

## A CRITICAL AYURVEDIC LITERARY REVIEW OF THE PLANT *AMLEEKA* (*Tamarindus indica* L.)

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### ABSTRACT

*Tamarindus indica* L. belongs to family Fabaceae is a valuable tropical tree that is extensively used as a medicine in traditional systems of healthcare. It is described as *Amleeka* in Ayurvedic medical literatures. This ethno medicinal plant is used to treat various ailments. All most all part of this plant is found to be useful for therapeutic purposes. The use of fruit of this plant and its pharmacological properties, synonyms, and therapeutic indications are elaborately mentioned, the other useful parts of this plant with rich medicinal values are yet to be compiled. The information cannot be retrieved easily from Ayurvedic literature and *samhithas* because of the non-availability of databases. This paper aims to provide a review article on the therapeutic potential of *Tamarindus indica* L. in Ayurvedic literature which will help in future research works.

**Keywords:** *Tamarindus indica* L., Samhithas, *Amleeka*, *Ayurveda*

### INTRODUCTION

*Ayurveda*, an Indian system of medicine retains an exhaustive collection of documented literature on the therapeutic potential of numerous plants. Many lead compounds can be traced out from these plants which may result in drug discovery and development. But information retrieval from Ayurvedic literature is a tedious and cumbersome process as most of the Ayurvedic text books are not accessible through contemporary databases. Many single drug therapies for various ailments can be found in

Ayurvedic literature, some of them are scientifically proven effective through various pharmacological experiments.

*Tamarindus indica* L., commonly known as Tamarind tree is abundantly found in Kerala, India and is a multipurpose tropical fruit tree species belonging to family Fabaceae<sup>[1]</sup>. It is a large evergreen tree with an exceptionally beautiful spreading crown and fragrant flowers<sup>[2]</sup>. It is cultivated throughout the tropics and subtropics and is used as a traditional medi-

cine in most of the tropical countries. *Tamarindus indica* served a variety of functions and uses including food, beverage, ethnomedicines for humans, ethno veterinary uses, aesthetic uses, environmental amelioration as well as cultural uses [3]. It is used traditionally in abdominal pain, diarrhea, dysentery, fever, malaria, constipation, gonorrhoea, eye diseases, helminthes infection and wound healing. The fruit pulp is used as a digestive, an important culinary ingredient and a remedy for bile disorders, to alleviate sunstroke, in *Datura* poisoning and alcohol intoxication etc. [4] The plant shows anti-oxidant, hypolipidaemic, ant diabetic, anti-inflammatory, analgesic, hepatoprotective and anti-microbial activity [2]. Some of the main books in modern era in which *Tamarindus indica* is mentioned are the wealth of India, Compendium of Indian Medicinal Plants, Indian Medicinal Plants, Pharmacognosy of Ayurvedic drugs-Kerala, and Glossary of vegetable drugs in Brihatrayi. But it is not included in Ayurvedic Pharmacopoeia of India, a legally valid drug document in Ayurveda and also its classical literature is not available in a compiled form. Many of its therapeutic uses are narrated in Ayurvedic treatises like *Sarvaroga chikitsaretnam*, *Vaidya tarakam*, *Sahasrayogam*, *Chikitsa manjari* and *Ayurveda Oushadha Nighantu*. In this paper descriptions about *Tamarindus indica* are retrieved from the above books, Google scholar and pubmed and are critically analysed. This paper is a critical review of therapeutic potential of *Tamarindus indica* in Ayurvedic literature which may provide as a ready reference for research scholars.

### Objective

To provide a comprehensive literary knowledge of *Amleeka* (*Tamarindus indica* L.) as per Ayurvedic Classics

### METHODOLOGY

Systematic review of various Ayurvedic Samhithas, Nighantus and recent textbooks of Dravya gunavijnanam and its critical analysis to satisfy the objective.

#### History [1,2, 4,5]

The name 'Tamarind' comes from a Persian word '*Tamar - I - hind*', meaning date of India. The descriptions about *Tamarindus indica* is not available in Vedic literature, but Tamarind tree has been widely cultivated since ancient times (between 1200 and 200 B.C), because its descriptions are found in the Indian *Brahmasamhitha* scriptures and *Vishnu Dharma Suthra*. It has been mentioned in *Caraka Samhita*, *Susruta Samhita*, *Ashtanga Sangraha* with the name '*Amleeka*' under *Amla varga* (group of sour drugs). Moreover its synonyms, properties, and action were narrated in *Nighantus* (a new corpus of literature which describes drugs in detail) like *Raja Nighantu*, *Dhanwantari Nighantu*, *Sodhala Nighantu*, *Bhavaprakasa Nighantu*, *Madanadi Nighantu*, and *Nighantu Adarsh*.

#### Etymology (*Nirukthi*) [6,7]

*Amleeka*: *amlo raso yasya asti*. It denotes the sour taste.

*Tinthidi*: '*timyathi ithi*', '*tim ardree bhave*', That which causes salivation in mouth.

*Chincha*: '*chim ithi avyaktham sabdam chinothi*', By eating this sounds like '*chim*' is produced.

#### Classification

In Ayurvedic literature, medicinal plants are grouped into different *Ganas*, *Skandhas Vargas* or *Kulas* based on similar characters, pharmacological properties, uses etc. *T.indica* is included in the following groups in various Ayurvedic text books.

**Table 1:** Classification of *Amleeka* in various text books

| Sl.No | Name of Text Book         | Name of Varga or Skandha           |
|-------|---------------------------|------------------------------------|
| 1     | <i>Charaka Samhita</i>    | <i>Amla skandha</i> <sup>[8]</sup> |
| 2     | <i>Ashtanga Samhita</i>   | <i>Amla skandha</i> <sup>[9]</sup> |
| 3     | <i>Susrutha Samhita</i> : | <i>Amla varga</i> <sup>[10]</sup>  |

|    |                               |   |
|----|-------------------------------|---|
| 4  | <i>Amarakosa</i>              | <i>Vanoushadhi varga</i> <sup>[6]</sup>       |
| 5  | <i>Bhava prakasa nighantu</i> | <i>Amradi phala varga</i> <sup>[11]</sup>     |
| 6  | <i>Dhanwanthari nighantu</i>  | <i>Amradi varga</i> <sup>[12]</sup>           |
| 7  | <i>Kaiyyadeva nighantu</i>    | <i>Ousadhi varga</i> <sup>[13]</sup>          |
| 8  | <i>Madanapala nighantu</i>    | <i>Phaladi varga</i> <sup>[14]</sup>          |
| 9  | <i>Nighantu Adarsh</i>        | <i>Poothi karanjadi varga</i> <sup>[15]</sup> |
| 10 | <i>Raja nighantu</i>          | <i>Amradi varga</i> <sup>[16]</sup>           |

**Table 2:** Synonyms mentioned in different text books:<sup>6,11,12,13,14,15,16,17</sup>

| SYNONYMS             | AK <sup>6</sup> | BPN <sup>11</sup> | DN <sup>12</sup> | KN <sup>13</sup> | MPN <sup>14</sup> | NA <sup>15</sup> | ON <sup>17</sup> | RN <sup>16</sup> |
|----------------------|-----------------|-------------------|------------------|------------------|-------------------|------------------|------------------|------------------|
| <i>Amla</i>          |                 | +                 |                  | +                |                   |                  | +                | +                |
| <i>Amlee</i>         |                 | +                 |                  |                  |                   |                  |                  | +                |
| <i>Amleeka</i>       | +               | +                 | +                |                  | +                 | +                | +                | +                |
| <i>Abdhika</i>       |                 |                   |                  |                  |                   |                  | +                |                  |
| <i>Atyamba</i>       | +               |                   |                  |                  |                   |                  |                  |                  |
| <i>Bhuktha</i>       |                 |                   |                  |                  |                   |                  | +                |                  |
| <i>Chanda</i>        |                 |                   |                  | +                |                   |                  |                  |                  |
| <i>Chincha</i>       | +               | +                 | +                | +                | +                 | +                | +                | +                |
| <i>Chimchika</i>     |                 | +                 | +                |                  |                   |                  | +                |                  |
| <i>Charithra</i>     |                 |                   |                  |                  |                   |                  | +                |                  |
| <i>Chukra</i>        |                 | +                 | +                | +                |                   |                  | +                | +                |
| <i>Chukrika</i>      |                 | +                 | +                | +                | +                 |                  | +                | +                |
| <i>Dantha sada</i>   |                 | +                 |                  |                  |                   |                  | +                |                  |
| <i>Guru pathra</i>   |                 |                   |                  |                  |                   |                  | +                |                  |
| <i>Pakthi patra</i>  |                 |                   |                  |                  |                   |                  | +                |                  |
| <i>Pichila</i>       |                 |                   |                  |                  |                   |                  | +                |                  |
| <i>Sa amla</i>       |                 |                   | +                |                  |                   |                  |                  | +                |
| <i>Sarvamla</i>      |                 |                   |                  |                  |                   |                  | +                |                  |
| <i>Shakachukrika</i> |                 |                   |                  |                  |                   |                  | +                | +                |
| <i>Suchakrika</i>    |                 |                   |                  |                  |                   |                  | +                |                  |
| <i>Suktha</i>        |                 |                   | +                | +                |                   |                  | +                |                  |
| <i>Sukthika</i>      |                 |                   | +                |                  | +                 |                  |                  |                  |
| <i>Sutinthidi</i>    |                 |                   |                  |                  |                   |                  | +                | +                |
| <i>Stambhanika</i>   |                 |                   |                  | +                |                   |                  |                  |                  |
| <i>Tinthidi</i>      | +               | +                 |                  | +                | +                 | +                | +                |                  |
| <i>Tinthideeka</i>   |                 | +                 | +                |                  |                   |                  | +                |                  |
| <i>Tinthili</i>      |                 |                   |                  | +                |                   |                  | +                |                  |
| <i>Tinthika</i>      |                 | +                 |                  |                  |                   |                  |                  |                  |
| <i>Yamadoothika</i>  |                 |                   |                  |                  |                   |                  | +                |                  |

„+“ indicates Present

AK: Amara Kosam, BPN: Bhavaprakash Nighantu, DN: Dhanwanthari Nighantu, KN: Kayyadeva Nighantu, MPN: Madanapala Nighantu, NA: Nighantu Adarsh, ON: Oushadha Nighantu, RN: Raja Nighantu

### Synonyms and probable interpretations<sup>[6,18,19,20]</sup>

*Tamarindus indica* is named as ‘Amleeka’ in Sanskrit and this name is used in Ayurvedic literature. The following synonyms are narrated for *Amleeka* based on morphological, organoleptic and therapeutic features.

|                    |   |
|--------------------|---|
| <i>Amleeka</i>     | : that which has <i>amla</i> rasa (Sour taste).                       |
| <i>Amla</i>        | : that which has <i>amla</i> rasa (Sour taste).                       |
| <i>Bahupatraka</i> | : having abundant small leaves.                                       |
| <i>Bhuktha</i>     | : that which is edible.   |
| <i>Chincha</i>     | : that which causes a <i>chim</i> sound in mouth by eating tamarind.  |
| <i>Dantha sada</i> | : causing teeth incapable of biting anything after eating sour fruits |
| <i>Ksharapada</i>  | : ash of tree is alkaline.  |
| <i>Suktha</i>      | : that which causes acidity.  |
| <i>Thinthidi</i>   | : the sour fruit that increases salivation in mouth                   |
| <i>Vishaghna</i>   | : that which overcomes poisonous effect.                              |

**Taxonomical order**<sup>[1,4]</sup>

|                |                                |
|----------------|--------------------------------|
| Kingdom        | : Plantae                      |
| Subkingdom     | : Tracheobionta                |
| Super division | : Spermatophyte                |
| Division       | : Magnoliophyta                |
| Class          | : Angiospermae (Magnoliopsida) |
| Subclass       | : Dicotyledonae (Rosidae)      |
| Super order    | : Rosanae                      |
| Order          | : Fabales                      |
| Family         | : Leguminosae (Fabaceae)       |
| Sub family     | : Caesalpinieae                |
| Genus          | : Tamarindus L.                |
| Species        | : Indica                       |
| Tribe          | : Detarieae                    |

**Vernacular names**<sup>[21,22]</sup>

|         |                                 |
|---------|---------------------------------|
| Arabic  | : Daralsida                     |
| Assam   | : Tamar, Teteli                 |
| Bengal  | : Tetula, Nuli, Tintil, Tinturi |
| Brazil  | : Jubay, Tamarindo              |
| Coorg   | : Pulinje                       |
| Dutch   | : Tamrinden boom                |
| English | : Tamarind tree                 |
| French  | : Tamarindien                   |
| German  | : Tamarindenbaum                |
| Gujarat | : Amlī, Ambli                   |
| Hindi   | : Amlī, Imli                    |

|           |                                     |
|-----------|-------------------------------------|
| Italian   | : Tamarindo                         |
| Kannada   | : hunise, imli.                     |
| Malayalam | : Puli, valampuli, kolpuli.         |
| Marati    | : Ambali, Amlī                      |
| Mysore    | : Asam, Hunese                      |
| Nepal     | : Titri                             |
| Persian   | : Ambalah                           |
| Portugese | : Tamarindo                         |
| Punjab    | : Imbli                             |
| Sanskrit  | : Amlīka, Chincha, Tinthidi, Chukra |
| Sind      | : Amri, Gidamri                     |
| Telugu    | : Amlīka, sinja, Tinthrini          |
| Urdu      | : Imli                              |
| Uriya     | : Tentuli                           |

**Distribution and habitat**<sup>[3,19,24]</sup>

A moderate sized to large evergreen tree which is indigenous to South India and is cultivated throughout India and Burma. The Tamarind tree is ethnic to Eastern Tropical Africa, which is spread from Abyssinia to Zambezi. It grows up to a height of about 24m and 7m in girth. In India, it is very common in Bengal, Assam, Konkan, Gujarat, Deccan, Madras and Kerala. It is often planted as an avenue tree along road sides and as an ornamental tree in gardens and is found throughout the tropics.

**Morphology**<sup>[3,5,19,21,23,24]</sup>

This evergreen tree has a thick trunk with dense and spreading crown of feathery foliage. Tamarind produces a deep tap root and an extensive lateral root system<sup>5</sup>, Bark is brownish or dark grey, rough and scaly, longitudinally and horizontally fissured. Dark red gum exudates from the trunk and the branches when they are damaged. Leaves are alternate, stipulate, abruptly or evenly pinnate, 5-15 cm long, rachis slender, channeled, stipules linear and caduceous. Leaflets generally 10 -20 pairs, sub sessile, closely set on rachis, obtuse, glabrous.

**Flowers:** Lax racemes at the end of branchlets, yellowish with pink stripes.

**Fruits:** Pods or indehiscent legume.

**Seeds:** Seeds 3 -12, obovate -oblong, exalbuminous.

**Parts used:**<sup>[21,23,25]</sup> Pulp of fruit, seeds, leaves, flowers, root bark and stem bark.

**Pharmacological properties**<sup>[11,25]</sup>.

In Ayurvedic literature, pharmacological properties responsible for therapeutic efficacy are described using the terms *Rasa*, *Guna*, *Veerya* and *Vipaka*.

**Table 3:** Properties of unripe and ripe fruit and tree of *T.indicus*

| Properties    | <i>Ama phala</i> (Unripe fruit)                    | <i>Pakwa phala</i> (ripe fruit)       | <i>Chincha vriksha</i> (tree)                         |
|---------------|--|---------------------------------------|---|
| <i>Rasa</i>   | <i>Amla</i>  | <i>Amla, madhura</i>                  | <i>Amla</i>   |
| <i>Guna</i>   | <i>Guru, rooksha</i>                               | <i>Guru</i>                           | <i>Guru</i>   |
| <i>Virya</i>  | <i>Usna</i>  | <i>Usna</i>                           | <i>Usna</i>   |
| <i>Vipaka</i> | <i>Amla</i>  | <i>Amla</i>                           | <i>Amla</i>   |
| <i>Karma</i>  | <i>Vatahara, Pitta kapha prada, raktha kopana,</i> | <i>vata hara, pitta raktha kopana</i> | <i>Pitta kapha prada, raktha kopana, Vata nasana.</i> |

The stem and root bark is said to be astringent in taste.

**Chemical constituents**<sup>[2,24,26]</sup>

*Tamarindus indica* has many active constituents like phenolic compounds, cardiac glycosides, L(-) mallic acid, mucilage, pectin, tartaric acid, arabinose, galactose, xylose, uronic acid. The aerial part of this plant has tartaric acid, acetic acid, succinic acid, gum, pectin, sugar, tannin, alkaloid, flavonoids, sesquiterpenes, and glycosides.

**Fruit pulp:** Tartaric acid, Citric acid, Malic acid, Acetic acid, formic acid.

**Bark:** Alkaloid – hordenine, Tannin, Proanthocyanidin, n- hexacosaine, Eicosanoic acid, octacosanyl ferulate,  $\beta$ - sitosterol, 21-oxobehenic acid (+) - pinitol

**Seed:** Procyanidins and major fatty acids like palmitic acid, oleic acid, stearic acid, linoleic acid, eicosanoic acid.

**Therapeutic uses**<sup>[27,33,36,37]</sup>

Anorexia: Jaggery water mixed with *Amleeka* and spiced with *twak* (*Cinnamomum zeylanicum*), *ela* (*Elettaria cardamom*), and *marica* (*Piper nigrum*) should be kept in mouth.

Diarrhea: covering of *Amleeka* seeds, dried ginger, rock salt and *yavani* (*Hyocyamis niger*) are mixed together and taken with fresh buttermilk.

Bleeding piles: The paste of tender leaves of *Amleeka* is mixed with water, strained and added with salts and taken. Leaves of *Amleeka* fried with oil and ghee, cooked in curd and pomegranate and

added with *dhanyaka* (*Coriandum sativum*) and *sunti* (*Zingiber officinale*) should be given. Liquid gruel soured with *amleeka* is also used.

Rectal prolapse: Fried *Amleeka* seeds are rubbed with water and pasted on anus.

Cough: Epicarp of *Amleeka* fruit 1part, *haridra* (*Curcuma longa*) 2 part, *sarja rasa* 3 part, *punarnava* (*Boerhavia diffusa*) 1 part, and *Jati* (*Myristica fragrans*) leaves 1 part this is made into a wick and fumigated.

Accidental wounds: Swelling caused by accidental injury subsides by application of bolus of wheat flour and salt with fruit and leaf juice of *Amleeka*

Fracture: External application of hot paste of *Amleeka* fruit mixed with sour gruel and oil sudates and relieves pain and swellings. Fruit pulp of *Amleeka* is finely pressed and mixed with lime. This is applied at the site of injury followed by fomentation.

Freckles: Application of paste of root bark of *Amleeka* removes freckles.

*Soma roga*: The seeds of *Amleeka* are soaked with water the previous day and pounded with milk. This paste if taken regularly alleviates *soma roga* (leucorrhoea).

Pox: *Haridra* and *Amleeka* leaves taken with cold water prevent pox.

Coryza; in acute coryza, soup made of *Amleeka* fruit is beneficial.

Abdominal distention: *Snuhi* (*Argemone Mexicana*), *palasa* (*Butea frontosa*), *apamarga* (*Achyranthus*

*aspera*), *Amleeka*, *arka* (*Calotropis*), *tila* (*Sesame indicum*), *yavakshara* and *svarjikshara* – these 8 *kshara* reduces abdominal distention.

Diseases due to vitiation of vata: The warm paste prepared from *Amleeka* leaves along with male flower stalks of *thala* alleviates pain caused by aggravation of vata.

Amenorrhoea - Take 10g of root bark with milk for two weeks for amenorrhoea.

Edema: Hot decoction of *Amleeka* leaves is poured over affected parts.

Ring worm: Local application of juice of *Amleeka* leaves cures ring worm.

Snake poison: leaf juice of *Amleeka* 160ml mixed with salt 20 g is taken in snake poison.

#### **Ethnomedicinal uses** <sup>[28,29]</sup>

*Tamarindus indica* is using as an ethno medicine in Andhra Pradesh, Maharashtra, Orissa, Nigeria and Manipur. People of Gooty forests in Andhra Pradesh use fruit pulp of *T.indicus* with salt for external application in scorpion sting. In Maharashtra, seedpaste is also applied externally to cure insect bite. The soaked fruits are eaten by rural peoples of Nigeria, to relieve constipation. The bark mixed with coconut oil is applied over burns in Bargarh district, Orissa. In North East India, Stem bark ash is given for burning sensation, leaves for eye diseases. Flowers are used in conjunctivitis. People of Manipur use crushed cotyledons in snake bite, ripe fruits along with banana and salt in dysentery and the decoction of fruit as laxative and carminative.

#### **Ayurvedic therapeutic formulations containing *Tamarindus indica* L.** <sup>[30,31,32]</sup>

In *Sahasrayoga* and API, pharmaceutical preparations of *T.indica* are indicated along with other medicinal plants. Some of the formulations are *Cincha kshara*, *Cincha panaka*, *Sankha vati*, *Sankha dravaka*, *Chinchadi lehya* and *Chinchadi taila*.

#### **Research updates** <sup>[2,3,34,35]</sup>

*Tamarindus indica* is reported to possess ant diabetic, antimicrobial, antivenomic, antioxidant, antimarial cardioprotective, hepatoprotective,

antiasthmatic, laxative and antihyperlipidemic activity.

- **Antidiabetic activity:** An aqueous extract from *Tamarindus indica* seeds had a potent antidiabetogenic activity in Streptozotocin – induced diabetic male rats. The aqueous extract of seeds was given to mild diabetic and severe diabetic rats, and hyperglycemia was significantly reduced, measured by fasting blood glucose levels. (Maithi .R, Das U.K 2004)
- **Anti-microbial activity:** *Tamarindus indica* has a broad spectrum of antibacterial activity. The aqueous, ethanolic and acetone extracts of leaf showed potent anti-microbial activity against *Salmonella paratyphii*, *Bacillus subtilis*, *Salmonella typhii*, *Staphylococcus aureus*. (Warda.s, Gadir. A 2007).
- **Anti-inflammatory and analgesic activity:** *Tamarindus indica* stem bark ether extract showed significant anti-inflammatory and analgesic effect by using suitable animal models and tests such as hot plate test and acetic acid induced writhing test. Preliminary phytochemical investigation showed presence of sterols and triterpenes which might be responsible for analgesic activity. (Dighe N.S, Pattany S.R 2009)
- **Hepatoprotective and anti-asthmatic activity:** The methanolic extracts of *Tamarindus indica* leaves exhibited significant anti-histaminic, adaptogenic, and mast cell stabilizing activity in laboratory animals. The aqueous extract of different parts such as tamarindus leaves, fruits and unroasted seeds etc were shown significant hepato regenerative effect. (Tayade P.M 2009, Pimple B.P 2007).
- **Anti-venom activity:** The seed extract significantly inhibited the enzymatic activity of venom and neutralized the myotoxic effects such as haemorrhage and edema, hence can be considered as an alternative to serum therapy. (Ushanandini. S, Nagaraju.S 2006)
- **Anti-oxidant activity:** All extracts of *Tamarindus indica* showed good anti-oxidant activity es-

pecially, seed and pericarp. (Sidhuraju p 2007, Aline Pereira 2016)

- Hypo lipidemic effect (Kuru P, 2014, Aline Pereira 2016). *T. indica* fruit extract showed weight reduction and hypolipidemic properties. It is thought that it shows its effect with increasing dopaminergic transmission, regulating lipid metabolism, decreasing plasma leptin level. Flavonoids and polyphenols could be responsible for weight reduction. On the behalf of weight reductive effect, it shows serum cholesterol and LDL reductive and HDL increasing effect

- Effects on cardiovascular system (Kuru P 2014, Aline Pereira 2016).

*T. indica* fruit is rich in polyphenol and flavonoid. It shows moderate antioxidant effect. Epidemiological studies have shown that flavonoid intake from fruits and vegetables have beneficial effect on cardiovascular health.

## CONCLUSION

*Tamarindus indica* is a medicinal plant having immense therapeutic potential as per Ayurvedic literature. But many of them are unexplored and are not clinically utilized. The leads in Ayurvedic literature should be assessed and validated by pharmacological and clinical research and can be included in Ayurvedic Pharmacopeia of India. It is a rich source of essential amino acids, phytochemicals and vitamins. Since it is a cheap and easily available, it can help in curing many diseases. Herbal drugs are facing severe scarcity this period; the unexplored plants with medicinal value should be promoted. The researchers showed *Tamarindus indica* has wide range of potentials like antidiabetic, antimicrobial, antivenom, antioxidant, antimalarial cardioprotective, hepatoprotective, antiasthmatic, laxative and antihyperlipidemic activity. More and more efforts for the scientific validations of this plant should be encouraged to serve mankind. This paper is a simple step taken to compile the classical literature of *Amleeka (Tamarindus indica L.)* so as to help the research scholars for future research works.

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