Research Article

PHARMACOGNOSTICAL STANDARDIZATION AND ANTIMICROBIAL ACTIVITY OF LEAVES OF SYZYGIUM CUMINI (LINN.) FROM VARIOUS REGION OF NORTH INDIA

Deepak Kumar *, Shefali Arora1 and Munee Alam1
1Department of Pharmaceutical Chemistry, Dolphin (PG) Institute of Biomedical and Natural Sciences, Dehradun (UK) India
2Department of Chemistry, University of Petroleum and Energy Studies, Dehradun (UK) India
*Corresponding Author Email: deepsingh2304@gmail.com

Article Received on: 23/10/13 Revised on: 09/01/14 Approved for publication: 20/01/14

DOI: 10.7897/2230-8407.050212

ABSTRACT

Syzygium cumini is one of the widely used medicinal plants in the treatment of various diseases in particular diabetes. In present investigation, the pharmacognostic study of Syzygium cumini leaf is carried out from different region of north India. The study includes determination of foreign matter, microscopy and macroscopy examination, determination of ash, determination of total alcoholic extractives and loss on drying. Preparation of different leaves extract, their phytochemical analysis and antimicrobial activity of Syzygium cumini were also carried out. Results from the above studies were comparable with different regions of India. From antimicrobial study, ethyl acetate extract showed maximum antimicrobial activity at a concentration 200 mg/ml.

Keywords: Syzygium cumini, Pharmacognostical Standardization, Antimicrobial, Chloramphenicol, Antifungal, Antibacterial.

INTRODUCTION

Syzygium cumini Linn (family Myrtaceae), commonly known as Jamun (Hindi), is a medicinal plant and utilizable species. Common names are Java plum, Black plum, Jambul and Indian Blackberry1. The original home of Jamun is India, distributed throughout India, in forest up to 1800 m usually along the bank and moist localities. The sprouts are refrigerant, carminative and astringent to bowels. Powdered seeds are used as a remedy in diabetes and in metrorrhagia2. The tree fruits once in a year and the berries are sweetish sour to taste. The ripe fruits are used for health drinks, making preserves, squashes, jellies and wine3. In association to its dietary use, all parts of the tree and importantly the seeds are used to treat a range of ailments, the most important being diabetes mellitus4. Different parts of the Jamun were also reported for its antioxidant, anti-inflammatory, neuropsychopharmacological, anti-microbial, anti-bacterial, anti-HIV, anti- leishmanial and antifungal, nitric oxide scavenging, free radical scavenging, anti-diarrheal, anti fertility, anorexigenic, gastro protective and anti ulcerogenic and radio protective activities4. The major phytoconstituents are reported to contain vitamin C, gallic acid, tannins, anthocyanins, includes cyanidin, petunidin, malvidinglucoside and other components4.5 The objective of present study was too standardize and evaluates antimicrobial activity of leaves of Syzygium cumini Linn. from the different region of North India.

MATERIALS AND METHODS

Collection and Identification of plant materials

The plant leaves were collected from different regions from North India (i.e. 4 different cities or states) likes Nagina, Bijnor (Uttar Pradesh), Dehradun (Uttarakhand), Pinjor (Punjab), Kanpur (Uttar Pradesh) and Mandi (Himachal Pradesh), India and Identified by Dr. Vidit Tyagi, Botanist, Dept. of Botany, Dolphin PG Institute of Biomedical and Natural Sciences, Dhradun, Uttarakhand, India.

Pharmacognostical Evaluation of leaves

The pharmacognostical evaluation or standardization of the raw material were done according to the guidelines mentioned by WHO in Quality control of Herbal Drugs7,8. Following parameters were evaluated.

Determination of Foreign Matter

50 g of leaves of Syzygium cumini leaf were taken and were looked for foreign matter by naked eyes and with the help of magnifying glass of 10x power.

Macroscopic and Microscopic Examination

The leaves of Syzygium cumini leaf were examined for their macroscopic and microscopic properties. Prior to the visual examination, leaves were softened with a cotton swab moistened with water.

Determination of ash

Total ash

2 g each of air dried leaves of Syzygium cumini leaf were taken in a pre-weighed and pre-ignited silica crucible. Then covered with a lid and kept in muffle furnace for 4 – 6 hours to heat up to 500 – 600°C. It was then cooled in desiccators and weighed again to determine the total Ash value, result shown in Table 1.

Acid-insoluble ash

To the total ash obtained from above, 25 ml of dilute hydrochloric acid (5.93 ml of conc- HCl diluted to 100 ml with water), was added and boiled for 5 minutes and then filtered with an ash-less filter paper. The insoluble matter was washed with hot water and then placed in the crucible and ignited again for about 6 – 8 hours and then weighed again, result shown in Table 1.

Water soluble ash

To the crucible of total ash, 25 ml of water was added and boiled for 5 minutes. The insoluble matter filtered on an ash less filter paper. The residue was washed with hot water and...
ignited in a crucible for 15 minutes at 450°C. The weight of the residue (in mg) from the weight of total ash, result shown in Table 1.

**Total Alcohol extractive**

4 g of air-dried leaves of *Syzygium cumini* leaf were taken in a 250 ml glass stoppered conical flask and 100 ml ethanol was added. It was then shaken frequently for about 6 hours and then left standing overnight (~18 h). Ethanol then was filtered and 25 ml of it was transferred into a pre-weighed china dish and evaporated to complete dryness and then weighed again. The weight of alcohol extractive was determined for 25 ml and was then multiplied by 4 to calculate the total alcohol extractive for 100 ml (4 g of sample) result shown in Table 1.

**Total Water extractive**

4 g of air-dried leaves of *Syzygium cumini* leaf were taken in a 250 ml glass stoppered conical flask and 100 ml distilled water was added. It was then shaken frequently for about 6 hours and then left standing overnight (~18 h). Water then was filtered and 25 ml of it was transferred in to a pre-weighed china dish and evaporated to complete dryness and then weighed again. The weight of water extractive was determined for 25 ml and was then multiplied by 4 to calculate the total water extractive for 100 ml (4 g of sample) result shown in Table 1.

**Loss on Drying**

2 g leaves, each of *Syzygium cumini* leaf were placed in a previously weighed weighing bottle and then kept in the oven, maintained at 105°C for about 2 hours and then weighed again to give weight of water and volatile matter in the sample, result shown in Table 1.

**Preparation of extracts**

The collected plant Material was washed with water to remove other undesirable material and dried under shade. The air-dried leaves (350 g) of *Syzygium cumini* were crushed. The crushed leaves extracted with Methanol by cold percolation method using percolator. The extract was evaporated till dryness to obtain a residue of 85 g (24.28%). From total methanol extract, preparation of different fractions by cold percolation method using increasing polarity of solvents by separation technique i.e. Petroleum Ether, Chloroform, Ethyl Acetate, Butanol were done.

**RESULTS**

<table>
<thead>
<tr>
<th>PLACE</th>
<th>LOD (%)</th>
<th>ASH (%)</th>
<th>Acid-insoluble ASH (%)</th>
<th>Water-soluble ASH (%)</th>
<th>Alcohol Extractive</th>
<th>Water Extractive</th>
<th>Foreign matter (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAGINA (UP)</td>
<td>6.6</td>
<td>5.82</td>
<td>1.0</td>
<td>1.55</td>
<td>7.30</td>
<td>13.90</td>
<td>2.0</td>
</tr>
<tr>
<td>DEHRADUN (UK)</td>
<td>11.2</td>
<td>3.55</td>
<td>1.25</td>
<td>4.33</td>
<td>10.25</td>
<td>8.40</td>
<td>1.44</td>
</tr>
<tr>
<td>PINJOR (HARYANA)</td>
<td>10.59</td>
<td>2.92</td>
<td>1.0</td>
<td>0.85</td>
<td>9.60</td>
<td>14.10</td>
<td>3.22</td>
</tr>
<tr>
<td>KANPUR (UP)</td>
<td>7.95</td>
<td>13.57</td>
<td>2.25</td>
<td>1.35</td>
<td>9.05</td>
<td>22.10</td>
<td>3.14</td>
</tr>
<tr>
<td>MANDI (HIMACHAL)</td>
<td>3.8</td>
<td>9.98</td>
<td>1.85</td>
<td>2.0</td>
<td>7.00</td>
<td>8.63</td>
<td>2.54</td>
</tr>
</tbody>
</table>

**Macroscopic Study**

The leaves measure about 10 to 15 cm long and 4 to 6 cm wide. These are entire, ovate-oblung, sometimes lanceolate and also acuminate, coraceous, tough and smooth with shine above. The fragrant flowers of Jamun are small, nearly 5 mm in diameter. These are arranged in terminal trichotomous panicles greenish white in color.

**Microscopy**

Transverse section of *S. cumini* leaves showed following features-

**Epidermis**

Two to three layered epidermis.
Mesophyll
It is composed of isodiametric thin walled parenchymatous
ground cells which are packed with simple starch grains. In
the mid-rib region, the vascular bundles show xylem, towards
upper epidermis and phloem on the lower side. Starch grains,
oil globules, tannin cells and stone cells are also visible.

The antibacterial activity of different extracts of Syzygium
cumini and standard drug chloramphenicol were tested for
different strains of bacteria and zone of inhibition was
recorded in mm.

Antifungal activity of different extracts of Syzygium cumini
and standard drug chloramphenicol were tested for different strains
of fungus and recorded the zone of inhibition in mm.

### DISCUSSION
The standardization results showed in Table 1, the LOD
(Loss on Drying) result is maximum in the Dehradun, India
leaf 11.2 %, it means that the maximum moisture content
found in the leaf of Dehradun, India and low moisture content
in Mandi (H.P), India leaf 3.8 % and other Nagina (U.P),
India leaf 6.6 % Pinjor (Haryana), India leaf 10.5 % Kanpur
(U.P), India leaf 7.95 %. The ash value maximum for the
Kanpur (U.P), India leaf 14 % and lower for the Pinjor
(Punjab), India leaf 3 % its show that the Kanpur leaf found
their low toxic substance as compare to pinjor (Haryana),
India leaf and other Nagina (U.P), India leaf 5.9 % Dehradun
(U.K), India leaf 5.25 % Mandi (H.P), India leaf 10 %. Acid
insoluble ash is equal (lower) for Nagina (U.P), India and
Pinjor (Haryana), India 1 % and the maximum for the Kanpur
leaf 2.25 % and other leaf Dehradun (U.K), India leaf 1.25 %
Mandi (H.P), India 1.85 %. Water soluble ash maximum for
the Dehradun leaf 4.33 % and minimum for the Pinjor
(Haryana), India leaf 0.85 % and other leaf Nagina (U.P),
India leaf 1.55 % Kanpur (U.P), India 1.35 % Mandi (H.P),
India 2 %. Alcohol extract is maximum for the leaf of
Dehradun (U.K), India 10.2 % and minimum for the Mandi
(H.P), India leaf 7.0 % and other Nagina (U.P), India leaf 7.3
Pinjor leaf 9.6 % Kanpur (U.P), India leaf 9.05 %. Water
extract is maximum for the leaf of Kanpur (U.P), India leaf
22.10 % and minimum for the Dehradun (U.K), India (8.40
%) leaf and other leaf Nagina (U.P), India 13.9 % Pinjor
(Haryana), India 14.1 % Mandi (H.P), India 8.62 %. Foreign
matter is maximum for the leaf of Pinjor (Haryana), India
3.22 % and minimum for the Dehradun (U.K), India leaf 1.44
% and other leaf Nagina (U.P), India 2 % Kanpur (U.P), India
3.14 % Mandi (H.P), India 2.54 %. From Phytochemical
analysis results we can find out that methanol extract was the
richest extract for phytoconstituents except tannins of
phenolic compounds, carbohydrates and flavonoids. It
contains all tested phytoconstituents viz. Alkaloids,
glycosides, proteins and amino acid, triterpinoids of sterols,
fats and fixed oil and saponins. Ethyl Acetate extract contain
protein and amino acid, and fats and fixed oil except
triterpenoids of sterols. Petroleum Ether, chloroform extracts
contains only saponin sterols and fats and fixed oil.
Antibacterial activity of total methanol extract and its
fractions against tested microorganism were done and
compared with standard drug Chloramphenicol. All extracts
showed antibacterial activity against Escherichia coli in
which maximum inhibition zone showed by the Ethyl Acetate
(26 mm) and minimum inhibition zone by petroleum ether
(15 mm) and other chloroform (16 mm), Butanol (17 mm),
and methanol (20 mm). Ethyl Acetate extract showed
maximum inhibition zone (27 mm) against K. pneumonia and
minimum inhibition zone showed by petroleum ether (13 mm) and other Methanol and Butanol both showed (18 mm) inhibition zone. Against *Bacillus cereus* bacterial strain Ethyl Acetate showed maximum inhibition zone (35 mm) and minimum inhibition zone showed by chloroform (13 mm). The inhibition zone against *Bacillus cereus* by methanol extract (29 mm) and Petroleum ether and Butanol both showed (19 mm). Against *Salmonella typhi*, Ethyl acetate extract showed maximum inhibition zone (21 mm), Butanol extract (19 mm) and methanol and petroleum ether extract both showed inhibition zone (18 mm). Against *S. aureus*, Methanol extract showed maximum inhibition zone (32 mm) and minimum inhibition zone showed by Petroleum ether (19 mm). Chloroform extract showed inhibition zone against *S. aureus* (24 mm), Ethyl acetate (28 mm), and Butanol (21 mm). All extracts showed Antifungal activity against *Penicillium chrysogenum* in which the maximum inhibition zone showed by the Ethyl Acetate (38 mm) and minimum inhibition zone showed by Butanol (17 mm) among other extract such as chloroform showed inhibition zone (19 mm) methanol extract (32 mm) except Petroleum Ether. All extracts showed Antifungal activity against *Aspergillus niger* in which Methanol extract and Petroleum ether showed maximum inhibition zone (33 mm), minimum inhibition zone showed by chloroform (18 mm) among other extract such as Ethyl acetate and Butanol both showed inhibition zone (30 mm). Against *Candida albicans* the maximum inhibition zone showed by Ethyl Acetate (31 mm) and minimum inhibition zone by Chloroform (20 mm) and among other extracts methanol showed (26 mm), Petroleum Ether and Butanol showed inhibition zone (30 mm); against *Saccharomyces cerevisiae* maximum inhibition zone showed by Methanol (27 mm) and Butanol (27 mm). Chloroform extract and ethyl acetate extract showed inhibition zone (19 mm) and (20 mm) respectively against *Saccharomyces cerevisiae*.

**CONCLUSION**

Finally we can find out the Pharmacognostical Standardization result of leaf of *Syzygium cumini* from North India the best result showed by the Pinjor (Haryana), India Plant region this mean the soil and nature are best for the *Syzygium cumini*. The standardization is thus a very crucial part of establishing its correct identity. The present study could therefore serve as important data for proper identification, collection and investigation of the *Syzygium cumini* leaves. However, the variation on reported values and estimated values in the present study may be expected due to the various ecological factors. Evaluation of antimicrobial activity of this plant in which Ethyl acetate showed maximum activity against both antibacterial and antifungal strains. Further Study needed for the isolation of active constituents.

**ACKNOWLEDGEMENT**

Authors are thankful to Management and Principal of Dolphin PG Institute of Biomedical Natural Sciences, Dehradun, India for providing necessary facilities for completion this work.

**REFERENCES**


**Cite this article as:** Deepak Kumar, Shefali Arora and Muneer Alam. Pharmacognostical standardization and antimicrobial activity of leaves of *Syzygium cumini* (Linn.) from various region of North India. Int. Res. J. Pharm. 2014; 5(2):62-65 [http://dx.doi.org/10.7897/2230-8407.050212](http://dx.doi.org/10.7897/2230-8407.050212)

Source of support: Nil, Conflict of interest: None Declared