**Syzygium cumini** Linn. (Jambul)

**Taxonomical classification**
- **Kingdom:** Plantae – Plants
- **Division:** Magnoliophyta – Flowering plants
- **Class:** Magnoliopsida – Dicotyledons
- **Subclass:** Rosidae
- **Order:** Myrtales
- **Family:** Myrtaceae – Myrtle family
- **Genus:** *Syzygium*
- **Species:** *cumini*

**Local name of the plant:-**
- **Sanskrit:** Mahajambu, Ksudrajambu
- **Assamese:** Jam
- **Bengali:** Jaam
- **English:** Black plum, Damson plum, Duhat plum, Jambolan plum, Java plum, Malabar plum, Portuguese plum
- **Gujrati:** Jambu, Jambuda
- **Hindi:** Jomuna, Raja Jambu
- **Kannada:** Merale, Jamnerald, Jambu, Neralamara
- **Malayalam:** Njaval, Naval
- **Marathi:** Jambhool
- **Oriya:** Jamukoli, Jamu, Jam
- **Punjabi:** Jammu
- **Tamil:** Naaval, Navval Sambu, Mahamaram, Nagal
- **Telugu:** Nesedu
- **Urdu:** Jamun
DESCRIPTION

The jambolan is fast-growing, reaching full size in 40 years. It ranges up to 100 ft (30 m) in India and Oceania; up to 40 or 50 ft (12-15 m) in Florida; and it may attain a spread of 36 ft (11 m) and a trunk diameter of 2 or 3 ft (0.6-0.9 m). It usually forks into multiple trunks a short distance from the ground. The bark on the lower part of the tree is rough, cracked, flaking and discolored; further up it is smooth and light-gray. The turpentine-scented evergreen leaves are opposite, 2 to 10 in (5-25 cm) long, 1 to 4 in (2.5-10 cm) wide; oblong-oval or elliptic, blunt or tapering to a point at the apex; pinkish when young; when mature, leathery, glossy, dark-green above, lighter beneath, with conspicuous, yellowish midrib. The fragrant flowers, in 1-to 4-in (2.5-10 cm) clusters, are 1/2 in (1.25 cm) wide, 1 in (2.5 cm) or more in length; have a funnel-shaped calyx and 4 to 5 united petals, white at first, then rose-pink, quickly shed leaving only the numerous stamens.

The fruit, in clusters of just a few or 10 to 40, is round or oblong, often curved; 1/2 to 2 in (1.25-5 m) long, and usually turns from green to light-magenta, then dark-purple or nearly black as it ripens. A white-fruited form has been reported in Indonesia. The skin is thin, smooth, glossy, and adherent. The pulp is purple or white, very juicy, and normally encloses a single, oblong, green or brown seed, up to 1 1/2 in (4 cm) in length, though some fruits have 2 to 5 seeds tightly compressed within a leathery coat, and some are seedless. The fruit is usually astringent, sometimes unpalatably so, and the flavor varies from acid to fairly sweet. (Plate 3 and Plate 5)

Origin and Distribution

The jambolan is native in India, Burma, Ceylon and the Andaman Islands. It was long ago introduced into and became naturalized in Malaya. In southern Asia, the tree is venerated by Buddhists, and it is commonly planted near Hindu temples because it is considered sacred to Krishna. The leaves and fruits are employed in worshipping the elephant-headed god, Ganesha or Vinaijaka, the personification of "Pravana" or "Om", the apex of Hindu religion and philosophy. Drug occurs in slightly curved or flat pieces, 0.5-2.5 cm thick, younger bark mostly channelled, external surface more or less rough and rugged due to exfoliation and vertical cracks, light grey to ash coloured, internal surface fibrous, rough, and reddish brown,
fracture, short and splinterly; taste, astringent. Stem Bark -Mature bark shows a wide zone of cork differentiated into upper and lower cork zones, forming a rhytidoma; cork consisting of tangentially elongated rectangular cells, upper few layers thick, stratified and reddish-brown, having groups of 2-4 stone cells and crushed elements of phloem; lower cork thin and colorless; cork cambium not distinct; secondary phloem composed of sieve elements, and phloem rays; phloem parenchyma thin-walled and polyhedral in shape; stone cells, oval to angular, elongated; fibres aseptate; both stone cells and fibres single or in groups present throughout this region , phloem rays 1-4 cells wide, , reddish- brown content, rosette crystals of calcium oxalate and simple, rounded to oval starch grain, measuring 5 -11 µ in diameter.

2-5 seeds, compressed together into a mass resembling a single seed, the whole seed enclosed in a cream coloured, coriaceous covering, smooth, oval or roundish, 1 cm long, 1 cm wide, brownish-black;. Shows cotyledons consisting of single layered epidermis, mesophyll composed of are diametric, thin-walled, parenchymatous cells fully packed with simple starch grains, oval, rounded measuring 7-28 µ in dia.; a few schizogenesis cavities are also found. It has been valued in Ayurveda and Unani system of medication for possessing variety of therapeutic properties. Most of the plant parts are used in traditional system of medicine in India. According to Ayurveda, its bark is acrid, sweet, digestive and astringent to the bowels, anthelmintic and in good for sore throat, ronchitis, asthma, thirst, biliousness, dysentery, blood impurities and to cure ulcers (Kirtikar and Basu, 1975).

**Medicinal Uses:-**

*Syzygium cumini* is a medicinal plant, whose parts were pharmacologically proved to possess hypoglycemic, antibacterial, anti-HIV activity and anti-diarrhea effects. (Bhuiyan et al., 1996; Kusumoto et al., 1995; Indira and Mohan, 1993; Ravi et al., 2004). Slowing et al. (1994) and Muruganandan et al. (2001) reported the anti-inflammatory activity of leaf and barks. Hence, the present study has been made to investigate the phytochemical screening of the *Syzygium cumini* seed.

The leaves, stems, flowerbuds, opened blossoms, and bark has some antibiotic activity. A decoction of the bark is taken internally for dyspepsia, dysentery, and diarrhea and also serves as an enema. The root bark is similarly employed. Bark decoctions are taken in cases of asthma and bronchitis and are gargled or used as mouthwash for the astringent effect on mouth ulcerations, spongy gums, and stomatitis. Ashes of the bark, mixed with water, are spread over local inflammations, or, blended with oil, applied to bums. In modern therapy,
Tannin is no longer approved on burned tissue because it is absorbed and can cause cancer. Excessive oral intake of tannin-rich plant products can also be dangerous to health.

The leaves, steeped in alcohol, are prescribed in diabetes. The leaf juice is effective in the treatment of dysentery, either alone or in combination with the juice of mango or emblic leaves. Jambolan leaves may be helpful as poultices on skin diseases.

Anthocyanins are the glycosides of anthocyanidins, and contribute greatly to the antioxidant properties of certain fruits. As pigments, they produce the orange, red and blue colors in fruits and flowers. The antioxidant anthocyanidin that colors blueberries and grapes bluish-red is delphinidin. Other known antioxidant anthocyanins include cyanidin (orange-red), pelargonidin (orange), malvidin (bluish-red) and peonidin (red) (Wang et al. 1997). Fruit color is therefore an important indicator of possible polyphenolic compounds.

*S. jambos* fruit is used as a tonic for the brain and for liver problems, as an astringent, and digestive and diuretic. Syzygium cumini seeds can also have various medicinal values such as anti-inflammatory, anti-diabetic and analgesic activities and also for central nervous system activity.
**Mimusops elengi Linn. (Bakul)**

**Taxonomical Classification**

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<thead>
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**Local name of the plant**

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<th>Language</th>
<th>Name</th>
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<td>Simshakesara</td>
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DESCRIPTION

Bakul is a small to large evergreen tree found all over the different parts of India. It is cultivated in gardens as an ornamental tree. Evergreen, small to medium-sized tree up to (30 – 40) m tall; bole up to 100 cm in diameter, often short and divided into several large main branches but sometimes branchless for up to 15(–20) m, buttresses absent or up to 2 m high; bark surface becoming deeply fissured and sometimes peeling off in thin scales, grey, brown or dark red to blackish, inner bark fibrous, pink or reddish, with scanty watery or white sticky latex; crown dense, rounded and spreading, glossy dark green. Leaves arranged spirally, more or less in tufts at the ends of branches, simple; stipules minute and caducous; petiole 1–3.5 cm long, grooved above; blade ovate to elliptical or oblong-elliptical, 4.5–17 cm × 2–7 cm, rounded at base, acuminate at apex, margins often wavy and upcurled, glabrous, with 10–20 pairs of lateral veins. Flowers in fascicles of up to 6 in the leaf axils, bisexual or functionally unisexual, regular, fragrant; pedicel 1–1.5 cm long; sepals in 2 whorls of 4; corolla white, with a short tube and 8 lobes each deeply divided into 3, c. 1 cm long; stamens 8, alternating with 8 staminodes; ovary superior, (6–)8-celled. Fruit an ovoid to ellipsoid berry 2–3 cm long, orange-red when ripe, 1–2-seeded. Seeds up to 2 cm long, laterally compressed, with
small circular basal scar. Seedling with epigeal germination; cotyledons leafy; hypocotyl elongated. (Plate 4 and Plate 5)

**Origin and distribution:-**

*Mimusops elengi* is native to India, Sri Lanka, the Andaman Islands, Myanmar and Indo-China, but is commonly planted as an ornamental tree throughout the tropics, also in Africa, where it has been recorded from e.g. Ghana, Tanzania, Mozambique, Réunion and Mauritius.

**Medicinal uses:-**

The bark, flowers, fruits and seeds are astringent, cooling, anthelmintic, tonic, and febrifuge. It is mainly used in dental ailments like bleeding gum's, pyorrhea, dental caries and loose teeth.

Extract of flowers used against heart diseases, leucorrhoea, menorrhagia and act as antiduretic in polyuria and antitoxin. The snuff made from the dried and powdered flowers used in a disease called Ahwa in which strong fever, headache and pain in the neck, shoulders and other parts of the body occurs. Leaves of *Mimusops elengi* were screened for their antibacterial and antifungal activities against some pathogenic bacteria and fungi. It has been used in the indigenous system of medicine for the treatment of various ailments. Several therapeutic uses as cardiotonic, alexipharmic, stomachic, anthelmintic and astringent have been ascribed to the bark the fruits are used in chronic dysentery, constipations; flowers are used as snuff to relieve headache, lotion for wounds and ulcers. Barks are used to increase fertility in women and known to have antiulcer activity (Shah et al., 2003).

Ripened fruits facilitates in burning urination. The ripe fruit pounded and mixed with water is given to promote delivery in childbirth. Powder of dried flowers is a brain tonic and useful as a snuff to relieve cephalalgia. Decoration of bark is used to wash the wounds. Fruits are used as astringent, coolant and anthelmintic. The tender stems are used as tooth brushes, and in cystorrhrea, diarrhea and dysentry. The seeds are used in constipation. A decoction of the bark of *Mimusops* is given as a gargling agent for diseases of gum and teeth and for infections in bladder and urethra, which are generally associated with *Staphylococcal* infections. Correspondingly the current study showed inhibition of *Staphylococcus* sp. by *Mimusops* bark extract. *Pseudomonas* strains cause skin infections (burn sites, wounds, sores and ulcers), urinary infections, respiratory infections, external ear infections and eye infections. A decoction of *T. purpurea* is prescribed in traditional medicinal systems for the
treatment of these conditions. Furthermore, the decoction of roots is believed to be efficacious against dyspepsia, chronic diarrhoea and colic. This indicates its possible role against coliforms revealed in this study. The absence of antibiotic activity in the water extracts (which were boiled) of *Tephrosia* could be due to heat sensitivity of the antibiotic compound.

The bark, flowers, fruit and seeds have great medicinal value. The plant is used both externally as well as internally. Bakula is used externally as a remedy for various odontopathies. Being an astringent and styptic, it is valuable aid in dental ailments like bleeding gums, pyorrhea, dental caries and loose teeth etc. In such conditions, the tender stems are used as tooth brushes or the powder of bark skin is used for cleansing the teeth. A popular combination of powders of its bark skin, roots of kantakari (*Solano xanthocarpum*), saireyaka (*Barleria prionitis*) leaves and skin of an almond fruit is burnt into ash and is used to cleanse the teeth and strengthen them. The gargles of decoction of its bark skin and that of khadira (*Acacia catechu*) are effective in bleeding and swollen gums. The unripe fruit is used as a masticatory and helps to fix loose teeth. The flowers are used for preparing a lotion for wounds and ulcers; the powder of dried flowers is a brain tonic and useful as a snuff to relieve cephalalgia. The extract of flowers is salutary in heart diseases as well. Internally the bark skin and flowers being astringent and styptic in properties are benevolent in leucorrhoea and menorrhagia. Bakula curbs premature ejaculations. It works well as an antiduretic in polyuria. It alleviates the toxins, hence useful as an anti toxin. The ripened fruit is rewarding as a general tonic in debility and also alleviates the burning sensation of body due to vitiated pitta dosa. The ripened fruits facilitate the urination and the squash prepared from them, alleviates burning micturition and helps elimination of urinary calculi.
**Histochemistry:**

Histochemical localization in different organs of the taxa under study was made, using methods described elsewhere. The initial presentation gives details about the occurrence of elastic content or secondary metabolites, Viz starch, protein, fat, tannin, saponin, glucoside and alkaloids in leaves and stem.

1) **Starch:**

Starch is the principal elastic substance of the protoplast. Starch is composed of long chain molecules, whose basic units are anhydrous glucose residues of the formula \( C_6H_{12}O_6 \). Starch has an ordinary arrangement of molecule and, therefore, shows optical anisotropy and double refraction. In starch granules the molecule is radially arranged, therefore, in polarized light a cross pattern is seen. The morphometric variation of starch grain is so extensive that they may be used taxonomically and pharmaconostically up to a limited extent (Kuster, 1956).

Starch deposition occurs widely in the plant body, but the particularly common places of its accumulation are seeds, the parenchyma of the secondary vascular tissue in wood and roots, tuber, rhizome and corms.

In the present work, for the taxa under study, starch was present in leaves and wood of all the taxa, Viz, *Butea monosperma* Lam (Table 4a and Plate 6) (*Madhuca indica* Gmel (Table 4b and Plate 14), *Syzygium cumini* Linn (Table 4c and Plate 22) *Mimusops elengi* Linn (Table 4d and Plate 30)

2) **Protein:**

Protein are the major constituents of the living protoplast, but they also occur as temporarily inactive elastic substance, Elastic protein is known as a storage material and is found deposited in amorphous and / or crystalline forms. Like starch and cellulose, crystalline protein combine crystalline and colloidal properties, therefore, the individual units of this material are spoken of as crystalloids (meaning crystal like) rather than as crystals.

This is also present in all the taxa under investigation. Protein were observed in the upper and lower epidermis, scattered cells of mesophyll of leaves, pith parenchyma and cortical parenchyma in the wood of *Butea monosperma* Lam (Table 4a and Plate 7),
Madhuca indica Gmel (Table 4b and Plate 15) Syzygium cumini Linn (Table 4c and Plate 23) and Mimusops elengi Linn (Table 4d and Plate 31)

3) Tannin:

Tannin is a heterogeneous group of phenol derivatives, usually related to glucosides. Tannins are particularly abundant in the leaves of much plant; in the xylem, in the testa of seeds and in pathological growth like galls (Kuster, 1956; Spelich, 1939). No tissue, however, appears to lack tannins entirely. They may be found in meristematic cells too. Sometimes tannins containing cells are conspicuously associated with a vascular tissue terminates beneath storage tissue or secretory cells of nectarines. The monocotyledons are notably poor in tannins (Sperlich, 1939).

Tannins also show distributions, occurring mostly in epidermis, mesophyll cortical as well as parenchymatous tissue, associated with conductive tissue. Tannins were observed in the leaves of Butea monosperma Lam (Table 4a and Plate 8) - Madhuca indica Gmel (Table 4b and Plate 16), Syzygium cumini Linn (Table 4c and Plate 24).and Mimusops elengi Linn (Table 4d and Plate)

4) Saponin:

The saponin are of rare occurrence and wherever present, they apparently remain to one or two organs. Saponin were observed in the mid-rib parenchyma of leaves and cortex and pith parenchyma of wood Butea monosperma Lam - Madhuca indica Gmel , Mimusops elengi Linn and Syzygium cumini Linn.

Saponin were observed in the cells of mesophyll and xylem parenchyma of wood of Butea monosperma Lam (Table 4a and Plate 9) Madhuca indica Gmel (Table 4b and Plate 17), Syzygium cumini Linn (Table 4c, Plate 25) and Mimusops elengi Linn (Table 4d and Plate33)

5) Fat:

Fat are widely distributed in the plant body, and they probably occur in small amounts in every plant cell. The term fat may be used to described not only the fats proper (that is, ester of fatty acids with glycerol), but also related substances grouped under the name of lipids (Seifriz, 1936).

As protoplast inclusion, fats are common reserve material in seeds, spores and embryos in meristematic cells and occasionally in differentiated tissue of the vegetable body
They occur as solid bodies or, more frequently, as fluid droplets of various size either dispersed in the cytoplasm or aggregated in large masses fatty substance are thought to be elaborated directly by the cytoplasm and also by leucoplast.

In taxa under study, fat was found in cells of mesophyll and phloem parenchyma (leaves and wood) of *Butea monosperma* Lam (Table 4a and Plate 10)- *Madhuca indica* Gmel (Table 4b and Plate 18), *Syzygium cumini* Linn (Table 4c and Plate 26) and *Mimusops elengi* Linn (Table 4d and Plate 34)

6) Glucoside:

Glucosides are the degradation production of carbohydrates glucosides were observed in the epidermis, pith parenchyma of leaves vascular bundles and scattered cells of medullary ray of wood *Butea monosperma* Lam (Table 4a and Plate 11)- *Madhuca indica* Gmel (Table 4b and Plate 19) *Syzygium cumini* Linn (Table 4c and Plate 27) and *Mimusops elengi* Linn (Table 4d and Plate 35)

7) Alkaloids:

Alkaloids are degradation of protein they were investigated by using two methods, namely; Mayer’s reagent and Wagner’s reagent. In Mayer’s reagent alkaloids were observed in the scattered cells of mesophyll of leaves and pith parenchyma of wood. In wanger’s reagent, alkaloids were found in the cells of mesophyll and cells of cortex parenchyma and pith parenchyma of wood of *Butea monosperma* Lam (Table 4a and Plate 12,13)- *Madhuca indica* Gmel (Table 4b and Plate 20,21), *Syzygium cumini* Linn (Table 4c and Plate 28,29) and *Mimusops elengi* Linn (Table 4d and Plate 36,37)
### Table - 4a

Histochemical test for fresh section of leaves and wood of *Butea monosperma* Lam

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<th>Leaves</th>
<th>Wood</th>
<th>Localization</th>
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<th>Wood</th>
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<td>+ve</td>
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<tr>
<td>2</td>
<td>Protein</td>
<td>-do-</td>
<td>-do-</td>
<td>Epidermis, Scattered cells of mesophyll, mid – rib Pith parenchyma</td>
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<tr>
<td>3</td>
<td>Tannin</td>
<td>-ve</td>
<td>-do-</td>
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<td>-----</td>
<td>, Scattered cells of Cortex and Pith parenchyma</td>
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<td>Saponin</td>
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<td>-do-</td>
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<td>Epidermis, Scattered cells of Cortex parenchyma, and Pith</td>
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<td>5</td>
<td>Fat</td>
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<td>-do-</td>
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<td>6</td>
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<td>a) Mayer’s reagent</td>
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<td>-do-</td>
<td>Cells of Mesophyll, Mid –rib</td>
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<td>b) Wagner’s reagent</td>
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<td>-do-</td>
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### Table - 4b

Histochemical test for fresh section of leaves and wood of *Madhuca indica* Gmel

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<td>-do-</td>
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<td>-do-</td>
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<td></td>
<td></td>
<td>Leaves</td>
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<td>Wood</td>
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<td>-do-</td>
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<td>-do-</td>
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<tr>
<td></td>
<td>b) Wagner’s reagent</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leaves</td>
<td>Epidermis, Scattered cells of cortical parenchyma, Medullary rays, and Vascular bundle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wood</td>
<td>-do-</td>
</tr>
</tbody>
</table>
Table - 4c
Histochemical test for fresh section of leaves and wood of *Syzygium cumini* Linn

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Ergastic content</th>
<th>Reaction</th>
<th>Localization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Leaves</td>
<td>Wood</td>
</tr>
<tr>
<td>1</td>
<td>Starch</td>
<td>†ve</td>
<td>†ve</td>
</tr>
<tr>
<td>2</td>
<td>Protein</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>3</td>
<td>Tannin</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>4</td>
<td>Saponin</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>5</td>
<td>Fat</td>
<td>†ve</td>
<td>-do-</td>
</tr>
<tr>
<td>6</td>
<td>Glucoside</td>
<td>†ve</td>
<td>†ve</td>
</tr>
<tr>
<td>7</td>
<td>Alkaloids</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>a) Mayer’s reagent</td>
<td>-do-</td>
<td>-do-</td>
<td>Upper epidermis Scattered cells of mesophyll, Mid rib pith parenchyma</td>
</tr>
<tr>
<td>b) Wagner’s reagent</td>
<td>-do-</td>
<td>-do-</td>
<td>Upper and lower cells of epidermis ,Pith parenchyma</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Ergastic content</td>
<td>Reaction</td>
<td>Localization</td>
</tr>
<tr>
<td>---------</td>
<td>------------------</td>
<td>----------</td>
<td>--------------</td>
</tr>
<tr>
<td></td>
<td>Leaves</td>
<td>Wood</td>
<td>Leaves</td>
</tr>
<tr>
<td>1</td>
<td>Starch</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Protein</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Tannin</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Saponin</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fat</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Glucoside</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Alkaloids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Mayer’s reagent</td>
<td>-do-</td>
<td>-do-</td>
<td>Epidermis and Mesophyll cells, Mid rib</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Wagner’s reagent</td>
<td>-do-</td>
<td>-do-</td>
<td>Epidermis, Scattered cell of mesophyll, Pith parenchyma</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Extractive Percentage:

Different plant species would obviously have different chemical profile. Chemical present in the plant material could be dissolved in different solvent for the purpose of further analysis. Therefore, three solvents –Water, alcohol and ether were selected to determine the soluble substance, this was again carried out in three seasons viz. summer, Monsoon and winter continuously for two years.

- **Butea monosperma Lam:**

  The summer collection of leaves showed higher content (4.3%) of water soluble extractive as compared to winter (3.6 %) and monsoon (3%). However, the summer sample of bark exhibited higher at summer (3.4 %) as compared to winter and Monsoon (Table-5a).

  In wood Summer shows higher content of extractive (2.25%) as compared to winter (1.75%) and Monsoon (1.15%).

  In summer collection of leaves (5.3%), bark (3.55%) and (2.35%) appeared significantly at 0.1% and 1% higher for alcohol soluble extractive over of monsoon and winter (Table)

  The range of ether soluble extractive in leaves ranged from 3.95 % to 2.95 %. Highest concentration being observed during summer season (3.95%) Ether soluble extractive of bark showed the ranged of (2.6 % to 3.15%) for three seasons tested. The wood seemed to be having concentration of (1.25% to 2.25%) ether soluble extractive when compared to leaves, and bark during two seasons examined. Generally, it was observed that the summer of leaves (3.95%), bark (3.15%) and wood (2.25%) showed significantly higher percentage of ether soluble extractive over that of monsoon and winter. The range of water alcohol and ether soluble extractive were found to be in increasing order of Wood< Bark<leaves, (Table 5a and Graph 1a)

- **Madhuca indica Gmel:**

  The water soluble extractive from leaves were comparatively raised in summer (4.6%) over that of monsoon (3.25%) and winter (3.55%) 1.95% to 2.55% of soluble extractive percentage was notice in wood during the different season tested ( Table-5b). In bark extractive percentage ranges from 2.2 % to 3.4 %, summer show higher 3.4% as compared to winter (2.2%) and monsoon (2.7%).
Leaves extracted with alcohol showed the concentration of 3.25 % to 4.85 %. During various seasons tested (Table 5b) Leaves appeared at significantly (at 1% levels based on ‘t’ test) at higher level 4.85% in alcohol soluble extractives. The summer bark accumulated maximum levels of soluble matter (i.e. 2.7%) over that of monsoon (1.85%) and winter (2.15%). The wood seemed to be comparatively low of alcohol soluble extractive (2.2 % to 3.25%).

The amount of ether soluble extractive is comparatively lower than the alcohol and water soluble extractive (Table). The ether soluble extractive percentage in leaves ranged from 2.3 % to 3.45 %. The bark ether soluble extractive maximum at summer (2.8%) as compared to winter (2.3%) and monsoon (1.6%). The wood exhibited low percentage of ether soluble extractive (1.2% to 1.95%) The range of water, alcohol and ether soluble extractive were found to be in increasing order of Wood< Bark<leaves. (Table 5b and Graph 1b)

Syzygium cumini Linn:

The water soluble extractive content was measured in the leaves of three seasons for two years (Table-5c) and found that the leaves stored (5.8%) significant concentration (significantly at 1% and 5%) of extractsive during summer. When compared to monsoon (4.25%) and winter (4.65%). Similarly, summer bark were able to maintain higher levels of water soluble extractive during summer (4.25%) over than of other season ( Table-5c ) . the wood exhibited ,comparatively low percentage of water soluble matter as compare to bark and leaves it ranges from (1.85%) to (2.4 %).

The alcohol soluble studies conducted in different season of two year period gave a clue that the summer collection of leaves and bark were the richest source ( significant at 1% levels based on ‘t’ test comparison) of alcohol soluble matter ( 6.7 % and 4.75% respectively) when compared to other season (Table) . Like water extractive of wood, the alcohol soluble matter of wood had low concentration among other plant parts tested in various seasons. It was commonly observed that the leaves and bark showed higher concentration (ranging from 4.65% to 3.8%) of ether soluble extractive over wood, which was similar to the water and alcohol extractive studies. (Table-5c)

The wood had comparatively showed very low level of 0.85% to 1.7% of ether soluble extractive. The range of water alcohol and ether soluble extractive were found to be in increasing order of Wood< Bark<leaves. (Table 5c and Graph 1c)
**Mimusops elengi Linn:**

The water soluble extractive content was measured in leaves of three seasons for two year (Table -5d) and found the leaves stored 4.45% of extractives during summer. When compared to monsoon (2.8% ) and winter ( 3.5% ), Similarly , summer bark were able to maintain higher level of water soluble extractives during summer (2.3%) over than other season ( Table-5d).

The alcohol soluble studies conducted in different season of two years. It ranges from 3.9% to 5.65%. The highest concentration being observed during summer 5.65 %, as compared to other season. In Bark low concentration of alcohol soluble extractive observed if ranges from 1.5% to 2.2% highest observed at summer season (2.2%) as compared to winter 1.85% and monsoon 1.5%.

Leaves extracted with ether showed the concentration of 2.35% to 3.85%. Highest concentration being observed during summer season (3.85%). Ether soluble extractive of bark showed the range of 1.245% to 1.88% for the three seasons tested. The Bark seemed to be poor concentration as compared to leaves.

The range of water alcohol and ether soluble extractive were found to be in increasing order of Bark<leaves. (Table 5d and Graph 1d)
Table – 5a

Determination of Extractive percentage of *Butea monosperma*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Water soluble extractive (%)</th>
<th>Alcohol soluble Extractive (%)</th>
<th>Ether soluble extractive (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2 year</td>
<td>mean</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>4.4</td>
<td>4.2</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>3.1</td>
<td>2.9</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>3.5</td>
<td>3.7</td>
<td>3.6</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>2.2</td>
<td>2.3</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>1.6</td>
<td>1.4</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>1.8</td>
<td>1.7</td>
<td>1.75</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>3.4</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>2.8</td>
<td>2.7</td>
<td>2.75</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>3.1</td>
<td>3.2</td>
<td>3.15</td>
</tr>
</tbody>
</table>
Extractive percentage of *Butea monosperma*

- **Season and plant parts:** Summer, Monsoon, Winter
- **Extractive types:** Water soluble, Alcohol soluble, Ether soluble

- **Graph No. – 1a**
Detail for the sample comparison and test of significance: - *Butea monosperma*

**Water soluble extractive**

Leaves

- L, S, is significantly different from L, M, at 1 % level based on ‘t’ test
- L, W, is significantly different from L, M, at 5 % level based on ‘t’ test
- L, S, is significantly different from L, W, at 1 % level based on ‘t’ test

Wood

- Wd, S, is significantly different from Wd, M, at 1 % level based on ‘t’ test
- Wd, W, is significantly different from Wd, M, at 1 % level based on ‘t’ test
- Wd, S, is significantly different from Wd, W, at 1 % level based on ‘t’ test

Bark

- B, S, is significantly different from B, M, at 1 % level based on ‘t’ test
- B, W, is significantly different from B, M, at 5 % level based on ‘t’ test
- B, S, is significantly different from B, W, at 1 % level based on ‘t’ test

**Alcohol Soluble extractive**

Leaves

- L, S, is significantly different from L, M, at 0.1 % level based on ‘t’ test
- L, W, is significantly different from L, M, at 10 % level based on ‘t’ test
- L, S, is significantly different from L, W, at 5 % level based on ‘t’ test
Wood

Wd, S, is significantly different from Wd, M, at 0.1% level based on ‘t’ test
Wd, W, is significantly different from Wd, M, at 5% level based on ‘t’ test
Wd, S, is significantly different from Wd, W, at 1% level based on ‘t’ test

Bark

B, S, is significantly different from B, M, at 1% level based on ‘t’ test
B, W, is significantly different from B, M, at 10% level based on ‘t’ test
B, S, is significantly different from B, W, at 5% level based on ‘t’ test

Ether soluble extractive

Leaves

L, S, is significantly different from L, M, at 1% level based on ‘t’ test
L, W, is significantly different from L, M, at 5% level based on ‘t’ test
L, S, is significantly different from L, W, at 0.1% level based on ‘t’ test

Wood

Wd, S, is significantly different from Wd, M, at 0.1% level based on ‘t’ test
Wd, W, is significantly different from Wd, M, at 10% level based on ‘t’ test
Wd, S, is significantly different from Wd, W, at 1% level based on ‘t’ test

Bark

B, S, is significantly different from B, M, at 5% level based on ‘t’ test
B, W, is significantly different from B, M, at 5% level based on ‘t’ test
B, S, is significantly different from B, W, at 5% level based on ‘t’ test
### Table – 5b

Determination of Extractive percentage of *Madhuca indica*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Water soluble extractive (%)</th>
<th>Alcohol soluble Extractive (%)</th>
<th>Ether soluble extractive (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 year</td>
<td>2 year</td>
<td>mean</td>
<td>1 year</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>4.5</td>
<td>4.7</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>3.1</td>
<td>3.4</td>
<td>3.25</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>3.5</td>
<td>3.6</td>
<td>3.55</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>2.6</td>
<td>2.5</td>
<td>2.55</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>1.9</td>
<td>2</td>
<td>1.95</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>2.4</td>
<td>2.2</td>
<td>2.3</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>3.2</td>
<td>3.6</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>2.1</td>
<td>2.3</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>2.6</td>
<td>2.8</td>
<td>2.7</td>
</tr>
</tbody>
</table>
Graph No. – 1b

Extractive percentage of *Madhuca indica*

<table>
<thead>
<tr>
<th>Season</th>
<th>Plant Parts</th>
<th>Water soluble extractive %</th>
<th>Alcohol soluble Extractive %</th>
<th>Ether soluble extractive %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>Leaves</td>
<td>4.5</td>
<td>3.5</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Wood</td>
<td>3.5</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Monsoon</td>
<td>Leaves</td>
<td>3.5</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Wood</td>
<td>2.5</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Winter</td>
<td>Leaves</td>
<td>2.5</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Wood</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Summer</td>
<td>Bark</td>
<td>2.5</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Monsoon</td>
<td>Bark</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Winter</td>
<td>Bark</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>
Detail for the sample comparison and test of significance:- *Madhuca indica*

**Water soluble extractive**

Leaves
- L, S, is significantly different from L, M at 1% level based on ‘t’ test
- L, W, is significantly different from L, M, at 10% level based on ‘t’ test
- L, S, is significantly different from L, W, at 1% level based on ‘t’ test

Wood
- Wd, S, is significantly different from Wd, M, at 1% level based on ‘t’ test
- Wd, W, is significantly different from Wd, M, at 5% level based on ‘t’ test
- Wd, S, is significantly different from Wd, W, at 10% level based on ‘t’ test

Bark
- B, S, is significantly different from B, M, at 5% level based on ‘t’ test
- B, W, is significantly different from B, M, at 5% level based on ‘t’ test
- B, S, is significantly different from B, W, at 5% level based on ‘t’ test

**Alcohol soluble extractive**

Leaves
- L, S, is significantly different from L, M, at 0.1% level based on ‘t’ test
- L, W, is significantly different from L, M, at 1% level based on ‘t’ test
- L, S, is significantly different from L, W, at 1% level based on ‘t’ test
Wood

Wd, S, is significantly different from Wd, M, at 1% level based on 't' test
Wd, W, is significantly different from Wd, M, at 5% level based on 't' test
Wd, S, is significantly different from Wd, W, at 10% level based on 't' test

Bark

B, S, is significantly different from B, M, at 1% level based on 't' test
B, W, is significantly different from B, M, at 5% level based on 't' test
B, S, is significantly different from B, W, at 1% level based on 't' test

Ether soluble extractive

Leaves

L, S, is significantly different from L, M, at 1% level based on 't' test
L, W, is significantly different from L, M, at non significant level based on 't' test
L, S, is significantly different from L, S, at 5% level based on 't' test

Wood

Wd, M, is significantly different from Wd, S, at 1% level based on 't' test
Wd, W, is significantly different from Wd, S, at 5% level based on 't' test
Wd, S, is significantly different from Wd, W, at 1% level based on 't' test

Bark

B, S, is significantly different from B, M, at 1% level based on 't' test
B, W, is significantly different from B, M, at 10% level based on 't' test
B, S, is significantly different from B, W, at 1% level based on 't' test
Table – 5c

Determination of Extractive percentage of *Syzygium cumini*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Water soluble extractive (%)</th>
<th>Alcohol soluble Extractive (%)</th>
<th>Ether soluble extractive (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2year</td>
<td>mean</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>5.8</td>
<td>5.8</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>4.2</td>
<td>4.3</td>
<td>4.25</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>4.5</td>
<td>4.8</td>
<td>4.65</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>2.1</td>
<td>2.7</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>1.9</td>
<td>1.8</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>2.2</td>
<td>2.1</td>
<td>2.15</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>4.1</td>
<td>4.4</td>
<td>4.25</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>2.8</td>
<td>2.9</td>
<td>2.85</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>3.2</td>
<td>3.3</td>
<td>3.25</td>
</tr>
</tbody>
</table>
Extractive percentage of *Syzygium cumini*

Season and plant parts

- Water soluble extractive %
- Alcohol soluble Extractive %
- Ether soluble extractive %
**Detail for the sample comparison and test of significance: --*Syzygium cumini***

**Water soluble extractive**

Leaves

L, S, is significantly different from L, M, at 0.1% level based on ‘t’ test

L, W, is significantly different from L, M, at 5% level based on ‘t’ test

L, S, is significantly different from L, W, at 1% level based on ‘t’ test

Wood

Wd, S, is significantly different from Wd, M, at 10% level based on ‘t’ test

Wd, S, is significantly different from Wd, M, at 5% level based on ‘t’ test

Wd, S, is significantly different from Wd, W, at non significant level based on ‘t’ test

Bark

B, S, is significantly different from B, M, at 1% level based on ‘t’ test

B, W, is significantly different from B, M, at 5% level based on ‘t’ test

B, S, is significantly different from B, M, at 1% level based on ‘t’ test

**Alcohol soluble extractive**

Leaves

L, S, is significantly different from L, M, at 1% level based on ‘t’ test

L, W, is significantly different from L, M, at 1% level based on ‘t’ test

L, S, is significantly different from L, M at 1% level based on ‘t’ test
Wood

Wd, S is significantly different from Wd, M at 1% level based on ‘t’ test
Wd, W is significantly different from Wd, M at 5% level based on ‘t’ test
Wd, S is significantly different from Wd, W at 1% level based on ‘t’ test

Bark

B, S is significantly different from B, W at 1% level based on ‘t’ test
B, W is significantly different from B, M at 5% level based on ‘t’ test
B, S is significantly different from B, W at 1% level based on ‘t’ test

Ether soluble extractive

Leaves

L, S is significantly different from L, M at 0.1% level based on ‘t’ test
L, W is significantly different from L, M at 1% level based on ‘t’ test
L, S is significantly different from L, W at 10% level based on ‘t’ test

Wood

Wd, S is significantly different from Wd, M at 1% level based on ‘t’ test
Wd, W is significantly different from Wd, M at 1% level based on ‘t’ test
Wd, S is significantly different from Wd, W at 5% level based on ‘t’ test

Bark

B, S is significantly different from B, M at 0.1% level based on ‘t’ test
B, W is significantly different from B, M at 5% level based on ‘t’ test
B, S is significantly different from B, W at 1% level based on ‘t’ test
## Table – 5d

Determination of Extractive percentage of *Mimusops elengi*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Water soluble extractive (%)</th>
<th>Alcohol soluble Extractive (%)</th>
<th>Ether soluble extractive (%)</th>
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<tr>
<td></td>
<td>1 year</td>
<td>2 year</td>
<td>mean</td>
<td>1 year</td>
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<tr>
<td>Leaves</td>
<td></td>
<td></td>
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<td></td>
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<tr>
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<td>Summer</td>
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<td>Monsoon</td>
<td>2.8</td>
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<tr>
<td></td>
<td>Winter</td>
<td>3.4</td>
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<td>3.5</td>
</tr>
<tr>
<td>Bark</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>2.4</td>
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</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>1.5</td>
<td>1.5</td>
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</tr>
<tr>
<td></td>
<td>Winter</td>
<td>1.6</td>
<td>1.5</td>
<td>1.55</td>
</tr>
</tbody>
</table>
Graph No. – 1d

Extractive percentage of *Mimusops elengi*

- **Summer Leaves**
  - Water soluble extractive (%)
  - Alcohol soluble extractive %
  - Ether soluble extractive %

- **Monsoon Leaves**
  - Water soluble extractive (%)
  - Alcohol soluble extractive %
  - Ether soluble extractive %

- **Winter Leaves**
  - Water soluble extractive (%)
  - Alcohol soluble extractive %
  - Ether soluble extractive %

- **Summer Bark**
  - Water soluble extractive (%)
  - Alcohol soluble extractive %
  - Ether soluble extractive %

- **Monsoon Bark**
  - Water soluble extractive (%)
  - Alcohol soluble extractive %
  - Ether soluble extractive %

- **Winter Bark**
  - Water soluble extractive (%)
  - Alcohol soluble extractive %
  - Ether soluble extractive %
Detail for the sample comparison and test of significance: *Mimusops elengi*

**Water soluble extractive**

Leaves

L, S, is significantly different from L, M, at 0.1% level based on ‘t’ test  
L, W, is significantly different from L, M, at 1% level based on ‘t’ test  
L, S, is significantly different from L, W, at 1% level based on ‘t’ test

Bark

B, S, is significantly different from B, M, at 1% level based on ‘t’ test  
B, W, is significantly different from B, M, at non significant level based on ‘t’ test  
B, S, is significantly different from B, W, at 1% level based on ‘t’ test

**Alcohol soluble extractive**

Leaves

L, S, is significantly different from L, M, at 1% level based on ‘t’ test  
L, W, is significantly different from L, M, at Non significant level based on ‘t’ test  
L, S, is significantly different from L, W, at 1% level based on ‘t’ test

Bark

B, S, is significantly different from B, M, at 5% level based on ‘t’ test  
B, W, is significantly different from B, M, at 5% based on ‘t’ test  
B, S, is significantly different from B, W at 1% level based on ‘t’ test
Ether soluble extractive

Leaves
L, S, is significantly different from L, M, at 0.1 % level based on 't' test
L, W, is significantly different from L, M, at 10% level based on 't' test
L, S, is significantly different from L, W, at 0.1% level based on 't' test

Bark
B, S is significantly different from B, W, at 1% level based on 't' test
B, W, is significantly different from B, M at non significant level based on 't' test
B, S, is significantly different from B, W at 5 % level based on 't' test.
Determination of Ash Value :-

A) Ash values of water solubility and insolubility :-

As values were determine with a purpose to find out the total amount of inorganic solutes present in the medicinal plant material. Quite a few herbal therapies make use of ash. It is very obvious that ash of any plant does not contain any organic material and therefore inorganic salts are used medicinally. It is also interesting to know about the different solubility of the components of ash. Therefore, the solubility of ash in water and hydrochloric acid was tested in the present study.

- **Butea monosperma Lam- (Palas)**

The total ash content of leaves ranges from 13.35% to 14.45%. Higher level during summer (14.45%), than winter (13.95%) and monsoon (13.35%). The total ash content of bark was higher level at summer (17.6%) than monsoon (15.3%) and winter (14.15%). The total ash content of wood was higher level at monsoon (8.15%) than summer (8.3%) and winter (8%) respectively. The percentage of total ash found to be in the increasing order of wood<leaves<bark.

The range of water soluble ash content of leaves was ranging from 3.4% to 3.7% highest solubility observed at winter 3.7%. Than summer 3.65% than monsoon 3.4%. Bark showed higher level of water soluble ash at monsoon 4.65% over than summer and winter (4.55%) and wood showed lower level of water soluble ash at both in monsoon and winter 2.7% than summer 2.35%.

The percentage of ash solubility in water to be increasing order as wood<leaves<bark.

The range of water insolubility ash content is highest them bark and wood it ranges from 9.9% to 10.25%, winter shows higher (10.25%) as compared to summer (10.8%) and monsoon (9.9%) In bark show higher level of water insolubility at summer 13.05% than monsoon 10.65% and winter 9.6%. The wood showes low water insolubility than leaves and bark it ranges from 5.3 to 5.95% summer season has higer value i.e 5.95% than other season.

The percentage of water insolubility to be in the increasing order of wood<leaves<bark. (Table 6a and Graph 2a)
● **Madhuca indica** Gmel – (Mahua)

Total ash content in leaves it ranges from 6.1% to 8.1% highest being observed in winter 8.1% than monsoon 7.15% and summer 6.1%. The bark had higher totals ash content at winter 16.65% as compared to monsoon 16.45 and summer 13.85. In wood total ash content higher at 16.25% than summer 14.61% and winter 12.5%. The percentage of total ash were found to be in the increasing order of leaves < wood < bark.

The water solubility of ash in leaves ranges from 2.6% to 4%. Monsoon (4%) show high ash solubility in water as compared to winter 2.8% and summer 2.6% respectively. Water solubility of ash content of bark was ranging from 6.3% to 6.65%. Highest being observed at winter 6.65% as compared to summer 6.55% and monsoon 6.3%. In wood summer show water solubility of ash at high level 4.9% as compared to monsoon 3.6% and winter 2.55%.

The percentage of water solubility of ash were found to be in the increasing order of leaves < wood < bark. (Table 6b).

The water insolubility of ash in leaves show higher level in winter 5.85% as compared to summer 3.55% and monsoon 3.15%.

The bark water insolubility of ash ranges from 7.25% to 10.1%. Higher insolubility observed at monsoon 10.1% than winter 10% and summer 7.25%.

The wood show highest water insolubility of ash as compared to bark and leaves it ranges from 9.7% to 12.65%. Higher insolubility observed in monsoon 12.65% than 9.95 and summer 9.7%.

The percentage of water insolubility of ash is increasing order of leaves < bark < wood. (Table 6b and Graph 2b)

● **Syzygium cumini** Linn (Jambul)

Total ash content of leaves was ranging from 6.5% to 7.65% among different season tested while summer leaves show high level of total ash 7.65% as compared to monsoon 7.4% and winter 6.5%. While in bark total ash ranges from 6.3% to 8.8%. Highest level of total ash observed at summer 8.8% than monsoon 7.8% and winter 6.3%. The wood total ash ranges from 5.3% to 6.85%. Higher level of total ash observed at summer 6.85% than monsoon 5.3% and winter 5.05%.
The percentage of total ash were found in the increasing order wood< bark< leaves.

The range of water solubility of ash content of leaves ranging from 0.8 to 2.75% highest level of water solubility observed at monsoon 2.75% as compared to winter 1.8% and summer 0.8%. Wood ash show lower level of water solubility ash content i.e. from 1.7% to 2.2% while Bark show highest level of water solubility ash content 2% to 3.15% higher ash solubility observed at winter 3.15% as compared to monsoon 2% and summer 2.55%.

The percentage of water solubility of ash were found to be in the increasing order of wood< leaves< bark.

The water insolubility of ash of leaves ranging from 4.65% to 6.85%. Summer show highest water insolubility of ash (6.85%) than winter (4.7%) than monsoon (4.65%). Bark show highest level of water insolubility of ash in summer (6.25%) than monsoon (5.8%) than winter (3.45%). Wood ash water insolubility show ranges from (3.1% to 5.15%) higher level observed at summer 5.15% than monsoon 3.1 and winter 3.5%

The percentage of water insolubility of ash were found be in the increasing order of leaves< wood<Bark. (Table 6c and Graph 2c)

- *Mimusops elengi* Linn (Bakul)

Total ash content of leaves ranges from 7.5 to 8.9%. Bark show higher level of total ash at 10.65% than winter 9.15% and summer 8.68%. Water solubility of ash of leaves show higher at 2.4% at summer than winter 2.35% and summer 2%. Bark show ash water solubility ranging from 2.45 to 3.5%. Water insolubility of ash of leaves ranges from 5.1% to 6.5% Higher level of water insolubility observed at summer 6.5% than monsoon 5.45% and winter 5.1% Bark show water insolubility highest at summer 7.15% as compared to winter 6.65% and summer 6.18% (Table 6d and Graph 2d)
B) Ash values of Acid solubility and insolubility :-

- **Butea monosperma Lam- (Palas)**

  Total ash of leaves range from 11.45% to 13.1% higher level of total ash show at summer (13.1%) than monsoon (11.45%) and winter (12.4%). Bark total ash showing at higher level at summer 11.15% as compared to monsoon 11.3% and winter 10.75%. Total ash of wood content show higher level at winter 16.5% than summer 14.95% and monsoon 14.65% The percentage of total ash were found to be in the increasing order of leaves< bark< wood.

  The range of acid soluble ash content of leaves was ranging from 8.45% to 9.45% among different season tested (Table-7a). Wood show higher level of acid solubility ash content (i.e.11.4 to 12.35%). Higher level show at summer (12.35%) than monsoon (11.3%) and winter (11.4%). Bark show higher level of ash soluble at summer and monsoon (9.3%) as compared to winter 7.2%.

  The percentage of acid solubility ash were found to be in the increasing order of leaves < bark< wood.

  Acid insoluble of ash of leaves was higher at summer3.65% as compared to winter 3.35% and monsoon 3%. The range of percentage of acid insoluble ash wood show higher than leaves (3.25% to 4.15%). Bark (1.85 %to 3.55%). In wood acid insoluble ash show higher level at summer 4.15% than monsoon 3.65% and winter 3.25%, while in bark highest acid solubility of ash at winter 3.55% than monsoon 2% and summer 1.85%

  The percentage of acid insoluble ash content were found to be in increasing order of bark< leaves< wood. (Table 7a and Graph 3a)

- **Madhuca indica** Gmel – (Mahua)

  It was generally observed that leaves and bark sample collected in various season showed highest ranges Bark (i.e. 9.6 to 12.45%) and leaves (i.e. 9.15% to 11.1%) of total ash content when compared to wood (i.e.7.3 to 8.6%) (Table -7b)

  The percentage of total ash content of leaves show highest level at summer 11.1% as compared to monsoon 10.65% and winter 9.15%. In bark total ash content observed higher level at summer 12.45% as compared to monsoon 11.1 % winter 9.6% while in wood total ash ranges from 7.3% to 8.6% highest level observe at winter 8.6% than summer 8.3% and monsoon 7.3%.
The percentage of total ash content where found to be in increasing order of Wood<Leaves< Bark.

The acid soluble ash of leaves was measures, summer (7.5%), monsoon (8.5%) and (4%) and found if maximum in monsoon (i.e. 8.5%). In wood acid soluble ash range from (4.9 to 6.45%), winter season show higher solubility i.e. 6.45%as compared to other season.

The bark acid soluble ash ranges from 5.35% to 8.5% higher being in summer 8.5%as compared to winter 5.35%and monsoon 6.55% The percentage of acid soluble of ash were found to be in the increasing order of Wood< leaves< bark.

The acid insoluble ash content of leaf was measure summer (3.6%), monsoon (2.15%) and winter (5.15%) and found its maximum in winter. The bark show acid insoluble as range from 3.95% to 4.55 %,higher level being observed in monsoon 4.55% as compared to winter 4.25 and summer 3.95% While in wood show very low acid insolubility of ash it measure at summer3.4%,monsoon 0.9% and winter 2.15% and found its maximum in summer.

The percentage of acid insolubility as were found to be in the increasing order of Wood< leaves<Bark. (Table 7b and Graph 3b)

- *Syzygium cumini* Linn (Jambul)

The total ash content of leaves range from (8.65% to 8.95%), higher level being during both season at summer and winter 8.95% than monsoon 8.65%. In bark acid soluble ash measure at summer 12.55%, monsoon 11.4%and winter 12.4 %, it found maximum in summer 12.55% while in wood observed that winter 10.4% maximum content of total ash as compared to monsoon 9.95 and summer 7.65% .

The percentage of total ash content were found to be in the increasing order of Wood< leaves< bark.

The Acid solubility of ash of leaves ranges from 4.1% to 8.05% as compared to monsoon 5.45 and winter 4.1%. In bark acid soluble ash ranges from 9.4%to 10.55%. Maximum solubility observed at summer 10.55% than monsoon 9.4% and summer 10.45%, Wood show acid soluble maximum at monsoon and summer similar i.e. 6.55% than winter 6.2% and summer 5.55%.The percentage of acid soluble ash content were found to be in increasing order of Wood<leaves<bark.

The acid insoluble ash concentration of leaves show maximum at winter 4.85% than monsoon 3.25% and summer 0.9%.The acid insoluble ash content of bark ranges from 1.95% to 2.0% maximum insolubility observed at summer and monsoon 2% .While percentage of
acid insolubility ash of wood was higher at winter 4.2% as compared to monsoon 3.25% and summer 2.1%. The percentage of acid insoluble as content were found to be in increasing order of Wood < leaves < Bark. (Table 7c and Graph 3c)

- *Mimusops elengi* Linn (Bakul)

  The total ash content of leaves from 7.1% to 8.95% Higher level observed as monsoon 8.95% than winter 7.75% and summer 7.1%, while bark show higher at summer (13.6%) and compared to monsoon (12.95%) and winter (10.65%). Acid solubility ash of leaves ranges from 5.5% to 6.55%. Higher level of acid solubility observed at monsoon 6.55% as compared to summer 6.45% and winter 5.5%. The percentage of acid solubility ash of bark was higher in monsoon (9.1%) as compared to both season i.e. summer and winter 8.45%

  The acid insolubility ash of leaves show maximum solubility at winter 2.4% and summer 0.7%. The percentage of acid insoluble ash of bark was higher in summer 5.15% as compared to monsoon 3.85% and winter 2.15%.

  The percentage of total ash, ash solubility of ash and acid insolubility of ash were found to be in the increasing order of leaves < Bark < respectively. (Table 7d and Graph 3d)
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<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Total Ash (%)</th>
<th>Water soluble (%)</th>
<th>Water insoluble (%)</th>
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<td></td>
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<td>1 year</td>
<td>2 year</td>
<td>Mean</td>
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<td>Leaves</td>
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<td>14.3</td>
<td>14.45</td>
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<td>13.6</td>
<td>13.35</td>
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<td>Winter</td>
<td>14.6</td>
<td>13.3</td>
<td>13.95</td>
</tr>
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<td>Wood</td>
<td>Summer</td>
<td>8.3</td>
<td>8.3</td>
<td>8.3</td>
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<td>Monsoon</td>
<td>8</td>
<td>8.3</td>
<td>8.15</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
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<td>15</td>
<td>15.3</td>
</tr>
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<td></td>
<td>Winter</td>
<td>14</td>
<td>14.3</td>
<td>14.15</td>
</tr>
</tbody>
</table>

Table - 6a

Determination of Ash Values of *Butea monosperma*
Graph – 2a

Total Ash, Water solubility and insolubility of *Butea monosperma*

- **Season and plant parts**
  - Summer
  - Monsoon
  - Winter
- **Plant parts**
  - Leaves
  - Wood
  - Bark

- **Graph Details**
  - **Total ash (%)**
  - **Water soluble (%)**
  - **Water insoluble (%)**
Detail for the sample comparison and test of significance: - *Butea monosperma*

**Total ash**

**Leaves**
- L, S, is significantly different from L, M, at 5 % level based on ‘t’ test
- L, W, is significantly different from L, M, at non significant level based on ‘t’ test
- L, S, is significantly different from L, W, at non significant level based on ‘t’ test

**Wood**
- Wd, S, is significantly different from Wd, M, at non significant level based on ‘t’ test
- Wd, M, is significantly different from Wd, W, at non significant level based on ‘t’ test
- Wd, S, is significantly different from Wd, M, at non significant level based on ‘t’ test

**Bark**
- B, S, is significantly different from B, W, at 5 % level based on ‘t’ test
- B, M, is significantly different from B, W, at 5 % level based on ‘t’ test
- B, S, is significantly different from B, M, at 10 % level based on ‘t’ test

**Water Solubility**

**Leaves**
- L, S, is significantly different from L, M, at 10 % level based on ‘t’ test
- L, W, is significantly different from L, M, at non significant level based on ‘t’ test
- L, W, is significantly different from L, S, at non significant level based on ‘t’ test
Wood

Wd, M, is significantly different from Wd, S, at 1% level based on ‘t’ test
Wd, M, is significantly different from Wd, S, at 5% level based on ‘t’ test
Wd, W, is significantly different from Wd, M, at non significant level based on ‘t’ test

Bark

B, S, is significantly different from B, W, at non significant level based on ‘t’ test
B, M, is significantly different from B, W, at non significant level based on ‘t’ test
B, M, is significantly different from B, S, at non significant level based on ‘t’ test

Water Insolubility

Leaves

L, S, is significantly different from L, M, at 5% level based on ‘t’ test
L, W, is significantly different from L, M, at non significant level based on ‘t’ test
L, S, is significantly different from L, W, at non significant level based on ‘t’ test

Wood

Wd, S, is significantly different from Wd, W, at 1% level based on ‘t’ test
Wd, M, is significantly different from Wd, W, at 5% level based on ‘t’ test
Wd, S, is significantly different from Wd, M, at 1% level based on ‘t’ test

Bark

B, S, is significantly different from B, W, at 5% level based on ‘t’ test
B, M, is significantly different from B, W, at 5% level based on ‘t’ test
B S, is significantly different from B, M, at 5% level based on ‘t’ test
Table – 6b

Determination of Ash Values of *Madhuca indica*

<table>
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<th>Plant parts</th>
<th>Season</th>
<th>Total Ash (%)</th>
<th>Water soluble (%)</th>
<th>Water insoluble (%)</th>
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<tbody>
<tr>
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<td></td>
<td>1 year</td>
<td>2year</td>
<td>mean</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
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<td>6</td>
<td>6.1</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>7.2</td>
<td>7.1</td>
<td>7.15</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
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<td>13.6</td>
<td>15.6</td>
<td>14.6</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>16.2</td>
<td>16.3</td>
<td>16.25</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>12.4</td>
<td>12.6</td>
<td>12.5</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>13</td>
<td>14.6</td>
<td>13.8</td>
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<tr>
<td></td>
<td>Monsoon</td>
<td>16.5</td>
<td>16.3</td>
<td>16.4</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>17.3</td>
<td>16</td>
<td>16.65</td>
</tr>
</tbody>
</table>
Graph – 2b

Total Ash, Water Solubility and insolubility of *Madhuca indica*

Season and plant parts

- Summer
- Monsoon
- Winter

- Leaves
- Wood
- Bark

- Total ash (%)
- Water soluble (%)
- Water insoluble (%)

Bar graph showing the total ash, water solubility, and insolubility for different seasons and plant parts of *Madhuca indica*.
Detail for the sample comparison and test of significance: - *Madhuca indica*

**Total Ash**

Leaves

L, M, is significantly different from L, S at 1% level based on ‘t’ test
L, W, is significantly different from L, S, at 1% level based on ‘t’ test
L, W, is significantly different from L, M, at 5% level based on ‘t’ test

Wood

Wd, M, is significantly different from Wd, W, at 0.1% level based on ‘t’ test
Wd, S, is significantly different from Wd, S, at 10% level based on ‘t’ test
Wd, M, is significantly different from Wd, S, at 10% level based on ‘t’ test

Bark

B, S, is significantly different from B, M, at 5% level based on ‘t’ test
B, W, is significantly different from B, S, at 5% level based on ‘t’ test
B, W, is significantly different from B, M, at non significant level based on ‘t’ test

**Water Solubility**

Leaves

L, M, is significantly different from L, S, at 1% level based on ‘t’ test
L, W, is significantly different from L, S, at 5% level based on ‘t’ test
L, M, is significantly different from L, M, at 10% level based on ‘t’ test
Wood

- Wd, S, is significantly different from Wd, W, at 5% level based on ‘t’ test
- Wd, M, is significantly different from Wd, W, at 5% level based on ‘t’ test
- Wd, S, is significantly different from Wd, M, at 10% level based on ‘t’ test

Bark

- B, S, is significantly different from B, M, at non significant level based on ‘t’ test
- B, W, is significantly different from B, M, at non significant level based on ‘t’ test
- B, W, is significantly different from B, S, at non significant level based on ‘t’ test

Water Insolubility

Leaves

- L, S is significantly different from L, M, at 1% level based on ‘t’ test
- L, W, is significantly different from L, M, at 1% level based on ‘t’ test
- L, S, is significantly different from L, S, at non significant level based on ‘t’ test

Wood

- Wd, M, is significantly different from Wd, S, at 5% level based on ‘t’ test
- Wd, W, is significantly different from Wd, S, at non significant level based on ‘t’ test
- Wd, M, is significantly different from Wd, W, at non significant level based on ‘t’ test

Bark

- B, M, is significantly different from B, S, at 5% level based on ‘t’ test
- B, W, is significantly different from B, S, at 10% level based on ‘t’ test
- B, M, is significantly different from B, W, at non significant level based on ‘t’ test
## Table – 6c

**Determination of Ash Values of *Syzygium cumini***

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Total Ash (%)</th>
<th>Water soluble (%)</th>
<th>Water insoluble (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2year</td>
<td>mean</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
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<td>8</td>
<td>7.65</td>
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<tr>
<td></td>
<td>Monsoon</td>
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<td>7.5</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>6.6</td>
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<td>6.5</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>6.8</td>
<td>6.9</td>
<td>6.85</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>5.6</td>
<td>5</td>
<td>5.3</td>
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<tr>
<td></td>
<td>Winter</td>
<td>4.9</td>
<td>5.2</td>
<td>5.05</td>
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<td>Summer</td>
<td>8.3</td>
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<td>8.3</td>
<td>7.3</td>
<td>7.8</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>6</td>
<td>6.6</td>
<td>6.3</td>
</tr>
</tbody>
</table>
Total Ash, Ash solubility and Ash insolubility in water of *Syzygium cumini*
**Detail for the sample comparison and test of significance:** *Syzygium cumini*

**Total Ash**

**Leaves**
- L, M, is significantly different from L, W, at 1 % level based on ‘t’ test
- L, S, is significantly different from L, W, at 5 % level based on ‘t’ test
- L, S, is significantly different from L, M, at non significant level based on ‘t’ test

**Wood**
- Wd, S, is significantly different from Wd, W, at 1 % level based on ‘t’ test
- Wd, S is significantly different from Wd, M, at 5 % level based on ‘t’ test
- Wd, M, is significantly different from Wd, W, at Non significant level based on ‘t’ test

**Bark**
- B, S, is significantly different from B, W, at 5 % level based on ‘t’ test
- B, M, is significantly different from B, W, at 5 % level based on ‘t’ test
- B, S, is significantly different from B, M, at non significant level based on ‘t’ test

**Water Solubility**

**Leaves**
- L, M, is significantly different from L, S, at 5 % level based on ‘t’ test
- L, W, is significantly different from L, S, at 10 % level based on ‘t’ test
- L, M, is significantly different from L, W, at non significant level based on ‘t’ test
Wood

Wd, M, is significantly different from Wd, S, at 5% level based on 't' test
Wd, S, is significantly different from Wd, M, at non significant level based on 't' test
Wd, S, is significantly different from Wd, M, at 5% level based on 't' test

Bark

B, W, is significantly different from B, M, at 5% level based on 't' test
B, S, is significantly different from B, M, at non significant level based on 't' test
B, W, is significantly different from B, S, at 5% level based on 't' test

Water Insolubility

Leaves

L, S, is significantly different from L, W, at 5% level based on 't' test
L, S, is significantly different from L, M, at 10% level based on 't' test
L, M, is significantly different from L, W, at non significant level based on 't' test

Wood

Wd, S, is significantly different from Wd, M, at 1% level based on 't' test
Wd, W, is significantly different from Wd, M, at 5% level based on 't' test
Wd, S, is significantly different from Wd, W, at 5% level based on 't' test

Bark

B, S, is significantly different from B, W, at 5% level based on 't' test
B, M, is significantly different from B, W, at 5% level based on 't' test
B, S, is significantly different from B, M, at non significant level based on 't' test
### Table – 6d

**Determination of Ash Values of *Mimusops elengi***

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Total Ash (%)</th>
<th>Water soluble (%)</th>
<th>Water insoluble (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2year</td>
<td>Mean</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>9.3</td>
<td>8.5</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>7.6</td>
<td>7.3</td>
<td>7.45</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>8</td>
<td>7</td>
<td>7.5</td>
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<tr>
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<td>Summer</td>
<td>8.36</td>
<td>9</td>
<td>8.68</td>
</tr>
<tr>
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<td>Monsoon</td>
<td>11</td>
<td>10.3</td>
<td>10.65</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>9.6</td>
<td>8.6</td>
<td>9.1</td>
</tr>
</tbody>
</table>
Graph – 2d

Total Ash, Ash solubility and Ash insolubility in Water of *Mimusops elengi*

Season and plant parts

- Summer
- Monsoon
- Winter

Leaves

Summer

Monsoon

Bark

Winter

<table>
<thead>
<tr>
<th></th>
<th>Total ash (%)</th>
<th>Water soluble (%)</th>
<th>Water insoluble (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
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</tr>
<tr>
<td>Monsoon</td>
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<td>Winter</td>
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<td></td>
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<tr>
<td>Summer</td>
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<tr>
<td>Monsoon</td>
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<td></td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Detail for the sample comparison and test of significance: - *Mimusops elengi*

**Total Ash**

Leaves

- L, S, is significantly different from L, W, at 5% level based on ‘t’ test
- L, S, is significantly different from L, W, at non significant level based on ‘t’ test
- L, W, is significantly different from L, M, at 1% level based on ‘t’ test

Bark

- B, M, is significantly different from B, S at 5% level based on ‘t’ test
- B, M, is significantly different from B, W, at 5% level based on ‘t’ test
- B, W, is significantly different from B, S, at non significant level based on ‘t’ test

**Water Solubility**

Leaves

- L, W, is significantly different from L, M, at 0.1% level based on ‘t’ test
- L, M, is significantly different from L, S, at 1% level based on ‘t’ test
- L, W, is significantly different from L, S, at 1% level based on ‘t’ test

Bark

- B, M, is significantly different from B, W, at 1% level based on ‘t’ test
- B, M, is significantly different from B, S, at 5% level based on ‘t’ test
- B, W, is significantly different from B, S, at non significant level based on ‘t’ test
Water Insolubility

Leaves
L, S, is significantly different from L, M, at 1 % level based on ‘t’ test
L, S, is significantly different from L, W, at 10 % level based on ‘t’ test
L, M, is significantly different from L, W, at non significant level based on ‘t’ test

Bark
B, M is significantly different from B, S, at 5 % level based on ‘t’ test
B, W, is significantly different from B, S, at non significant level based on ‘t’ test
B, M, is significantly different from B, W at non significant level based on ‘t’ test
Table 7a

Determination of Ash Values of *Butea monosperma*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Total Ash (%)</th>
<th></th>
<th>Acid soluble (%)</th>
<th></th>
<th>Acid insoluble (%)</th>
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<td>2year</td>
<td>mean</td>
<td>1 year</td>
<td>2year</td>
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<tr>
<td>Leaves</td>
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<td>9.3</td>
<td>9.6</td>
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<tr>
<td></td>
<td>Monsoon</td>
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<td>11.3</td>
<td>11.45</td>
<td>8.3</td>
<td>8.6</td>
<td>8.45</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>12.2</td>
<td>12.6</td>
<td>12.4</td>
<td>9</td>
<td>9.2</td>
<td>9.1</td>
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<td>12.4</td>
<td>12.3</td>
<td>12.35</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>15.3</td>
<td>14.6</td>
<td>14.95</td>
<td>11.3</td>
<td>11.3</td>
<td>11.3</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>14</td>
<td>15.3</td>
<td>14.65</td>
<td>11.1</td>
<td>11.7</td>
<td>11.4</td>
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<td>Summer</td>
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<td>9.2</td>
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<td>11</td>
<td>11.6</td>
<td>11.3</td>
<td>9</td>
<td>9.6</td>
<td>9.3</td>
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<td></td>
<td>Winter</td>
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<td>10</td>
<td>10.75</td>
<td>7</td>
<td>7.4</td>
<td>7.2</td>
</tr>
</tbody>
</table>
Graph – 3a

Total Ash, Ash solubility and Ash insolubility in acid of *Butea monosperma*

Season plant parts
- Summer
- Monsoon
- Winter

Plant parts
- Leaves
- Stem
- Bark

Key:
- Total ash (%)
- Acid soluble (%)
- Acid insoluble (%)
Detail for the sample comparison and test of significance:- *Butea monosperma*

**Total ash**

**Leaves**
- L, S, is significantly different from M, at 5% level based on ‘t’ test
- L, W, is significantly different from L, M, at 5% level based on ‘t’ test
- L, S, is significantly different from L, M, at non significant level based on ‘t’ test

**Wood**
- Wd, S, is significantly different from Wd, W, at 5% level based on ‘t’ test
- Wd, S, is significantly different from Wd, M, at 5% level based on ‘t’ test
- Wd, M, is significantly different from Wd, W, at non significant level based on ‘t’ test

**Bark**
- B, S, is significantly different from B, M, at non significant level based on ‘t’ test
- B, S, is significantly different from B, M, at non significant level based on ‘t’ test
- B, M, is significantly different from B, W, at non significant level based on ‘t’ test

**Ash Solubility**

**Leaves**
- L, S, is significantly different from L, M, at 5% level based on ‘t’ test
- L, M, is significantly different from L, W, at 5% level based on ‘t’ test
- L, M, is significantly different from L, W, at 10% level based on ‘t’ test
Wood
   Wd, S, is significantly different from Wd, M, at 0.1% level based on 't' test
   Wd, S, is significantly different from Wd, M, at 5% level based on 't' test
   Wd, M, is significantly different from Wd, W at non significant level based on 't' test

Bark
   B, M, is significantly different from B, W, at 1% level based on 't' test
   B, S, is significantly different from B, W, at 1% level based on 't' test
   B, S, is significantly different from B, M, at non significant level based on 't' test

Ash Insolubility

Leaves
   L, S, is significantly different from L, M, at non significant level based on 't' test
   L, W, is significantly different from L, S, at non significant level based on 't' test
   L, S, is significantly different from L, M, at non significant level based on 't' test

Wood
   Wd, S, is significantly different from Wd, W, at 5% level based on 't' test
   Wd, M, is significantly different from Wd, W, at non significant level based on 't' test
   Wd, S, is significantly different from Wd, M, at non significant level based on 't' test

Bark
   B, W, is significantly different from B, S, at 10% level based on 't' test
   B, W, is significantly different from B, M, at 10% level based on 't' test
   B, S, is significantly different from B, M, at non significant level based on 't' test
<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Total Ash (%)</th>
<th>Acid soluble (%)</th>
<th>Acid insoluble (%)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1 year</td>
<td>2 year</td>
<td>Mean</td>
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<tr>
<td>Leaves</td>
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<td>11.2</td>
<td>11.1</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>10.3</td>
<td>11</td>
<td>10.65</td>
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<td></td>
<td>Winter</td>
<td>9.3</td>
<td>9</td>
<td>9.15</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>8.3</td>
<td>8.3</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>7</td>
<td>7.6</td>
<td>7.3</td>
</tr>
<tr>
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<td>Winter</td>
<td>8.6</td>
<td>8.6</td>
<td>8.6</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>12.2</td>
<td>12.7</td>
<td>12.45</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>11</td>
<td>11.2</td>
<td>11.1</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>9.6</td>
<td>9.6</td>
<td>9.6</td>
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</tbody>
</table>
Graph – 3b

Total Ash, Ash solubility, and Ash insolubility in acid of *Madhuca indica*

<table>
<thead>
<tr>
<th>Season and plant parts</th>
<th>Total ash (%)</th>
<th>Acid soluble (%)</th>
<th>Acid insoluble (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer Leaves</td>
<td>10</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Monsoon Leaves</td>
<td>12</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Winter Leaves</td>
<td>11</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Summer Stem</td>
<td>9</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Monsoon Stem</td>
<td>10</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Winter Stem</td>
<td>12</td>
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<td>4</td>
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<td>Summer Bark</td>
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<tr>
<td>Monsoon Bark</td>
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<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Winter Bark</td>
<td>12</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>
Detail for the sample comparison and test of significance: - *Madhuca indica*

**Total Ash**

Leaves

- L, S, is significantly different from L, W, at 1 % level based on ‘t’ test
- L, M, is significantly different from L, W, at 5 % level based on ‘t’ test
- L, S, is significantly different from L, M, at non significant level based on ‘t’ test

Wood

- Wd, S, is significantly different from Wd, M, at 5 % level based on ‘t’ test
- Wd, W, is significantly different from Wd, M, at 5 % level based on ‘t’ test
- Wd, W, is significantly different from Wd, S, at non significant level based on ‘t’ test

Bark

- B, S, is significantly different from B, W, at 1 % level based on ‘t’ test
- B, M, is significantly different from B, W, at 1 % level based on ‘t’ test
- B, S, is significantly different from B, M, at 5 % level based on ‘t’ test

**Acid Solubility**

Leaves

- L, S, is significantly different from L, W, at 1 % level based on ‘t’ test
- L, M, is significantly different from L, W, at 1 % level based on ‘t’ test
- L, M, is significantly different from L, S, at 5 % level based on ‘t’ test
Wood
Wd, M, is significantly different from Wd, S, at 5% level based on ‘t’ test
Wd, W, is significantly different from Wd, S, at 5% level based on ‘t’ test
Wd, W, is significantly different from Wd, M, at non significant level based on ‘t’ test

Bark
B, S, is significantly different from B, W, at 1% level based on ‘t’ test
B, M, is significantly different from B, W, at 5% level based on ‘t’ test
B, S, is significantly different from B, M, at 5% level based on ‘t’ test

**Acid Insolubility**
Leaves
L, W, is significantly different from L, M, at 1% level based on ‘t’ test
L, S, is significantly different from L, M, at 5% level based on ‘t’ test
L, W, is significantly different from L, S, at 5% level based on ‘t’ test

Wood
Wd, S, is significantly different from Wd, W, at 5% level based on ‘t’ test
Wd, M, is significantly different from Wd, W, at non significant level based on ‘t’ test
Wd, S, is significantly different from Wd, M, at 10% level based on ‘t’ test

Bark
B, M, is significantly different from B, S, at 5% level based on ‘t’ test
B, W, is significantly different from B, S, at non significant level based on ‘t’ test
B, M, is significantly different from B, W, at non significant level based on ‘t’ test
### Table – 7c

**Determination of Ash Values of *Syzygium cumini***

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Total Ash (%)</th>
<th>Acid soluble (%)</th>
<th>Acid insoluble (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2year</td>
<td>Mean</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>9.3</td>
<td>8.6</td>
<td>8.95</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>8</td>
<td>9.3</td>
<td>8.65</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>8.3</td>
<td>9.6</td>
<td>8.95</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>8</td>
<td>7.3</td>
<td>7.65</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>10.2</td>
<td>9.6</td>
<td>9.9</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>10.6</td>
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<td>Bark</td>
<td>Summer</td>
<td>13</td>
<td>12.1</td>
<td>12.55</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>11.3</td>
<td>11.5</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>12.3</td>
<td>12.5</td>
<td>12.4</td>
</tr>
</tbody>
</table>
Graph – 3c

Total Ash, Ash solubility and Ash insolubility in acid of *Syzygium cumini*

Season and plant parts

- **Total ash (%)**
- **Acid soluble (%)**
- **Acid insoluble (%)**
Detail for the sample comparison and test of significance: *Syzygium cumini*

**Total Ash**

Leaves

- L, S, is significantly different from L, M, at 5% level based on 't' test
- L, W, is significantly different from L, M, at 1% level based on 't' test
- L, S, is significantly different from L, W, at non significant level based on 't' test

Wood

- Wd, W, is significantly different from Wd, S, at 1% level based on 't' test
- Wd, M, is significantly different from Wd, S, at 5% level based on 't' test
- Wd, W, is significantly different from Wd, M, at non significant level based on 't' test

Bark

- B, S, is significantly different from B, M, at 1% level based on 't' test
- B, W, is significantly different from B, M, at 5% level based on 't' test
- B, S, is significantly different from B, W, at non significant level based on 't' test

**Acid Solubility**

Leaves

- L, S, is significantly different from L, W, at 0.1% level based on 't' test
- L, M, is significantly different from L, W, at 1% level based on 't' test
- L, S, is significantly different from L, M, at 1% level based on 't' test
Wood

Wd, M, is significantly different from Wd, S, at 1% level based on 't' test
Wd, W, is significantly different from Wd, S, at 5% level based on 't' test
Wd, M, is significantly different from Wd, W, at 5% level based on 't' test

Bark

B, S, is significantly different from B, M at 1% level based on 't' test
B, W, is significantly different from B, S, at 5% based on 't' test
B, M, is significantly different from B, W, at non significant level based on 't' test

**Acid Insolubility**

Leaves

L, M, is significantly different from L, S, at 5% level based on 't' test
L, W, is significantly different from L, S, at non significant level based on 't' test
L, W, is significantly different from L, M, at non significant level based on 't' test

Wood

Wd, W, is significantly different from Wd, S, at 5% level based on 't' test
Wd, M, is significantly different from Wd, W, at 5% level based on 't' test
Wd, M, is significantly different from Wd, S, at 10% level based on 't' test

Bark

B, S, is significantly different from B, M, at non significant level based on ‘t’ test
B, W, is significantly different from B, M, non significant level based on ‘t’ test
B, S, is significantly different from B, W, at non significant level based on ‘t’ test
Table – 7d
Determination of Ash Values of *Mimusops elengi*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Total Ash (%)</th>
<th>Acid soluble (%)</th>
<th>Acid insoluble (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2year</td>
<td>Mean</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>7.3</td>
<td>6.9</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>9.3</td>
<td>8.6</td>
<td>8.95</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>7.2</td>
<td>8.3</td>
<td>7.75</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>13.2</td>
<td>14</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>13.3</td>
<td>12.6</td>
<td>12.95</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>11.6</td>
<td>9.6</td>
<td>10.6</td>
</tr>
</tbody>
</table>
Total Ash, Ash solubility and Ash insolubility in acid of *Mimusops elengi*

Season and plant parts:
- Total ash (%)
- Acid soluble (%)
- Acid insoluble (%)

Graph – 3d
Detail for the sample comparison and test of significance: *Mimusops elengi*

**Total Ash**

Leaves

L, M, is significantly different from L, S, at 5% level based on ‘t’ test

L, M, is significantly different from L, W, at 10% level based on ‘t’ test

L, M, is significantly different from L, W, non significant at level based on ‘t’ test

Bark

B, S, is significantly different from W, at 5% level based on ‘t’ test

B, M, is significantly different from B, W, at 10% level based on ‘t’ test

B, S, is significantly different from B, M, at non significant level based on ‘t’ test

**Acid Solubility**

Leaves

L, M, is significantly different from L, S, at 1% level based on ‘t’ test

L, W, is significantly different from L, S, at 10% level based on ‘t’ test

L, M, is significantly different from L, S, at non significant level based on ‘t’ test

Bark

B, W, is significantly different from B, S, at non significant level based on ‘t’ test

B, W, is significantly different from B, S, at non significant level based on ‘t’ test

B, M, is significantly different from B, W, at non significant level based on ‘t’ test
Acid Insolubility

Leaves

L, M, is significantly different from L, S, at 1% level based on 't' test
L, W, is significantly different from L, S, at 5% level based on 't' test
L, W, is significantly different from L, M, at 5% level based on 't' test

Bark

B, S, is significantly different from B, W at 10% level based on 't' test
B, M, is significantly different from B, W, at no significant level based on 't' test
B, S, is significantly different from B, M, at non significant level based on 't' test
**Lipid and Alkaloids:**

The estimation of lipid and alkaloid content was carried out in different parts like leaves, bark and wood of four taxa during summer, monsoon and winter for two consecutive years.

- **Butea monosperma Lam.**

  The lipid concentration of leaves was higher in summer (25.95 mg/gm) (Significant at 1% and 5% levels based on ‘t’test) over that of monsoon (22.5 mg/gm) and winter (24.25 mg/gm). The bark of lipid concentration was ranging from 18.35 to 19.85mg/gm and significantly higher in summer (19.85 mg/gm) (Table- 8a) the lipid content of wood was comparatively low (9.7 to 10.45 mg/gm)

  The alkaloids content of leaves was ranging from 1.55mg/gm to 2.15 mg/gm and attained its peak concentration (2.15 mg/gm) during summer season. Alkaloids range content was from 1 mg/gm to 1.5 mg/gm in bark and from 1.25 to 1.85 mg/gm in wood during the three seasons tested. Highest concentration observed in summer season i.e. 1.5 mg/gm and 1.85 mg/gm in bark and wood respectively.

  The lipid and alkaloids content were in increasing order from bark<wood<leaves. (Table8a and Graph 4a).

- **Madhuca indica Gmel:**

  The Madhuca indica had stored more Lipid (12.55 to15.8 mg/gm) in leaves over that of monsoon (12.55 mg/gm) and winter (14.55 mg/gm).In bark highest concentration was observes in summer (8.3 mg/gm) over than in monsoon and winter respectively. And in Wood show very low concentration range from 1.3 to 2.2 mg/gm.

  The alkaloids content of leaves was higher in summer (1.85mg/gm) (significantly at 0.1 and 1 % levels based on ‘t’ test) than the monsoon (1.45 mg/gm) and winter (1.6 mg/gm).

  Similarly, the alkaloids content of bark was higher (significantly different at 5 %from others based on ‘t’ test) in summer (1.4 mg/gm) over that of monsoon (1.05 mg/gm) and winter (1.275 mg/gm).

  The wood witnessed very low alkaloids contents if ranging from 0.45 to 0.8 mg/gm. The lipid and alkaloids content were in increasing order from wood<bark<leaves (Table) (Table8b and Graph 4b)
● *Syzygium cumini* Linn:

The lipid content of leaves was higher (significantly different other than 1% level based on ‘t’ test in summer (27.475 mg/gm) over than monsoon (24.45 mg/gm) and winter (26.55 mg/gm) (Table-8c). The range of lipid content of bark was from 13.15 to 16.3 mg/gm. Highest level in bark was being observed during summer (16.3 mg/gm). The wood was poor in having lipid content (from 5.65 to 8.05 mg/gm).

*Syzygium cumini* accumulated highest level of alkaloids in its leaves over than bark and wood, and these trends of observation were similar to *Butea monosperma* and *Madhuca indica* – throughout the course if investigation.

The lipid and alkaloids content were in increasing order from wood<bark<leaves. (Table 8c and Graph 4c)

● *Mimusops elengi* Linn:

The lipid concentration of leaves was higher in summer (32.7 mg/gm) over that of monsoon (29.75 mg/gm) and winter (30.7 mg/gm). The bark of lipid concentration was ranging from 13.5 to 16.8 mg/gm). Summer (16.8 mg/gm) show highest content over other season i.e. monsoon (13.5 mg/gm) and winter (14.7 mg/gm).

The alkaloids contents of leaves ranging from 0.8 to 2.6 mg/gm. Highest content of alkaloid observed at summer (2.6 mg/gm) over than monsoon (0.8 mg/gm) and winter (1.8 mg/gm) respectively. (Table 8d) Bark range of alkaloids from low concentration than leaves from 1.15 to 1.6 mg/gm).

The lipid and alkaloids content were in increasing order from wood<bark<leaves. (Table 8d and Graph 4d)
Table – 8a
Seasonal variation of some organic constituents levels of different plants parts of *Butea monosperma*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Lipid (mg/g dry wt)</th>
<th>Alkaloids (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2 year</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>26.4</td>
<td>25.5</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>22.3</td>
<td>22.7</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>23.8</td>
<td>24.7</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>10.4</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>9.3</td>
<td>9.2</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>9.8</td>
<td>9.6</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>20.1</td>
<td>19.6</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>18.3</td>
<td>18.4</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>19.2</td>
<td>19.6</td>
</tr>
</tbody>
</table>
Graph No. – 4a

Lipid and Alkaloids of *Butea monosperma*

<table>
<thead>
<tr>
<th>Season</th>
<th>Plant Part</th>
<th>Lipid (mg/g dry wt)</th>
<th>Alkaloids (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>Leaves</td>
<td>27</td>
<td>1.5</td>
</tr>
<tr>
<td>Monsoon</td>
<td>Leaves</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>Winter</td>
<td>Leaves</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td>Summer</td>
<td>Wood</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Monsoon</td>
<td>Wood</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>Winter</td>
<td>Wood</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>Summer</td>
<td>Bark</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Monsoon</td>
<td>Bark</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>Winter</td>
<td>Bark</td>
<td>16</td>
<td>4</td>
</tr>
</tbody>
</table>
Detail for the sample comparison and test of significance: *Butea monosperma*

**Lipid**

**Leaves**
- L, S, is significantly different from L, M, at 1% level based on ‘t’ test
- L, W, is significantly different from L, M, at 5% level based on ‘t’ test
- L, S, is significantly different from L, W, at 5% level based on ‘t’ test

**Wood**
- Wd, S, is significantly different from Wd, M, at 1% level based on ‘t’ test
- Wd, W, is significantly different from Wd, M, at 5% level based on ‘t’ test
- Wd, S, is significantly different from Wd, W, at 1% level based on ‘t’ test

**Bark**
- B, S, is significantly different from B, M, at 1% level based on ‘t’ test
- B, W, is significantly different from B, M, at 5% level based on ‘t’ test
- B, S, is significantly different from B, W, at non significant level based on ‘t’ test
**Alkaloids**

**Leaves**
- L, S, is significantly different from L, M, at 1% level based on ‘t’ test
- L, W, is significantly different from L, M, at 5% level based on ‘t’ test
- L, S, is significantly different from L, W, at 5% level based on ‘t’ test

**Wood**
- Wd, S, is significantly different from Wd, M, at 1% level based on ‘t’ test
- Wd, W, is significantly different from Wd, M, at 5% level based on ‘t’ test
- Wd, S, is significantly different from Wd, W, at 1% level based on ‘t’ test

**Bark**
- B, S, is significantly different from B, M, at 5% level based on ‘t’ test
- B, W, is significantly different from B, M, at 10% level based on ‘t’ test
- B, S, is significantly different from B, W, at 10% level based on ‘t’ test
Table – 8b
Seasonal variation of some organic constituents levels of different plants parts of *Madhuca indica*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Lipid (mg/g dry wt)</th>
<th>Alkaloids (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2year</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>16</td>
<td>15.6</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>12.5</td>
<td>12.6</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>14.5</td>
<td>14.6</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>2.1</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>1.1</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>1.9</td>
<td>1.8</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>8.4</td>
<td>8.2</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>5.52</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>7.3</td>
<td>6.9</td>
</tr>
</tbody>
</table>
Graph No. - 4b

Lipid and Alkaloids of *Madhuca indica*

Season and plant parts:
- Leaves
- Stem
- Bark

<table>
<thead>
<tr>
<th>Season</th>
<th>Leaves</th>
<th>Stem</th>
<th>Bark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monsoon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lipid (mg./g dry wt) and Alkaloids (mg./g dry wt)
Detail for the sample comparison and test of significance: - *Madhuca indica*

**Lipid**

**Leaves**

- $L, S,$ is significantly different from $L, M$ at 1% level based on ‘t’ test
- $L, W,$ is significantly different from $L, M,$ at 0.1% level based on ‘t’ test
- $L, S,$ is significantly different from $L, W,$ at 1% level based on ‘t’ test

**Wood**

- $Wd, S,$ is significantly different from $Wd, M,$ at 5% level based on ‘t’ test
- $Wd, W,$ is significantly different from $Wd, M,$ at 5% level based on ‘t’ test
- $Wd, S,$ is significantly different from $Wd, W,$ at 5% level based on ‘t’ test

**Bark**

- $B, S,$ is significantly different from $B, M,$ at 1% level based on ‘t’ test
- $B, W,$ is significantly different from $B, M,$ at 5% level based on ‘t’ test
- $B, S,$ is significantly different from $B, W,$ at 5% level based on ‘t’ test
Alkaloids

Leaves
L, S, is significantly different from L, M, at 5 % level based on ‘t’ test
L, W, is significantly different from L, M, at 5 % level based on ‘t’ test
L, S, is significantly different from L, W, at 5 % level based on ‘t’ test

Wood
Wd, S, is significantly different from Wd, M, at 1% level based on ‘t’ test
Wd, W, is significantly different from Wd, M, at 5 % level based on ‘t’ test
Wd, S, is significantly different from Wd, W, at 5 % level based on ‘t’ test

Bark
B, S, is significantly different from B, M, at 1 % level based on ‘t’ test
B, W, is significantly different from B, M, at 5 % level based on ‘t’ test
B, S, is significantly different from B, W, at 5 % level based on ‘t’ test
Table – 8c
Seasonal variation of some organic constituents levels of different plants parts of *Syzygium cumini*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Lipid (mg/g dry wt)</th>
<th>Alkaloids (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2 year</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>27.3</td>
<td>27.65</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>24.3</td>
<td>24.6</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>26.3</td>
<td>26.8</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>8.5</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>5.5</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>6.5</td>
<td>6.4</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>16</td>
<td>16.6</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>13.3</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>14.6</td>
<td>15</td>
</tr>
</tbody>
</table>
Graph No. - 4c

Lipid and Alkaloids of Syzygium cumini

mg/gm dry wt

Season and plant parts
- Summer
- Monsoon
- Winter
- Leaves
- Stem
- Bark

Lipid (mg./g dry wt)  Alkaloids (mg./g dry wt)
Detail for the sample comparison and test of significance: - *Syzygium cumini*

**Lipid**

**Leaves**

L, S, is significantly different from L, M, at 1 % level based on ‘t’ test

L, W, is significantly different from L, M, at 1 % level based on ‘t’ test

L, S, is significantly different from L, W, at 5 % level based on ‘t’ test

**Wood**

Wd, S, is significantly different from Wd, M, at 5 % level based on ‘t’ test

Wd, S, is significantly different from Wd, M, at 5 % level based on ‘t’ test

Wd, S, is significantly different from Wd, W, at 5 % level based on ‘t’ test

**Bark**

B, S, is significantly different from B, M, at 1 % level based on ‘t’ test

B, W, is significantly different from B, M, at 1 % level based on ‘t’ test

B, S, is significantly different from B, M, at 5 % level based on ‘t’ test
Alkaloids

Leaves
L, S, is significantly different from L, M, at 1 % level based on 't' test
L, W, is significantly different from L, M, at 5% level based on 't' test
L, S is significantly different from L, M, at 5 %level based on 't' test

Wood
Wd, S is significantly different from Wd, M at 1 % level based on 't' test
Wd, W, is significantly different from Wd, M, at 5% level based on 't' test
Wd, S is significantly different from Wd, W, at 1 %level based on 't' test

Bark
B, S is significantly different from B, W, at 5 % level based on 't' test
B, W is significantly different from B, M, at 5% level based on 't' test
B, S is significantly different from B, W, at 5 % level based on 't' test
Table – 8d

Seasonal variation of some organic constituents levels of different plants parts of *Mimusops elengi*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Lipid (mg/g dry wt)</th>
<th>Alkaloids (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2 year</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>32.6</td>
<td>32.8</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>29.7</td>
<td>29.8</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>30.2</td>
<td>31.2</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>17.8</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>13.6</td>
<td>13.4</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>14.6</td>
<td>14.8</td>
</tr>
</tbody>
</table>
Graph No. - 4d

Lipid and Alkaloids of *Mimusops elengi*

<table>
<thead>
<tr>
<th></th>
<th>Leaves</th>
<th>Bark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipid (mg/g dry wt)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alkaloids (mg/g dry wt)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Season and plant parts:
- Summer
- Monsoon
- Winter
Detail for the sample comparison and test of significance:- *Mimusops elengi*

**Lipid**

**Leaves**
L, S, is significantly different from L, M, at 0.1% level based on ‘t’ test
L, W, is significantly different from L, M, at 10 % level based on ‘t’ test
L, S, is significantly different from L, W, at 5 % level based on ‘t’ test

**Bark**
B, S, is significantly different from B, M, at 5 % level based on ‘t’ test
B, W, is significantly different from B, M, at 1 % based on ‘t’ test
B, S, is significantly different from B, W, at 10 % level based on ‘t’ test

**Alkaloids**

**Leaves**
L, W, is significantly different from L, M, at 1 % level based on ‘t’ test
L, W, is significantly different from L, M, at no significant level based on ‘t’ test
L, S, is significantly different from L, W, at 5 % level based on ‘t’ test

**Bark**
B, S, is significantly different from B, M, at 1 % level based on ‘t’ test
B, W, is significantly different from B, M, at 5 % based on ‘t’ test
B, S, is significantly different from B, W at no significant level based on ‘t’ test
Total Carbohydrates:

Carbohydrates are made of carbon, hydrogen and oxygen in accordance with the empirical formula \((\text{CH}_2\text{O})_n\) are of special importance because they direct product of photosynthesis therefore the primary substance from which most other the primary energy storage compound and the basic organic compound found in plant synthesized...

- **Butea monosperma** Lam- (Palas)

  Leaves and bark harvested during the summer, monsoon and winter showed almost identical range of Starch, total sugar and total carbohydrates, throughout the year (Table 9a).

  The leaves were the richest source of starch content 4.79% to 6.15% as compared to bark 1.41% to 4.32% and wood 3.43% to 5.43%

  The range of total carbohydrates content in leaves was from 7.58% to 10.74% leaves harvest during the summer showed maximum level off total carbohydrates i.e. (10.74%). The total carbohydrates concentration of bark was higher in summer (6.35%) over that of winter (5.43%) and monsoon (1.958%). The total carbohydrates concentration of wood was comparatively low (From 5.166% to 6.692%) monsoon 6.662%:maximum concentration of total carbohydrates as compared to summer 5.166 and monsoon 5.806%.

  The concentration of total carbohydrates were found to be increasing order wood< bark< leaves. (Table 9a and Graph 5a)

- **Madhuca indica** Gmel – (Mahua):

  The pattern of carbohydrates accumulates in this plant different from *Butea monosperma*. Total sugar and starch content of is higher in wood as compared to leaves and barks.

  The continuous two year investigation showed that leaves generally accumulated total carbohydrate ranges from 11.18% to 11.553% higher level of total carbohydrates observed at summer 11.553 % as compared to winter 11.506% and monsoon 11.186%. In wood it observed that at summer 14.04% of total carbohydrates accumulates higher than winter i.e. 12.97% and monsoon 11.89%. Summer show highest level of level of total carbohydrates .While in bark total carbohydrates ranges from 8.71% to 9.46% higher level observed in summer 9.46% as compared to winter 8.82% and monsoon 8.71%
The percentage of total carbohydrates were found to be increasing order of bark< leaves< wood.

The total sugar of wood show higher level than leaves and bark, wood ranges total sugar 4.16% to 4.45% higher level observed at monsoon 4.45% as compared to winter 4.42% and 4.16%. In leaves total sugar accumulated high level observed at summer season i.e. (3.84%) than winter i.e. (3.83%) and monsoon(3.54%) While in bark range of total sugar is low, it ranges from 2.47% to 2.79% highest level observed at summer 2.79% as compared to monsoon 2.50% and winter 2.47% respectively.

The percentage of total sugar were found to be in increasing order of Bark< leaves< wood.

The starch ranges of leaves show from 7.63% to 7.71% highest level observed at summer season i.e. 7.71% as compared to winter i.e. 7.674% and monsoon 7.63%.

In wood starch accumulation observed high at summer 9.88% as compared to winter i.e. 8.55% and monsoon i.e. 7.43%.

The starch accumulation in bark show low than leaves and wood in bark higher accumulation of starch at summer 6.67% than winter 6.35% and monsoon 6.20%

The concentration of starch were found to be increasing order of bark< leaves < wood. (Table 9b and Graph 5b)

- **Syzygium cumini Linn (Jambul):**

  The starch content of leaves not show much more difference in summer 5.80%, in monsoon 5.75% and in winter 5.67% In wood highest level observed at winter i.e. 5.54% as compared to monsoon 5.44% and summer 5.42%, while in bark starch accumulated much more in winter 4.64% than summer 4.58% and monsoon 4.32%

  The percentage of starch of starch were found to be increasing order of wood< leaves < bark.

  The total sugar content of leaves and bark show lower than wood, in leaf total sugar ranges from 1.67% to 1.76%. Higher accumulation of total sugar observed at summer 1.76% than winter 1.67% and monsoon 1.69%.

  The range of total sugar content of wood was between 2.42% to 3.07% it show higher than bark and leaves. Higher level observed at summer i.e. 3.07% as compared to monsoon 2.65% and winter 2.42%, while in bark, higher accumulation of total sugar observed at summer 1.75% than in winter 1.67% and monsoon 1.53%. 
The total carbohydrates content of leaves, bark and wood were usually higher in summer. The range of total carbohydrates content of leaves was higher in summer i.e. 7.57% than monsoon 7.45% and 7.34%.

The range of total carbohydrates content of wood was between 7.97% to 8.50%. Higher accumulation observed at summer (8.50%) as compared to monsoon (8.09%) and winter (7.97%).

The concentration of total carbohydrates were found to be in increasing order of bark< leaves < wood. (Table 9c and Graph 5c)

- *Mimusops elengi* Linn (Bakul):

  The range of starch content of leaves was between 5.99% to 6.41%, higher accumulation of starch observed at monsoon 6.41%, as compared to summer 6.26% and winter 5.99%. While in wood higher accumulation of starch observed as summer i.e. 7.77% than monsoon 7.55% and winter 7.35%. In bark starch ranges in between 7.39% to 7.86% higher accumulation of starch observed at monsoon 7.86% as compared to summer 7.46% and winter 7.39%.

  The concentration if starch were found to be in increasing order of leaves < Bark< wood.

  The range of total sugar content of leaves was from 1.51% to 1.73 %, during different season. The range of total sugar observe at summer i.e. 2.16 % as compared to winter i.e. 2.14 % and monsoon 2.03 %, while in bark total sugar accumulated range from 1.14 % to 1.61 %, Higher level of total sugar observed at winter 1.61 % than monsoon 1.14 % and summer 1.44%.

  The concentration of total sugar were found to be in increasing order bark < leaves < wood.

  The total carbohydrates of total content of leaves was higher in monsoon i.e. 8.14 % than summer 7.99% and winter 7.51 % The range of total carbohydrates content of wood was between 9.49 % to 9.93 %, higher concentration was observed at summer 9.93 % as compared to monsoon 9.59 % and winter 9.49 % .The range of total carbohydrates content of bark was from 8.90 % to 9.01 % during different season higher level observed at monsoon 9.01% as compared winter 9.00 % and summer 8.90 %

  The total carbohydrates concentration were found to be in increasing order of leaves < bark< wood (Table 9d and Graph 5d)
Table No. - 9a
Seasonal variation of some total carbohydrates levels of different plants parts of *Butea monosperma*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Starch (mg/g dry wt)</th>
<th>Total Sugar (mg/g dry wt)</th>
<th>Total Carbohydrates (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2year</td>
<td>Mean</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>5.62</td>
<td>5.834</td>
<td>5.727</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>2.993</td>
<td>3.871</td>
<td>3.432</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>6.02</td>
<td>2.049</td>
<td>4.034</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>4.46</td>
<td>4.189</td>
<td>4.324</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>1.29</td>
<td>1.54</td>
<td>1.415</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>3.255</td>
<td>3.065</td>
<td>3.16</td>
</tr>
</tbody>
</table>
Graph No. – 5a

Starch, Total Sugar and Total Carbohydrates of *Butea monosperma*

<table>
<thead>
<tr>
<th>Season</th>
<th>Plant parts</th>
<th>Starch (mg/g dry wt)</th>
<th>Total Sugar (mg/g dry wt)</th>
<th>Total Carbohydrates (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>Leaves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monsoon</td>
<td>Leaves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>Leaves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>Wood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monsoon</td>
<td>Wood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>Wood</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>Bark</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monsoon</td>
<td>Bark</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>Bark</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Detail for the sample comparison and test of significance:- *Butea monosperma*

**Starch**

Leaves

L, S, is significantly different from L, W, at 5% level based on 't' test
L, M, is significantly different from L, W, at 5% level based on 't' test
L, S, is significantly different from L, M, at non significant level based on 't' test

Wood

Wd, S, is significantly different from Wd, W, at non significant level based on 't' test
Wd, W, is significantly different from Wd, M, at non significant level based on 't' test
Wd, W, is significantly different from Wd, S, at 10% level based on 't' test

**Bark**

B, S, is significantly different from B, M, at 1% level based on 't' test
B, S, is significantly different from B, W, at 1% level based on 't' test
B, W, is significantly different from B, M, at 1% level based on 't' test

**Total Sugar**

Leaves

L, S, is significantly different from L, W, at 5% level based on 't' test
L, M, is significantly different from L, W, at non significant level based on 't' test
L, S, is significantly different from L, M, at 5% level based on 't' test
Wood

Wd, S, is significantly different from Wd, M, at 10% level based on t’ test
Wd, W, is significantly different from Wd, M, at 5% level based on t’ test
Wd, S, is significantly different from Wd, W, at non significant level based on t’ test

Bark

B, S, is significantly different from B, M, at 1% level based on t’ test
B, W, is significantly different from B, M, at 1% level based on t’ test
B, W, is significantly different from B, S, at non significant level based on t’ test

Total carbohydrates

Leaves

L, S, is significantly different from L, W, at 5% level based on t’ test
L, S, is significantly different from L, M, at non significant level based on t’ test
L, W, is significantly different from L, M, at non significant level based on t’ test

Wood

Wd, S, is significantly different from Wd, M, at non significant level based on t’ test
Wd, M, is significantly different from Wd, W, at non significant level based on t’ test
Wd, S, is significantly different from Wd, M, at 10% level based on t’ test

Bark

B, S, is significantly different from B, M, at 0.1% level based on t’ test
B, W, is significantly different from B, M, at 1% level based on t’ test
B, S, is significantly different from B, W, at 5% level based on t’ test
**Table No. – 9b**

Seasonal variation of some total carbohydrates levels of different plants parts of *Madhuca indica*

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Starch (mg/g dry wt)</th>
<th>Total Sugar (mg/g dry wt)</th>
<th>Total Carbohydrates (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 year</td>
<td>2year</td>
<td>Mean</td>
<td>1 year</td>
</tr>
</tbody>
</table>
Starch, Total Sugar and Total Carbohydrates of *Madhuca indica*

**Graph No. - 5b**
Detail for the sample comparison and test of significance: - *Madhuca indica*

**Starch**

**Leaves**

L, W, is significantly different from L, M, at 5% level based on ‘t’ test

L, S, is significantly different from L, M, at non significant level based on ‘t’ test

L, S is significantly different from L, W, at 5% level based on ‘t’ test

**Wood**

Wd, S, is significantly different from Wd, M, at 5% level based on ‘t’ test

Wd, W, is significantly different from Wd, M, at 5% level based on ‘t’ test

Wd, S, is significantly different from Wd, W, at 10% level based on ‘t’ test

**Bark**

B, S, is significantly different from B, M, at 5% level based on ‘t’ test

B, S, is significantly different from B, W, at 10% level based on ‘t’ test

B, W, is significantly different from B, M, at 10% level based on ‘t’ test

**Total sugar**

**Leaves**

L, S, is significantly different from L, M, at non significant level based on ‘t’ test

L, W, is significantly different from L, M, at non significant level based on ‘t’ test

L, S, is significantly different from L, W, at non significant level based on ‘t’ test
Wood

Wd, M, is significantly different from Wd, S, at non significant level based on ‘t’ test
Wd, M, is significantly different from Wd, W, at non significant level based on ‘t’ test
Wd, S, is significantly different from Wd, M, at non significant level based on ‘t’ test

Bark

B, S, is significantly different from B, W, at non significant level based on ‘t’ test
B, M, is significantly different from B, W, at non significant level based on ‘t’ test
B, S, is significantly different from B, M, at 10 % level based on ‘t’ test

Total carbohydrates

Leaves

L, S, is significantly different from L, M, at non significant level based on ‘t’ test
L, S, is significantly different from L, W, at 5 % level based on ‘t’ test
L, W, is significantly different from L, M, at 5 % level based on ‘t’ test

Wood

Wd, S, is significantly different from Wd, M, at 10 % level based on ‘t’ test
Wd, S, is significantly different from Wd, W, at non significant level based on ‘t’ test
Wd, W, is significantly different from Wd, M, at non significant level based on ‘t’ test

Bark

B, S, is significantly different from B, M, at 5 % level based on ‘t’ test
B, W, is significantly different from B, M, at non significant level based on ‘t’ test
B, S, is significantly different from B, W, at 10 % level based on ‘t’ test
<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Starch (mg/g dry wt)</th>
<th></th>
<th>Total Sugar (mg/g dry wt)</th>
<th></th>
<th>Total Carbohydrates (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2 year</td>
<td>Mean</td>
<td>1 year</td>
<td>2 year</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>5.643</td>
<td>5.969</td>
<td>5.806</td>
<td>1.934</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>5.693</td>
<td>5.823</td>
<td>5.758</td>
<td>1.618</td>
<td>1.775</td>
</tr>
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<td>Winter</td>
<td>5.75</td>
<td>5.594</td>
<td>5.672</td>
<td>1.546</td>
<td>1.799</td>
</tr>
<tr>
<td>Wood</td>
<td>Summer</td>
<td>5.451</td>
<td>5.406</td>
<td>5.428</td>
<td>2.948</td>
<td>3.201</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>5.248</td>
<td>5.645</td>
<td>5.446</td>
<td>2.856</td>
<td>2.449</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>5.547</td>
<td>5.545</td>
<td>5.546</td>
<td>2.34</td>
<td>2.513</td>
</tr>
<tr>
<td></td>
<td>Monsoon</td>
<td>4.32</td>
<td>4.324</td>
<td>4.322</td>
<td>1.591</td>
<td>1.472</td>
</tr>
</tbody>
</table>
Graph No. – 5c

Starch, Total Sugar, Total Carbohydrates of *Syzgium cumini*

- **Leaves**
  - Summer: 8.5 mg/gm dry wt
  - Monsoon: 7.5 mg/gm dry wt
  - Winter: 6.0 mg/gm dry wt

- **Wood**
  - Summer: 6.5 mg/gm dry wt
  - Monsoon: 5.5 mg/gm dry wt
  - Winter: 4.0 mg/gm dry wt

- **Bark**
  - Summer: 5.0 mg/gm dry wt
  - Monsoon: 4.5 mg/gm dry wt
  - Winter: 3.0 mg/gm dry wt

Legend:
- Sugar (mg/gm dry wt)
- Total Sugar (mg/gm dry wt)
- Total Carbohydrates (mg/g dry wt)
Detail for the sample comparison and test of significance: *Syzygium cumini*

**Starch**

Leaves

- L, S, is significantly different from L, W, at non significant level based on ‘t’ test
- L, M, is significantly different from L, W, at non significant level based on ‘t’ test
- L, M, is significantly different from L, M, at non significant level based on ‘t’ test

Wood

- Wd, M, is significantly different from Wd, S, at non significant level based on ‘t’ test
- Wd, M, is significantly different from Wd, W, at non significant level based on ‘t’ test
- Wd, W, is significantly different from Wd, S, at 5% level based on ‘t’ test

Bark

- B, S, is significantly different from B, M, at non significant level based on ‘t’ test
- B, W, is significantly different from B, M, at 5% level based on ‘t’ test
- B, S, is significantly different from B, W, at non significant level based on ‘t’ test

**Total Starch**

Leaves

- L, S, is significantly different from L, W, at non significant level based on ‘t’ test
- L, M, is significantly different from L, W, at non significant level based on ‘t’ test
- L, S, is significantly different from L, M at non significant level based on ‘t’ test
Wood

- $W_d, S, \text{ is significantly different from } W_d, W, \text{ at } 5\% \text{ level based on } 't' \text{ test}$
- $W_d, M, \text{ is significantly different from } W_d, W, \text{ at non significant level based on } 't' \text{ test}$
- $W_d, S, \text{ is significantly different from } W_d, M, \text{ at } 10\% \text{ level based on } 't' \text{ test}$

Bark

- $B, S, \text{ is significantly different from } B, M, \text{ at non significant level based on } 't' \text{ test}$
- $B, W, \text{ is significantly different from } B, M, \text{ at non significant level based on } 't' \text{ test}$
- $B, S, \text{ is significantly different from } B, W, \text{ at non significant level based on } 't' \text{ test}$

**Total carbohydrates**

Leaves

- $L, S, \text{ is significantly different from } L, W, \text{ at } 5\% \text{ level based on } 't' \text{ test}$
- $L, M, \text{ is significantly different from } L, W, \text{ at non significant level based on } 't' \text{ test}$
- $L, S, \text{ is significantly different from } L, M, \text{ at non significant level based on } 't' \text{ test}$

Wood

- $W_d, M, \text{ is significantly different from } W_d, W, \text{ at non significant level based on } 't' \text{ test}$
- $W_d, S, \text{ is significantly different from } W_d, M, \text{ at } 5\% \text{ level based on } 't' \text{ test}$
- $W_d, S, \text{ is significantly different from } W_d, W, \text{ at } 5\% \text{ level based on } 't' \text{ test}$

Bark

- $B, S, \text{ is significantly different from } B, M, \text{ at } 5\% \text{ level based on } 't' \text{ test}$
- $B, W, \text{ is significantly different from } B, M, \text{ at } 5\% \text{ level based on } 't' \text{ test}$
- $B, S, \text{ is significantly different from } B, W, \text{ at non significant level based on } 't' \text{ test}$
Table No. – 9d
Seasonal variation of some total carbohydrates levels of different plants parts of Mimusops elengi

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Season</th>
<th>Starch (mg/g dry wt)</th>
<th>Total Sugar (mg/g dry wt)</th>
<th>Total Carbohydrates (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 year</td>
<td>2year</td>
<td>Mean</td>
</tr>
<tr>
<td>Leaves</td>
<td>Summer</td>
<td>6.478</td>
<td>6.05</td>
<td>6.264</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>5.993</td>
<td>6.006</td>
<td>5.99</td>
</tr>
<tr>
<td>Bark</td>
<td>Summer</td>
<td>7.475</td>
<td>7.456</td>
<td>7.465</td>
</tr>
</tbody>
</table>
Graph No. – 5d

Starch, Total Sugar and Total carbohydrates of *Mimusops elengi*

<table>
<thead>
<tr>
<th></th>
<th>Starch (mg/g dry wt)</th>
<th>Total Sugar (mg/g dry wt)</th>
<th>Total Carbohydrates (mg/g dry wt)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leaves</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monsoon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wood</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monsoon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bark</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monsoon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Starch, Total Sugar and Total carbohydrates of *Mimusops elengi*
Detail for the sample comparison and test of significance:- *Minusops elengi*

**Starch**

Leaves

L, M, is significantly different from L, W, at 10% level based on ‘t’ test

L, S, is significantly different from L, W, at 5% level based on ‘t’ test

L, S, is significantly different from L, M, at non significant level based on ‘t’ test

**Wood**

Wd, S, is significantly different from Wd, W, at 10% level based on ‘t’ test

Wd, M, is significantly different from Wd, W, at non significant level based on ‘t’ test

Wd, S, is significantly different from Wd, M, at non significant level based on ‘t’ test

**Bark**

B, S, is significantly different from B, W, at non significant level based on ‘t’ test

B, M, is significantly different from B, W, at 5% level based on ‘t’ test

B, S, is significantly different from B, M, at 1% level based on ‘t’ test

**Total sugar**

Leaves

L, S, is significantly different from L, W, at 10% level based on ‘t’ test

L, M, is significantly different from L, W, at 10% level based on ‘t’ test

L, S, is significantly different from L, M, at non significant level based on ‘t’ test
Wood

Wd, S, is significantly different from Wd, M, at non significant level based on ‘t’ test
Wd, W, is significantly different from Wd, M, at non significant level based on ‘t’ test
Wd, S, is significantly different from Wd, W, at non significant level based on ‘t’ test

Bark

B, S, is significantly different from B, M, at 5% level based on ‘t’ test
B, W, is significantly different from B, M, at 5% level based on ‘t’ test
B, S, is significantly different from B, W, at non significant level based on ‘t’ test

Total carbohydrate

Leaves

L, S, is significantly different from L, W, at 10% level based on ‘t’ test
L, M, is significantly different from L, W, at 5% level based on ‘t’ test
L, S, is significantly different from L, M, at non significant level based on ‘t’ test

Wood

Wd, S, is significantly different from Wd, W at 10% level based on ‘t’ test
Wd, M, is significantly different from Wd, W at non significant level based on ‘t’ test
Wd, S, is significantly different from Wd, M at non significant level based on ‘t’ test

Bark

B, M, is significantly different from B, S, at non significant level based on ‘t’ test
B, W, is significantly different from B, S, at non significant level based on ‘t’ test
B, M, is significantly different from B, W at non significant level based on ‘t’ test
Protein and Amino acid :

- **Butea monosperma Lam- (Palas):**
  The Protein content of leaves was higher (2.14 mg/gm) in summer over than winter (2.053 mg/gm) and monsoon (1.83 mg/gm). Range of protein content of wood was from (1.186 mg/gm to 1.332mg/gm). The protein content of wood was very low in all season. The range in wood was from 1.41 to 1.65 mg/gm and show higher in summer. The protein content showed increasing order of wood < bark < leaf. (Table 10a and Graph 6a)

- **Madhuca indica Gmel – (Mahua):**
  The protein content of leaves was higher (7.744 mg/gm) in summer, (7.726 mg/gm) in winter and (7.313 mg/gm) in monsoon. The range of protein content of bark was from 6.642 to 7.135 mg/gm higher levels during summer (7.135 mg/gm). The wood has low percentage of protein content as compare to leaves and bark. protein range of wood from 5.57 to 5.903mg/g and show higher in monsoon (5.903 mg/g). The percentage of protein content were increasing in order wood < bark < leaves . (Table 10b and Graph 6b)

- **Syzygium cumini Linn (Jambul):**
  The ranges of protein content of leaves were from of 2.588 to 2.875mg/gm. In Bark highest was being observed during summer 3.817mg/gm over that of winter 3.75 mg/gm and monsoon 3.230. mg/gm. The protein content of wood was comparatively low from 2.456 to 2.783mg/gm and shows higher in summer (2.783 mg/gm). The percentage of protein content were increasing in order as wood < Bark < leaf. (Table 10c and Graph 6c)

- **Mimusops elengi Linn (Bakul):**
  The range of protein content of leaves was from 3.524mg/gm to 4.21mg/gm. Highest was being observed in summer (4.21mg/gm). The bark had higher level in summer 4.93mg/gm as comparatively winter 4.74mg/gm and monsoon 4.729mg/gm. The protein content of wood was comparatively low (from 2.66 to 2.84mg/gm) if show higher in winter (2.84mg/gm) than summer (2.83smg/gm) and monsoon (2.66mg/gm).
  The percentage of protein content is in increasing Wood < bark < wood. (Table 10d and Graph 6d)