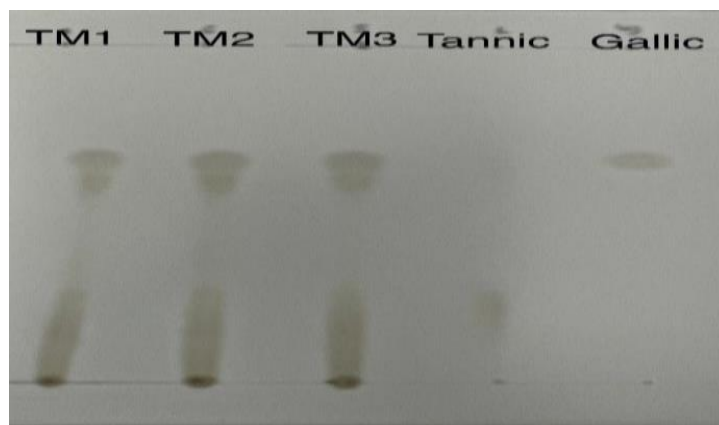


Fig. 5: Spotted TLC plate

Results

Organoleptic characters

Organoleptic character for the raw materials was done with samples taken from the Ayurveda shop. The results obtained and the standard values are given Table 2.

According to the organoleptic properties, *Tikta Kashaya* taste is the most prominent taste in all three proportions, and compared to the others, TM2 has the strongest characters compared with other two samples.

Physiochemical Screening

Determination of pH

The pH of *Triphala* mouthwash in different proportions were determined separately and the pH value obtained is tabulated in Table 3.

The pH value of all three samples shows an acidic nature, and TM1 showed slightly higher value and compared with the sample TM 2 showed the lowest value.

Determination of Foaming Index

The foaming index was calculated and expressed according to the WHO recommendations and of all 3 samples was found to be less than 100.

Phytochemical parameters

Preliminary phytochemical analysis for all three proportions revealed the positive results for total 6 compounds such as tannin, saponin, phenol, carbohydrates, flavonoid, and alkaloid (Table 5).

Table 2: Organoleptic characters

S. No.	Sample	Parameters		
		Colour	Taste	Odour
1.	1:1:1 ratio (TM1)	Brown	<i>Tikta, Kashaya+</i>	Characteristic
2.	1:2:3 ratio (TM2)	Blackish Brown	<i>Tikta, Kashaya+++</i>	Characteristic
3.	1:2:4 ratio (TM3)	Dark Brown	<i>Tikta, Kashaya++</i>	Characteristic

Table 3: Determination of pH

S: No	Sample	pH
1	1:1:1 ratio (TM1)	3.98
2	1:2:3 ratio (TM2)	3.92
3	1:2:4 ratio (TM3)	3.96

Table 4: Determination of Foaming Index

	1:1:1 ratio	1:2:3 ratio	1:2:4 ratio
Foaming Index	Less than 100	Less than 100	Less than 100

Table 5: Determination of phytochemical parameter

S. No.	Phytochemical constituents	Name of the test	Observation	Result		
				1:1:1 ratio	1:2:3 ratio	1:2:4 ratio
1	Tannin	FeCl ₃ test	Blue colour appear	+	+	+
2	Saponin	Foam test	Persistent froth appears	+	+	+
3	Phenol	Vanillin test	Red color appears	+	+	+
4	Carbohydrate	Molisch's test	Reddish violet ring appears	+	+	+
5	Flavonoid	Ammonia test	Yellow color appears	+	+	+
6	Alkaloid	Mayer's test	Yellow color appears	+	+	+

TLC and HPTLC Fingerprinting

TLC analysis of *Triphala* mouthwash in different proportions revealed the presence of various bioactive compounds and among them, according to the literature Tannin and Gallic Acid are the major bioactive present. Therefore, in the present study the TLC was run with equivalent to the tannin and gallic acid and it showed the parallel bands in all three samples. Under the 366 nm wave length also showed the presence of the tannin and gallic acids (Figure 6 and 7).

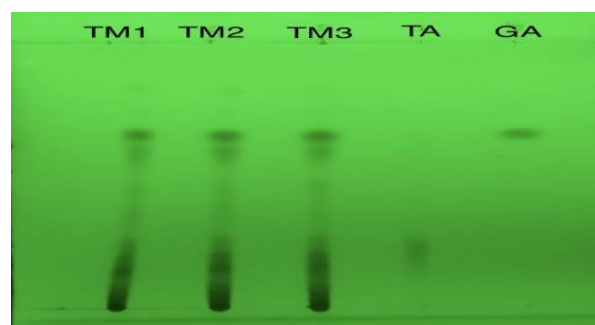


Fig. 6: TLC photo documentation under 256nm UV light



Fig. 7: TLC photo documentation under 366 UV light

In the ratio of the 1:1:1 showed the 5 peaks with the Rf values of -0.07, 0.01, 0.18, 0.41, 0.60 respectively and highest Rf value was the 0.60 while the highest height of the peak was for the first peak which is 239.5 Au (Figure 8 and Table 6).

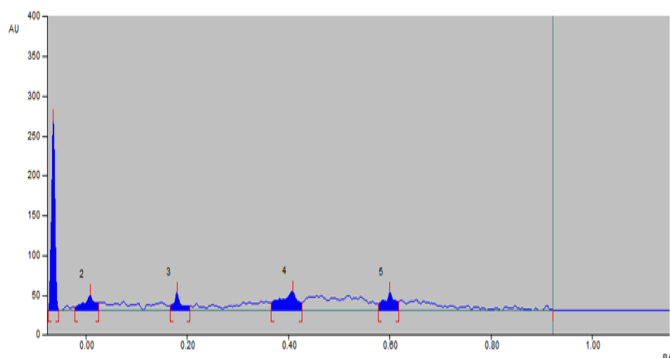


Fig 8: HPTLC fingerprint profiles under 254nm of TM in ratio of 1:1:1

In the ratio of the 1:2:3 showed the 7 peaks with the Rf values of -0.07, 0.08, 0.39, 0.50, 0.67, 0.74, 0.83 respectively and highest Rf value was the 0.83 while the highest height of the peak was for the sixth peak which is 276.0 Au (Figure 9 and Table 7).

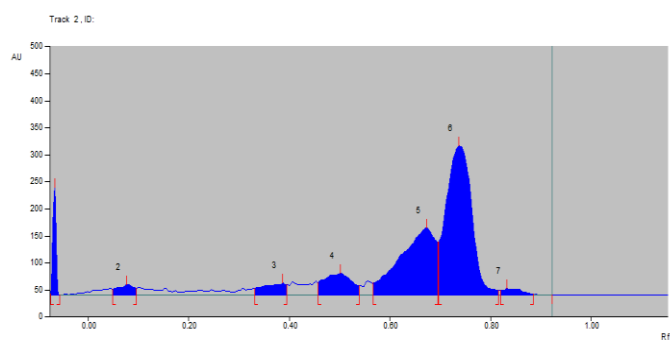


Fig. 9: HPTLC fingerprint profiles under 254nm of TM in ratio of 1:2:3

In the ratio of the 1:2:4 showed the 2 peaks with the Rf values of 0.56, 0.73 respectively and highest Rf value was the 0.73 while the highest height of the peak was for the second peak which is 38.0 Au (Figure 10 and Table 8).

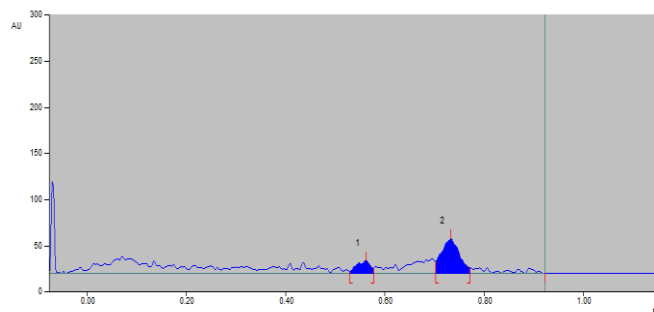


Fig. 10: HPTLC fingerprint profiles under 254nm of TM in ratio of 1:2:4

Pharmacodynamic properties^{14,20,21,22}

Pharmacodynamic properties of *Triphala* mentioned in Ayurveda authentic texts were tabulated in Table 9.

According to the findings it showed that common *Guna* of the *Triphala* is *Ruksha* and both *Harithaki* and *Vibhithaka* are *Ushna veerya* and all three are in *Madhura vipaka*. When considering to the pacification of *Dosha*, only *Vibhithaka* is showing *Kapha, Pitha shamaka*.

Discussion

Oral health is identified as an important part of quality of life, and maintaining proper oral hygiene is essential for both the body and oral health. Oral diseases can influence a person's growth and development, as well as their psychic productivity and social capacity.²³

In *Ayurveda*, *Gandusha* is advised for maintaining oral health. It increases mechanical pressure inside the oral cavity, activates the salivary glands, enhances vascular permeability, and keeps the oral pH stable.

A mouthwash is a solution used to rinse the oral cavity, and it helps oral hygiene by decreasing plaque and tartar or treating periodontal diseases, interdental bleeding, bad breath, and gingivitis.

Table 6: Peak values of HPTLC fingerprint profiles of TM in ratio of 1:1:1

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %	Assigned substance
1	-0.08 Rf	0.6 AU	-0.07 Rf	239.5 AU	73.25 %	-0.06 Rf	0.9 AU	1232.6 AU	44.90 %	unknown *
2	-0.02 Rf	4.3 AU	0.01 Rf	19.2 AU	5.88 %	0.02 Rf	9.5 AU	323.3 AU	11.78 %	unknown *
3	0.17 Rf	6.2 AU	0.18 Rf	22.3 AU	6.81 %	0.20 Rf	4.9 AU	232.3 AU	8.46 %	unknown *
4	0.36 Rf	10.0 AU	0.41 Rf	23.6 AU	7.20 %	0.43 Rf	9.2 AU	603.6 AU	21.99 %	unknown *
5	0.58 Rf	8.3 AU	0.60 Rf	22.5 AU	6.87 %	0.62 Rf	10.8 AU	353.5 AU	12.88 %	unknown *

Table 7: HPTLC fingerprint profiles with peak values of TM in ratio of 1:2:3

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %	Assigned substance
1	-0.08 Rf	2.3 AU	-0.07 Rf	199.7 AU	28.83 %	-0.06 Rf	0.6 AU	924.8 AU	4.37 %	unknown *
2	0.05 Rf	11.2 AU	0.08 Rf	19.2 AU	2.78 %	0.10 Rf	12.6 AU	474.0 AU	2.24 %	unknown *
3	0.33 Rf	12.5 AU	0.39 Rf	22.0 AU	3.17 %	0.39 Rf	18.9 AU	728.0 AU	3.44 %	unknown *
4	0.46 Rf	23.3 AU	0.50 Rf	40.0 AU	5.77 %	0.54 Rf	16.8 AU	1655.7 AU	7.83 %	unknown *
5	0.57 Rf	21.9 AU	0.67 Rf	123.8 AU	17.86 %	0.70 Rf	98.0 AU	6506.2 AU	30.78 %	unknown *
6	0.70 Rf	98.4 AU	0.74 Rf	276.0 AU	39.84 %	0.82 Rf	8.1 AU	10513.1 AU	49.73 %	unknown *
7	0.82 Rf	8.7 AU	0.83 Rf	12.2 AU	1.75 %	0.88 Rf	1.2 AU	339.2 AU	1.60 %	unknown *

Table 8: HPTLC fingerprint profiles of TM in ratio of 1:2:4

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %	Assigned substance
1	0.53 Rf	2.1 AU	0.56 Rf	13.7 AU	26.58 %	0.58 Rf	5.5 AU	285.8 AU	21.70 %	unknown *
2	0.70 Rf	13.1 AU	0.73 Rf	38.0 AU	73.42 %	0.77 Rf	6.2 AU	1031.1 AU	78.30 %	unknown *

Table 9: Pharmacodynamic properties of Triphala

Name	Rasa	Guna	Virya	Vipaka	Dosha karma
Haritaki	Pancharasa(except lavana),Kashaya pradhana	Laghu Ruksha	Ushna	Madhura	Tridoshahara
Vibhitaki	Kashaya	Laghu Ruksha	Ushna	Madhura	Kapha Pitta Shamaka
Amalaki	Pancharasa (except lavana), Amla pradhana	Guru Ruksha	Sheeta	Madhura	Tridoshahara
Triphala	Kashaya	Laghu Ruksha Vishada	Anushna	Madhura	Kapha Pitha Shamaka

According to *Sharangadara Samhita*, *Triphala* can be used as a *Gandusha* for dental diseases. *Triphala* is one of the well-known polyherbal formulations being used in traditional *Ayurveda* medicine since ancient times. *Triphala* possesses astringent action and anti-bacterial, anti-septic, and anti-inflammatory properties. Because of these properties, it is commonly used as a mouthwash in *Ayurveda*.

In the present study, *Triphala* mouth wash was prepared in the form of *Kwatha* (decoctions) as modification of the dosage form of *Gandusha*. The three myrobalans that are used in the making of *Triphala Kwatha* can be in equal or unequal proportions. Therefore, the present study, *Triphala* mouthwash, was prepared in those three proportions. One is in equal proportions: *Terminalia chebula*, *Terminalia bellerica*, and *Phyllanthus emblica*. The other two are 1:2:3 proportion and 1:2:4 proportion respective to the above-mentioned medicinal plants. Herbal drug standardization is confirmation of its identity and determination of its quality and purity. It is a tool for quality control. WHO mentioned the specific guidelines for the evaluation of the safety, efficacy, and quality of herbal drugs. Three prepared proportions of *Triphala* mouthwash were analyzed to establish standard parameters. When considering the organoleptic characters, even though 1:2:4 contained more *Amalaki* and it had *Amla Pradhana* in taste during the preparation of decoction, the dominant *Amla* taste might be subsided. However, the *Tiktha kashaya* taste is a bit more in TM2 than in the other two proportions, which may be due to the high proportions of *Vibhithaka* compared with the 1:1:1 ratio and in the comparatively less proportion in the 1:2:4 ratio. *Kwatha* must have a pH between 3 and 5 for better pharmacological action. Analysis showed the pH values of TM1, TM2, and TM3 were 3.98, 3.92, and 3.96 respectively, which are the required pH levels for better effectiveness. The pH of all prepared samples is acidic, which might be helpful in reducing the *Malabhutha Kapha* and thereby reducing the *Mukha Daurgandhatha*. The foaming ability of an aqueous decoction of plant materials and their extracts is measured in terms of a foaming index according to the WHO guidelines.

The height of froth measured was less than 1 cm in every test tube for all three proportions. Provided the mentioned reading for the foaming index.

Qualitative phytochemical analysis was done to detect and compare the chemical constituents of each proportion of *Triphala* mouth wash. The presence of tannin, saponin, phenol, carbohydrate, flavanoid, and alkaloid would be responsible for anti-oxidant, anti-inflammatory, anti-bacterial, wound healing, etc. These drug actions are important in curing lots of diseases that are related to the mouth, such as *Krimi Dantha*, *Mukha Paka*, *Mukha Daurgadha*, etc. *Triphala* has significant antimicrobial action against gram-positive and gram-negative bacteria, namely *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Bacillus subtilis*, *Escherichia coli*, and *Pseudomonas aeruginosa*. This is due to the presence of various chemical constituents, like flavonoids and alkaloids. TLC is the initial step to recognizing the phytochemical compounds present in the sample. With the advancement of TLC, HPTLC can provide an electronic image of chromatographic finger prints. In the present study, as we prepared the decoction, the dichloromethane fractions were used to develop TLC and HPTLC fingerprints. Because of the gallic acid is the biomarker for the *Harithaki* and tannin is the biomarker for the *Vibhithaki*, the TLC was developed equivalent to gallic acid and tannic acid. The fingerprint profile of *Triphala* mouthwash in different proportions proved the presence of various bioactive compounds in the decoctions, and tannin and gallic acid could be clearly identified with the markers visualized under UV at 254 and 366 nm. Gallic acid and tannic acid also have anti-oxidant, anti-inflammatory, anti-bacterial, etc. Because of tannic acid and gallic acid, *Triphala* can inhibit *Streptococcus mutans*, which causes dental plaque and gingival inflammation. Also, *Triphala* shows a significant inhibitory effect on *Candida*, probably due to gallic acid. A HPTLC study was done to compare the area and intensity of the spots that appeared in the TLC profile. According to the HPTLC analysis, *Triphala* mouth

wash prepared in a ratio of 1:2:3 showed the highest Rf value, which was 0.83.

The strong antioxidant action of *Triphala* may be *Haritaki* and *Vibhithaki*, which are effective for bleeding gums, gingival ulcers, and carious teeth, and *Amalaki* consists of vitamin C, which is most effective to prevent bleeding from gums.

Kapha dosha naturally dominates the oral cavity. *Vikrita kapha*, which is considered *Mala*, is mainly involved in the disease of the oral cavity. The majority of *Mukha roga* are *Kapha Raktha pradhana*. Hence, it is effective to use medicines, which are mainly in *Kapha* and *Pittahara* properties. *Triphala* mainly consists of *Kashaya rasa*, and *Kashaya rasa* mainly has *Stambhana*, *Ropana*, *Shodhana*, and *Kaphahara* properties. According to the *Panchamahabhautika* constitution, *Triphala* has *Ruksha*, *laghu* and *Vishadha guna*. These properties are just opposite the *Kapha guna*. Also, *Triphala* consists of *Katu* and *Tikta rasa*. *Tikta rasa* pacifies the *Pitta*, and *Katu rasa* has the property of *Vaktra shoshana*. Therefore, *Triphala gandusha* is very effective for various kinds of *Mukha Roga*.^{24,25,26,27,28,29,30,31,32,33}

The effectiveness of the therapeutic action may vary depending on the proportions of the ingredients. An equal proportion of *Triphala* has *Kapha-Pitta shamaka* property. *Terminalia chebula* and *Phyllanthus emblica* consist of *Tridosahara* property, and *Terminalia bellerica* consists of *Kapha*, *Pittahara* property. Therefore, 1:2:3 and 1:2:4 proportions of *Triphala* mouth washes are more towards the *Kapha*, *Pittahara* property than equal proportion. Hence, 1:2:3 and 1:2:4 proportions may be more effective for *Kapha*, *Raktha pradhana Mukha rogs* than an equal proportion of *Triphala*.

Conclusion

Triphala mouth wash in all three proportions can prevent and heal oral diseases by increasing mechanical pressure inside the oral cavity, stimulating salivary glands, maintaining oral pH, and its anti-oxidant, anti-inflammatory, anti-bacterial, and wound-healing qualities. Hence, all three proportions of *Triphala* mouth wash can be

used for oral diseases, but the effectiveness of the therapeutic action may vary slightly depending on the proportions of the decoction. Therefore, 1:2:3 and 1:2:4 proportions may be more towards the *Kapha-Pitta Hara* property than equal proportions.

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