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"EVALUATION OF ANTIHYPERGLYCEMIC EFFECT OF *OXALIS LATIFOLIA KUNTH* IN STREPTOZOTOCIN - INDUCED DIABETIC RATS"

Arunkumar Subramanian*, Suganya V N, Venkateswaran V

Dept. of Pharmacology, J.K.K.Nattraja College of Pharmacy, Kumarapalayam, Tamilnadu, India.

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ABSTRACT

The ethanolic extract of *Oxalis latifolia Kunth* was evaluated for antihyperglycemic activity against streptozotocin-induced diabetic rats. The blood glucose level at various time intervals of 0, 1, 2 and 3 hours after the administration of ethanolic extract of *Oxalis latifolia Kunth* was calculated. It decreased the blood glucose levels significantly from 334.64±5.14 to 137.94±5.04 at 3 hours after the administration of 200 mg/kg of ethanolic extract and from 333.65±6.04 to 122.68±6.44 at 3 hours after the administration of 400 mg/kg of ethanolic extract. The antihyperglycemic activity was evaluated in comparison of the administration of an oral hypoglycemic agent, Tolbutamide which decreased the blood glucose level from 327.48±6.91 to 112.26±3.09 after 3 hours of administration. The results provide promising baseline information for the potential use of ethanolic extract of whole plants of *Oxalis latifolia Kunth as an anti-hyperglycemic agent.*

Corresponding author
Arunkumar Subramanian
Dept. of Pharmacology,
J.K.K.Nattraja college of Pharmacy,
Kumarapalayam, Tamilnadu, India.
mailtoarun2196@gmail.com

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INTRODUCTION

Diabetes mellitus (DM) is characterised by hyperglycemia, which causes modification in carbohydrate, lipid and protein metabolisms. The symptoms of DM include polyphagia, polydipsia, pruritis, polyuria and weight loss. Apart from hyperglycemia, other reasons such as hyperlipidemia and dyslipidemia are also involved in the burgeoning of both macro and microvascular complications. DM has become the major cause of mortality and morbidity. There are many anti-diabetic agents available in the market but still the urge for a new anti-diabetic agent of natural origin with lesser side effects is continuing.

Oxalis latifolia kunth is a species of flowering plant known by the common names garden pink-sorrel and broadleaf wood-sorrel. It is native to Mexico. It is found widely in Central and South America and South Asia. The plant juices are traditionally used as antioxidant, anticancer, antipyretic and analgesic.

Since this plant *Oxalis latifolia Kunth is of natural origin. The therapeutic use of this plant will be with lesser side effects.* Hence, the present study was an attempt, to study the antihyperglycemic activity of ethanolic extract of *Oxalis latifolia Kunth* against streptozotocin induced Wistar rats.

Fig no. 1 – Monograph of whole plants of *Oxalis latifolia Kunth.*

MATERIALS AND METHODS

Plant material

The whole plants of *Oxalis latifolia Kunth* were collected from the foot hills of Yercaud, Salem district in the month of July 2019. The plant was then taxonomically identified and authenticated by the Botanist Dr. Bala Subramaniam. The authenticated plant material was used for preparation of extracts.

Preparation of the extract

The leaves of the plant *Oxalis latifolia Kunth* was extracted by continuous hot percolation method, using Soxhlet apparatus with various solvents such as a Pet. Ether, Chloroform, Acetone, Alcohol and Water by their increasing order of polarity. After the extraction, the extracts were dried under reduced pressure. The marc of extracted crude drug powder was once again subjected to successive extraction with the other polar solvents, and their extractive values were calculated. The dried extracts were subjected to various chemical tests to identify the phytoconstituents.

Animals

Swiss albino mice of either sex weighing about 20- 25g and Wistar albino rats of 175-200 gm of approximately the same age were used for the acute toxicity studies and antihyperglycemic studies, respectively. The animals were housed in their polypropylene cages and fed pellets and water ad *libitum*. The animals were exposed to an alternative cycle of 12 hours darkness and light each. The animals have fasted for at least 12 hours before each test. The experimental protocols were subjected to the institutional animal ethics committee and were cleared by the same.

Acute toxicity studies

The acute toxicity studies were conducted in Swiss albino mice, as per the OECD guideline (423) and the animals were observed up to 48 hours for any mortality and the LD_{50} was calculated.

Induction of diabetes

The Wistar rats were kept fast for 24 hours before induction of diabetes and the freshly prepared streptozotocin (45 mg/kg, i.p.) was administered. After 7 days, rats those have fasting blood glucose of more than 300 mg/dl were selected for the study.

Effect of *Oxalis latifolia Kunth* on glucose tolerance in rats

The fasted animals were divided into 3 groups each containing six animals. The first group acted as a control and received only water for injection. II and III groups received an oral dose of the ethanolic extract of *Oxalis latifolia Kunth* and Tolbutamide at 200mg/kg and 100 mg/kg, respectively. After 30 min of administration of the extract. All the rats were treated orally with 2g/kg of glucose solution. The blood samples were withdrawn periodically at 0, 0.5, 1, 1.5 and 2 hours after the administration of glucose. The blood samples were analysed by the O-toluidine method for the blood glucose level.

Effect of *Oxalis latifolia Kunth* on Streptozotocin induced Diabetes on rats

Different groups of Diabetic induced rats were used to study the effect of ethanolic extract of *Oxalis latifolia Kunth*. The animals were divided into 6 groups each containing 6 animals. Groups I and II actd like normal and diabetic control and were administered with water for injection alone. Groups III, IV and V were diabetic rats treated with ethanolic extract (100, 200, 400mg/kg) of *Oxalis latifolia Kunth*. Group VI of diabetic rats were treated with Tolbutamide 100 mg/kg, an oral hypoglycemic agent. The animals were kept fast for overnight and the extracts suspended in 1% CMC was administered orally. The blood samples were withdrawn from the tail vein at 0, 1, 2, 3 hours after the administration of the plant extracts and the std drug. The blood samples were analysed by the O-toluidine method for the blood glucose level.

RESULTS AND DISCUSSION

The plant *Oxalis latifolia Kunth* was collected from Foothills of Yercaud, Salem, Tamil-nadu. The extracts were prepared by continuous hot extraction method using Soxhlet apparatus. The percentage yield of ethanolic extract of *Oxalis latifolia Kunth* was found to be 4.48 % w/w. The LD_{50} of ethanolic extract of *Oxalis latifolia Kunth* was performed as per OECD guideline 423, and it was found to be 2000 mg/kg. The ethanolic extract did not show any toxic effect up to 1000 mg/kg when single i.p dose was administered to mice.

The effect of ethanolic extract *Oxalis latifolia Kunth* on glucose tolerance is shown in Table 1. The ethanolic extract of *Oxalis latifolia Kunth* did not allow the blood glucose levels to increase significantly (P<0.001) after the administration of glucose and the maximum tolerance was found in 120 min.

Table 1: Effect of ethanolic extract of *Oxalis latifolia Kunth* on oral glucose tolerance in rats.

Groups	Dose (mg/ml)	Fasting Blood glucose (mg/dl) after treatment				
		0 min	30 min	60 min	90 min	120 min
Control	----	80.17 ±1.30	153.81±2.58	132.42±2.36	114.26±2.84	103.45±2.54
Ethanolic extract of *Oxalis Latifolia Kunth*	200	81.34 ±1.24	119.14±2.12*	109.31±1.25*	97.94 ±2.44*	88.27 ±1.76*
Tolbutamide	100	83.48 ±1.48	105.85±2.41*	94.54 ±2.09*	86.84 ±1.25*	79.45 ±2.08*

Values are expressed as mean ±SEM, n=6, * P<0.001 when compared with control

Table 2: Effect of ethanolic extract of Oxalis latifolia Kunth on fasting blood glucose levels (mg/dl) in diabetic rats.

Groups	Dose (mg/ml)	Fasting Blood glucose at different hours after treatment			
		0 hour	1 hour	2 hour	3 hour
Normal	-	81.74±1.42	83.69±1.34	85.72±1.44	85.89±1.74
Diabetic Control	-	331.31±6.24	334.76±5.82	326.50±5.07	323.62±4.87
Ethanolic extract of *Oxalis Latifolia Kunth*	100	332.52±6.14	276.83±7.22*	242.46±7.46*	197.49±6.04*
Ethanolic extract of *Oxalis Latifolia Kunth*	200	334.64±5.14	252.19±5.02*	188.92±5.64*	137.94±5.04*
Ethanolic extract of *Oxalis Latifolia Kunth*	400	333.65±6.04	241.14±6.12*	164.51±6.08*	122.68±6.44*
Tolbutamide	100	327.48±6.91	195.65±5.52*	153.04±5.05*	112.26±3.09*

Values are expressed as mean ±SEM, n=6, * P<0.001 when compared with control

The effect of ethanolic extract of *Oxalis latifolia Kunth* on fasting blood glucose level was evaluated in diabetic-induced rats at different time intervals are shown in Table 2. A significant decrease in blood glucose level was observed, 3 hours after administration, in the all the diabetic group of animals treated with *Oxalis latifolia Kunth* from 332.52±6.14 to 197.49±6.04, 334.64±5.14 to 137.94±5.04 and 333.65±6.04 to 122.68±6.44 mg/dl, for 100, 200 and 400 mg/kg, respectively, which is comparable to the antihyperglycemic effect (327.48±6.91 to 112.26±3.09) of tolbutamide at the dose of 100 mg/kg.

In this present study, the ethanolic extract of *Oxalis latifolia Kunth* was administered in 3 different doses of 100, 200 and 400 mg/kg to determine the dose-dependent activity. Even the starting dose of 100 mg/kg also produced a significant activity after the administration of the crude extracts. But, the standard drug tolbutamide caused more significant antihyperglycemic activity when compared with the extract of all doses.

The mechanism of this antihyperglycemic effect of the extracts is not enlightened in this study. Some medicinal plants with antihyperglycemic activities are known to increase circulating insulin level in glycemic rats. A possible mechanism of action may be the extract stimulated the residual pancreatic mechanism, which is increasing peripheral utilization of glucose. Further investigation is expected to isolate the active principle which is responsible for the activity and elucidate the mechanism of action

CONCLUSION

From the above study, it may be concluded that the ethanolic extracts of *Oxalis latifolia Kunth* produced the dose-dependent glucose lowering activity in streptozotocin-induced diabetic rats. Since the plant is of natural origin, it is expected to cause minimal side effects when compared to the other available anti-diabetic agents.

These results provide promising baseline information for the potential use of ethanolic extract of whole plants of *Oxalis latifolia Kunth* as an anti-hyperglycemic agent. However further investigations are essential for the isolation of the active constituents of Ethanolic extract of *Oxalis latifolia Kunth* and to detail its mechanism of action.

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