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HYPOGLYCEMIC ACTIVITY OF *PASSIFLORA EDULIS* SIMS LEAF EXTRACT IN WISTAR ALBINO RATS

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ABSTRACT
The traditional medicinal plant *P.edulis* was tested for its hypoglycemic effect in Wistar albino rats. The oral glucose tolerance test was performed in overnight fasted normal as well as in alloxan induced diabetic rats (150 mg/kg, of alloxan, i.p.) with the administration of 100,200,300,400 mg/kg of b.wt of *P.edulis*. The blood sample withdrawn at 0, 60, 120, 180 min of glucose administration from the retro orbital sinus by capillary puncture indicated the hypoglycemic nature of the *P.edulis* leaf extract and identified the most effective dose as 200mg/kg b.wt.
KEYWORDS: *Passiflora edulis*, Hypoglycemia, Alloxan mono hydrate, GTT

INTRODUCTION

Diabetes, a non communicable disease results from shortage or lack of insulin secretion or reduced sensitivity of the tissue to insulin[1]. It is one of the common metabolic disorder with micro and macro vascular complication that results in significant morbidity and mortality and considered as the fifth leading cause of death in the world[3,4]. Insulin is the principal hormone secreted by β-cells of pancreas that regulate the uptake of glucose from the blood into most cells. In diabetes mellitus the body either does not make enough insulin or it cannot use its own insulin or both. This accumulates sugar in blood, leading to various potential complications [4,5].

The incidence of diabetes is considered to be high world wide[6]. According to the International Diabetes Federation, there are 246 million people with diabetes on the globe and this figure will rise to 380 million by the year 2025[7]. India is stated to be the diabetic capital of the world by 2025. In India alone, the prevalence of diabetes is expected to increase from 31.7 million in 2000 to 79.4 million in 2030[8]. The prevalence of type 2 diabetes is 4-6 times higher in the urban areas of India as compared to rural areas[9].

Historical and traditional medicinal plant used in folklore medicine is *Passiflora edulis*, also known as yellow passion fruit and yellow granadilia. *P.edulis* Sims (Passion fruit) belongs to the genus Passiflora, comprising about 500 species that are distributed in warm temperatures and tropical regions. It is a vigorous climber. The leaves are evergreen and alternate, 3 lobed when mature. Several species are grown in the tropics for edible fruits, the most widely grown being *P.edulis*. The leaves and stems of *P.edulis* have shown antiinflammatory, antianxiety, antitumour, antimicrobial and antioxidant activity[10]. In this study, GTT, the most commonly used test for the diagnosis of diabetes which measures how quickly the glucose is cleared off from the blood after administration of glucose is carried out to assess the hypoglycemic nature of the plant.

MATERIALS AND METHODS

Plant Material and Extraction

Passiflora edulis leaves were collected from a local farm and authenticated by Dr.G.V.S.Moorthy, Botanical Survey of India, Tamilnadu Agricultural University Campus, Coimbatore. The Voucher No is BSI/SRC/73/5/23/09-10/Tech.-624 and the specimen was deposited in the department herbarium for future reference. After washing with water the leaves were dried at 25^0C for 10 days in the absence of sunlight and powdered coarsely using a mixer. Then they were weighed and kept in an airtight container and stored in the refrigerator for future use.

Animals

The adult male albino rats, weighing about 150-180 g were procured from animal house of Karpagam University, Coimbatore and used for the study. Rats were housed at constant temperature of 22+5°C with a 12-hour light, 12-hour dark cycle. The rats were fed on pellets with free access to tap water. All the experiments were carried out according to the guidelines recommended by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA), Government of India.

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. A positive test for benedicts reaction in urine sugar was taken as a support for the selection of diabetic rats.

Experimental Design

Effect of aqueous extract of *P.edulis* on GTT of normal rats

The oral glucose tolerance test was performed in overnight fasted normal rats by the method of Bonnerweir[11]. They were allowed to take up only drinking water during the fasting period. The animals were divided into five groups of five animals each. Group 1 was treated with normal saline. Group 2-5 receives 100,200,300,400 mg/kg of *P.edulis*. Before the treatment, fasting blood samples were collected and the respective doses of *P.edulis* were given to the treatment groups. After 30 min, blood was again drawn that gives the 0 h value. The animals were given a glucose solution (4 g/ kg b.wt) orally and blood samples were withdrawn from the retro orbital sinus by capillary puncture at 1, 2, 3 hrs after glucose administration which gives the 1, 2, 3 hr values. From the collected sample the glucose level was estimated using Barham and Trinder method [12] and the percent decrease in glucose was calculated.

$$\% \text{ decrease in glucose level} = \frac{(\text{Before treatment} - \text{After treatment}) \times 100}{\text{Before treatment}}$$

Effect of aqueous extract *of P.edulis* on GTT of diabetic rats

The glucose tolerance test was also studied in the aqueous extract of *P.edulis* on diabetic rats. As mentioned above GTT was carried out in over night fasted diabetic rats. The animals were divided into seven groups with five animals each. Group 1 was treated with normal saline. Group 2 was diabetic control and group 3 was diabetic treated with glibenclamide (5mg/kg), group 4-7 receives 100,200,300,400 mg/kg of *P.edulis*.

Before the treatment, the fasting blood samples were collected and the respective doses of *P.edulis* were given to the various groups. After 30 min, blood was again drawn that gives the 0 h value. The animals were given a glucose solution (4g/ kg b.wt) orally and blood samples were collected at 1, 2, 3 hrs after glucose administration which gives the 1, 2, 3 hr values.

RESULTS AND DISCUSSION

Male Wister albino rats were used in this study mainly to draw the adequate borderline data since their blood glucose levels are fairly stable. Oral administration was choosen in our study since that is the most common route of drug administration.

Figure 1 represents the hypoglycemic potential of single administration of various doses of aqueous extract of *P.edulis* on GTT of normal rats. The present study result indicated that % reduction of glucose was found to be 6.31, 7.14, 6.73 and 6.00 with the doses of 100,200,300 and 400mg/kg body weight respectively (Figure 2). Among the different dose level significant reduction in blood glucose was observed in 200mg/kg in *P.edulis* which brought the maximum fall in blood glucose and was found to be the most effective. Lesser fall in blood glucose was identified in doses like 300 and 400mg/kg and this lesser reduction in blood glucose at high dose level is not a new phenomenon which was also observed at higher dose level of *Brassica nigra*[13].

Figure 3 demonstrated the antidiabetic effect of single administration of various doses of aqueous extract of *P.edulis* on GTT of diabetic rats. Here also the dose level of 200mg/kg of *P.edulis* produced the maximum fall of 47.25 % in blood glucose after 3 hours of glucose administration. The fall of blood glucose in non treated diabetic was very minimum (5%), but the antidiabetic drug glibenclamide treated rats were maximum (52%). A fall of 43.33, 46.04 and 45.28 % was observed with the administration of 100,300 and 400 mg/kg of *P.edulis* (Figure 4). This study again confirms that 200mg of *P.edulis* /kg b.wt was the most effective dose.

The fruits of *P.edulis* were reported to have anti oxidant, anti-tumour activity[10]. Earlier phytochemical screening of of *P.edulis* leaves indicated the presence of phenols and flavonoids. The presence of these phytochemicals may be responsible for the observed hypoglycaemic acitivity of *P.edulis*[14].

Increased oxidative stress was reported in patients with diabetes mellitus. This increased oxidative stress as a result of increased free radical formation has also been suggested for its contribution in vascular damage that occur in diabetes[15]. There is high correlation between antioxidant activity and phenolic compounds[16]. Aliyu et al.,[17] reported that phenolic compounds are the major group of compounds that acts as primary antioxidant because of it reaction with oxygen free radicals such as hydroxyl, superoxide anion radicals and lipid peroxyl radicals. Besides acting as antioxidants, phenols and flavonoids also inhibits amylase, sucrase as well as Sodium Glucose Transporter-1(S-GLUT-1) of intestinal brush border cells and hence reduce the absorption of glucose[18].

CONCLUSION

Thus the significant hypoglycemic activity of *P.edulis* may be attributed to the presence of phenols and flavonoids. Since the extract produced significant blood glucose lowering effect in alloxan diabetic rats it suggests that it will be of more helpful in controlling blood sugar level in diabetes**.**

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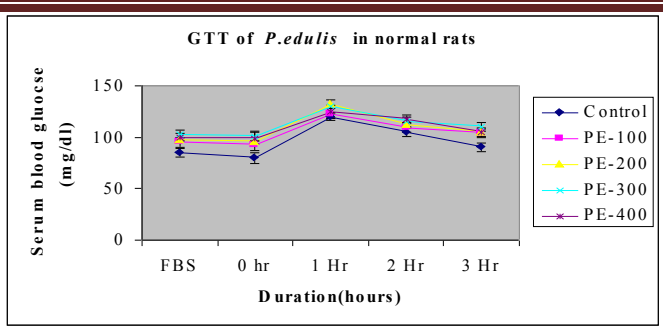
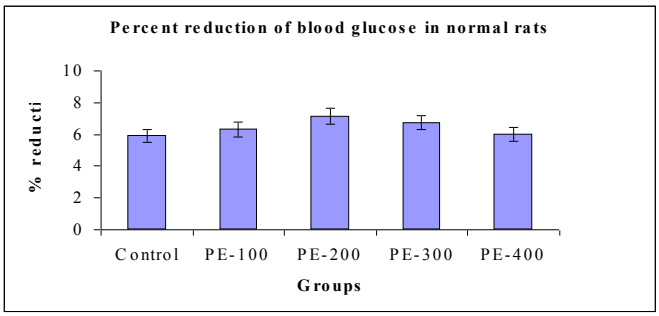


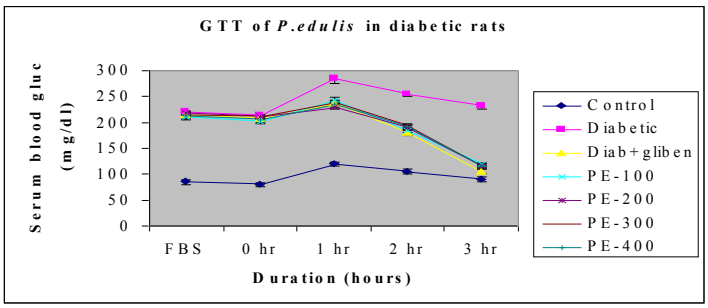
Values are expressed as Mean ± S.D of five individual experiments
PE-100-P.edulis 100mg/kg b.wt; PE-200-P.edulis 200mg/kg b.wt
PE-300-P.edulis 300mg/kg b.wt; PE-400-P.edulis 400mg/kg b.wt

Figure: 1- Effect of aqueous extract of *P.edulis* on GTT of normal rats



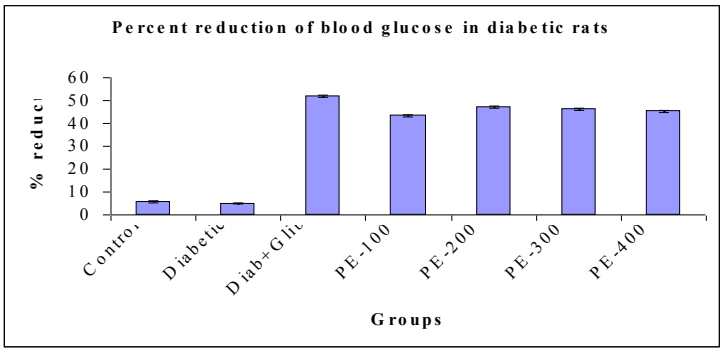
Values are expressed as Mean ± S.D of five individual experiments
PE-100-P.edulis 100mg/kg b.wt; PE-200-P.edulis 200mg/kg b.wt
PE-300-P.edulis 300mg/kg b.wt; PE-400-P.edulis 400mg/kg b.wt

Figure: 2 % Reduction of blood glucose by various doses of *P.edulis* in normal rats



Values are expressed as Mean ± S.D of five individual experiments
Diab+gliben -Diabetic ats treated with glibenclamide
PE-100 -P.edulis 100mg/kg b.wt; PE -200-P.edulis 200mg/kg b.wt
PE -300-P.edulis 300mg/kg b.wt; PE -400-P.edulis 400mg/kg b.wt

Figure: 3- Effect of aqueous extract of *P.edulis* on GTT of diabetic rats



Values are expressed as Mean ± S.D of five individual experiments
Diab+gliben -Diabetic rats treated with glibenclamide (5mg/kg b.wt)
PE-100 -P.edulis 100mg/kg b.wt; PE -200-P.edulis 200mg/kg b.wt
PE -300-P.edulis 300mg/kg b.wt; PE -400-P.edulis 400mg/kg b.wt

Figure: 4 % Reduction of blood glucose by different doses of *P.edulis* in diabetic rats

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