Published online in http://iijam.co.in
ISSN: 0976-5921
International Journal of Ayurvedic Medicine, 2014, 5(1), 37-42

Pharmacognostic and Phytochemical evaluation of fruit pulp of *Tamarindus Indica* linn.

Research article

Kalpesh Panara[1]*, Harisha CR[2], Shukla VJ[3].

1. Ph.D. scholar, 2. Head of pharmacognosy lab, 3. Head of pharmaceutical lab
Dravyaguna department, Institute of Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, India.

Abstract

Tamarind is fruit of plant which is botanically known as a *Tamarindus indica* Linn., belonging to *Caesalpinaceae* subfamily of *Fabaceae*. In *Ayurveda*, Tamarind (*Amlika*) is used to treat *Arsha* (piles), *Gulma* (abdominal lump), *Yakshma* (tuberculosis) etc., which indicates it high medicinal value traditionally. Pharmacognostical standardization of fruit pulp of *Tamarindus indica* is necessary as it is highly potent commercially. Pharmacognostical study is the preliminary step in the standardization of crude drugs. The present study established macro and microscopic characteristics, physicochemical values, and phytochemical screening of fruit pulp of *Tamarindus indica*. Microscopy showed presence of thin-walled elongated to polygonal paranchymatous cells, long fibro-vascular bundles, starch granules, thin walled fibers and numerous prismatic crystals of calcium oxalate. Physicochemical analysis revealed loss on drying 16.8% w/w, total ash content 4.7% w/w, Acid insoluble ash 10.6% w/w, water soluble extractive 83.6% w/w and alcohol soluble extractive 67.8% w/w. Phytoconstituents like carbohydrates, alkaloids, amino acids, phenols and glycosides were found present in aqueous and methanolic extracts of pulp. These parameters may serve as standard data for quality control studies of pharmaceutical preparations made from the fruit pulp of *T. indica*.

Keywords: Tamarind, *Amlika*, *Chincha*, *Tamarindus indica,* Pharmacognostical study

Introduction:

Tamarind, commonly called as *Imli* in Hindi, is known as *Chincha* or *Amlika* in Ayurveda (1). It is botanically identified as a *Tamarindus indica* Linn., the member of *Caesalpinaceae* subfamily of *Fabaceae* family. It is distributed throughout India, particularly in the south, often cultivated.

*Corresponding Author:
Kalpesh Panara
Ph.D Scholar,
Dravyaguna Department
IPGT&RA,
Gujarat Ayurved University,
Jamnagar- 361008
E-mail: kbpanara@gmail.com
Phone No: +91-9426371105

The tree averages 20-25 m in height and 1 m in diameter, slow growing, but long lived, with an average life span of 80-200 years. Virtually every part of *Tamarindus indica* L. (wood, root, leaves, bark and fruits) has either nutritional or medicinal value, with a number of industrial and commercial applications (2). Tamarind is useful in gastric disorders, bilious vomiting, scurvy, datura poisoning, alcoholic intoxication, scabies, pharyngitis, otalgia, stomatitis, constipation, haemorrhoids and eye diseases (3). Tamarind pulp is also said to aid in the cure of malarial fever (4). The fruits are reported to have hypolipidemic, anti-inflammatory, anti-fungal and anti-

bacterial properties (5). Tamarind pulp typically contains 20.6% water, 3.1% protein, 0.4% fat, 70.8% carbohydrates, 3.0%fibre and 2.1% ash (6). It is also used as an ingredient in *Ayurvedic* medicinal formulations such as *Shankha Vati, Mahashankha Vati, Agnisandeepano Rasa*, *Gudapippali*, *Bhruhat Gudapippali*, and *Shankhadravaka Rasa* etc (7). It is used to treat *Arsha* (piles), *Gulma* (abdominal lump), *Yakshma* (tuberculosis) etc., which indicates it high medicinal value traditionally (8).

Pharmacognosy deals with the knowledge and authentication of medicinal and related products of crude or primary type originated from both plants and animals in the detailed form (9). In recent years, there has been a rapid increase in the standardization of selected medicinal plants with significant potential as therapeutics due to their specific healing properties and potential actions. As the most cost effective aid in identification of a medicinal herb, microscopic characteristics have been the mainstay of classical pharmacognosy and remain a vital component of the monograph. In the present study, fruit pulp of *Tamarindus indica* Linn., was studied to evaluate its macroscopic and microscopic characters. Physico-chemical analysis and phytochemical screening were also analyzed for the standardization of drug.

Materials and Methods

Collection and authentication of plant material:

Ripened fruits of *Tamarindus indica* were identified and collected from Morbi town (Latitude 22° 49' N, Longitude 70° 54' E), Gujarat, in month of May 2009. It was further authenticated by botanist, pharmacognosy lab., I.P.G.T. & R.A., Gujarat Ayurved University, Jamnagar. Fruit pulp was separated from its rinds, seeds and fibres manually. Further, Fruit pulp was shade dried for a week and preserved in an airtight glass vessel for further study. The material were deposited in the pharmacognosy lab., I.P.G.T. & R.A., Gujarat Ayurved University for further reference (specimen no. 6013). For the phytochemical analysis, aqueous and methanolic extracts were prepared with maceration extraction method.

Macroscopic Study:

Macroscopic characters of fruit pulp of *Tamarindus indica* were analyzed systematically and its morphological characters like size, shape etc., were noted down (10).

Organoleptic Study:

Pulp was evaluated for its organoleptic characters like texture, taste, odor and color etc (11).

Microscopic Study:

High concentrated water solution of the fruit pulp was prepared and the observed under the microscope with and without stain (12). Important characters were noted and microphotographs were taken with the help of Carl Zeiss Trinocular microscope, attached with camera.

Physicochemical analysis:

Physico-chemical Parameters like loss on drying, total ash, alcohol soluble extractive (90% methanol), water-soluble extractive and pH values were determined as per the API guidelines for the powdered leaves (13)

Qualitative chemical tests:

Qualitative tests of aqueous and methanol soluble extracts of the sample for various functional groups like alkaloids, glycosides, steroids, amino acids, carbohydrate, tannins, phenols and flavanoids were carried out with the help of standard procedures (14).

Published online in http://iijam.co.in
ISSN: 0976-5921
International Journal of Ayurvedic Medicine, 2014, 5(1), 37-42

RESULTS

Macroscopic Study:

Fruit (fig. 1) is a pod, indehiscent, subcylindrical, 10-14 X 3 cm, straight or curved, velvety, rusty-brown; the shell of the pod (fig. 2) is brittle and the seeds are embedded in a sticky edible pulp by a tough leathery membrane (the endocarp) and pulpy mesocarp. Fruit pulp (fig. 3) occurs as a reddish-brown, moist, sticky mass, in which yellowish-brown fibers are readily seen. Seeds are 3-10, approximately 1.6 cm long, irregularly shaped, and testa hard, shiny, and smooth.

Organoleptic study

Pulp of *Amlika* possesses soft, sticky and moist touch; reddish-brown color; Acidic with sweet taste and characteristic sour odour (table 1).

Table 1- Organoleptic characters of fruit pulp of *Tamarindus indica.*

Sr. No.	Parameters	Characters
1	Texture	Soft, sticky and moist
2	Colour	Reddish-brown
3	Taste	Acidic and sweet
4	Odour	Characteristic, sour

Microscopic study

Microscopic study of fruit pulp showed that presence of thin-walled elongated to polygonal paranchymatous cells (fig. 4), long fibro-vascular bundles (fig. 8), simple starch granules with hilum (fig. 5), thin walled fibers (fig. 9) and numerous prismatic crystals of calcium oxalate (fig. 6 & 7).

Fig. 1 fruit of *Amlika*

Fig. 2 Fruit pods

Fig. 3 Fruit pulp

Fig. 4 Paranchymatous cells

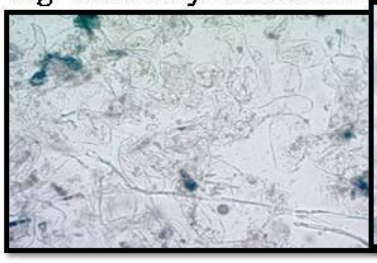


Fig. 5 Starch granules

Fig 6 Prismatic crystal

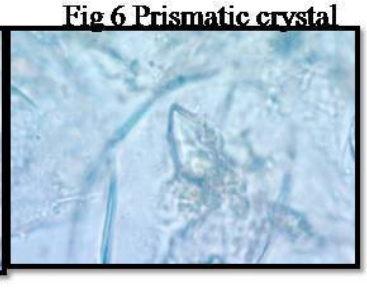


Fig. 7 Calcium oxalate crystal

Fig. 8 Fibro-vascular bundles

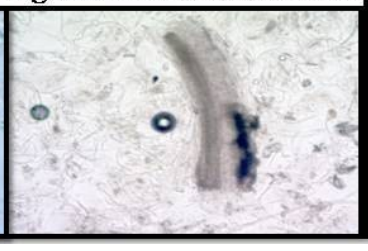
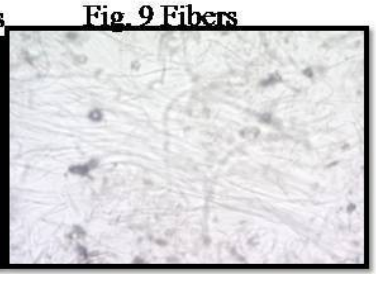


Fig. 9 Fibers



Physicochemical tests

Physicochemical analysis (table 2) of pulp revealed loss on drying 16.8% w/w, total ash content 4.7% w/w, Acid insoluble ash 10.6% w/w, water soluble extractive 83.6% w/w, alcohol soluble extractive 67.8% w/w, and pH (5% aqua solution v/w) 3.0.

Table 2- Physicochemical parameters of *Tamarindus indica* fruit pulp

Sr. No.	Physicochemical Parameter	Values
1	Loss on drying	16.8% w/w
2	Ash value	4.7 % w/w
3	Acid insoluble ash	10.6 % w/w
4	Water soluble extractive	83.6% w/w
5	Alcohol soluble extractive	67.8 % w/w
6	pH (5% aqua solution v/w)	3.0

Phytochemical analysis

The pharmacological action of the crude drug largely depends on the metabolites present in it. In the present investigation, the qualitative screening by using prepared extracts revealed the presence of a wide range of phytoconstituents like carbohydrates, alkaloids, amino acids, phenols and glycosides in both extracts (table 3).

Table 3- Phytochemical analysis of aqueous and alcoholic extracts of fruit pulp

Sr. No.	Tests	Name of test	In aqueous extract of fruit pulp	In methanol extract of fruit pulp
1.	Alkaloids	Dragondroff's test	+	+
2.	Steroids	Solkowski reaction	-	-
3.	Amino acids	Ninhydrin test	+	+
4.	Carbohydrate	Benedict's reagent test	+	+
5.	Glycosides	Ferric chloride test	+	+
6.	Tannins	Lead acetate test	-	-
7.	Flavanoids	Ammonia test	-	-
8.	Phenols	Phosphomolybdic acid test	+	+

Discussion & Conclusion:

It is evident that plants having therapeutic value usually contain diverse groups of secondary metabolites and *T. Indica* proved no exception. The most outstanding characteristic of tamarind is its

sweet acidic taste due to mostly tartaric acid (10%) and reducing sugars. Tartaric is an unusual plant acid formed from the primary carbohydrate products of photosynthesis, and once formed, it is not metabolically used by the plant. The content of tartaric acid does not decrease during fruit ripening, suggesting it is not utilized in fruit development. At this same time of fruit development; reducing sugars increase to 30-40% giving the sour fruit a sweeter taste. Besides being a rich source of sugars, tamarind fruit is an excellent source of vitamin B and also contain minerals and exhibit high antioxidant capacity that appear to be associated with a high phenolic content, thus can be an important food source (15).

There are a number of crude drugs where the plant source has not yet been scientifically identified. Hence pharmacognostic study gives the scientific information regarding the purity and quality of the plant drugs. The detailed pharmacognostical evaluation gives valuable information regarding the morphology, microscopical and physical characteristics of the crude drugs (16). Presence of thin-walled, elongated to polygonal paranchymatous cells, long fibro-vascular bundles and numerous prismatic crystals of calcium oxalate is the important microscopic characters of the fruit pulp of *Amlika.* Among physicochemical analysis**,** less ash content indicates that leaves contain inorganic compound in lesser amount. Higher water soluble extractive compare to methanol shows that leaf of *C. medica* possesses more water soluble constituents. pH indicates pulp is highly acidic in nature.

Well defined pharmacognostic parameters and standards must be established before the inclusion of any crude drug in a herbal pharmacopoeia. The studied pharmacognostical and phytochemical characters of fruit pulp of *T. indica* will be useful to identify the plant in crude form and in the elimination of adulterants. After the present investigation it can be concluded that the pharmacognostical studies of the fruit of *T. indica* provided a set of qualitative and quantitative standards that can serve as an important source of information to ascertain the identity and to determine the quality and purity of the plant materials for future studies.

REFERENCES

1. Khare CP. Indian Medicinal Plants. 2nd ed. New delhi, Springer; 2007. 643p.
2. Emmy DC, Halamova K, Damme PV. *Tamarindus indica* L. A review of traditional uses, phytochemistry and pharmacology. Africa focus, 2010;23(1);82
3. Anonymous, Database on Medicinal Plants used in Ayurveda & Siddha vol. 5, CCRAS, Dept. of Ayush, Ministry of Health & family welfare, Govt. of India. 2008; 29p.
4. Timyan J. Important trees in Haiti, Washington, Southeast Consortium for International Development, 1996, 418p.
5. John J, Joy M, Abhilash EK. Inhibitory effects of tamarind (*Tamarindus indica* L.) on polypathogenic fungi. Allelopath J 2004;14(1): 43-49
6. El Siddig K., Ebert G., Ludders P. Tamarind (*Tamarindus indica* L.): a Review on a Multipurpose Tree with Promising Future in the Sudan. Journal of Applied Botany, Angewandte Botanik, 1999;73;202-205
7. Naveena K, Patgiri BJ, Harisha CR, Shukla VJ. Pharmacognostical and physicochemical analysis of *Tamarindus indica* Linn. stem. Journal of Ayurveda & Integrative Medicine. 2012;3(1):6

8. Agnivesha, Charaka, Dridhabala. Charaka Samhita, Chikitsasthana, Acharya JT editor. Varanasi, Chaukhambha Surabharati Publications, 2008.
9. Kokate C.K., Purohit A.P, Gokhale S.B. Pharmacognosy, Ed. 36th Pune, Nirali Prakashan; 2006; 6-24p.
10. Trease G.E, Evans W.C. Pharmacognosy, 12th Ed. Eastbourne, Bailliere Tindall; 1983;95-99, 512-547p.
11. Jain S.K., Rao R.R. Field and Herberium Methods. New Delhi, Today & Tomorrow Publishers; 1976;22-61p.
12. Wallis T.E. Text book of Pharmacognosy, 5th Ed, CBS Publishers, New Delhi, 1985;571-578p.
13. Anonymous, the Ayurvedic Pharmacopoeia of India, Part-I, Vol. 1-4. New Delhi; Govt. of India, Dept. of Ayush; 1999; 155-56p.
14. Baxi A.J,Shukla V.J, Bhatt U.B. Methods of Qualitative Testing of Some Ayurvedic Formulation, Jamnagar, Gujarat Ayurveda University Press, June 2001; 05-12p.
15. Emmy DC, Halamova K, Damme PV. *Tamarindus indica* L. A review of traditional uses, phytochemistry and pharmacology. Africa focus, 2010;23(1);57
16. Sumitra S., Vijay N, Surendra K.S, Pharmacognostic Studies on the Leaves of *Prosopis cineraria* (L) Druce. Growing in South Haryana India, Journal of Pharmacognosy and Phytochemistry. 2013;2(1):320

*****