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A COMPARATIVE STUDY ON THE ANTIDIABETIC ACTIVITY OF ETHANOLIC EXTRACT OF UNRIPEN *Passiflora edulis* PEEL FLOUR AND GLIMEPIRIDE IN STREPTOZOTOCIN INDUCED DIABETIC ALBINO RATS

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ABSTRACT

Diabetes is considered as a metabolic disorder characterized by elevated level of glucose in the blood. The present study is aimed to compare the antidiabetic activity of ethanolic extract of *passiflora edulis* peel flour with that of a marketed product, glimepiride, in streptozotocin -induced diabetic rats. The study was performed by the measurement of blood glucose level using a glucometer. It was found that the ethanolic extract of *passiflora edulis* peel flour showed antidiabetic activity comparable to that of glimepiride. It can thus be inferred that ethanolic extract of *passiflora edulis* peel flour possesses significant antidiabetic activity.

INTRODUCTION

Medicinal plants play an important role in the new history of modern medicine. Numerous medicinal plants and their formulations are used for various disorders in medical practices as well as in traditional system of medicines. Experiments over the years by scientific and observational efforts of scientists has gradually developed the allopathy. However, the basis of its development remains strong in traditional medicine and therapies. Whenever we administer a chemical substance to a biological system it carry out different types of interactions and it results in a series of dose-related responses. In most cases these responses are desired and useful, but there are a number of other effects which are not advantageous. (Sathya.M *et.al.*, 2012).

Diabetes mellitus (DM) is a chronic disease caused by inherited and acquired deficiency in production of insulin by the pancreas or by ineffectiveness of produced insulin to reach into the cells for metabolism such a deficiency results in increased concentration of glucose in the blood which in turn damages many systems in the body particularly the blood vessels and nerves. As the number of the diabetic people multiplies worldwide, It is projected that the diabetes will become world's main disablers and killers within the next 25 years. Regions with greatest potential are Asia and Africa, where diabetes rates could rise to two-to-three-folds compared with the present rates. Apart from currently available therapeutic options, many herbal medicines have been recommended for the treatment of diabetes. Traditional plant medicines are used throughout the world for a range of diabetic presentation. (Syed Mansoor Ahmed*et.al.*, 2005).

*Passiflora edulis*is commonly known as passion fruit. Passion fruit peel are no longer considered as an industrial waste, as it can be used in the development of new products. The passion fruit peel contain considerable amount of natural antioxidants. (Maria Luiza Zeraik *et.al*., 2011).

Passion fruit plants are grown from their seeds, which are recalcitrant in nature and as the storage period increases it lose its viability. Cleaned and stored seeds have a slower and lower rate of germination. It is always better to sow seeds quickly after harvesting. The germination capacity of seed can be enhance by increase in enzyme activity of the seed by different methods.(Gurung *et.al.*, 2014).

The peel of passion fruit consist more amount of minerals and fiber especially pectin. Pectin is a fraction of the soluble fiber found in the gastrointestinal tract that forms a gel that prevent the absorption of some nutrients. Pectin is widely used as an ingredient in pharmaceutical preparations as antidiarrheal and detoxifying substance. It decreases serum cholesterol and triglycerides levels through the formation of gel which prevents the absorption of cholesterol derived from the diet. (Jocelem mastrodi salgado *et.al*., 2010). The intake of dietary fibers may reduce the chance of causing disease in populations, particularly cardiovascular and gastrointestinal diseases, colon cancer and obesity (Chau huang, 2004).

Thus the extensive use of passion fruit peel in the community could create an awareness of a natural therapeutic aid in certain diseases (Araújo *et al* 2017). The present investigation was

therefore carried out to evaluate the antidiabetic activity of the ethanolic extract of *Passiflora edulis*(unripen fruit peel) in wistar albino rats.

MATERIALS AND METHODS

Collection of plant material

Passiflora edulis, unripen fruits were collected from chalakudy, Thrissur district, Kerala, India during the month of November 2017.

Material processing

The unripen fruit were cleaned out and only the peel was used for the production of the flour. The peel of the fruit was rinsed with distilled water, placed in trays and dried in a circulating forced air incubator at 55 and 60 °C for 48 hours. The dry peels were ground to fine powder using a blender and stored in clear polyethylene bags at 10°C prior to use.

Preparation of Plant Extract

The peel flour was soaked in ethanol for about 24hrs in a separate clean round bottomed flask at room temperature with occasional shaking. After 24hrs the solution was filtered using cotton filter and Whatman's filter paper. The extract was used for further experiment.

Selection of Animals

Healthy adult male albino rats weighing about 150 to 200 g were purchased from Animal Breeding Centre, Kerala Agricultural University, Mannuthy, Thrissur, Kerala, India. The rats were kept in properly numbered large polypropylene cages with stainless steel top grill having facilities for pelleted food. Paddy husk was used as bedding material and changed twice a week. The animals were maintained in 12 hrs light and dark cycle at 28°C ±2° C in a well-ventilated animal house under natural conditions and they were observed in laboratory conditions for 10 days prior to the commencement of the experiment. The animals were fed with standard pelleted diet supplied by AVM foods, Coimbatore, Tamilnadu, India. All animal experiments were performed according to the ethical guidelines.

Experimental Design

All the animals were randomly divided in to four groups with six animals in each, serving as control group (non-diabetic), diabetic control, diabetic treated with plant extracts and diabetic reference control, that is glimepiride. Glimepiride was given at a dose of 15µg/kg of body weight. The oral administration of ethanolic extract of peel flour (250 mg/b.w) was continued

once daily at the rate of 0.5ml/rat/day for 28 days. Body weight and blood glucose levels were estimated periodically.

Group I: Control group received normal pelleted diet for 28 days.

Group II: Streptozotocin induced (50mg/kg) diabetic rats received normal pelleted diet for 28 days.

Group III: Streptozotocin induced Diabetic rats received ethanolic extract of *Passiflora edulis* peel flour (250mg/b.w) administered orally at the rate of 0.5ml/rat/day for 28 days.

Group IV: streptozotocin induced Diabetic rats treated with Glimepiride at a dose of (15 µg/kg) administered orally in 1 ml of water at the rate of 1ml/rat/day for 28 days.

Induction of Diabetes

All the rats were fasted overnight before the administration of Streptozotocin. Diabetes was induced in rats by intra peritoneal injection of 50mg/kg of streptozotocin (STZ), reconstituted in freshly prepared normal saline (0.9%). After the injection they had free access to food and water. The animals were allowed to drink 5% glucose solution overnight to overcome hypoglycemic shock. The development of diabetes was confirmed after 48hrs of Streptozotocin injection. Blood was withdrawn from the tail vein and blood glucose level was estimated by using glucometer.

Collection of blood sample

A small amount of blood without sacrificing the animals was collected from the tail vein by snipping off the tip of the tail. The blood from the tail vein was used to determine the glucose level. As bleeding starts, the animals were held close to the blood glucose test strip and allowed the drop to fall on the strip. The Glucometer was switched on and the test was allowed to react with the blood. After few seconds the blood glucose level was displayed on the screen.

Blood Serum Collection

After completing four weeks treatment the rats were first anesthetized with diethyl ether. Blood was collected by sino-orbital puncture, the blood samples were centrifuged at 4000 rpm for 20 minutes at 22˚C and the plasma sample were frozen up at −4˚C until biochemical estimations.

Assessment of Effects of peel flour Extract on Biochemical Parameters

Oral administration with plant extracts was started after 3 days of streptozotocin injection in diabetic rats while control group and the toxicity group animals were administered only with normal food. The rats were sacrificed after 28 days of treatment with the ethanolic extract of fruit peel flour *Passiflora edulis* and the blood was collected on by sino-orbital puncture. Serum was collected and analyzed for cholesterol, triglycerides, LDL, HDL, SGOT, SGPT, ALP, creatinine, and total protein estimation.

Statistical Analysis

Values were expressed as mean ± SEM for six rats in the each group. The above estimations were analyzed statistically by applying One-way analysis of variance (ANOVA) followed by Dennett's test for multiple comparisons. The differences were considered significant when $P < 0.05$.

RESULT AND DISCUSSION

Table 1: Changes in body weight gain of control and experimental groups of rats.

Groups	0^{Th} day	14^{Th} day	28^{Th} day
Group I	160.66±1.54	172.66±1.22	182.16±0.70
Group II	163.00±1.06a	158.33±0.84a	145.83±0.90a
Group III	168.00±0.93b	165.16±0.90b	177.16±0.70b
Group IV	175.83±1.01c	169.00±1.39c	179±1.61c

Values are expressed as mean ± SEM of six animals

Statistical comparisons

a- Group II is compared with group I b- Group III is compared with group I

b- Group IV is compared with group I

c- Significance at 5% level *-p<0.05

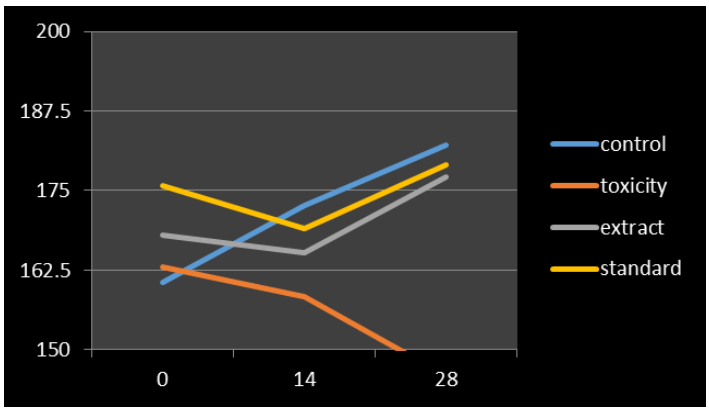

Fig. 1: Changes in body weight gain of control and experimental groups of rats.

The above graph represents the variation in body weights of the experimental rats throughout the antidiabetic study for 28 days. Here it is clear that there is a gradual increase in the body weight of the rats in control group whereas the rats under the toxicity show a gradual decrease in the body weight after the streptozotocin injection. But the rats in the extract group displayed a slight decrease in the body weight after the streptozotocin injection and slowly started increasing weight in the final days with the administration of the extract. In the same way the rats under the standard group showed a decrease in its body weight and have a sudden a sudden increase is recorded with the administration of the standard drug.

Table 2: Levels of blood glucose of control and experimental groups of rats.

Groups	7^{Th} day	14^{Th} day	21^{Th} day	28^{Th} day
Group I	110.12±0.30	95.01±0.41	100.22±1.63	115.11±0.22
Group II	285.34±0.12a	250.22±1.23a	265.12±1.21a	280.16±0.43a
Group III	280.11±0.11b	200.89±1.33b	175.33±0.91b	135.67±0.70b
Group IV	220.02±0.70c	170.00±0.90c	155.00±0.43c	125.38±1.46c

Statistical comparison: Each group (n=6), each value represents Mean ± SEM

a- Group II is compared with group I b- Group III is compared with group I

b- Group IV is compared with group I

c- Significance at 5% level *-p<0.05

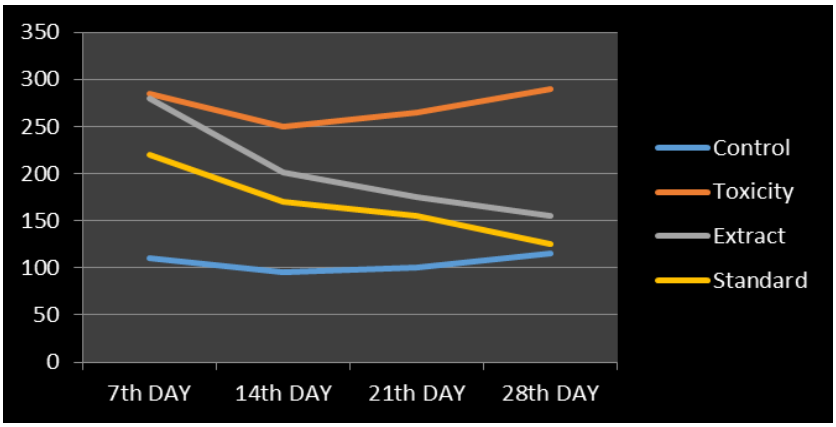

Fig 2: Effect of ethanolic peel flour extract of *passiflora edulis*on the glucose level of experimental rats.

The above graph represents the blood glucose level of the experimental rats throughout the antidiabetic study for 28 days. The control rats shows a stable glucose level gradually decreasing in the initial days and then a slight increase is observed. While the rats under the toxicity control shows a constant increase in the blood glucose level after the streptozotocin injection. Whereas the rats in the extract group displayed a significant decrease in the blood

glucose level after the administration of the plant extract. In the same way the rats under the standard group showed a rapid decrease in its blood glucose level with the administration of the standard drug.

Table 3: Level of SGOT, SGPT, ALP of normal control and experimental groups of rats.

Group	Control (Group I)	Toxicity (Group II)	Extract (Group III)	Standard (Group IV)
SGOT(U/L)	68±12.60	128.30±2.24***	102.70±4.44*	86.84±2.59
SGPT(U/L)	53.90±13.08	89.95±13.08	62.15±3.26	43.55±0.43
ALP(U/L)	121.70±12.45	151.70±9.29	129.00±1.73	135.5±5.48

Statistical comparison

Each group (n=6), each value represents Mean ± SEM.One way ANOVA, followed by Dunnett comparison was performed. ***(***P<0.001)*** control group was compared with standard group. ***(***P<0.001-**P<0.01, *P<0.05)*** treated groups III was compared with group I.

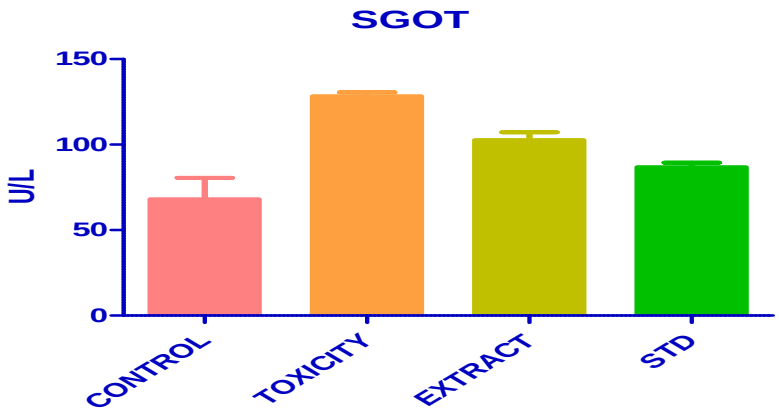

Fig 3: variation in the SGOT level of control and experimental rats.

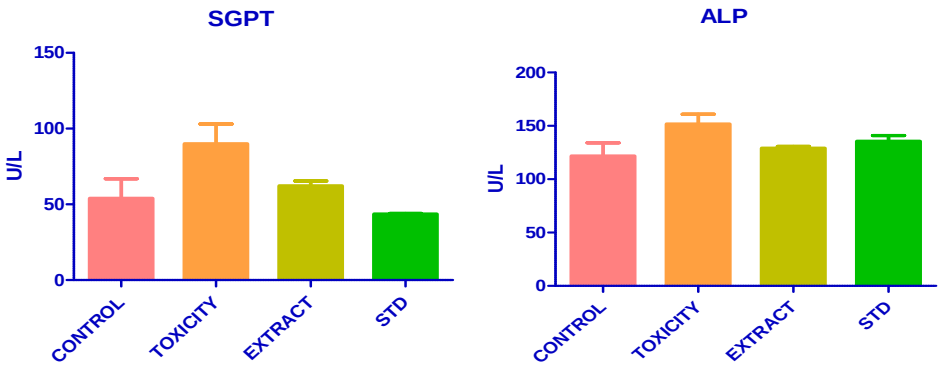

Fig 4: variation in SGPT and ALP level of control and experimental rats at the end of the study.

The above graph represents the variations in the liver enzymes like SGOT, SGPT and ALP during the study for 28 days. The level SGOT showed a significant increase in the toxicity which gradually decreased in the extract and standard group of rats. Similarly, the level of SGPT showed an increase in its level in the toxicity group which eventually decreased in the extract and standard groups. Whereas, the level of ALP showed a hike in the toxicity group when compared to that of the extract group from which there was again a slight increase in the standard group.

Table 4: Level of Protein, urea of normal control and experimental groups of rats.

Group	Control (Group I)	Toxicity (Group II)	Extract (Group III)	Standard (Group IV)
PROTEIN (mg/dl)	1.18±0.02	1.07±0.08	0.92±0.03*	0.6955±0.01***
UREA (mg/dl)	38.97±1.31	30.60±1.15*	28.50±3.29*	17.60±0.75***

Statistical comparison: Each group (n=6), each value represents Mean ± SEM.One way ANOVA, followed by Dunnett's comparison was performed. ***(***P<0.001)*** control group was compared with std group-II. ***(***P<0.001-**P<0.01, *P<0.05)*** treated groups III, IV was

Compared with Group I.

The above graph represents the level of protein and urea present in the serum examined throughout the 28days. Both protein and urea shows a gradual decrease in its level in the blood.

CONCLUSION

The present study focuses on the anti-diabetic properties of *Passiflora edulis*against streptozotocin induced diabetic rats. The development of the diabetics was confirmed by checking the blood glucose level of the experimental rats which was induced with streptozotocin.

The standard drug Glimepiride stimulates the insulin secretion from the beta-cells of islet of Langerhans. So the study suggests that the mechanism obey that the plant extract decrease the blood glucose level may be by the potential of secretion of insulin by the beta-cells of islets of Langerhans or by increase in the peripheral glucose intake.

There was a rapid decrease in the body weight of the diabetic rats but which had slowly started increasing significantly with the oral administration of the plant extract in period of 28days.

The blood glucose level was increased in the diabetes induced rats with streptozotocin (STZ) whereas the ethanolic peel flour extract decreased the blood glucose level in the treated groups.

The toxic streptozotocin inhibits the insulin secretion from the beta-cells of islet of Langerhans. Therefore, the study suggests that the mechanism of the plant extract decrease the blood glucose level may be by the potential of secretion of insulin by the beta-cells of islets of Langerhans.

Thus, the result of our present study indicates that the treatment with the peel flour extract is capable of counteracting the toxic effect caused by streptozotocin (STZ). Thus, it can be used as an anti-diabetic drug. The fruit peel flour can be recommended as an effective anti-diabetic agent for various forms of diabetes.

REFERENCES

1. Sathya M*, Kokilavani R, Ananta Teepa K.S, Acute and subacute toxicity studies of ethanolic extract of acalypha indica linn in male wistar albino rats, Asian Journal of Pharmaceutical and Clinical Research, 2012; 5: 1. ISSN - 0974-2441.
2. Syed Mansoor Ahmed, Vrushabendra Swamy B.M, P Gopkumar, R Dhanapal and V M Chandrashekara, Anti-diabetic activity of *terminalia catappa* linn. Leaf extracts in alloxan-induced diabetic rats, Iranian Journal of Pharmacology & Therapeutics, 2005; 4(1): 36-39. 1735-2657.
3. Maraia F Elmhdwi1*, Naema M Saed Elaali1, Nura N Mohamed2, Mona A Muktar3 and Negia B buzgeia4, Anti-Diabetic Activity of Methanolic Extract of Grape Seeds in Alloxan Induced Diabetic Rats, Agricultural Research & Technology: Open Access jounals, 2017; 6: 5. ISSN:2471 6774.
4. N. Gurung, G.S.K. Swamy, S.K. Sarkar, S.O. Bhutiaand K.C. Bhutia, Studies on seed viability of passion fruit (Passiflora edulis f. flavicarpa Deg.), Journal of Crop and Wee, 2014; 10(2): 484-487.
5. Jocelem Mastrodi SALGADO, Talita Aparecida, Dias BOMBARDE, Débora Niero MANSI, Sonia Maria de Stefano PIEDADE, Laura Maria Molina MELETTI, Effects of

different concentrations of passion fruit peel (Passiflora edulis) on the glicemic control in diabetic rat, Cienc Tecnol, Aliment., Campinas, 2010; 30(3): 784-789. ISSN 0101-2061.

6. CHAU C. F, HUANG Y. L Characterization of passion fruit seed fibres: a potential fibre source. Food Chemistry, 2004; 85: 189-194.
7. Márcio Flávio Moura de Araújo, Vivian Saraiva Veras, Roberto Wagner Júnior Freire de Freitas, Maria do Livramento de Paula, Thiago Moura de Araújo, Lilian Raquel Alexandre Uchôa, Maria Wendiane Gueiros Gaspar, Maria da Conceição do Santos Oliveira Cunha, Maria Aparecida Alves de Oliveira Serra, Carolina Maria de Lima Carvalho, Edmara Chaves Costa and Marta Maria Coelho Damasceno, The effect of flour from the rind of the yellow passion fruit on glycemic control of people with diabetes mellitus type 2: a randomized clinical trial, Journal of Diabetes & Metabolic Disorders, 2017. DOI 10.1186/s40200-017-0300-z.