



# *Phytochemical Investigation and Comparative study on percentage yield with different solvent of “*Syzygium cumini*” leaf*

**Rajkumari Lodhi\*, Mamta Yadav<sup>1</sup>, Smita Jain<sup>1</sup>, Satish Nayak<sup>1</sup>**

Bansal college of Pharmacy, Kokta, Bhopal MP-462022

Corresponding Author: Rajkumari Lodhi

## **Abstract:**

As we know jamun (*Syzygium cumini*) plant is a worldwide medicinal plant traditionally used in herbal medicines due to its vaunted properties against cardio metabolic disorders, which include: antihyperglycemic, anti-inflammatory, cardio protective, and antioxidant activities.

In present study, we used various solvents like methanol, Ethanol, Acetone, Distilled water, etc. These solvents are used for the extraction of *Syzygium cumini* leaves (Jamun leaves). Jamun can cure the symptoms of diabetes type 2 including frequent urination and thirst. It's low glycemic index, which keeps the blood sugar levels normal. It can also prevent the onset of type 2 diabetes which is lifestyle driven disease,” says the nutritionist

In this research we performed the extraction process to get the plant leaves extract from using different solvent after that we compare the extract obtained by the extraction method and then calculate the percentage yield. Plant-derived substances have recently become of great Interest owing to their versatile applications. Medicinal plants are the richest bio-resource of Drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements, Folk medicines.

**Keywords:** *syzygium cumini*, diabetes type 2, glycemic index, nutraceuticals, Folk medicines.

## **Introduction**

As we know jamun (*Syzygiumcumini*) plant is a worldwide medicinal plant traditionally used in herbal medicines due to its vaunted properties against cardiometabolic disorders, which include: antihyperglycemic, anti-inflammatory, cardio protective, and antioxidant activities<sup>1</sup>.

Jamun is rich in protein, fibre, antioxidants<sup>2</sup>, calcium, iron, phosphorous, potassium, manganese, vitamin C and B6 and several other nutrients. Clearly, it qualifies as a superfood that should be consumed on a regular basis. The leaves contain antioxidants and have anti-virus, anti-inflammatory properties<sup>3</sup>, while helping lower blood sugar

levels, treating constipation and eliminating allergies As we know everything has their possible side effects so here are some possible side effects of Jamun As reported in the literature, flatulence, delayed digestion, laryngitis, inflammation in the lungs, and emphysema are all possible side effects of jamun<sup>5</sup>.

In present study, we used various solvents like methanol, Ethanol, Acetone, Distilled water, etc. These solvents are used for the extraction of *Syzygium cumini* leaves (jamun leaves). Jamun can cure the symptoms of diabetes type 2 including frequent urination and thirst. It's low glycemic index, which keeps the blood sugar levels normal. It can also prevent the onset of type 2 diabetes which is lifestyle driven disease," says the nutritionist.<sup>6</sup>

Plants of this family are known to be rich in volatile oils which are reported for their uses in medicine and many fruits of the family have a rich history of uses both as edibles and as traditional medicines in divergent ethnobotanical practices throughout the tropical and subtropical world. Some of the edible species of *Syzygium* are planted throughout the tropics worldwide<sup>7</sup>.

### Botony

Jambolan is a large evergreen and densely foliaceous tree with greyish-brown thick bark, exfoliating in woody scales<sup>8</sup>. The wood is whitish, close grained and durable; affords brown dyes and a kind of a gum Kino. The leaves are leathery, oblong-ovate to elliptic or obovate-elliptic with 6 to 12 centimetres long (extremely variable in shape, smooth and shining with numerous nerves uniting within the margin), the tip being broad and less acuminate. The dark violet coloured ripe fruits give the impression the fruit of the olive tree both in weight and shape and have an astringent taste. The fruit has a combination of sweet, mildly sour and astringent flavour and tends to colour the tongue purple<sup>9</sup>.



Figure -01 Leaves of *Syzygium cumini*

### Plant Description<sup>10</sup>

Scientific name	<i>Syzygiumcumini</i>
Kingdom	Plantae
Order	Myrtales
Family	Myrtaceae
Genus	<i>Syzygium</i>
Species	<i>S.cumini</i>
Common Names	Jamun, Malabar plum, jambul, java plum Black plum
Chemical constituents	Anthocyanins, glucoside, ellagic acid, isoquercetin, kaemferol and myrecetin
Life span	60 Years

## Medicinal Parts

All parts of Jamun Tree are used in medicines.

- Seeds (whole with seed coat and kernel)
- Kernel
- Fruit Pulp
- Leaves
- Stem Bark

## Phytochemistry (Chemical Composition)

Jamun Plant Is A Good Source of Following Phytochemicals:

- Anthocyanins
- Glucoside
- Ellagic Acid
- Isoquercetin
- Kaemferol
- Myrecetin

## Nutrients in Jamun

The composition of Jamun fruit mainly depends on the region where it is cultivated and on the climate of that particular region<sup>11</sup>. Climate plays a very important role on the composition of minerals rather than that of the vitamins. The major minerals present in Jamun pulp as well as seeds include: Sodium, Potassium, Magnesium, Calcium Sodium and potassium are two important electrolytes that are required for regulating blood pressure whereas, magnesium and calcium are vital for strong bones and teeth. Besides this, Jamun pulp and seeds also contain other minerals such as zinc, phosphorus, iron, copper, manganese, chromium and chlorine. It also contains a variety of vitamins such as vitamin A, thiamine (vitamin B1), riboflavin (vitamin B2), niacin (vitamin B3), folic acid (vitamin B9) and vitamin C<sup>12</sup>.

## Medicinal Properties and Use

- The bark is acrid, sweet, digestive, astringent to the bowels, anthelmintic and used for the treatment of sore throat, bronchitis, asthma, thirst, biliousness, dysentery and ulcers.
- It is also a good blood purifier<sup>13</sup>.
- The fruit is acrid, sweet, cooling and astringent to the bowels and removes bad smell form mouth, biliousness, stomachic, astringent, diuretic and antidiabetic.
- The fruit has a very long history of use for various medicinal purposes and currently has a large market for the treatment of chronic diarrhoea and other enteric disorders.
- The seed is sweet, astringent to the bowels and good for diabetes<sup>14</sup>.
- The ash of the leaves is used for strengthening the teeth and gums.
- Jamun Keeps the Heart Healthy

- Vinegar prepared from the juice of the ripe fruit is an agreeable stomachic and carminative and used as diuretics and it is also useful in spleen enlargement and an efficient astringent in chronic diarrhoea. Jamun Increases Haemoglobin.
- Jamun Treats Digestive Problems
- Fights Respiratory Problems
- Jamun Helps with Weight Loss and Skin Healthy and Radiant

## EXTRACTION METHOD

Extraction is the first step to separate the desired natural products from the raw materials. Extraction methods include solvent extraction, distillation method, pressing and sublimation according to the extraction principle. Solvent extraction is the most widely used method.<sup>15</sup> The extraction of natural products progresses through the following stages:

1. The solvent penetrates into the solid matrix
2. The solute dissolves in the solvents
3. The solute is diffused out of the solid matrix
4. The extracted solutes are collected.

Any factor enhancing the diffusivity and solubility in the above steps will facilitate the extraction. The properties of the extraction solvent, the particle size of the raw materials, the solvent-to-solid ration, the extraction temperature and the extraction duration will affect the extraction efficiency. The selection of the solvent is crucial for solvent extraction. Selectivity, solubility, cost and safety should be considered in selection of solvents. Based on the law of similarity and intermiscibility (like dissolves like), solvents with a polarity value near to the polarity of the solute are likely to perform better and vice versa. Alcohols (EtOH and MeOH) are universal solvents in solvent extraction for phytochemical investigation.

## SOXHLET EXTRACTION METHOD

### Principle

The Soxhlet extraction method integrates the advantages of the reflux extraction and percolation, which utilizes the principle of reflux and siphoning to continuously extract the herb with fresh solvent. The Soxhlet extraction is an automatic continuous extraction method with high extraction efficiency that requires less time and solvent consumption than maceration or percolation. The high temperature and long extraction time in the Soxhlet extraction will increase the possibilities of thermal degradation.

Soxhlet extractor extracts the components using the condensed vapors of the solvent. The condensed vapors come in contact with the sample powder and the soluble part in the powder gets mixed with the solvent.<sup>16</sup>

Soxhlet extraction is a modern extraction technique in which we circulate the same solvent through the extractor several times. It is a type of continuous extraction technique but we can call it a series of short maceration. Soxhlet extractor needs the desired compound to be soluble in the solvent at a high temperature.

One cycle of the soxhlet extraction method involves extraction following the evaporation of the solvent<sup>17</sup>. And theoretically, we can perform this cycle as many times as we want to get the maximum yield of the desired compound soxhlet extractor makes the extraction process much more efficient than that of the traditional method. Soxhlet extraction Method contains the following glassware apparatus for it's assembly and they are-

**Glassware:**

- Condenser
- Siphon tube
- Round Bottom Flask

**Apparatus:** Heating mantle

These are the important components of soxhlet extraction procedure<sup>18</sup>. The Soxhlet extraction process heats the solvent (for example - ethanol) to boiling temperature ( $>78^{\circ}\text{C}$ ). The evaporated ethanol is contained within the apparatus by the condenser unit; however the apparatus should be placed under a fume hood in case of escape.

**METHOD AND MATERIAL****Plant Collection**

The leaves of *SyzygiumCumini* were collected from plants growing in the tulsinagar district- Bhopal during the months of August, 2022. The leaves was dried at room temperature for 15 days, then it was blended into coarse powder by electrical grinder. The powdered drug was passed through sieve No.22 to get uniform particle size.

**Material**

Ethanol (In pure form), Acetone (In pure form), Chloroform (In pure form), Petroleum Ether (In pure form), Distilled water, Hydrogen peroxide, Hydrochloric acid, Sulphuric acid, Alpha-naphthol, Copper sulphate, Sodium hydroxide, Barfoed's solution, Benedict's solution, Potassium bismuth iodide, Iodine, Potassium iodide, Con.HNO<sub>3</sub>, NH<sub>4</sub>OH, Millon's reagent, Ninhydrin, Biuret reagent, Ammonia, 95% Ethanol, lead acetate, Potassium hydroxide, Lead acetate, Ferric chloride, , phosphate, Calcium carbonate, Standard measuring flasks, Messaring cylinder, Beakers, , Glass funnel, Test tubes, Holder, Glass rod

**Preparation of plant extract**

A comparative study was performed to investigate the effect of solvents on the extraction yield and the content of flavonoids, alkaloids, and terpenoids etc. For this we collected the leaves of *Syzygiumcumini* and washed the leaves under the running tap water and dried it at room temperature. When the leaves were completely dried, we grind the leaves and collect the powder and used that powder for extraction<sup>19</sup>.

**Percentage yield determination of *Syzygium cumini* using different solvent**

- 1) Extraction by using Ethanol solvent
- 2) Extraction by using Acetone solvent
- 3) Extraction by using Chloroform solvent

- 4) Extraction by using Distilled water solvent
- 5) Extraction by using Petroleum ether solvent

### Percentage Yield

The percentage yield of the extracts was determined as percentage of the weight of the extracts to the original weight of the dried sample.

Using the formula;

$$\text{Percentage yield} = \frac{\text{Weight of the extract}}{\text{Weight of the sample}} \times 100$$

### Extraction by using Ethanol Solvent

The total ethanolic content was determined by the Soxhlet extraction method.

20g of *Syzygium cumini* leaves powder was put into a thimble and placed into the siphon tube for the soxhlet extraction assembly using ethanol as a solvent<sup>20</sup>.

After 3 days we get all the Extract from the powder. The total weight of the extract after drying is 3.35 g and the result of percentage yield is 16 %.

### Extraction by using Chloroform Solvent

The Total chloroform content was determined by using Soxhlet extraction Method.

For which we take 20g of *Syzygium cumini* leaves powder and put that into a thimble and the thimble was placed into the siphon tube after Chloroform solvent

After 3 days we get all the Extract from the powder. The total weight of the extract after drying is 1g and the result of percentage yield is 5%

### Extraction by using Acetone Solvent

For which we take 20g of *Syzygiumcumini* leaves powder and put that into a thimble and the thimble was placed into the siphon tube after we placed a round bottom flask (capacity of 500ml) in the heating mentle of capacity 500ml.

And the siphon tube is placed into the round bottom flask. the condenser is attached at the top of siphon tube .We assembled this soxhlet Extraction assembly using Acetone solvent<sup>21</sup>

After 3 days we get all the Extract from the powder. The total weight of the extract after drying is 1.40 g and the result of percentage yield is 7%

### Extraction by using distilled water

The total Distilled water content was determined by using Soxhlet extraction Method

For which we take 20g of *Syzygium cumini* leaves powder and put that into a thimble and the thimble was placed into the siphon tube after that we placed a round bottom flask (capacity of 500ml) in the heating mentle of capacity 500ml.

And the siphon tube is placed into the round bottom flask .the condenser is attached at the top of siphon tube .We assembled this soxhlet extraction assembly using Distilled water solvent<sup>22</sup>.

After 3 days we didn't get any extract from the powder so we remain the assembly set for another 2 days .and we didn't get any extract in water solvent than we conclude in aquas solvent plant extract not found and some specific amount and specific time duration required for the aquas extract of Jamun leaf *Syzygium cumini*.

### Extraction by using Petroleum Ether

The total Petroleum ether content was determined by using Soxhlet extraction Method.

For which we take 20g of *Syzygium cumini* leaves powder and put that into a thimble and the thimble was placed into the siphon tube after that we set the Soxhlet extraction assembly using Petroleum ether.

After 3 days we get all the Extract from the powder. The total weight of the extract after drying is 0.22g and the result of percentage yield is 1.1g.

## RESULT AND DISCUSSION

### Percentage yield

Percent yield is the percent ratio of actual yield to the theoretical yield. It is calculated to be the experimental yield divided by theoretical yield multiplied by 100%. If the actual and theoretical yield is the same, the percent yield is 100%.<sup>23</sup> Usually, percent yield is lower than 100% because the actual yield is often less than the theoretical value. Reasons for this can include incomplete or competing reactions and loss of sample during recovery. It's possible for percent yield to be over 100%, which means more sample was recovered from a reaction than predicted. This can happen when other reactions were occurring that also formed the product. It can also be a source of error if the excess is due to incomplete removal of water or other impurities from the sample. Percent yield is always a positive value<sup>24</sup>.

Table- 03 (Percentage yield in different solvent)

S. no.	Solvent name	Solvent in ml	Sample weight	Extract weight	% yield
1.	<b>Ethanol</b>	100 ml	20g	3.35g	16%
2.	<b>Acetone</b>	100 ml	20g	1.40g	7%
3.	<b>Chloroform</b>	100 ml	20g	1.0g	5%
4.	<b>Distilled Water</b>	100 ml	20g	0g	0%
5.	<b>Petroleum Ether</b>	100 ml	20g	0.22g	1.1g

### Phytochemical screening

Various secondary metabolites viz., flavonoids, phenolic acids, tannins, and terpenes have been reported in different parts of *S. Cumini*<sup>25</sup> For instance, leaves of this plant species contain high levels of flavonoids, especially quercetin, myricetin, myricitrin, kaempferol, and their glucoside derivatives, in addition to simple phenols like ellagic acid, ferulic acid, chlorogenic acid, and gallic acid<sup>26</sup>.

**Table -04 Phytochemical screening results**

Test	Ethanol	Acetone	Chloroform	Petroleum Ether
Saponins	(+)	(+)	(+)	(+)
Alkaloids	(-)	(-)	(-)	(-)
Carbohydrates	(+)	(+)	(+)	(+)
Proteins	(-)	(-)	(-)	(-)
Amino acid	(-)	(-)	(-)	(-)
Flavonoids	(+)	(+)	(+)	(+)
Tannins	(+)	(+)	(+)	(+)
Terpenoid	(+)	(+)	(+)	(+)
Glycosides	(+)	(+)	(+)	(+)

### Conclusion

In conclusion it was observed that *Syzygium cumini* leaves contained significant bioactive compounds that make the plant a potential Antioxidant, anti-diabetic, anti-microbial, and among other therapeutic properties. Also observed that after the calculation of percentage yield the percentage yield of ethanol was found to be the highest (16%) and the percentage yield of the distilled water is found to be the lowest (0%) This study aims to summarize the most recent literature related to botany, traditional applications, phytochemical ingredients, pharmacological activities, nutrition, and potential food applications of *S. cumini*. Traditionally, *S. cumini* has been utilized to combat diabetes and dysentery<sup>27</sup>, and it is given to females with a history of abortions. Anatomical parts of *S. cumini* exhibit therapeutic potentials including antioxidant, anti-inflammatory, analgesic, antipyretic, antimalarial, anticancer, and antidiabetic activities attributed to the presence of various primary and secondary metabolites such as carbohydrates, proteins, amino acids, alkaloids, flavonoids (i.e., quercetin, myricetin, kaempferol), phenolic acids (gallic acid, caffeic acid, ellagic acid) and anthocyanins (delphinidin-3,5-*O*-diglucoside, petunidin-3,5-*O*-diglucoside, malvidin-3,5-*O*-diglucoside)<sup>28</sup>. Different fruit parts of *S. cumini* have been employed to enhance the nutritional and overall quality of jams, jellies, wines, and fermented products<sup>29</sup>. Today, *S. cumini* is also used in edible films. So, we believe that *S. cumini*'s anatomical parts, extracts, and isolated compounds can be used in the food industry with applications in food packaging and as food additives. Future research should focus on the isolation and purification of compounds from *S. cumini* to treat various disorders. More importantly, clinical trials are required to develop low-cost medications with a low therapeutic index.



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