A REVIEW STUDY ON ETHNOPHARMACOLOGICAL & PHYTOCHEMICAL COMPARISON BETWEEN SYZYGIUM CUMINI & SYZYGIUM JAMBOS OF GENUS SYZYGIUM (FAMILY: MYRTACEAE).

Nisrat Jahan*

Lecturer, Department of Pharmacy, Southeast University, Banani, Dhaka, Bangladesh.

*Corresponding Author: Nisrat Jahan
Lecturer, Department of Pharmacy, Southeast University, Banani, Dhaka, Bangladesh.

ABSTRACT
This article aims to provide detailed information on two species of *Syzygium cumini* & *Syzygium jambos* from genus *Syzygium* of family Myrtaceae. An extensive search on electronic databases and conference papers was done to come across significant articles on different pharmacological activities with the traditional use of this genus. The presence of various phytochemical constituents have been reported that have significant prominence on the bioactive belongings. Hence, this current review is a detailed outline on the prospective medicinal values from previous studies. However, further exploration on the possible underlying mechanisms with the isolation of more respective active compounds remains under investigation.

KEYWORDS: *Syzygium cumini, Syzygium jambos*, pharmacological activities & phytochemical activities.

1. INTRODUCTION
Over 50% of all modern drugs are of natural product source and they play an significant role in drug development programs of the pharmaceutical industry.[1] The use of herbal medicines worldwide has provided an excellent opportunity worldwide to look for therapeutic lead compounds from an ancient system of therapy, i.e. Ayurveda, which can be utilized for development of new drug. Epidemiological evidence suggests that dietary factors play an important role in human health and in the treatment of certain chronic diseases including cancer.[2,3] The collective role of plants in the treatment of disease is emerged by their employment in all major systems of medicine irrespective of the underlying philosophical premise. Cultivation of medicinal plants with laboratory generated species is taken on the basis of chemical composition and ethnopharmacological investigation.[4]

The genus Syzygium is one of the genera of the family of Myrtaceae that is widely distributed throughout tropical & subtropical regions. The whole plants possess some medicinal values according to ayurvedic, unani & sidha due to presence of volatile oil as well as other bioactive phytoconstituents. The fruit is edible & traditionally used for miscellany medicinal possessions. The present study has been performed to assess the phytochemical & pharmacological properties of two species of this genus. *Syzygium cumini* & *Syzygium jambos* are extensively known for their ethnopharmacological assets. Different researchs were reviewed from previous studies to carry out this review study.

2. METHODOLOGY
The bibliographic research was performed in the following databases: PubMed, Google Scholar, Scopus, ScienceDirect, Classical text books of Ayurveda and other compilatory treatises where these databases were searched for relevant studies on about two species of this genus (*Syzygium cumini* & *Syzygium jambos*) in terms of phytopharmacological information. No limit was placed on the search time frame in order to retrieve all relevant papers. About 134 papers have been reviewed including journal articles and proceedings as well as the reference lists of articles for additional relevant studies.

3. *Syzygium cumini*
3.1 Plant Profile: *Syzygium cumini* (L.) Skeels (Myrtaceae) commonly known as Indian blackberry; commonly known as Black Plum in English, Jamun in Hindi, Jambu in Sanskrit and Jaman in Urdu.[5] It is a large tree distributed throughout South & West asia also in Thailand, Philippines, Madagascar Africa, Caribbean and Tropical America. The tree is commonly grow in damp places and in evergreen forests & planted as an ornamental tree in gardens and roadsides. The berries are sweetish sour to taste. The ripe fruits are used for health drinks, making preserves, squashes, jellies and wine.[6] This plant grows up to 30 meters and girth of 3.6 meters with a bole up to 15 meters.[7] The plant is
carminative, digestive, antihyperglycaemic, antihelminthic and antibacterial agent also used to cure diabetes, pharyngitis, spleenopathy, urethrorrhoea, ringworm infection, to strengthen teeth and gums,[8,9] biliousness, dysentery, sore throat, bronchitis, thirst, asthma and ulcers.[10] diabetes, constipation, leucorrhoea, fever, gastropathy and dermopathy and to inhibit blood discharge in the faeces.[11-12]

**Taxonomical Classification**

Kingdom- Plantae  
Order- Myrtales  
Family- Myrtaceae

### 3.2 Phytochemical Review

<table>
<thead>
<tr>
<th>Plant Parts</th>
<th>Phytoconstituents present in <em>Syzygium cumini</em></th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem Bark</td>
<td>Betulinic acid, 6-sitosterol, friedeanol, epi-friedeanol, eugenin, 6-sitosterol-D-glucoside, Kamepferol-3-O-glucoside, Quercetin, myricetin, astragalin, and gallic acid.</td>
<td>[13-14]</td>
</tr>
<tr>
<td>Fruit</td>
<td>Malic acid, oxalic acid Gallic acid, tannins, cyanidine and diglycoside glucose, fructose, mannose, and galactose (principal sugar moieties). Ca, Mg, Na, K, Cu and vitamins such as thiamine, riboflavin, nicotinic acid, anthocyanins, delphinidin, petunidin, malvidin-diglucosides.</td>
<td>[15]</td>
</tr>
<tr>
<td>Seed</td>
<td>Glucoseosid jamboline, chlorophyll, fat, resin, gallic acid, furfural acid guairol, resorcinol, dimethyl ether, corilaginin, protein, calcium. Phenolic such as ellagic acid, gallic acid, caffeic and furfural acids and derivatives, guairol, resorcinol dimethyl ether, corilaginin. Flavonoid such as rutin, quercetin,11 and β-sitosterol</td>
<td>[16]</td>
</tr>
<tr>
<td>Leave</td>
<td>Gallitanins, essential oil (terpenes, 1-limonene and dipentene), monoterpenoid terpinene, terpenolone, borbeneol, 3-phenylanidine,a-terpineol and eugenol, flavonoid such as rutin, quercetin,11 and β-sitosterol</td>
<td>[17]</td>
</tr>
<tr>
<td>Flower</td>
<td>Kaempferol, quercetin, myricetin, isoquercetin (quercetin-3-glucoside), myricetin-3-L-arabinose, quercetin-3-D-galactoside, dihydromyricetin, oleuronic acid, acetyl auranonic acid, eugenol-triterpenoid A and eugenol-triterpenoid B.</td>
<td>[18,19, 20]</td>
</tr>
<tr>
<td>Root</td>
<td>Myricetin 3-O-glucoside and myricetin 3-o-robinoside.</td>
<td>[21-22]</td>
</tr>
<tr>
<td>Essential oils</td>
<td>α-terpeneol, myrtenol, eucarvone, muurolol, α-myrtanol, 1, 8-cineole, geranyl acetone, α-cadinol and pinocarvone. Terpenes, 1-limonene and dipentene. Llauric (2.8%), myristic (31.7%), palmitic (4.7%), stearic (6.5%), oleic (32.2%), linoleic (16.1%), malvacic (1.2%) and vernolic (3%) acids.13 Novel compounds such as 5,6-dihydropyridine-3-(4-hydroxy-6-(hydroxymethyl)-3,5-di[3,4,5-trihydroxy-6-(hydroxyphosphoryl)tetrahydro-2H pyranyl]oxy][2-methoxy-10,13 dimethylerhydrocycloapenta[a] phanthen-17-y1 (phenyl) methyl acetate,14 3,15-dihydroxy ? 3 androstene [16, 17-C]6-methyl, 1213-dihydroxy-1-propene] 4H pyran and 3-hydroxy androstane [16,17-C]6-methyl, 2'-1-hydroxy –isopropene-1-y1] 4,5,6 H pyran, 15androstane [16,17-C]6-methyl, 2'-1-hydroxy –isopropene-1-y1] 4,5,6 H pyran. The essential oils isolated from the freshly collected leaf (accounting for 82% of the oil)</td>
<td>[23-28]</td>
</tr>
</tbody>
</table>

**Genus-** *Syzygium*  
**Species-** *cuminum*  

**Synonyms**

1. *Eugenia jambolana* Lam.  
2. *Myrtus cumini* Linn.  
3. *Syzygium jambolana* DC.  
4. *Syzygium jambolanum* (Lam.) DC.  
5. Eugenia djouant Perr.  
7. *Eugenia cumini* (Linn.) Druce and  
α-Pinene, camphene, β-Pinene, myrcene, limonene, cis-Ocimene, trans-Ocimene, γ-Terpinene, terpinolene, bornyl acetate, α-Copaene, β-Caryophyllene, α-Humulene, γ-Cadinene and δ-Cadinene

Trans-ocimene, cis-ocimene, β-myrcene, α-terpineol, dihydrocarvyl acetate, geranyl butyrate, terpinyl valerate.

α-terpineol, β-caryophyllene, α-humulene, β-selinene, calacorene, α-murolol, α-santalol, cis-farnesol: lauric, myristic, palmitic, stearic, oleic, linoleic, malvalic, sterulic and vernolic acids

Unsaponifiable matter of the seed fat was also chemically investigated.

### 3.3 Pharmacological Review

<table>
<thead>
<tr>
<th>Pharmacological Activity of Syzygium cumini</th>
<th>Plant Part</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antihyperlipidaemic effect</strong></td>
<td>Aqueous extract of pulp</td>
<td>[44]</td>
</tr>
<tr>
<td></td>
<td>Seed kernel</td>
<td>[45]</td>
</tr>
<tr>
<td></td>
<td>Fruit pulp</td>
<td>[46]</td>
</tr>
<tr>
<td></td>
<td>Ethanoic extract of kernels</td>
<td>[47]</td>
</tr>
<tr>
<td></td>
<td>seeds</td>
<td>[48]</td>
</tr>
<tr>
<td><strong>Free radical-scavenging and antilipidperoxidative activity</strong></td>
<td>Aqueous seed powder extract</td>
<td>[49]</td>
</tr>
<tr>
<td></td>
<td>Extracts of fruit pulp, seed coat and kernel</td>
<td>[50]-[52]</td>
</tr>
<tr>
<td><strong>Antioxidant effect</strong></td>
<td>Aqueous seed powder extract</td>
<td>[53]</td>
</tr>
<tr>
<td></td>
<td>Methanolic Leaf extract</td>
<td>[54]</td>
</tr>
<tr>
<td></td>
<td>Methanolic extract of leaves, bark and seeds</td>
<td>[55]-[58]</td>
</tr>
<tr>
<td><strong>Hepatoprotective effect</strong></td>
<td>Ethanoic Pulp extract</td>
<td>[59]</td>
</tr>
<tr>
<td></td>
<td>Alcoholic extract of the pulp</td>
<td>[60]</td>
</tr>
<tr>
<td></td>
<td>Aqueous leaf extract</td>
<td>[61]</td>
</tr>
<tr>
<td></td>
<td>Methanolic seed extract</td>
<td>[62]</td>
</tr>
<tr>
<td><strong>Antiarthritic effect</strong></td>
<td>Methanolic seed powder extract</td>
<td>[63]</td>
</tr>
<tr>
<td><strong>Antiulcer effect</strong></td>
<td>Ethanoic seed powder extract</td>
<td>[64]</td>
</tr>
<tr>
<td></td>
<td>Seed kernel extract</td>
<td>[64]</td>
</tr>
<tr>
<td></td>
<td>Fruit extract</td>
<td>[65]</td>
</tr>
<tr>
<td><strong>Antiallergic effect</strong></td>
<td>Aqueous leaf extract</td>
<td>[66]</td>
</tr>
<tr>
<td></td>
<td>Aqueous leaf extract</td>
<td>[67]</td>
</tr>
<tr>
<td><strong>Antibacterial effect</strong></td>
<td>Aqueous and acetone bark extract</td>
<td>[68]</td>
</tr>
<tr>
<td></td>
<td>Stem, leaf and fruit extracts (Against <em>Routella plantikola</em>)</td>
<td>[69]</td>
</tr>
<tr>
<td></td>
<td>Seed extract (Against multidrug-resistant human bacterial pathogens)</td>
<td>[70]</td>
</tr>
<tr>
<td></td>
<td>Ethyl acetate, petroleum ether and methanolic leaf extracts (Against <em>Salmonella typhimurium</em>, <em>Bacillus subtilis</em>, <em>Pseudomonas aeruginosa</em>, <em>Staphylococcus aureus</em> and <em>Enterobacter aerogenes</em>)</td>
<td>[71]</td>
</tr>
<tr>
<td></td>
<td>Acetone, aqueous and ethanolic bark extracts (Against <em>Vibrio cholera</em>)</td>
<td>[72]</td>
</tr>
<tr>
<td></td>
<td>Aqueous leaf extract (Against <em>Klebsiella sp.</em>, <em>Salmonella paratyphi A &amp; B</em>, <em>Citrobacter sp.</em>, <em>Proteus mirabilis</em>, <em>Escherichia coli</em>, <em>Staphylococcus aureus</em>, <em>Shigella sonnei</em>, <em>Pseudomonas aeruginosa</em>, <em>Salmonella typhimurium</em>, <em>Shigella boydii</em>, <em>Streptococcus faecalis</em>, <em>Shigella flexneri</em> and <em>Salmonella typhi</em>)</td>
<td>[73]</td>
</tr>
<tr>
<td><strong>Anti-inflammatory effect</strong></td>
<td>Ethyl acetate and methanolic seed powder extract</td>
<td>[74]</td>
</tr>
<tr>
<td></td>
<td>Ethyl-acetate and methanolic leaves and seeds extracts</td>
<td>[75]-[76]</td>
</tr>
<tr>
<td><strong>Nephroprotective activity</strong></td>
<td>FLIC, isolated from aqueous pulp Extract</td>
<td>[77]</td>
</tr>
<tr>
<td><strong>Antidiarrhoeal effect</strong></td>
<td>Ethanoic bark extract</td>
<td>[78]</td>
</tr>
<tr>
<td></td>
<td>Ethanoic fruit extract</td>
<td>[79]</td>
</tr>
<tr>
<td><strong>Central nervous system effect</strong></td>
<td>Methanolic and ethyl acetate seed extracts</td>
<td>[80]</td>
</tr>
<tr>
<td><strong>Neuropsychopharmacological</strong></td>
<td>Ethyl acetate and methanolic seed powder extract</td>
<td>[80]</td>
</tr>
</tbody>
</table>
4. *Syzygium jambos*

4.1 **Plant Profile:** *Syzygium jambos* Alston (syn. *Eugenia jambos* L.; *Jambosa jambos* Millsp.; *Jambose vulgaris* DC.; *Caryophyllus jambos* Stokes) (Family: Myrtaceae) is an evergreen tree. It is native to Southeast Asia. It is a small tree with spreading branches, leaves, simple, opposite, lanceolate, narrowed into short petioles, secondary nerves joined by a prominent looping intramarginal vein. Flowers greenish white in short terminal racemose cymes, stamens many, yellowish white, fruits pale yellow to pinkish white, globose, seeds 1-2, grey in large cavity of the succulent pulp. Due to medicinal properties this plant has some traditional use such as to treat fever, diarrhea, dysentery, rheumatism, sore eyes, asthma, bronchitis, hoarseness, epilepsy, diabetes, herpes simplex type 1 and type 2, vesicular stomatitis virus, toothache, mouth sores, cough, wound dressing, respiratory disorders, eczema, malaria, and infectious diseases. Other study claimed anesthetic, diuretic febrifuge activity, of the plant.

**Taxonomical Classification**

- **Kingdom:** Plantae  
- **Order:** Myrtales  
- **Family:** Myrtaceae  
- **Genus:** Syzygium  
- **Species:** jambos

**Synonyms**

1. *Eugenia jambos* Myrtus cumini Linn.  
2. *Jambosa jambos* Syzygium jambolanum (Lam.) DC.

4.2 **Phytochemical review**

<table>
<thead>
<tr>
<th>Plant Parts</th>
<th>Phytoconstituents present in <em>Syzygium jambos</em></th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leaves</strong></td>
<td>Polyphenols, anthraquinones, tannins, and steroids</td>
<td>[118]</td>
</tr>
<tr>
<td></td>
<td>Friedelin (1)</td>
<td>[119]</td>
</tr>
<tr>
<td></td>
<td>Amyrin acetate</td>
<td>[120]</td>
</tr>
<tr>
<td></td>
<td>Betulinic acid (2)</td>
<td>[121]</td>
</tr>
<tr>
<td></td>
<td>Lu peol</td>
<td>[122]</td>
</tr>
<tr>
<td></td>
<td>Friedelolactone (3)</td>
<td>[123]</td>
</tr>
<tr>
<td></td>
<td>Friedelanol (4)</td>
<td></td>
</tr>
<tr>
<td><strong>Bark</strong></td>
<td>Polyphenols, anthraquinones, tannins, and steroids</td>
<td>[119]</td>
</tr>
<tr>
<td></td>
<td>Triterpenes and saponins</td>
<td>[124]</td>
</tr>
<tr>
<td></td>
<td>Triterpenoids such friedelin, β-amyrin acetate, betulinic acid, and lupeol</td>
<td>[125]</td>
</tr>
</tbody>
</table>
4.3 Pharmacological Review

<table>
<thead>
<tr>
<th>Pharmacological Activity of Syzygium jambos</th>
<th>Plant Part</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antifungal activity (Against T. mentagrophytes and T. soudanense)</td>
<td>Ethyl acetate extract of the stem bark</td>
<td>[125]</td>
</tr>
<tr>
<td>Antidermatophytic activity</td>
<td>Crude extract and fractions</td>
<td>[126]</td>
</tr>
<tr>
<td>Antibacterial activity potential (against sensitive strains of Staphylococcus aureus, Bacillus subtilis, Enterococcus gallinarum, Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoniae, Proteus vulgaris, Enterococcus faecium, Salmonella typhi, and Vibrio cholera)</td>
<td>Fruit extracts</td>
<td>[127]</td>
</tr>
<tr>
<td>Antibiotic-modulating activity (potentiate the activity of antibiotics on more than 70% of bacteria) of extracts at MIC/2 on more than 70% tested strains of S. aureus</td>
<td>Bark extracts</td>
<td>[128]</td>
</tr>
<tr>
<td>Antimicrobial activity (Minimum inhibitory concentrations for faecalis 797.5 µg/mL and A. hydrophilia 384.6 µg/mL, B. cereus 182.6 µg/mL and S. aureus 346.5 µg/mL)</td>
<td>Methanol extracts of bark and leaves</td>
<td>[129,130]</td>
</tr>
<tr>
<td>Hepatoprotective agent</td>
<td>Acetone and aqueous extracts from the bark</td>
<td>[131]</td>
</tr>
<tr>
<td>Analgesic effects</td>
<td>Methanolic extract of leaf</td>
<td>[132]</td>
</tr>
<tr>
<td>Anti oxidant, anti inflammatory, anti diabetic, anticancer, anti ulcer, anti pyretic, cardio vascular diseases, anti hyperlipidimic and neurological disorders like Alzheimer’s, anti parkinsonism</td>
<td>Hydro-alcoholic leaf extracts</td>
<td>[133]</td>
</tr>
<tr>
<td>Anti oxidant, anti inflammatory, anti diabetic, anticancer, anti ulcer, anti pyretic, cardio vascular diseases, anti hyperlipidimic and neurological disorders like Alzheimer’s, anti parkinsonism</td>
<td>Extract of fruit, leaf &amp; bark.</td>
<td>[134]</td>
</tr>
</tbody>
</table>

CONCLUSION

Large scale literature study revealed that the featured plants have potential pharmacological activities against various diseases performed in vivo & in vitro. The phytoconstituents which are present in the plants are mainly alkaloid, tannin, glycoside, carbohydrate, saponin, steroids and flavonoids which are responsible for the bioactivity. Further significant review is needed to find out the appropriate estimation and revival on pharmacological effect. Chemical investigations are needed to find out the future lead compound to develop drugs. Plant sources are being used for a long time to explore our medicinal sector because of their less side effects and more effectiveness.

CONFLICT OF INTEREST

We have no conflict of interest.

ACKNOWLEDGEMENT

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REFERENCE


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