



## Hypoglycemic activity of *Psidium guajava* Linn. leaf extract

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### Abstract

**Objective:** To evaluate the hypoglycemic activity of ethanol extract of *Psidium guajava* leaves. **Materials and methods:** The ethanol extract of leaves of *Psidium guajava* was tested for its hypoglycemic activity in alloxan-induced hyperglycemic Wistar rats. **Results:** In both acute and sub-acute tests, the ethanol extract, at an oral dose of 250 mg/kg, showed statistically significant and considerable hypoglycemic activity. **Conclusion:** *Psidium guajava* leaves possess statistically significant hypoglycemic activity.

Key words: *Psidium guajava* Linn., hypoglycemic activity.

### 1. Introduction

*Psidium guajava* Linn. (Myrtaceae), an arborescent shrub or small tree, up to 8 m high; often referred to as the apple of tropics; native of tropical America and has long been naturalized in India [1]. The leaves contain catechol, tannins, wax, resins, sugars, carotene, vitamins B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, niacin [2], essential oil, vitamin C [3], calcium and manganese in combination with phosphoric, oxalic and maleic acids [4].

The plant contains  $\beta$ -sitosterol, quercetin, leucocyanidin, gallic acid [5], ellagitannin-guavin A, B, C, D from leaves [6]. The leaves are astringent, anodyne, febrifuge, antispasmodic and tonic. They are useful in wounds, ulcers, cholera,

diarrhoea, vomiting [7, 8], for swollen gums and ulceration of mouth [9]. The biological activities, viz. antidiarrhoeal [10], anticough and antimicrobial [11], analgesic, anti-inflammatory, CNS depressant [12-17], topical haemostatic [18], antiamebic [19], antipyretic, antiarthritic [20], hypoglycemic [21, 22] of the various extracts of leaf and stem bark of the plant have been reported.

There are only a few reported antidiabetic activities on this plant and we have undertaken both acute and sub-acute activities. In order to evaluate if there is scientific basis to use the leaves of this plant as hypoglycemic, we undertook the present study.

## 2. Materials and methods

### 2.1 Plant material

Fresh leaves of *Psidium guajava* Linn. (Myrtaceae), were collected from Bullandshehar district of Uttar Pradesh, India and authenticated by Dr. M P Sharma, Taxonomist, Department of Botany, Faculty of Science. A voucher specimen is deposited in the laboratory of Pharmacognosy and Phytochemistry, Jamia Hamdard, New Delhi.

### 2.2 Preparation of the extract

Dried leaves (5 Kg) were macerated in ethanol (95 %). The ethanol extract was dried under reduced pressure and obtained 125 g of the dry extract (yield 2.5%).

### 2.3 Animals

Male Wistar rats (160-200 g) were used in the experiment. They were procured from Central Animal House, Jamia Hamdard, New Delhi (173/CPCSEA), after approval under project number 135. They were maintained under standard environmental conditions and had free access to feed (Hindustan Lever, India) and tap water *ad libitum* during the quarantine period. The animals were fasted

for 16 h before experiment but allowed free access to water.

## 3. Effect of *P. guajava* Linn. extract on alloxan-induced hyperglycemia

### 3.1 Acute treatment

Hyperglycemia was induced by a single i.p. injection of 120 mg/kg of alloxan monohydrate in sterile saline [23]. After 5 days of alloxan injection, the diabetic rats (glucose level >300 mg/dl) were separated and divided into three groups of six diabetic animals each. Group I was previously selected from normal rats and served as normal control and was given distilled water and no alloxan.

Group II served as diabetic control and was given distilled water. Group III received standard anti-diabetic drug Gliclazide at an oral dose of 25 mg/kg (Panacea Biotech Ltd., Batch No. 01030513). Group IV was treated orally with ethanol extract at a dose of 250 mg/kg; the dose was selected after preliminary behavioural and acute toxicity tests. Blood samples were collected from the tip of tail just prior to and 1 and 3 h after the extract/drug administration.

Table 1.

Effect of acute treatment of *P. guajava*, ethanol leaf extract (250 mg/kg, p.o.), on blood glucose level in alloxan induced diabetic rats<sup>a</sup>.

Group	Treatment	Blood Glucose (mg/dl)		
		Basal value	1 h	3 h
I	Normal Control (Distilled water only)	75.60 ± 1.24	77.00 ± 1.87	74.80 ± 2.08
II	Diabetic Control (Alloxan only)	353.80 ± 18.29	352.60 ± 10.67	352.00 ± 10.29
III	Standard (Alloxan+Std. drug)	329.00 ± 10.85	315.60 ± 10.26 <sup>NS</sup>	308.20 ± 9.58 <sup>NS</sup>
IV	Test (Alloxan+extract)	345.20 ± 11.20	272.60 ± 7.30 <sup>***</sup>	220.00 ± 8.30 <sup>***</sup>

<sup>a</sup>Values are means ± S.E.; n = 6, \*\*\*p<0.001, NS - not significant vs. group II.

Table 2.

Effect of sub-acute treatment of *P. guajava*, ethanol leaf extract (250 mg/kg, p.o., once daily), on blood glucose level in alloxan induced diabetic rats<sup>a</sup>.

Group	Treatment	Blood Glucose (mg/dl)				
		Basal value	Day 1	Day 3	Day 7	Day 10
I	Normal Control (Distilled water only)	75.60 ±1.24	93.80 ±6.08	88.20 ±5.45	91.80 ±3.48	92.20 ±1.77
II	Diabetic Control (Alloxan only)	353.80 ±18.29	353.40 ±10.20	353.60 ±9.65	354.40 ±10.15	354.80 ±10.83
III	Standard (Alloxan+Std. drug)	329.00 ±10.85	303.80 ±11.62 <sup>NS</sup>	306.40 ±10.77 <sup>NS</sup>	304.40 ±10.09 <sup>NS</sup>	304.60 ±11.40 <sup>NS</sup>
IV	Test (Alloxan+extract)	345.20 ±11.20	235.40 ±14.70 <sup>***</sup>	210.40 ±11.47 <sup>***</sup>	147.20 ±15.55 <sup>***</sup>	95.60 ±7.75 <sup>***</sup>

<sup>a</sup>Values are means ± S.E.; n = 6, \*\*\*p<0.001, NS - not significant vs. group II.

### 3.2 Sub-acute treatment

In sub-acute treatment, the administration of extract/drug was continued for 10 days, once daily. Blood samples were collected from the tip of the tail just prior to and on days 1, 3, 7 and 10 of the extract/drug administration. The blood glucose levels were determined for all the samples by glucose-oxidase method [24]. Data were expressed as ±SE, n=6. Statistical significance was determined by using, one-way analysis of variance (ANOVA) followed by Dunnet's *t* test. P<0.05 indicates significant differences between group means.

### 4. Results and discussion

The ethanol extract of *P. guajava* (Table 1) has shown statistically significant (P< 0.001) and considerable fall in blood glucose levels in alloxan-induced diabetic rats. In the untreated animals, blood glucose level did not change significantly. The sub-acute treatment with

*P. guajava* extract in alloxan-induced diabetic rats produced consistent reduction in the blood glucose level (Table 2), as compared with diabetic control.

### 5. Conclusion

The results indicate that *P. guajava* leaves possess significant hypoglycemic activity in both acute and sub-acute treatments. It is generally accepted that alloxan treatment causes permanent destruction of β-cells [25]. It is, therefore, conceivable that the hypoglycemic principles in the ethanol extract of *P. guajava* may exert their effect by an extra pancreatic mechanism in diabetic rats.

### 5. Acknowledgement

The authors wish to thank the UGC, New Delhi for providing financial support and Panacea Biotech Ltd. for providing complimentary sample of gliclazide.

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