



EVALUATION OF PHYSICOCHEMICAL PARAMETERS ON THE FRUIT OF *TERMINALIA BELLIRICA* ROXB

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ABSTRACT

The present communication attempts to evaluate the physicochemical and preliminary phytochemical studies on the fruit of *Terminalia bellirica* Roxb., Combretaceae family. Bibhitaka is a large tree, up to 40m height. Leaves petiolate, broadly elliptic, clustered towards the end of branches, Flowers greenish yellow, in solitary, simple, axillaries spikes, Fruits globular, 1.5-2.5 cm in diam., obscurely 5 - angled when dry. It is found in deciduous forests throughout the greater part of India, but not in the arid regions, in areas of Upper Gangtic Plain, Chota Nagpur, Bihar, Orissa, West Bengal, Chittagong, Konkan, Deccan, S.M. country and most of the part of South India. The mostly part used Fruit, Seed and Bark. The bark is mildly diuretic and is useful in anaemia and leucoderma. Fruits are astringent, acrid, sweet, thermogenic use as anti-inflammatory digestive, anthelmintic, expectorant and antipyretic, antiemetic. They are useful in cough asthma, bronchitis, ophthalmic disorders, skin diseases, ulcers. The oil obtained from seeds is trichogenous and is useful in dyspepsia, skin diseases, leucoderma and greyness of hair. As there is no detailed standardization work reported on fruit, the physicochemical parameters, preliminary phytochemical constants, toxic heavy metals, pesticide residue and aflatoxin analysis are carried out. The study revealed specific identities for the particular crude drug which will be useful in identification and control to adulterations of the raw drug.

Keywords: Extractive values, Toxic metals, *Terminalia bellirica* Roxb, Physicochemical studies.

INTRODUCTION

Medicinal plants have been used in all cultures as a source of medicine, since times immemorial. Herbal Medicine is still the mainstay of health care in several developing countries. The widespread use of herbal remedies and health care preparations, as those described in ancient texts such as the Vedas and the Bible, and obtained from commonly used traditional herbs and medicinal plants, has been traced to the occurrence of natural products with medicinal properties. The World Health Organization has estimated that more than 80% of the world's population in developing countries depends primarily on herbal medicine for basic healthcare needs [1].

The trade name Bahera is based on the Indian name of the tree. The word *Bellirica* is taken from the scientific name of the tree and distinguishes this *myrobalan* from the other one (*Chebulic myrobalan*) [2]. *Terminalia bellirica* is also known as in Sanskrit-Vibhitaka, Vibhitaki, in English Belliric myrobalan, in Hindi Baheda, Bhaira, Bulla, in Tamil- Tanni, Tanrikkai, in Punjabi- Bahera, Birha.

Terminalia bellirica Roxb. is large tree, upto 40 m high. Leaves petiolate, broadly elliptic, clustered towards the end of branches. Flowers greenish yellow, in solitary, simple, axillary spikes. Fruits globular, 1.5 - 2.5 cm in diameter, obscurely 5- angled when dry. *Terminalia bellirica* Roxb. is found in deciduous forests throughout the greater part of India, but not in the arid regions, in areas of upper Gangetic Plain, Chota Nagpur, Bihar, Orissa, West Bengal, Chittagong, Konkan, Deccan, and most of the parts of South India [3].

Terminalia bellirica Roxb. plant contain the different chemical constituent in different parts such as stem bark contains arjungenin and its glycosides, belleric acid, bellericosides. Fruits contain

hexahydroxydiphenic acid ester, β -sitosterol, gallic acid, ellagic acid, ethyl gallate, galloyl glucose, chebulagic acid, mannitol, glucose, galactose, and rhamnose [4].

Terminalia bellirica Roxb. bark is mildly diuretic and is useful in anaemia and leucoderma. Fruits are anti-inflammatory, antihelmintic, expectorant, ophthalmic, antipyretic, antiemetic. Fruits are useful in cough, asthma, bronchitis, dropsy, dyspepsia, cardiac disorders, skin diseases, leprosy, ulcer and myocardial depressive activity [5]. Ripe fruits used as astringent in combination with chebulic myrobalan (*Terminalia chebula*) and *phyllantus emblica* as the famous Triphala drug of Ayurveda. Fruits are also useful in eye diseases and scorpion sting [6].

The bark of *Terminalia bellirica* Roxb. is used as adulterant to bark of *Terminalia arjuna*. The fruits of *Terminalia bellirica* Roxb. are reported to be used as substitute in tanning industry for *Terminalia chebula* Retz. Therefore, the present paper attempts to evaluate the physicochemical parameters, preliminary phytochemical screening and heavy metal analysis of the fruits of *Terminalia bellirica* Roxb. for identification of the drug in dry form and control the adulterants.

RESULTS AND DISCUSSION

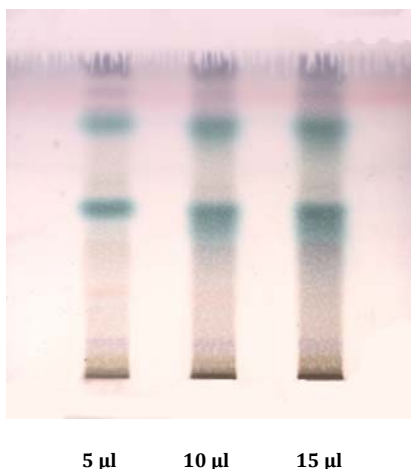
The fruits of *Terminalia bellirica* Roxb was collected and analysed the various standardisation parameters. Preliminary phytochemical results showed the presence or absence of certain phytochemicals in the drug. The tests performed using n-Hexane, Chloroform, Ethyl acetate, alcoholic and water extracts. Phytochemical test revealed the presence of Alkaloid, antraquinone glycoside, saponins, flavonoids, polysaccharides, Steroid, Tannin and results are given in Table1.

Table 1: Preliminary phytochemical tests for different solvent extract of fruit of *Terminalia bellirica* Roxb

S. No.	Natural product	Test performed	Results
1.	Alkaloid	Dragendorff's test	+ve
2.	Coumarin	Alkaline test	+ve
3.	Flavone	Shinoda test	+ve
4.	Steroid	Liebermann-Burchard reagent	+ve
5.	Tannin	Neutral FeCl ₃	+ve
6.	Glycoside/Sugar	Molisch's test	+ve
7.	Terpenoid	Noller's test	+ve
8.	Saponin	NaOH solution	+ve

Table 2: Physico-chemical parameters of fruit of *Terminalia bellirica* Roxb

S.No.	Parameters	Results
1.	Description	Brownish
2.	Foreign matters	1% w/w
3.	Loss on drying at 105 °C	6.76% w/w
4.	Total Ash	7.62 % w/w
5.	Acid-insoluble ash	1.67 % w/w
6.	Water-soluble extractive	60.26 % w/w
7.	Alcohol-soluble extractive	32.06 % w/w
8.	pH (10 % w/v aqueous solution)	3.77
9.	Bulk density	0.414 gm/ml
10.	Tap density	0.54 gm/ml

**Fig. 1: TLC of *Terminalia belerica* Roxb (Toluene : Ethyl acetate: Acetic acid :: 4.5: 5: 0.5 v/v)**

The presence of heavy metals namely Arsenic, Mercury, Cadmium and Lead were analysed in the sample, the concentration of all the heavy metals were below the WHO/FDA permissible limits. The presence of pesticide residue organochlorine pesticide, organophosphorous pesticides and Pyrethroids were not detected in the sample.

Physio-chemical parameters of the fruits of *Terminalia bellirica* Roxb. are tabulated in Table 2. The foreign matters are less than 1 percent. The pH value of 10% w/v aqueous solution is acidic (3.77). Deterioration time of the plant material depends upon the amount of water present in plant material. If the water content is high, the plant can be easily deteriorated due to fungus. The loss on drying at 105°C in fruits was found to be 6.76 %. Total ash value of plant material indicated the amount of minerals and earthy materials attached to the plant material. Analytical results showed total ash value content was 7.62%. The negligible amount of acid-insoluble siliceous matter present in the plant was 1.67%. The water-soluble extractive value was indicating the presence of sugar, acids and inorganic compounds. The alcohol soluble extractive values indicated the presence of polar constituents like phenols, alkaloids, steroids, glycosides, flavonoids the results given in Table 2.

Thin layer chromatographic technique was used to separate the chemical compounds present in the drug. Various solvent systems were checked to separate the maximum number of chemical compounds in the drug. TLC of the ethyl acetate extract developed in the mobile phase of Toluene : Ethyl acetate : acetic Acid :: 4.5 : 5 : 0.5 (Figure. 1). After air drying the plate was not visualized in UV 254 and 366 nm. The plate was then dipped in Vanillin - Sulphuric acid and heated in hot air oven at 105°C till the spots observed under visible light 5 spots at R_f value 0.26 (grey colour), 0.38 (grey), 0.51(olive green), 0.71(olive green), and 0.86 (grey colour).

CONCLUSION

Preliminary phytochemical as well as various aspects of the fruits sample was studied and described along with physico-chemical parameters, toxic heavy metal, aflatoxin and Thin Layer Chromatography (TLC) studies in authentication and adulteration for quality control of raw drugs. The fruits of *Terminalia bellirica* Roxb exhibit a set of diagnostic characters, which will help to identify the drug in dried condition.

It has been concluded from this study that estimation of heavy metals, pesticides residue and aflatoxin is highly essential for raw drugs or plant materials used for the preparation of compound formulation drugs. The periodic assessment is essential for quality assurance and safer use of herbal drugs.

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REFERENCES

1. Yip PY, Chau, Mak CF, Kwan CY. DNA methods for identification of Chinese medicinal materials. *Chin med.* 2007, 2: 9.
2. Jain SK, Medicinal plants. National book trust, India, 1999, p.n. 178.
3. Sharma PC, Yelne MB, Dennis TJ, Database on medicinal plants used in Ayurveda.2005, Vol. 3: 158-162.
4. Yoganasimhan S N, Medicinal plants of India, (Tamilnadu), 2000, 540.
5. The wealth of India, A Dictionary of Indian Raw Materials and Industrial Products. National Institute of Science Communication and Information Resources, New Delhi. 2004, Vol.- 5: R- Z, P-201.

6. Nadkarni AK. Indian material medica ,1976 Vol.1: page no 244.
7. Nair RT, Kalariya J, Chanda S. Antibacterial activity of some selected Indian medicinal flora. Tuky J. Biol. 2005, 29: 41-47.
8. Stiffness M, Douros J. Current status of the NCL plants and animals product programme. J. Nat. Prod. 1982, 45: 1-45.
9. Anonymous. Indian Pharmacopeia. Ministry of Health & Family Welfare Govt. of India, Controller of Publications, New Delhi, 53-54.
10. AOAC Official methods of analysis of AOAC International, 16th edition. AOAC International, Suite 400, 2200 Wilson Boulevard, Arlington, Virginia, USA, 1995.
11. World Health Organization, Quality control methods for medicinal plant materials. Published by WHO, Geneva, 1998.