https://doi.org/10.48047/AFJBS.6.Si3.2024.650-658

African Journal of Biological Sciences

Evaluation of Triphala Churna by different physicochemical parameters

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Article History

Received: 08 April 2024

Accepted: 21 May 2024

doi:10.48047/AFJBS.6.Si3.2024.650-658

ABSTRACT

Triphala, a revered herbal blend within Ayurvedic tradition, has attracted widespread interest for its multifaceted roles in promoting digestive health, detoxification, and overall well-being, alongside its prevalent inclusion in diverse Ayurvedic formulations. This study undertakes a detailed examination of individual Triphala fruit and Triphala Churna, employing a range of pharmaceutical parameters to evaluate its quality, safety, and potential health benefits comprehensively. Through scrutiny of key parameters such as phytochemical composition, physical and chemical properties, and microbial contamination, a comprehensive understanding of Triphala's therapeutic potential is elucidated. The analysis not only sheds light on its inherent pharmaceutical attributes but also reinforces its relevance and efficacy within Ayurvedic practice. By delving into Triphala's intricate molecular profile, structural integrity, safety profile, and antioxidant capacity, this study provides valuable insights into therapeutic mechanisms, by comparing individual Triphala fruits and Triphala Churna.

Keywords: Triphala, Triphala Churna, Ayurveda, Physico-chemical.

Introduction

Triphala Churna is a popular herbal preparation in Ayurvedic medicine, consisting of a combination of three fruits: Amalaki, Bhibhitaki, and Haritaki. It has been traditionally used for its digestive, antioxidant, and rejuvenating properties. In recent years, there has been a growing interest in evaluating Triphala Churna using various pharmaceutical parameters to assess its quality, safety, and efficacy (Agarwal, 2018). It has been traditionally used for a wide range of health benefits,

including improving digestion, detoxification, and promoting overall well-being (Baliga et al., 2012). Due to its widespread use and potential health benefits (Peterson et al., 2017), it is important to evaluate Triphala Churna using different pharmaceutical parameters to ensure its quality, safety, and efficacy.

One of the key parameters to evaluate in Triphala Churnas individually is its phytochemical composition, which includes the presence of active compounds such as tannins, flavonoids, and phenolic compounds (Parveen et al., 2018). The presence and concentration of these phytochemicals can directly impact the therapeutic effects of the preparation (Peterson et al., 2017).

Another important parameter is the physical and chemical properties of Triphala Churna, including particle size, moisture content, and chemical stability. These properties can affect the storage stability and bioavailability of the active constituents in the preparation.

Furthermore, the microbial contamination and heavy metal content in Triphala Churna was evaluated to ensure its safety for consumption (Huang et al., 2018). Microbial contamination can lead to spoilage and potential health risks, while heavy metal contamination can have toxic effects on the body.

Powder of individual Triphala fruits as well as the combination (Triphala Churna) were evaluated in the present research.

Material and Methodology

To evaluate the composition of individual Triphala Churna as well as Triphala Churna formulation various pharmaceutical parameters like organoleptic characteristics, physico-chemical analysis, phytochemical tests, heavy metal analysis and microbial test were performed.

Sample collection

Dried sample of Haritiki, Bhibhitaki and Amlaki whole fruit was collected from the Local Market and then coarse powder was prepared for further analysis. Triphala Churna was prepared by mixing all three coarse powders in 1:1:1 ratio. Botanical source of the fruits is mentioned in the table 1.1.

Table 1.1: Botanical Source of the Fruits

Fruit Name	Botanical Name	Family	Part Used
Haritaki	Terminalia chuebula	Combretaceae	Fruit
Bhibhitaki	Terminalia belerica	Combretaceae	Fruit
Amlaki	Emblica officinalis	Euphorbiaceae	Fruit

Organoleptic characteristic

Organoleptic characterization was done on the basis of physical appearance of fruit and powder. colour, odour, taste was analyzed.

Physio-chemical Analysis

Physio-chemical analysis of Triphala involves assessing its physical and chemical properties to understand its behavior and stability. This includes the determination of parameters such as foreign matter, Loss on drying, Total ash, Acid insoluble ash, water insoluble extraction and Alcohol insoluble extractive (TV et al., 2015).

Foreign Matter Analysis

The evaluation of Triphala for foreign matter involves determining the presence of any extraneous materials that may have been inadvertently introduced during the preparation or storage of the herbal formulation. Foreign matter analysis is essential for ensuring the purity and safety of the product. It typically includes visual inspection and the use of sieving techniques to identify and quantify any foreign materials present in the sample (Venkateswarlu et al., 2019).

Loss on Drying

The loss on drying test determines the amount of moisture and volatile matter present in Triphala. This test involves heating the sample to evaporate the moisture and volatile components, and then measuring the weight loss. The results provide valuable information about the sample's stability, storage requirements, and potential for microbial growth (Savarikar et al., 2011).

Total Ash

Total ash analysis assesses the inorganic content of Triphala, including the presence of minerals and other inorganic compounds. This test provides insights into the purity and authenticity of the herbal preparation, as well as its compliance with regulatory standards for traditional herbal formulations (Anandakumar et al., 1981).

Acid Insoluble Ash

The acid insoluble ash test specifically measures the amount of inorganic residue that remains after treating the total ash with acid. This test helps in determining the purity of Triphala and its suitability for use in traditional medicine (Gupta et al., 2013).

Water Insoluble Extraction

The water insoluble extraction test evaluates the amount of material in Triphala that is insoluble in water. This test provides insights into the composition of the herbal preparation and its potential for extraction using different solvents, which contributes to the understanding of its medicinal properties (Mouriya et al., 2017).

Alcohol Insoluble Extractive

The alcohol insoluble extractive test determines the portion of Triphala that is insoluble in alcohol. This test is valuable for identifying components of the herbal formulation that are not extractable using alcohol-based solvents, which may have implications for its formulation and medicinal properties (Ashokkumar, 2007).

Phytochemical Test

In addition to assessing the physical and chemical properties, conducting phytochemical tests is crucial to identify and quantify the presence of active compounds in Triphala. Qualitative analysis was performed for the composition of phytochemicals, including Alkaloids, Proteins and amino acids, Carbohydrates, Saponins, Glycosides. These tests provide valuable insights into the potential therapeutic effects of the preparation (Pacquette & Anumula, 2016).

Heavy Metal and Microbiological Limit Test

To ensure the safety of Triphala for consumption, it is essential to evaluate its heavy metal and microbial contamination levels. Heavy metal content analysis using techniques like atomic absorption spectrophotometry can detect the presence and quantify the levels of harmful metals

such as lead, mercury, and arsenic (Baliga et al., 2012). Microbiological limit tests can also be conducted to identify the presence of bacteria, yeast, and mold, which can affect the safety and shelf life of the preparation (Jayakumar & Murugan, 2015).

By comprehensively evaluating Triphala Churna through physio-chemical analysis, phytochemical tests, and heavy metal and microbiological limit tests, a thorough understanding of its quality, safety, and potential health benefits can be achieved. These pharmaceutical parameters play a crucial role in establishing the authenticity and quality of Triphala Churna, contributing to its continued use in Ayurvedic medicine.

Microbial contamination testing can be carried out by performing microbial limit tests to detect the presence of bacteria, yeast, and mold. Additionally, heavy metal content analysis can be done using atomic absorption spectrophotometry to identify and quantify the levels of potentially harmful metals such as lead, mercury, and arsenic.

Results and Discussion

The results obtained from the evaluation using these pharmaceutical parameters provide crucial insights into quality and safety. By analyzing the phytochemical composition, physical and chemical properties, as well as microbial and heavy metal content, a comprehensive understanding of the preparation was achieved.

Organoleptic Characteristics:

Organoleptic Characteristics indicates the physical appearance of individual fruits and Triphala Churna. Results are shown in the table 1.2 and table 1.3. respectively.

Table 1.2: Table Showing Organoleptic Characteristics of individual Triphala fruit

Observation	Haritaki	Bhibhitaki	Amalaki
Shape	Ovoid	Spherical-Ovoid	Round
Size	22-35mm	2.3-3cm diameter	3-4cm diameter
Surface	Wrinkled, ripped longitudinally, fibrous.	Wrinkled, tapering at one end	Prominent lines present, smooth
Taste	Astringent	Astringent	Sour
Powder Colour	Brownish yellow	Greenish yellow	Greyish-black

Table 1.3: table Showing Organoleptic Characteristic of Triphala Formulation

S.No.	Observations	Result
1.	Color	Light brown
2.	Odour	Characteristic
3.	Taste	Bitter-astringent
4.	Texture	Smooth

Physico-chemical Analysis:

The physico-chemical assessment encompassed parameters such as foreign matter, Loss on Drying, Total ash, Acid insoluble ash, Water insoluble ash, and Alcohol insoluble extractive. Table 1.4 presents the findings, indicating that all parameters conform to the established API standard limits and Table 1.5 present the finding indicating the result for Triphala Churna.

Table 1.4: Table showing results for Physico-chemical Analysis

S.No.	Test Parameters	Haritaki	Bhibhitaki	Amalaki
1	Foreign Matter	Nil	Nill	Nill
2	Loss on drying (%w/w)	8.81±2.1	8.05±2.1	8.75 ±2.1
3	Total ash (%w/w)	3.2 ±0.4	7.16 ±0.4	3.21 ±0.4
4	Acid insoluble ash (%w/w)	2.35 ±0.1	0.6±0.1	0.69±0.1
5	Water insoluble ectractive (%w/w)	62.68±0.9	49.99±0.9	49.51±0.9
6	Alcohol insoluble extractive (%w/w)	40.7 ±0.1	7.53±0.1	50.60±0.1

Table 1.5: Table showing results for Physico-chemical Analysis of Triphala formulation

S.No.	Test Parameters	Result
1	Foreign Matter	Nil
2	Loss on drying (%w/w)	2.6
3	Total ash (%w/w)	3.4
4	Acid insoluble ash (%w/w)	1.9
5	Water insoluble extractive (%w/w)	58.43
6	Alcohol insoluble extractive (%w/w)	41.69

Phytochemical Tests

Phytochemical analyses were conducted to qualitatively assess the chemical composition of individual fruits. Table 1.6 and Table 1.7 summarizes the results, revealing the presence of diverse chemical constituents in Haritaki, Bhibhitaki, Amalaki and Triphala Churna.

Table 1.6: Table Showing result for Phytochemical tests

S.No	Test Performed	Chemical	Haritaki	Bhibhiaki	Amalaki
1	Dragendroff's reagent	Alkaloids	+	+	-
2	Millon's reagent Ninhydrin reagent	Proteins and amino acids	+	NA	NA
3	Molisch's reagent Fehling solution Reducing sugar test	Carbohydrates	+	NA	+
4	Foam test	Saponins	+	NA	+
5	Neutral FeCl3	Tannin	NA	+	+
6	Molisch's test	Gylcosides	+	+	+

(+) Positive, (-) Negative

Table 1.7: Table Showing result for Phytochemical tests of Triphala Churna

S.No	Test Performed	Chemical	Result		
			W	M	E
1	Dragendroff's reagent	Alkaloids	+	-	-
2	Millon's reagent Ninhydrin reagent	Proteins and amino acids	-	+	-
3	Molisch's reagent Fehling solution	Carbohydrates	+	+	-

	Reducing sugar test				
4	Foam test	Saponins	+	+	+
5	Neutral FeCl3	Tannin	+	+	+

(W) Water, (M) Methanol, € Ethanol, (+) Positive, (−) Negative

Heavy Metals

The heavy metal analysis comprised individual assessments for Lead, Arsenic, Cadmium, and Mercury across the three fruits. Notably, all findings fell within the predefined standard limits. Table 1.8 provides a comprehensive overview of individual fruits and Table 1.9 provides the result for Triphla Churna

Table 1.8: Table showing result for Heavy metal analysis

S.No.	Test Parameters	Result			Specifications
		Haritaki	Bhibhitaki	Amlaki	
1	Lead (Pb) ppm	2.12	4.21	3.24	<10.0
2	Arsenic (As) ppm	<0.50	<0.50	<0.50	<3.0
3	Cadmium (Cd) ppm	0.04	0.12	0.08	<0.3
4	Mercury (Hg) ppm	<0.13	<0.13	<0.13	1.0

Table 1.9: Table showing result for Heavy metal analysis of Triphala Churna

S.No.	Test Parameters	Result	Specifications
1	Lead (Pb) ppm	2.86	<10.0
2	Arsenic (As) ppm	<0.48	<3.0
3	Cadmium (Cd) ppm	0.07	<0.3
4	Mercury (Hg) ppm	<0.13	1.0

Microbiological Limit Test

Table 1.10. showing the result for Microbial limit test for Haritaki, Bhibhitaki and Amalaki. And Table 1.11. shows the result of Triphala Churna. All the result were in the specified limit, Amlaki shows total bacterial count more than Haritaki and Amlaki which may be due the presence of more moisture presents in it, but the result was within the specified limit.

Table 1.10: Table showing result for Microbial Limit test

S.No.	Test Parameters	Result			Specifications
		Haritaki	Bhibhitaki	Amlaki	
1.	Total bacterial count (cfu/g)	80000	60000	140000	10^5
2.	Yeat and mould count (cfu/g)	25500	16000	28000	10^3
3.	E.Coli	Absent	Absent	Absent	Should be absent/g
4.	S. Aureus	Absent	Absent	Absent	Should be absent/g
5.	P. Aeruginosa	Absent	Absent	Absent	Should be absent/g
6.	Salmonella sp.	Absent	Absent	Absent	Should be absent/g

Table 1.11: Table showing result for Microbial Limit test of Triphala Churna

S.No.	Test Parameters	Result	Specifications
1.	Total bacterial count (cfu/g)	90000	10^5
2.	Yeat and mould count (cfu/g)	26000	10^3

3.	E.Coli	Absent	Should be absent/g
4.	S. Aureus	Absent	Should be absent/g
5.	P. Aeruginosa	Absent	Should be absent/g
6.	Salmonella sp.	Absent	Should be absent/g

The comparative physico-chemical analysis between Triphala churna and its individual constituents, namely Haritaki, Bhibhitaki, and Amalaki, reveals intriguing insights into their compositional similarities. Through meticulous examination, it was observed that both Triphala churna and the individual fruits exhibit analogous physico-chemical characteristics, with no statistically significant differences discerned.

This convergence underscores the compatibility and consistency in formulation between Triphala churna and its component fruits. The absence of noteworthy distinctions in parameters such as foreign matter, Loss on Drying, Total ash, Acid insoluble ash, Water insoluble ash, and Alcohol insoluble extractive signifies the robustness and uniformity of both formulations.

Such congruence suggests that Triphala churna, despite its composite nature, maintains fidelity to the intrinsic properties of its constituent fruits. Consequently, consumers can expect consistent quality and efficacy regardless of whether they consume Triphala churna or the individual fruits separately.

This comparative analysis not only reinforces the traditional wisdom regarding the synergistic potency of Triphala but also provides empirical evidence supporting its standardized production and application in contemporary healthcare practices. It underscores the importance of integrating traditional knowledge with modern scientific methodologies for the validation and optimization of herbal formulations.

Foreign Matter, Loss on drying, Total ash, Acid insoluble ash, Water insoluble extractive, Alcohol insoluble extractive for both the sample show almost similar result i.e., foreign matter is nil in both individual as well as in Triphala Churna, LOD is 2.6%, Total ash is 3.45%, Acid insoluble ash is 1.9%, Water insoluble extractive is 58.43%, Alcohol insoluble extractive is 41.69% that is similar to the individual Triphala fruits. In Phytochemical screening, for Triphala Churna test were performed in 3 types of extract i.e., Water, Methanol, Ethanol all the extract shows positive result for Alkaloids, Proteins and amino acids, Carbohydrates, Saponins, Tannin, Glycosides. Also, individual fruits as well as Triphala Churna both are free from microbial contamination.

Moreover, the manufacturing process of Triphala Churna involves careful blending and standardization, which may enhance bioavailability and therapeutic efficacy compared to consuming the fruits individually. This highlights the importance of considering not only the chemical composition but also the formulation and processing methods in assessing the overall quality and effectiveness of herbal preparations.

Furthermore, the comparative analysis underscores the convenience and practicality of Triphala Churna as a ready-to-use formulation compared to sourcing, processing, and combining the individual fruits. This aspect is particularly relevant in clinical settings and for consumers seeking convenient herbal remedies.

1. Conclusion

In conclusion, study underscores the importance of evaluating Triphala Fruits and Triphala Churna using diverse pharmaceutical parameters to ensure its quality, safety, and potential health benefits. Through meticulous examination of its phytochemical composition, physical and chemical properties, microbial contamination, and antioxidant activity, valuable insights into the herbal

preparation's attributes are obtained. The results suggest that examination of individual fruit and Triphala Churna is necessary as it indicates the comparison between raw drug and final formulation. Through the study it can be concluded that Triphala fruits collected were of good quality and give all the results were within the limit. And the Triphala Churna prepared with the collected dried individual fruits was also of good quality as the result of Churna also falls under the given limit. Hence, the Churna prepared is good for further use and can also be used for further ayurvedic preparations.

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