Genus Luffa - an Ethnopharmacological and Phytochemical review.

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Abstract - Luffa acutangula and Luffa cylindrica are the two important species under the genus Luffa. These two species are used by traditional medicinal practitioners for treating various human disorders. The phytochemical analysis of the various parts of these plants has revealed many phytoconstituents of medicinal importance. The wide distribution of these species has made it easily available and many experimental pharmacology studies have been conducted to prove its efficacy and to support its culinary and therapeutic use.

Key words: Luffa acutangula, Luffa cylindrica, phytochemistry and ethnopharmacology

Introduction

Genus Luffa which belongs to Cucurbitaceae family is a tropical or sub tropical vine. Luffa is a warm climate fast growing plant and it grows up to a height of 15 feet. The formal botany genus name Luffa was introduced by Botanist Joseph piton de Tournefort in 1706.

Luffa acutangula (L.) Roxb

It is also called as angled luffa, ridge gourd, vegetable guard and Chinese okra. Some of the Asian varieties are Summer long, Hybrid green diamond, Lucky Boy, Hybrid Asian pride, hybrid Extra long.

Leaves of Luffa acutangula are orbicular in outline, 15-20 cm long, palmately 5-7 angled or sublobate and scabrid. Male flowers are arranged axillary in 12-20 flowered racemes and female flowers solitary. Fruits are 15-30 cm long, clavate-oblong, tapering towards the base, and are longitudinally ribbed (Fig. 1).

Fig 1. Luffa acutangula fruits.

Phytochemistry

Phytochemical analysis of fruit extracts of Luffa acutangula extracts has revealed the presence of Sterols, Glycosides, saponins, carbohydrates, flavinoids and Triterpenes (1). Seeds of Luffa acutangula showed the presence of saturated and unsaturated fatty acid palmitic, stearic, oleic, linoleic acid. While the fruits contain cucurbitacin B, cucurbitacin E and oleanalic acid (2).

Ethnopharmacology

The pounded leaves are applied locally in spleenitis, hemorrhoids, ringworm infection and leprosy. Juice of the fresh leaves is installed into the eyes of children in granular conjunctivitis. Fruit is demulcent, diuretic and
nutritive. The seeds possess purgative, emetic and anthelmintic properties (3). As per folk lore claims, whole plant is useful in treating jaundice, tetanus, vomiting, insanity and itches (4).

**Safety profile**

Hydro alcoholic extract of *Luffa acutangula* fruits was found to be safe up to 10000 mg/kg in Swiss Mice. (5). Petroleum ether extract of *Luffa acutangula* (whole plant) was safe up to 2500 mg/kg in rats. (6)

**Experimental Pharmacology**

Animal experimentations have revealed analgesic, anti-inflammatory, hepatoprotective and cerebroprotective activities of various extracts of *Luffa acutangula* (Table 1.)

Table 1. Experimental Pharmacology studies on *Luffa acutangula*.

<table>
<thead>
<tr>
<th>Plant part</th>
<th>extract</th>
<th>Dose</th>
<th>Activity</th>
<th>Method</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeds</td>
<td>Alcohol extract</td>
<td>200 and 400 mg/kg B.W.</td>
<td>Analgesic activity (P&lt;0.05) at 30 minutes</td>
<td>Tail Flick method</td>
<td>(5)</td>
</tr>
<tr>
<td>seeds</td>
<td>Alcohol extract</td>
<td>200 and 4000 mg/kg B.W.</td>
<td>Analgesic activity (P&lt;0.05) at 30 minutes</td>
<td>Tail Immersion method</td>
<td></td>
</tr>
<tr>
<td>Seeds</td>
<td>Alcohol extract</td>
<td>200 and 4000 mg/kg B.W.</td>
<td>Anti-inflammatory activity (P&lt;0.05) at 60, 120, and 180 minutes</td>
<td>Hind paw edema method</td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>Petroleum ether and ethanol extracts</td>
<td>150 mg/kg</td>
<td>Hepatoprotective activity</td>
<td>Carbon Tetrachloride induced liver damage</td>
<td>(1)</td>
</tr>
<tr>
<td>Fruits</td>
<td>Hydro alcoholic extract</td>
<td>400 mg/kg</td>
<td>Hepatoprotective activity</td>
<td>Carbon Tetrachloride induced liver damage</td>
<td>(5)</td>
</tr>
<tr>
<td>Fruits</td>
<td>Hydro alcoholic extract</td>
<td>200 and 400 mg/kg</td>
<td>Hepatoprotective activity</td>
<td>Rifampicin induced liver damage</td>
<td></td>
</tr>
<tr>
<td>Whole Plant</td>
<td>Petroleum Ether extract</td>
<td>200 and 400 /kg B.W.</td>
<td>Cerebroprotective activity</td>
<td>Bilateral carotid artery Occlusion induced stroke</td>
<td>(6)</td>
</tr>
</tbody>
</table>

*Luffa cylindrica* Roem

It is also known as smooth luffa and sponge luffa. Some of the Asian varieties are Edible Ace, Smooth Boy, Hybrid Smooth Beauty, Hybrid summer Cross, Extra long smooth, Hybrid Southern Legacy. Hybrid Jupiter.

Leaves of *Luffa cylindrica* are orbicular-reniform, 10-20 cm long, palmately 5 (rarely 7) lobed and both surfaces are finely scabrous. Male flowers are arranged axillary in 4-20 flowered racemes and female flowers are solitary. Fruits are 12-30 cm long, cylindric, blunt at the end with marked longitudinal lines (Fig. 2-4).
Phytochemistry
Preliminary phytochemical screening revealed the presence of carbohydrates, flavanoids, glycosides and saponins in *Luffa cylindrica* fruit extracts (7).

A new saponin of pentacyclic triterpenoid named lucyoside O has been isolated from the leaves of *Luffa cylindrica* (8).

The peptide, namely luffacyclin with antifungal activity has been isolated from *Luffa cylindrica* seeds (9). Two triterpinoid sapogenins (1 & 2) were isolated from ethanolic extract of seeds of *Luffa cylindrica* and were found to exhibit immunomodulatory effect in Balb/C mice (10).

Ethnopharmacology
*Luffa cylindrica* is used in traditional medicine; fruits are used in the traditional Chinese medicine as an anthelmintic, stomachic, antioxidant and antipyretic (11). Crushed leaves are used to alleviate pain and inflammation and heat rashes of children in summer. It is used in the treatment of hemorrhage from bowels or bladder, hemorrhoids, jaundice, menorrhagia, haematuria, leprosy and spleenopathy. Antiseptic, anthelmintic, carminative, emmenagogue and galactagogue, properties of ripe fruits have also been reported (12).

Safety profile
The methanolic extract of the leaves of *Luffa cylindrica* was found to be safe in Wistar rats upon single exposure up to dose of 2000mg /kg orally (13). Acute toxicity study of methanolic extract *Luffa cylindrica* fruits has shown that, it is safe up to 3000mg/kg in Wistar rats (14). Aqueous and alcoholic extracts of fruits of *Luffa cylindrica* were found to be safe in Swiss mice up to dose of 2000 mg/kg. (7).

Experimental Pharmacology
Various extracts of *Luffa cylindrica* have shown analgesic, anti-inflammatory, hepatoprotective, anti-hyperglycemic and wound healing activities in experimental animals (Table 2).
Table 2. Experimental Pharmacology studies on *Luffa cylindrica*.

<table>
<thead>
<tr>
<th>Plant part</th>
<th>extract</th>
<th>Dose</th>
<th>Activity</th>
<th>Method</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>Aqueous extract</td>
<td>100 mg/kg B.W.</td>
<td>Analgesic activity (P&lt;0.01)</td>
<td>Acetic acid Induced writhing</td>
<td>(7)</td>
</tr>
<tr>
<td>Fruits</td>
<td>Alcoholic extract</td>
<td>100mg/kg B.W.</td>
<td>Analgesic activity (P&lt;0.001)</td>
<td>Acetic acid Induced writhing</td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>Alcoholic extract</td>
<td>100mg/kg B.W.</td>
<td>Analgesic activity (P&lt;0.01) at 60 minutes P&lt;0.001 at 90 and 120 minutes</td>
<td>Tail immersion method</td>
<td></td>
</tr>
<tr>
<td>Leaves</td>
<td>Ethanol extract</td>
<td>500mg /kg B.W.</td>
<td>Analgesic activity P&lt;0.01 at 2nd Hour</td>
<td>Analgesy Meter Test</td>
<td>(12)</td>
</tr>
<tr>
<td>Flowers</td>
<td>Ethanol extract</td>
<td>500mg /kg B.W.</td>
<td>Analgesic activity P&lt;0.01 at 2nd Hour</td>
<td>Analgesy Meter Test</td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>Ethanol extract</td>
<td>500mg /kg B.W.</td>
<td>Analgesic activity P&lt;0.05 at 1 hour</td>
<td>Analgesy Meter Test</td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>Methanolextract</td>
<td>200 and 400 /kg B.W.</td>
<td>Analgesic activity</td>
<td>Acetic acid induced writhing</td>
<td>(16)</td>
</tr>
<tr>
<td>Leaves</td>
<td>Methanolic extract</td>
<td>250 and 500mg /kg B.W.</td>
<td>Hepatoprotective activity</td>
<td>Paracetamol induced liver damage</td>
<td>(13)</td>
</tr>
<tr>
<td>Fruits</td>
<td>Aqueous extract</td>
<td>200 and 400 mg/kg</td>
<td>Hepatoprotective activity</td>
<td>Paracetamol induced liver damage</td>
<td>(11)</td>
</tr>
<tr>
<td>Fruits</td>
<td>Alcoholic extract</td>
<td>200 and 400 mg/kg</td>
<td>Hepatoprotective activity</td>
<td>Paracetamol induced liver damage</td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>Methanolic extract</td>
<td>200 and 400 /kg B.W.</td>
<td>Anti-hyperglycemic activity</td>
<td>Alloxan induced diabetes</td>
<td>(14)</td>
</tr>
<tr>
<td>Leaves and Flowers</td>
<td>Ethanol and hexane extracts</td>
<td>150 mg/kg</td>
<td>Anti-inflammatory</td>
<td>Hind paw oedema method</td>
<td>(17)</td>
</tr>
<tr>
<td>Flowers</td>
<td>Ethanol and hexane extracts</td>
<td>500,750 and 1000 mg/kg</td>
<td>Antiemetic activity</td>
<td>Chick emesis method</td>
<td></td>
</tr>
<tr>
<td>Whole plant</td>
<td>Chloroform extract</td>
<td>50 mg/kg</td>
<td>Anti-inflammatory activity</td>
<td>Hind paw oedema</td>
<td>(18)</td>
</tr>
<tr>
<td>Whole plant</td>
<td>Chloroform extract</td>
<td>10% (W/W)</td>
<td>Wound healing activity</td>
<td>Excision wound method</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion**

Review of the literature pertaining to phytochemistry and ethnopharmacology and experimental Pharmacology reveals potential nature of *Luffa acutangula* and *Luffa cylindrica* species. Advanced experimental Pharmacology studies may further unfold and strengthen its lesser/unknown therapeutic uses.

**Acknowledgement**

Authors are thankful to Director General, CCRAS and staff members of National Research Institute for Panchakarma, Cheruthuruthy, Thrissur for their cooperation.

**References**

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