

## Antibacterial study and effect on glucoamylase *in vitro* of aqueous and methanolic extracts of *Syzygium cumini* seeds

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### ABSTRACT

Antibacterial and glucoamylase inhibitory effect of aqueous and methanolic extracts isolated at different temperatures from seeds of *Syzygium cumini* is studied *in vitro*. Both aqueous and methanolic extracts are antibacterial against *E. coli*, *B. subtilis*, *P. aeruginosa* and *S. aureus*. The aqueous extract isolated at 25°C and methanolic extract isolated at 10°C showed 35% and 50% of maximum inhibition of glucoamylase respectively. Water extracts of *Syzygium cumini* seed are low inhibitors of glucoamylase than methanolic extracts. We observed that water extract isolated at 25°C is moderate inhibitor of glucoamylase. Even though the extraction yield with methanol is less but inhibition of glucoamylase is greater (25 to 50%). Thus we conclude that methanolic extract of *Syzygium cumini* seed is potent inhibitor of glucoamylase and hence hypoglycaemic than aqueous extracts in diabetes type-2.

**Key words:** *Syzygium cumini*, Glucoamylase, Antibacterial,  
Glucoamylase inhibitor, Hypoglycaemic, Diabetes type-2

### INTRODUCTION

In traditional medicinal systems of India, different parts of the plant have been claimed to have medicinal properties. The large number of herbal products including several metals and minerals has been reported for the care of diabetes mellitus in ancient literature<sup>1</sup>. The plant drugs are considered to be less toxic and free from side effects than synthetic drugs<sup>2</sup>. The *Syzygium cumini* (jamun) is a large evergreen tree, grown widely in the indagangetic plains and also in the Cauvery delta of Tamilnadu<sup>3</sup>. The jamun belongs to the family Myrtaceae and is botanically identified as *Syzygium cumini* Linn<sup>4</sup>. *Syzygium cumini* (Jamun) seeds have hypoglycaemic<sup>5,6,7</sup>, anti-inflammatory<sup>8</sup>, antipyretic<sup>9</sup>, psychopharmacological<sup>10</sup>, hypolipidaemic<sup>11</sup>, and antioxidant<sup>12, 13, 14</sup> activities. It is reported that the jamun seed extracts given to animals with 5 g/Kg body weight was more effective than glibenclamide<sup>6</sup>, an antidiabetic or hypoglycaemic drug mostly given orally in case of diabetes type-2. Glibenclamide is also glucoamylase inhibitor. Thus it controls the

degradation of glycogen and maintains glucose level in the blood. Reports are available that a decoction of the dry leaves of the *Syzygium cumini* gives hypoglycaemic effect<sup>15</sup>. The oral administration of alcoholic seed extract of jamun has a hypoglycaemic effect which also reduces glycosuria<sup>3</sup>. There is no report available on aqueous and alcoholic extracts of *Syzygium cumini* (Jamun) seed on glucoamylase and antibacterial activity. In the present work we have studied the effect of aqueous and alcoholic extracts of *Syzygium cumini* (Jamun) seed isolated at different temperatures on glucoamylase and antibacterial activity *in vitro*.

### MATERIAL AND METHODS

#### Plant material

*Syzygium cumini* (Jamun) seeds were collected fresh from local market, and washed with distilled water and dried in presence of sunlight. The plant was identified and authenticated at the Blatter Herbarium ST. Xavier's College, Mumbai-400 001, India, with specimen no. 1848 of G.L.Shah. The

dried seeds were ground in electrical mill and the powdered seeds were kept separately in plastic containers in dark until used.

#### Preparation of aqueous Jamun seed extracts (JSEts) at different temperatures

A suspension of 10 g of seed powder in 100 ml of distilled water was stirred manually for half an hour at 4°C temperature. The suspension was centrifuged for 5 minutes at about 6000 rpm. The centrifugate was evaporated to dryness at 80°C in an oven. Similarly the aqueous extracts were prepared at 10, 15, 20, 25, 30, 35, 40, 45 and 50°C.

#### Preparation of methanolic Jamun seed extracts (JSEts) at different temperatures

A suspension of 10 g of seed powder in 100ml of methanol was stirred manually for half an hour at 4°C temperature. The suspension was centrifuged for 5 minutes at about 6000 rpm. The centrifugate was evaporated to dryness at 80°C in an oven. Similarly the aqueous extracts were prepared at 10, 15, 20, 25, 30, 35, 40, 45 & 50°C.

#### Antibacterial study

The aqueous and methanolic extracts obtained at different temperatures were tested against four microorganisms by agar cup method<sup>16</sup>. All bioassays were carried out in triplicate and average values were taken.

#### Glucoamylase activity

1 mL of the reaction mixture containing 0.5 mL of starch solution (5 mg/mL prepared in 100 mM acetate buffer pH 4.5) and a suitable amount of enzyme (0.1 mL, 2 mg) were incubated at 37°C for 30 minutes. The reaction was terminated by keeping the test tubes in boiling water bath for 1-2 minutes, cooled under running tap water and the liberated glucose was estimated by DNS method<sup>17</sup>. A unit activity is defined as the mg of glucose liberated per mg of protein per minute.

### RESULTS AND DISCUSSION

The oral administration of aqueous and alcoholic extracts of *Syzygium cumini* seed resulted in a significant reduction in blood glucose level<sup>15,18,19</sup>. There is no report available for the study of aqueous and alcoholic extracts of *S. cumini* seed

isolated at different temperatures on glucoamylase and antibacterial activity. In the present project we have studied the effect of aqueous and alcoholic extracts of *S. cumini* seed isolated at different temperatures on glucoamylase *in vitro*.

The percentage yield of aqueous and methanolic extracts of *Syzygium cumini* seeds are depicted in Table 1. The percentage yield of aqueous extracts of *S. cumini* seeds were significantly elevated at different temperatures as compared to methanolic extracts. Maximum 18% yield with water whereas only 8% yield is obtained with methanol between +4 to 50°C.

The inhibition of glucoamylase of aqueous and methanolic JSEts isolated at different temperatures is given in Fig. 1. In our study, we have found that the aqueous and methanolic JSEts inhibits the glucoamylase activity *in vitro*. The methanolic JSEts isolated at different temperatures are found inhibitors of glucoamylase activity as compared to aqueous JSEts. The aqueous JSEt isolated at 25°C and the methanolic JSEt isolated at 10°C shows 35% and 50% inhibition of glucoamylase respectively. It is also observed that the percentage inhibition is 5% and 25% in case of aqueous and methanolic extract respectively isolated at 45°C. The possible mechanism by which JSEts bring about its hypoglycaemic action may be by affecting the activity of glucoamylase or by increasing the glycogen biosynthesis. The significant inhibition of glucoamylase suggests that the active hypoglycaemic compound present in aqueous and methanolic extracts of *jamun* seeds does not

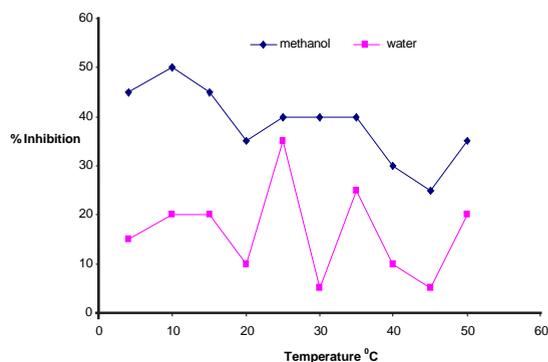


Fig. 1: Inhibitory action of aqueous and methanolic JSEts on glucoamylase *in vitro*

**Table 1: Percentage yield of aqueous and methanolic JSEts**

Temperature (°C)	Yield	
	Water	Methanol
4	14	7
10	17	8
15	16	8
20	17	6
25	16	7
30	18	7
35	18	6
40	16	7
45	18	8
50	17	6

necessarily require the presence of functioning of  $\beta$  -cells for its favorable action seen in type-I. It means the aqueous and methanol JSEts may act in a variety of diabetic conditions with or without functioning of pancreatic  $\beta$ -cells. An antibacterial effect of methanolic and aqueous JSEts is given in Table 2 and Table 3 respectively. The methanolic JSEts shows remarkable antibacterial activity as compared to aqueous JSEts.

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**Table 2: Antibacterial activity of methanolic extracts of seeds of *Syzygium cumini***

Temperature (°C)	Inhibition ( Excluding control, 8mm)			
	<i>E. coli</i>	<i>P. aeruginosa</i>	<i>S. aureus</i>	<i>B. subtilis</i>
4	12	3	9	7
10	7	3	7	9
15	7	4	7	7
20	7	5	7	7
25	7	3	8	7
30	7	2	7	7
35	7	3	8	7
40	3	3	6	7
45	10	4	7	7
50	7	4	7	7

**Table 3: Antibacterial activity of aqueous extracts of seeds of *S. cumini***

Temperature (°C)	Inhibition ( Excluding control, 8mm)			
	<i>E. coli</i>	<i>P. aeruginosa</i>	<i>S. aureus</i>	<i>B. subtilis</i>
4	4	3	3	4
10	4	4	3	2
15	4	5	3	5
20	5	2	6	5
25	3	2	4	4
30	3	3	2	4
35	4	4	3	4
40	3	3	4	5
45	5	5	4	4
50	4	4	4	5

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