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Standardization of fruits of *Terminalia bellirica* (Gaertn.) Roxb. and *Terminalia chebula* Retz. with special reference to their pharmacognostic study

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Abstract- The genus *Terminalia* (Family-Combretaceae) have a history of usage in traditional medicinal system and is known for its rich source of secondary metabolites. The present study focused to analyze physical, physicochemical and phytochemical screening of fruits of *Terminalia bellirica* (Gaertn.) Roxb. and *Terminalia chebula* Retz. and compare both species on the basis of these analysis. Organoleptic and macroscopic characters of freshly collected fruits were studied. Moisture content, Extractive values and Ash values were evaluated. Moisture content of *T. bellirica* was more (81.4±2.23), so high chance of growth of microbes during storage. Extractive value of *T. chebula* was higher (74.33±2.19) than *T. bellirica* and ash value of *T. bellirica* was more (3.33±0.33) as compared to *T. chebula*. Fluorescence analysis and phytochemical screening were also tested. The screening of phytochemicals revealed the presence for alkaloids, flavonoids phenols, proteins and tannins for both species. The determination of these parameter will be very helpful for future researchers in the standardization and authentication of both *Terminalia* species.

Key words: Standardization, Physical, Physicochemical, Phytochemical, *Terminalia*, Fruit

INTRODUCTION

Plants have a historical background of usage as medicinal agents and were the main source of medicines prior to the development of modern medicine. Ayurvedic medicine is still commonly practiced within India with an estimated 85% of Indians still using crude plant preparations for the treatment of a wide variety of diseases and ailments.¹ With the various benefits of natural drugs such as easy availability, economic and less or no side effects they are the victims of adulteration. Therefore correct identification of the starting material is an essential prerequisite to ensure reproducible quality and will contribute immensely to its safety and efficacy.²

Pharmacognosy is the study that deals with standardization and authentication of natural drugs, mainly from plants. The genus *Terminalia* (Family Combretaceae) comprises approximately 200-250 species of medium to large flowering trees, many of which have a history of usage in traditional medicinal systems.³ *Terminalia* is known for its rich source of secondary metabolites.⁴ *Terminalia bellirica* (Gaertn.) Roxb is a large tree and is widely used in Ayurveda, Siddha and Chinese systems of medicine.⁵ It has antidiabetic, anticancer and antimicrobial properties.⁶ The fruit extract stimulates the secretion of insulin and enhance its action and inhibits starch digestion.⁷ It possesses active compounds which can be used to develop antidiabetic drugs.⁸ *T. Chebula* possesses a wide variety of activities like antimicrobial⁹, antioxidant¹⁰, antiviral¹¹,

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anticarcinogenic¹², hypocholesterolemic¹³, radioprotective¹⁴ antispasmodic & antipurgative¹⁵. The present study focused to analyze physical, physicochemical and phytochemical screening of fruits of *T. bellirica* and *T. chebula* and compare both species on the basis of these analysis.

MATERIALS & METHODS

Collection and Preparation of extracts

T. bellirica fruit was collected from the field of Central Tasar Research and Training Institute, Ranchi and *T. chebula* fruit was collected from the field of Birsa Agricultural University, Kanke, Ranchi in the month of December. The collected plant samples were washed under tap water to remove dust particles and then completely dried in hot air oven at 60 °C. The dried plant materials were homogenized to fine powder using an electric grinder and stored in air tight bottles.

Cold maceration technique was employed for preparation of various extracts of powdered plant materials. The filtered extracts were then dried at 30 °C. The dried crude extracts were stored in airtight bottles till further use.

Organoleptic and Macroscopic Study

Colour: - The untreated part of the drug was taken and colour of the drug was examined under sunlight.

Odour and Taste: - A small portion of the drug were taken, slowly and repeatedly inhaled the air over the material and examined the odour. And taste, a small portion of drug was taken on the tongue and find out the taste of drug.

Size and Shape: - Width and length of fruit was measured with the help of scale. Shape of fruit was confirmed by comparing with literature.

Surface characteristic: - Characteristics of surface were confirmed by comparing with literature.

Physicochemical Analysis

The physicochemical analysis of the crude powder *T. bellirica* fruit and *T. chebula* fruit was carried out as per WHO guidelines.¹⁶ The parameters analyzed were Moisture content, Total Ash, Water insoluble ash, Chloroform soluble extractive, Acetone soluble extractive, Ethanol soluble extractive, Methanol soluble extractive, Water soluble extractive. Fluorescence analysis was performed as per reported standard procedures.¹⁷

Phytochemical Analysis

The crude powder of fruits of *T. bellirica* and *T. chebula* was subjected to qualitative phytochemical analysis.¹⁸ The extracts were subjected to test for alkaloids,

carbohydrates, cardiac glycosides, flavonoids, phenols, proteins, saponins, terpenoids and tannins.

RESULTS & DISCUSSION

Organoleptic and Macroscopic characteristics

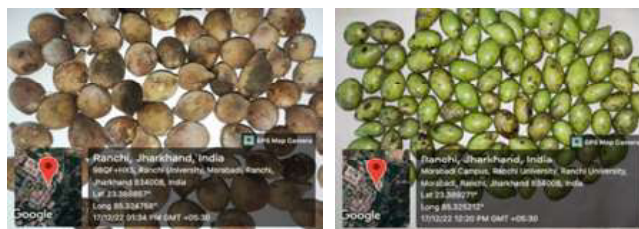
Organoleptic study of the fruits of both *Terminalia* species indicated characteristic colour, odour and taste. The macroscopic characters include their shape, size and surface characteristics. These characters are shown in Table 1.

Physicochemical Study

Various physico-chemical parameters of powdered drug are shown in Table 2. Moisture content of drugs could be at minimal level to unfavour the growth of any microbes during storage. Ash values are used to check quality and purity of crude drug. It indicates presence of various adulterant like carbonate, oxalate and silicate. The water soluble ash is used to determine the amount of inorganic compound present in drugs. The extractive values are useful to evaluate the chemical constituents present in the crude drug and also help in evaluation of specific constituents soluble in a particular solvent. Ethanol soluble extractive value is higher than any other solvent for both the species, which indicates the presence of polar chemical constituents such as alkaloids, flavonoids, phenols, proteins, etc. Fruit powder of both the species treated with various reagents showed characteristic fluorescence at visible light, short UV and long UV showed in Table 3. However, various research papers showed different physicochemical values for the fruits of both species.¹⁹⁻²¹ These variations may be because of difference in climatic condition, sample collection in different season or different host plant species.

Qualitative phytochemical analysis of different extracts of fruits of *Terminalia* species

The preliminary phytochemical analysis gives an idea about the chemical nature of the drug. The screening of phytochemicals revealed the presence for alkaloids, flavonoids phenols, proteins, tannins. Several studies have reported the presence of similar phytoconstituents in fruits of *T. bellirica* and *T. chebula*.¹⁹⁻²⁴



T. bellirica fruit

T. chebula fruit

Fig. 1 Freshly collected fruits of *T. bellirica* and *T. chebula*

Table 1- Organoleptic and Macroscopic characteristics

Sl. No.	Parameters	<i>T. bellirica</i>	<i>T. chebula</i>
1.	Odour	Odourless	Odourless
2.	Color	Yellowish brown	Yellowish green
3.	Taste	Astringent	Bitter
4.	Shape	Ovoid	Ovoid
5.	Size	3-4cm length, 2-3cm wide	3.5-4cm length, 1.5-2cm wide
6.	Surface Characteristics	Irregular, wrinkled, five longitudinal ridges	Longitudinal, 5 ridges

Table 2- Physicochemical Parameters of Fruits of *T. bellirica* and *T. chebula*

Parameters	<i>T. bellirica</i> fruit	<i>T. chebula</i> fruit
Moisture content	81.4±2.23	26.00±1.03
Water soluble extractive	19.00±1.53	19.67±1.86
Methanol soluble extractive	8.67±0.88	29.00±1.15
Ethanol soluble extractive	25.33±0.88	74.33±2.19
Acetone soluble extractive	4.33±0.33	10.00±0.58
Chloroform soluble extractive	1.33±0.33	1.67±0.33
Total ash	3.33±0.33	1.67±0.33
Water insoluble ash	1.00±0.00	1.00±0.00

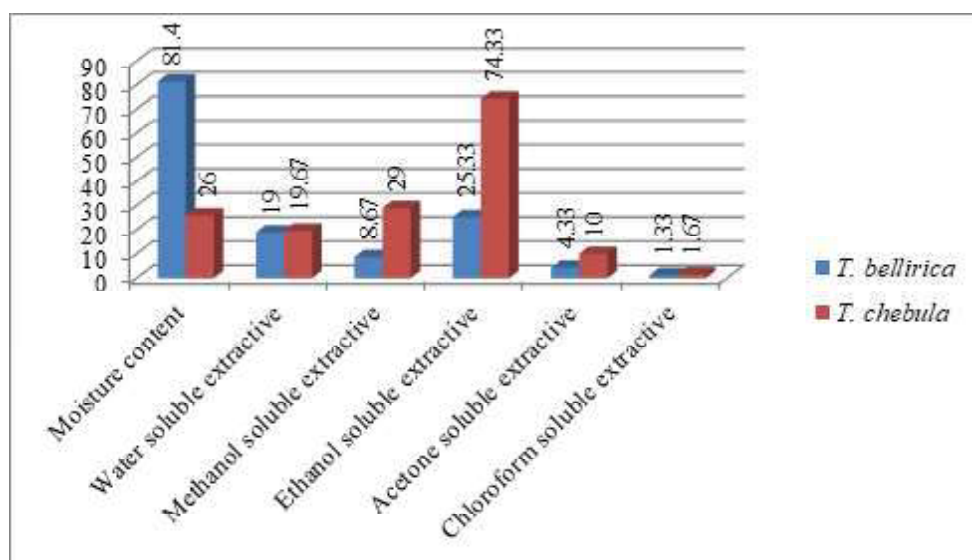


Fig. 2- Comparison of physicochemical parameters of fruits of *T. bellirica* and *T. chebula*

Table 3- Fluorescence Analysis of *T. bellirica* Fruit

Treatment	Visible light	Short UV (254nm)	Long UV (365nm)
Powder	Yellowish brown	Light green	Dark green
Powder + Distilled water	Light brown	Dark green	Black
Powder + Methanol	Orange brown	Light green	Dark green
Powder + Ethanol	Yellow	Light green	Dark green
Powder + Petroleum ether	Light yellow	Light green	Fluorescent red
Powder + Chloroform	Dark brown	Greenish black	Black
Powder + 20% NaOH	Dark brown	Dark green	Greenish black
Powder + 5% FeCl ₃	Dark blue	Black	Black
Powder + Formic Acid	Brown	Greenish black	Black
Powder + Ethyl Acetate	Light brown	Light green	Fluorescent red
Powder + 50% H ₂ SO ₄	Dark brown	Dark green	Black
Powder + 70% HNO ₃	Orange	Light green	Greenish black

Source:- Asian Paints Color Chart

Table 4- Fluorescence Analysis of *T. chebula* Fruit

Treatment	Visible light	Short UV (254nm)	Long UV (365nm)
Powder	Light brown	Light green	Dark green
Powder + Distilled water	Yellowish brown	Dark green	Black
Powder + Methanol	Yellowish brown	Dark green	Black
Powder + Ethanol	Yellow	Fluorescent green	Greenish black
Powder + Petroleum ether	Light brown	Light green	Fluorescent red
Powder + Chloroform	Brown	Dark green	Black
Powder + 20% NaOH	Dark brown	Dark green	Greenish black
Powder + 5% FeCl ₃	Dark blue	Black	Black
Powder + Formic Acid	Dark green	Greenish black	Black
Powder + Ethyl Acetate	Light brown	Light green	Greenish black
Powder + 50% H ₂ SO ₄	Light brown	Light green	Greenish black
Powder + 70% HNO ₃	Orange	Light green	Black

Source:- Asian Paints Color Chart

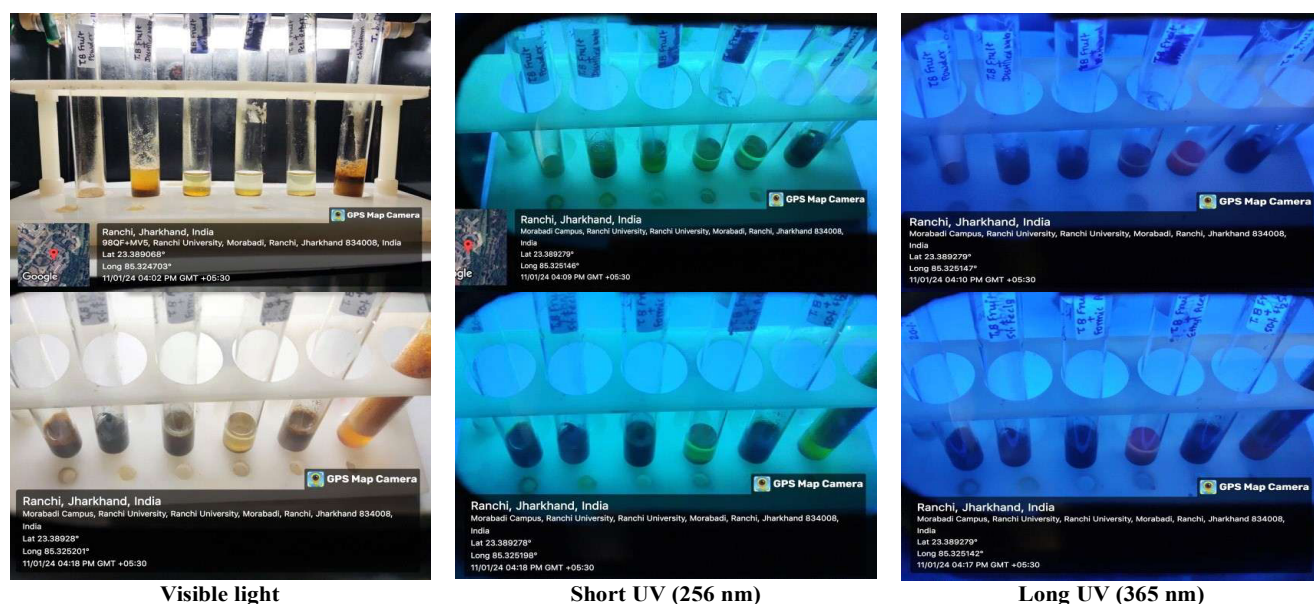


Fig. 3 Fluorescence analysis of fruits of *T. bellirica*

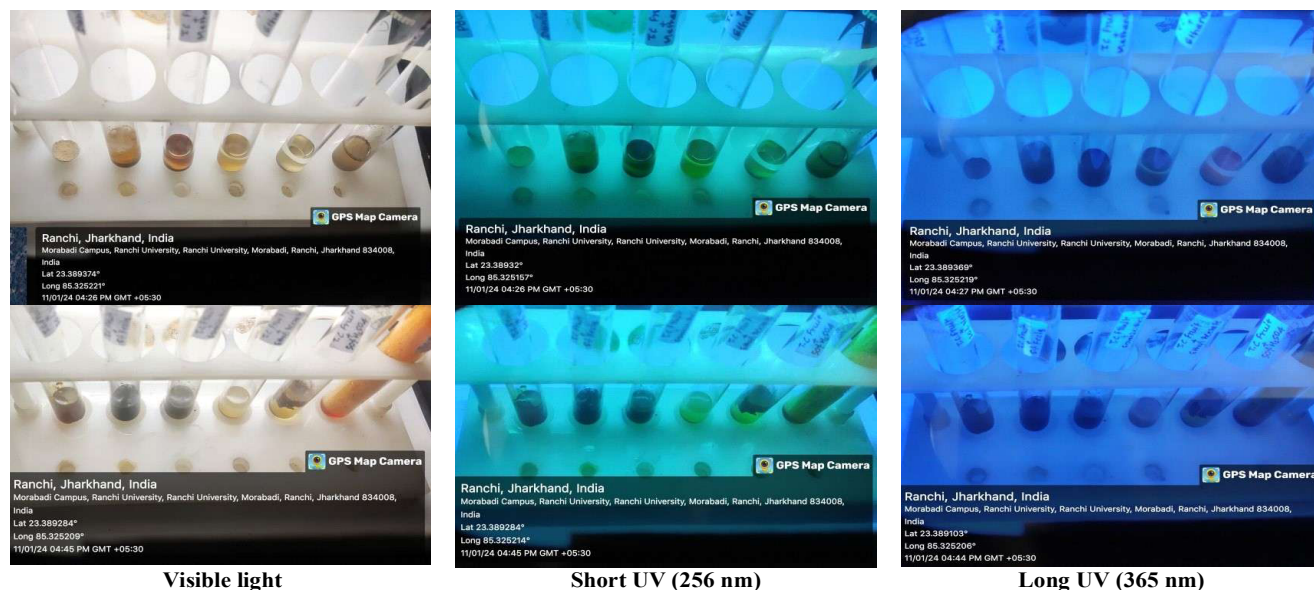


Fig. 4 Fluorescence analysis of fruits of *T. chebula*

Table 5: Qualitative Phytochemical analysis of different extract of Fruits of *T. bellirica* and *T. chebula*

Phytochemicals	Test	<i>T. bellirica</i>			<i>T. chebula</i>		
		Aqueous	Methanol	Ethanol	Aqueous	Methanol	Ethanol
Alkaloids	Dragendroff's Test	+ve	+ve	+ve	+ve	+ve	+ve
Carbohydrates	Molisch's Test	+ve	+ve	-ve	+ve	+ve	-ve
Cardiac Glycosides	Keller Kelliani's Test	-ve	+ve	-ve	-ve	-ve	-ve
Flavonoids	Alkaline reagent Test	+ve	+ve	+ve	+ve	+ve	+ve
Phenols	Ferric chloride Test	+ve	+ve	+ve	+ve	+ve	+ve
Proteins	Millon's Test	+ve	+ve	+ve	+ve	+ve	+ve
Saponins	Foam Test	+ve	-ve	-ve	+ve	-ve	-ve
Tannins	Braymer's Test	+ve	+ve	+ve	+ve	+ve	+ve
Terpenoids	Salkowski's Test	-ve	+ve	+ve	-ve	+ve	-ve

CONCLUSION

The organoleptic and macroscopic characters offer a scientific basis for the use of *T. bellirica* and *T. chebula* in different systems of medicine. The physicochemical values of both the species could be used as standardization parameters. Preliminary phytochemical analysis of three different extracts revealed the presence of several phytochemicals justifying its use in many Ayurvedic formulations.

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REFERENCES

1. Kamboj V. P. 2000. Herbal medicine, *Current Science*. 78:35-39.
2. Thomas S., D. A. Patil, A. G. Patil and Naresh Chandra. 2008. Pharmacognostic evaluation and physicochemical analysis of *Averrhoa carambola* L. fruit. *J. Herbal Med Toxicol*. 2(2): 51-54.
3. McGaw L. J., Rabe T., Sparg S. G., Jäger A. K., Ejoff J. N. & Van Staden J. 2001. An investigation on the biological activity of *Combretum* species, *Journal of Ethnopharmacology*. 75: 45-50.
4. Cao S., Brodie P. J., Callmander M., Randrianaivo R., Rakotobe E., Rasamison V. E., & Kingston D. G. 2010. Saponins and a lignan derivative of *Terminalia tropophylla* from the Madagascar Dry Forest. *Phytochemistry*, 71(1): 95-99.
5. Saraswathi M. N., Karthikeyan M., Kannan M. & Rajasekar S. 2012. *Terminalia bellerica* Roxb-A phytopharmacological Review, *IJRPBS*. 3(1):96-99.
6. Kumudhavalli M. V., Vyas M. & Jayakar B. 2010. Phytochemical and Pharmacological evaluation of the plant fruit of *Terminalia bellerica* Roxb., *IJPLS*. 1(1):1-11.
7. Violet K., Peter R. F. & Yasser H. A. A. 2010. *Terminalia bellirica* stimulates the secretion and action of insulin and inhibits starch digestion and protein glycation *in vitro*, *British Journal of Nutrition*. 103:212-217.
8. Latha R. C. R. & Daisy P. 2010. Influence of *Terminalia bellerica* Roxb. Fruit extracts on biochemical parameters in Streptozotocin Diabetic Rats, *International J. of Pharmacology*. 6(2):89-96.
9. Sato Y., Oketani H., Singyouchi K., Ohtsubo T., Kihara M., Shibata H. & Higuti P. 1997. Extraction and purification of effective antimicrobial constituents of *Terminalia chebula* Retz. against methicillin-resistant *Staphylococcus aureus*, *Bull Pharm Bull*. 20:404.
10. Cheng H. Y., Lin T. C., Yu K. H., Yang C. M. & Lin C. C. 2003. Antioxidant and free radical scavenging activities of *Terminalia chebula*, *Biol Pharm Bull*, 26:13355.
11. Jeong A. H. N., Kim C. Y., Lee J. S., Kim T. G., Kim S. H., Lee C. K., Lee B., Shim C. G., Hoon H. & Kim J. 2002. Inhibitors of HIV-1 integrase by galloyl glucose from *Terminalia chebula* and flavonol glycoside gallates from *Euphorbia peginensis*, *Planta Medica*. 68:459.

12. **Hushum Saleem M., Harkonen P. & Pihlaja K. 2002.** Inhibition of cancer cell growth by crude extract and phenolics of *Terminalia chebula* fruit, *J Ethno pharmacol.* **81**:336.
13. **Thakur C. P., Thakur B., Singh S. & Sinha S. K. 1988.** The Ayurvedic Medicines Haritaki, Amla and Bahira reduced cholesterol induced atherosclerosis in rabbits, *Int J Cardiol.* **21**:175.
14. **Gandhi N. M. & Nayar C. K. K. 2005.** Radiation protection by *Terminalia chebula* some mechanistic aspects, *Molecular and Cellular Biochemistry.* **277**:48.
15. **Miglani B. D., Sen P. & Sanyal P. K. 1971.** Purgative action of an oil obtained from *Terminalia chebula*, *Indian J Med Res.* **52**:283.
16. **WHO. 2002.** Quality control methods for medicinal plants, *Geneva.* 28-31.
17. **Kokoski C. J., Kokoski R. J., Slama F. J. 1958.** Fluorescence of powdered vegetable drugs under ultraviolet radiation, *J. Am. Pharm Assoc Am. Pharm Assoc.* **47(10)**:715-7.
18. **Harborne J. B. 1973.** Phytochemical methods, 2nd Ed, London (Chapman & Hal).
19. **Singh Manish Pal, Gupta Avneet & Sisodia Siddhraj S. 2018.** A Comparative Pharmacognostic Evaluation of Different Extracts of *Terminalia bellerica* Roxb. Fruit, *Journal of Research in Medical and Dental Science.* **6(1)**: 213-218.
20. **K. Hazra. 2019.** Phytochemical investigation of *Terminalia bellirica* fruit inside, *Asian J. Pharm Clin Res.* **12(8)**:191-194.
21. **Singh Manish Pal & Sharma Chandra Shekhar. 2010.** Pharmacognostical Evaluation of *Terminalia Chebula* fruits on different market samples, *Int. Journal of ChemTech Research.* **2(1)**:57-61.
22. **Abraham Aji, Mathew Lizzy & Samuel Sarala. 2014.** Pharmacognostic studies of the fruits of *Terminalia bellirica* (Gaertn.) Roxb, *Journal of Pharmacognosy and Phytochemistry.* **3(2)**:45-52.
23. **Singh Sadhana. 2018.** Phytochemical and Pharmacognostic study on Haritaki (*Terminalia chebula* Retz.), *International Journal of Research and Analytical Reviews.* **5(2)**:2349-5138.
24. **Choudhary R. Arbind Kumar, Manivannan E., R Chandrashekar, Ravi Indla, Sivasankari V. & Arul Arul Kothai. 2021.** Phytochemical analysis of ethanolic extract of fruits of *Terminalia chebula* and its medicinal use in human, *Pharmacologyonline.* **2**:43-54.
