

**EVALUATION OF ANTIDIABETIC ACTIVITY OF ETHANOLIC EXTRACT OF
PASSIFLORA EDULIS IN ALLOXANINDUCED DIABETIC RATS**Sajja Ravindra Babu^{1*}, G. Soumya², K. Preeti³, D. Chandana⁴ and K. Anil⁵

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ABSTRACT

The present study was carried out to evaluate the antidiabetic activity of ethanolic extract of whole plant of *Passiflora edulis* in alloxan induced diabetic rat model in which the rats were treated with alloxan (150mg/kg, i.p). The study was carried out on a 17 day protocol and the parameter monitored was blood glucose levels. Our study clearly indicated that the ethanolic extract of *Passiflora edulis* whole plant showed significant antidiabetic activity at both doses (250mg/kg and 500mg/kg) as significant decrease ($P < 0.05$) in blood glucose was observed. The ethanolic extract of *Passiflora edulis* whole plant also showed significant increase ($P < 0.05$) in body weight when compared with diabetic control rats. The results indicated that the extract of *Passiflora edulis* at high dose (500mg/kg) exhibited significant ($P < 0.05$) anti-hyperglycemic activity than low dose of (250mg/kg) of extract in diabetic rats. The present study indicated that EEPE possessed the highest phenolic and flavonoid compounds and exhibited strong antidiabetic and antioxidant activities.

KEYWORDS: *Paasiflora edulis*, Anti-hyperglycemic, Alloxan, Flavonoid.**INTRODUCTION**

Diabetes mellitus is a chronic metabolic disorder characterised by hyperglycaemia and altered metabolism of carbohydrates, lipids and proteins. It is a common condition affecting 1-2% of population with a strong hereditary tendency. Diabetes mellitus is a disorder that affects the body's ability to make or use insulin. Insulin is a hormone produced in the pancreas that helps transport glucose (blood sugar) from the bloodstream into the cells so they can break it down and use it for fuel. People cannot live without insulin. Diabetes results in abnormal levels of glucose in the bloodstream. This can cause severe short-term and long-term consequences ranging from brain damage to amputations and heart disease. Diabetes mellitus is usually irreversible while it allows the patient to have reasonably normal life style, its complications result in a considerably reduced life expectancy.^[2]

Passiflora edulis commonly known as Passion fruit. Passion fruit has been used to treat analgesic, anti-inflammatory, antianxiety and antioxidant activity.^[1] In this study the ethanolic extract of whole plant of *Passiflora edulis* was used in the treatment of diabetes mellitus as claimed in the literature.

MATERIALS AND METHODS

Plant Material: The plant material of *Passiflora edulis* used for the study was collected from local market, Hyderabad.

Preparation of Plant extract: The whole plant of *Passiflora edulis* was washed with distilled water and

shade dried. The whole plant was powdered and was subjected to extraction using Soxhlet apparatus with ethanol. This cycle was repeated many times, over hours or a few days, until the colour of the solvent in the siphon of the soxhlet faded away. The extract was concentrated by vacuum distillation and was subjected to phytochemical screening.

Phytochemical screening: *Passiflora edulis* was subjected to qualitative chemical screening for the identification of various plant constituents present in this study.

Experimental Animals: Albino rats of either sex weighing 150-200g were purchased from the animal house of Vyaas labs, Hyderabad, with free access to routine feed and water ad libitum. The housing environment was set at standard environmental conditions i.e., temperature set at 22 ± 2 °C with alternative dark and light cycle of 12 hours. All the experiments were carried out with the prior of Institutional Animal Ethical Committee (IAEC) of Mallareddy Institute of Pharmaceutical Sciences, Secunderabad (Reg.No:1662/PO/Re/S/12/CPCSEA).

Induction of Diabetes: Diabetes induction was done by single intra peritoneal injection of alloxan monohydrate (150 mg/kg) in saline. The hyperglycemia was confirmed after 72 hrs by the elevation of blood glucose and the behavioral changes (Excess thirst and frequent urination). The rats with blood glucose level more than 250 mg/dl were used for the study.^[2]

Experimental Design

Diabetes in rats was induced by a single dose of 5% alloxan monohydrate (150 mg/kg, i.p.) after 24 h fasting. Induction of diabetes was confirmed after four days of alloxan treatment by estimation of fasting blood glucose level. Only those rats with blood glucose level between 200–300 mg/dl were included in the study. These rats were further divided into five groups.

Group I: Control rats orally administered with distilled water.

Group II: Alloxan-induced diabetic rats administered intraperitoneal.

Group III: Alloxan-induced diabetic rats administered orally with Glibenclamide (5 mg/kg) dissolved in distilled water.

Group IV: Alloxan-induced diabetic rats administered orally with ethanolic extract of Passion fruit (250 mg/kg) dissolved in distilled water.

Group V: Alloxan-induced diabetic rats administered orally with ethanolic extract of Passion fruit (500 mg/kg) dissolved in distilled water.

All the treatments were started on the fourth day after Alloxan injection and once a day continued for 17 days. The blood glucose levels were measured by glucometer

on day 0, 3, 10, 17. The blood samples were collected from tail vein puncture and blood glucose levels were analyzed.^[3]

Statistical analysis

The results obtained were expressed as mean \pm SEM. Statistical analysis was performed using a one-way analysis of variance (ANOVA). Data was considered statistically significant at $p < 0.05$. When data was found to be very ($p < 0.01$) or highly ($p < 0.001$) significant, this was indicated in the results. All statistical analyses were performed using Graph Pad prism 8 software.

RESULTS

Phytochemical screening

Preliminary phytochemical screening was carried out using color forming and precipitating chemical reagents for detecting plant constituents from their extracts. The results obtained from the tests were summarized in Table 1, indicating the presence of flavonoids, tannins, saponins, phenolic compounds and steroids. Flavonoids, tannins and alkaloids were some of the documented compounds that were isolated from the plant with a potential to decrease the blood glucose level.

Table 1: Effect of Ethanolic Extract of *Passiflora Edulis* on Blood Glucose Level In Alloxan Induced Diabetic Rats at Different Days of Treatment.

Groups	Treatment	Day 0 (mg/dL)	Day 3 (mg/dL)	Day 10 (mg/dL)	Day 17 (mg/dL)
Group I	Normal control	112 \pm 3.67	110 \pm 5.40	98 \pm 3.84	95 \pm 6.78
Group II	Diabetic control	119 \pm 4.62	274 \pm 7.12 [#]	283 \pm 4.79 [#]	280 \pm 5.56 [#]
Group III	Glibenclamide (5mg/kg)	105 \pm 7.56	265 \pm 6.74 ^{ns}	127 \pm 5.93 ^{**}	103 \pm 3.26 ^{**}
Group IV	EEPE (250mg/kg)	115 \pm 3.73	273 \pm 5.66 ^{ns}	204 \pm 6.95 [*]	179 \pm 4.32 [*]
Group V	EEPE (500mg/kg)	99 \pm 5.61	262 \pm 5.86 ^{ns}	141 \pm 3.27 ^{**}	110 \pm 5.18 ^{**}

The values are expressed as mean \pm SEM (n=6). Significance at $p < 0.01$ [#] when compared with normal control group. *= $p < 0.05$, **= $p < 0.01$ when compared with diabetic control group. Where ns=not significant. EEPE: Ethanolic extract of *Passiflora edulis*

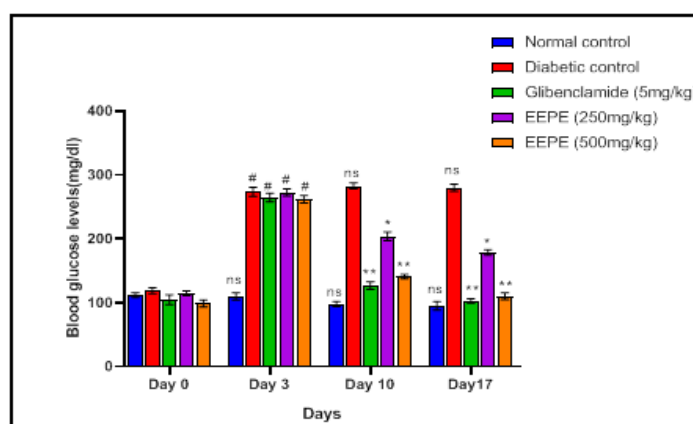


Fig. 1: Effect of Ethanolic Extract of *Passiflora Edulis* on Blood Glucose Level In Alloxan Induced Diabetic Rats at Different Days of Treatment.

Significance at $p < 0.01$ [#] when compared with normal control group. *= $p < 0.05$, **= $p < 0.01$ when compared with diabetic control group. Where ns=not significant. EEPE: Ethanolic extract of *Passiflora edulis*.

The results indicated that the blood glucose levels during the experimental period (day 0–17) were significantly

higher in diabetic control group as compared with the normal control group. Significantly decreased blood

glucose levels were observed in glibenclamide group (5 mg/kg) from day 0 to 17 (103 ± 3.26 mg/dl) when compared to diabetic control group (280 ± 5.56 mg/dl). Similarly, blood glucose levels were significantly reduced in ethanolic extract of *Passiflora edulis* treated rats (250 and 500 mg/kg) compared to diabetic control group. Statistically lowest blood glucose level was observed given the extracts of *Passiflora edulis* at higher dose (500 mg/kg) exhibited greater decrease in mean in glibenclamide group (103 ± 3.26 mg/dl). The study also showed that the rats which had been in blood glucose level (110 ± 5.18) as compared to those given at a dose of 250 mg/kg b.w. on day 17.

DISCUSSION

Oxidative stress plays an imperative role in developing diabetes mellitus complications; in contrast, complementary antioxidant supplementation is helpful for patients with diabetes mellitus to ameliorate diabetes mellitus-associated complications. The plant realm, renowned for its abundant phenolic and flavonoid compounds, has demonstrated significant antioxidant effects, providing protection against various oxidative stress-related ailments, including diabetes mellitus.^[4,5] The present study showed that EEPE contains a significant amount of phenolic and flavonoid compounds that give its free radical scavenging capability. These findings are consistent with prior investigations involving different plant materials. These outcomes imply that the elevated antioxidant potency of EEPE can be attributed to the presence of phenols and flavonoids.

Alloxan causes massive reduction in insulin release, through the destruction of β -cells of the islets of Langerhans. Elevated blood glucose level or hyperglycemia due to a lack of insulin production by the pancreas or insulin resistance is the most common symptom of DM. In this study, we found that oral administration of EEPE significantly decreased blood glucose levels in diabetic mice compared to that of diabetic control mice.^[6]

Phytochemical screening of ethanolic extract of *Passiflora edulis* revealed the presence of tannins, saponins, flavonoids, polyphenols, terpenoids, steroids, phytosterols. Flavonoids, polyphenols, tannins, saponins, steroids, alkaloids, terpenoids, glycosides, carbohydrates, and polysaccharides have been demonstrated to have antidiabetic activity. Thus, the potential antidiabetic activity of the crude extract of *Passiflora edulis* could be attributed to the aforementioned bioactive phytochemical implicated for their potential antihyperglycemic activity which might exert their effects individually or in synergy with each other.^[7]

CONCLUSION

In conclusion, the leaf extract of *P. edulis* shows more total phenolic, alkaloid, and flavonoid contents. Nonetheless, the leaf extract was rich in antioxidant potential and anti-diabetic properties via functioning as

an inhibitor of α -amylase, α -glycosidase. Hence, the results revealed that *P. edulis* has considerable levels of phytochemicals and good therapeutic properties. This should lead to further research into how such material would affect human health as potential pharmaceuticals and nutraceuticals. Passion fruit seeds, by-products of the juice industry, have the potential for use as a low-cost antioxidant and bioactive source for developing nutraceuticals and dietary supplements, for managing blood glucose levels. In this work, *P. edulis* showed a potent antidiabetic and antioxidant potential at bioactive concentrations. The present study indicated that EEPE possessed the highest phenolic and flavonoid compounds and exhibited strong antidiabetic and antioxidant activities.

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