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# Comparative study of sweet and bitter varieties of *Aegle marmelos* (L.) Correa on hypoglycemic activity in rabbits

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**Abstract**

Objective: To investigate the hypoglycemic activity of ethanolic extract of leaves of sweet and bitter varieties of *Aegle marmelos* in normal rabbits. Methods: Albino rabbits were treated with ethanolic extract of leaves of two varieties (sweet and bitter) of *Aegle marmelos* (250 mg/kg and 500 mg/kg, p.o and tolbutamide (40 mg/kg, p.o). Blood samples were collected from marginal ear vein just before and 0.5, 1, 2, 4, 6, 8, 16 and 24 h after the commencement of the experiment. Glucose-Oxidase assay method was used for the estimation of blood glucose. Results: Sweet and bitter varieties of *Aegle marmelos* produced hypoglycemic activity in a dose dependent manner. Sweet variety (250 mg/kg, 500 mg/kg) produced maximum percent blood glucose reduction (10.59±0.26, 15.9±0.55) at 6 h. Bitter variety (250 mg/kg, 500 mg/kg) produced maximum percent blood glucose reduction (21.96±0.43, 41.68±1.26) at 8 h and continued upto 24 h. Tolbutamide (40 mg/kg) produced maximum percent blood glucose reduction (38.90±0.71) at 6 h. Conclusion: Bitter variety of *Aegle marmelos* produced greater hypoglycemia than the sweet variety and the difference may be due to the presence of potent bioactive molecules in bitter variety.

**Key words:** *Aegle marmelos,* bitter, sweet, hypoglyemic activity

## 1. Introduction

The roots, leaves and fruits of *Aegle marmelos Correa*. ex Roxb [1] (Rutaceae) are used in Ayurvedic medicine for the treatment of various ailments [2]. The two varieties of the plant *viz.*, wild and sweet are found in Sub-Himalayan tracts, in Central and Southern India and in Burma [3,4]. The root bark has been used in intermittent fevers, heart diseases and also as a fish poison [5]. The fruit is regarded as astringent, digestive and spasmogogue [6,7]. It

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is also used in diarrhea and dysentry [8,9]. The seed oil is reported to have purgative value[10]. Earlier workers demonstrated that *Aegle marmelos* possessed a potent hypoglycemic effect similar to insulin [11-14].

Fresh leaves of *Aegle marmelos* collected in Pondicherry (India) were found to have two distinct tastes-sweet and bitter. Basing on the characteristic taste observed, these two are considered as two varieties of *Aegle marmelos* for our investigation. In the present paper a comparative evaluation of hypoglycemic activity of the leaf extracts of these two varieties of *Aegle marmelos* was made in normal rabbits.

## 2. Materials and methods

### *2.1 Plant Material*

Fresh leaves of *Aegle marmelos* of both varieties (sweet and bitter) were collected in Pondicherry and shade dried. Voucher specimens of the two varieties have been preserved in the Department of Botany, Andhra University. The authenticity of the samples was identified by Botanist Dr. Venkaiah, Department of Botany, Andhra University, Visakhapatnam.

### *2.2 Extraction*

The dried leaf powder (200 g) of each variety was extracted separately with 95% ethanol using Soxhlet apparatus and the process was repeated for 20 cycles. Then the extracts were evaporated to dryness by a rotavapor.

### *2.3 Chemicals Used*

Tolbutamide was a generous gift sample from Hoechst Pharmaceuticals, Mumbai. Glucose Analysis kit was obtained from the Diagnostic Division of Dr. Reddy's Laboratories, Hyderabad.

### *2.4 Experimental*

Adult albino rabbits (1.5-2 kg) of either sex divided into 6 groups each consisting of five animals. They were maintained on standard diet and water *ad libitum*. The extracts were administered orally (p.o). Group A treated with 5% gum acacia served as control. Groups B and C were treated respectively with 250 and 500 mg/kg of the alcoholic extract of leaves of sweet variety of *Aegle marmelos.*

Groups D and E were treated with 250 and 500 mg/kg of the alcoholic extract of leaves of bitter variety of *Aegle marmelos* respectively. Group F was treated orally with tolbutamide (40 mg/kg) and served as reference.

The blood samples were collected from the marginal ear vein just before and 0.5, 1, 2, 4, 6, 8, 16 and 24 h after the commence-ment of the experiment. Glucose-Oxidase assay [15,16] method was used to determine the blood glucose.

### *2.5 Statistical Analysis*

Data was expressed as means ± standard error of means. Statistical analysis was made with Student's *t* - test. $P<0.05$ was considered significant.

## 3. Results

The ethanolic extracts of leaves of sweet and bitter varieties of *Aegle marmelos* produced hypoglycemic activity in a dose dependent manner and the results are given in Table 1.

The doses of 250 mg/kg and 500 mg/kg of the extract of *Aegle marmelos* (sweet) produced maximum percent reduction ($p<0.05$) in blood glucose of 10.59±0.26 and 15.92±0.55 respectively at 6 h whereas the bitter variety at doses of 250 mg/kg and 500 mg/kg produced 18.29±0.55 and 31.14±1.57 percent reduction ($p<0.001$) in blood glucose levels at 6 h respectively and reached to maximum 21.96±0.43 and 41.68±1.26 percent ($p<0.001$)

Table 1
Effect of ethanolic extract of leaves of sweet and bitter varieties of *Aegle marmelos* in rabbits

| Group | Treatment | Dose | Blood Glucose Levels | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mg/kg | 0 h | 0.5 h | 1 h | 2 h | 4 h | 6 h | 8 h | 16 h | 24 h |
| A | Control | | 109.69±4.15 | 108.37±3.71 | 108.18±4.29 | 105.67±4.76 | 102.82±3.60 | 103.66±1.36 | 102.10±2.98 | 104.25±3.33 | 104.26±2.99 |
| B | Sweet | 250 | 111.76±1.36 | 110.17±1.67 | 107.13±0.96 | 105.50±1.32 | 102.83±1.08 | 99.92±0.97$^{*}$ | 100.50±0.86 | 102.13±1.05 | 102.13±1.67 |
| C | “ | 500 | 109.83±2.26 | 108.37±2.58 | 105.70±2.09 | 101.27±2.01 | 97.53±1.90 | 92.34±3.15$^{*}$ | 96.27±2.99 | 103.03±2.28 | 104.10±2.34 |
| D | Bitter | 250 | 109.03±0.82 | 106.42±0.82 | 101.73±0.94 | 97.39±0.41 | 92.01±0.75$^{*}$ | 89.09±0.24$^{***}$ | 85.09±0.26$^{***}$ | 89.58±0.93$^{**}$ | 90.28±1.15$^{**}$ |
| E | “ | 500 | 111.76±1.09 | 105.80±0.58 | 100.87±0.94 | 96.18±0.94 | 88.02±1.40$^{**}$ | 76.96±1.90$^{***}$ | 65.18±1.41$^{***}$ | 71.39±1.75$^{***}$ | 74.92±1.23$^{***}$ |
| F | Tolbutamide | 40 | 115.33±2.17 | 112.12±2.51 | 107.30±2.51 | 100.19±1.94 | 87.70±2.91$^{*}$ | 70.47±2.93$^{***}$ | 77.00±1.72$^{***}$ | 99.46±2.08 | 102.19±2.16 |

*p<0.05, **p<0.01, ***p<0.001 *vs* control ; Values are in Mean ± SEM

at 8 h and thereafter the higher level blood glucose reduction was continued upto 24 h. The reference tolbutamide (40 mg/kg) produced significant ($p<0.001$) reduction in blood glucose compared to control at 6 h (38.90%).

**4. Discussion**

Blood glucose levels are maintained mainly by insulin and glucagon which are secreted by β - cells and $\alpha_2$-cells of the islets of Langerhans [17]. Insulin facilitates the uptake, utilization and storage of glucose. Lowering of blood glucose is also produced by extrahepatic action by enhancing tissue uptake of glucose at cellular level.

The results indicate that bitter variety of *Aegle marmelos* have more pronounced hypoglycemic activity than the sweet variety and the compounds present may produce direct or indirect hypoglycemic activity. The observed difference in the hypoglycemic activity of the two varieties may be due to the possible variability in the chemical composition. However, it require further chemical investigation on these two varieties of *Aegle marmelos.*

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