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Research Article

ANTIDIABETIC ACTIVITY OF AQUEOUS EXTRACTS OF BARKS OF *ALANGIUM SALVIIFOLIUM WANG* IN NORMAL AND ALLOXAN-INDUCED DIABETIC RATS

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Abstract: The anti-diabetic activity of stem barks of *Alangium salviifolium wang* belonging to family Alangiaceae was studied in rats. The barks of *Alangium salviifolium wang* were collected and dried in shade and subjected for successive extraction with petroleum ether, chloroform, methanol using soxhlet apparatus and distilled water by maceration. The acute toxicity studies were carried out according to the ICH Guideline and anti-diabetic activity by Vogel's screening model. The present study reveals that the aqueous extract of Alangium salviifolium wang shows lowering of blood glucose level.

Key**words:** Hypoglycemic, *Alangium salvifolium wang,* alloxan, aqueous extract, tail vein.

INTRODUCTION:

Diabetic mellitus is a chronic metabolic disorder affecting approximately 1.5% of the total population that continues to present a major worldwide health problem. It is characterized by absolute or relative deficiencies in insulin secretion and /or insulin associated with chronic hyperglycemia and disturbances of carbohydrate, lipid and protein metabolism. As a consequence of metabolic derangement in diabetes, various complications develops, including both macro and micro vascular dysfunctions,[1] where complete cure with insulin and oral hypoglycemic agents without side effects has been challenging.[2,3] Many herbal products, several metals and minerals have been prescribed for the cure of diabetes mellitus alone or in combination with oral hypoglycemic agents, in ancient literature.[4,5] *Alangium salvifolium Wang Alangiaceae* known as Ankula, Cyanko & Dhalanga. It is a tall thorny tree of 3-10 meter height, ash colored, rough and faintly fissured barks, leaves are elliptic oblong, elliptic lanceolate or oblong lanceolate. The flowers are greenish white, fascicled, axillaries or on old wood. This plant is found in India. It is also found in Western Africa, Madagascar, Southern Asia, Philippines and tropical Australia, and the Pacific Islands and China [6]. Stem bark of this plant is used as antiarthritics & antifertility [7, 8]. Different parts of plants are used as acrid, emollient, astringent, diuretic, purgative and anthelmintic. The stem bark has been reported its biphasic action on blood pressure in cats in lower dose and hypotension in higher dose.[9] However, no scientific data is available regarding the effect of *Alangium salvifolium Wang* on blood glucose level. The present study was under taken to explore the effect of the bark extracts of *Alangium salvifolium Wang* on the blood glucose level of experimental animals.

MATERIALS AND METHODS:

Materials:

The stem bark of *Alangium salvifolium* wang was collected in the month of October-November from Dhalatanga Forest, Jagatsinghpur district, Odisha. The fresh plant was identified and authenticated by Department of Botany, Utkal University, Bhubaneswar, Odisha.

Extraction

The stem bark of *Alangium salvifolium wang* was cut into small pieces, shade dried at room temperature and pulverized to coarse powder. The resultant then subjected for successive extraction with petroleum ether, chloroform and methanol with soxhlet apparatus and distilled water with maceration. The extracts were then concentrated in vacuum under reduced pressure using rotary flash evaporator and dried in desiccators.

Animals

Adult albino wister rats of either sex, weighing 150-200gm, was acclimatized for a period of 10 days at room temperature and 50% relative humidity. They were housed in a standard cage and maintained on standard pellets and water at libitum. The animals were described as "fasted", deprived of food for 18 hrs but had free access to water.

Methodology:

Hypoglycemic activity of *Alangium salvifolium* in single dose treatment was carried out in:

a) Normoglycemic animals
b) Diabetic animals
c) Glucose loaded animals (Glucose tolerance test-GTT)

a) Hypoglycemic activity in normoglycemic animals :

- The acute toxicity study is aimed to establish the therapeutic index i.e., the ratio between the pharmacologically effective dose and the lethal dose, and also to perform the primary screening.
- All the extract (pet. ether, chloroform, methanol & distilled water) of *Alangium salvifolium Wang* was administered once orally at 5 dose levels (200,400,600,800 &1000mg/kg) to group of 10 mice of both sexes about equal in number which have been fasting overnight (about 18hrs).
- The treated mice were observed continuously for two hours and then occasionally for further four hours and finally overnight mortality recorded.
- During the course of study the behaviors of the mice were carefully observed and fall of time, reduction of spontaneous activity also determined using instruments like rotarod, actophotometer.
- The animals were classified in to four groups (n = 6). Group 1 was kept as control, and was given a single dose of 2ml/kg of the vehicle (normal saline); group 2 was treated with glibenclamide (2.5 mg/kg) as the hypoglycemic reference drug. Groups 3 and 4 were treated with aqueous extract at two dose levels (50 and 100 mg/kg) (p.o.). Blood samples were collected from the tail tip at 0 (before oral administration), 0.1, 3, 6 and 8 h after administration. [10] The blood sugar level was measured using Glucomoniter™ Test strips in Glucomonitor from Home Health ™ test meter.

b) Hypoglycemic activity in alloxan induced diabetic animals:

- Alloxan monohydrate (120mg/kg body weight) dissolved in normal saline and injected i.p. in 18 hrs fated rats to induce diabetes.
- After one hour of alloxan administration the animals were fed standard pellets and water at libitum.11 after 72 hrs, the blood glucose levels were estimated, applying the glucose oxidase method and rats having blood glucose level more than 150mg/dl were selected for the study.
- Fasting blood glucose level before and 2 hrs after the administration of the drug were estimated.
- Blood glucose levels were measured in all four groups at different time intervals like 1, 3, 6 & 8 hrs.

c) Hypoglycemic activity in glucose loaded hyperglycemic animals:

- The oral glucose tolerance test was performed in overnight 18 hrs fasted rats. Rats divided into four groups (n=6) were administered aqueous extract of barks of *Alangium salvifolium wang* 50 and 100mg/kg, respectively.
- Glucose (1g/kg) was fed 30 min after the administration of the extract. Glibenclamide (2.5mg/kg) was selected as the standard drug of choice.
- Blood glucose level of the animals was calculated by collecting the blood sample from the tail vein followed by analysis in Glucometer.
- The process was repeated for 0, 1, 2, 3, 4 hrs respectively and concurrent readings were collected.

RESULTS AND DISCUSSION:

Results:

- **The effect of aqueous extract in fasted normal rats:** Based on the anti hyperglycemic activity, the active aqueous extract was subjected to hypoglycemic studies at two dose levels (50 and 100 mg/kg) and the results are given in [Table1]. The aqueous extract of *Alangium salvifolium Wang* shows significant decrease in blood glucose level. It shows 46.84 and 56.25 % decrease in blood glucose at dose level of 50 & 100mg/kg body weight respectively.

- **Effect of aqueous extract in alloxan induced diabetic rats:** The aqueous extract shows 44.78 & 57.21% decrease in blood glucose level in alloxan induced diabetic rats at dose level of 50 % 100 mg/kg body weight.

- **The effect of extracts in glucose loaded hyperglycemic animals:** The antihyperglycemic effect in glucose loaded hyperglycemic rats, after administration of the plant extracts at a dose of 50 & 100mg/kg is illustrated in [Table 3]. After 0.5 hr of the glucose load, there was a significant rise in the blood glucose levels of the control animals, and at the end of two hours, the glucose level declined. Aqueous extract exhibited significant antihyperglycemic activity at 1hr, 2hr and 4 hrs after glucose load, compared to control.

Table-1: Hypoglycemic activity of aqueous extracts of barks of *Alangium salvifolium* in Normoglycemic rats.

Group No.	Treatment	0hrs	1hrs	3hrs	6hrs	8hrs	%age decrease at the end of 8hrs
I	Solvent(Normal Saline-2ml/kg)	73±3.15	74±3.07**	73±2.89**	74±2.88***	72.2±4.96	…….
II	Standard (Glibenclamide 2.5mg/kg)	78.83±2.78*	61±2.13**	50±1.94***	48.83±2.20***	30.67±3.24*	61.09
V	Aqueous ext.50mg/kg	76.5±6.89*	70.66±6.93**	63.00±1.93***	51±1.94**	40.66±6.1**1	46.84
VI	Aqueous ext.100mg/kg	80.0±6.93*	68±6.86**	50.16±5.59***	41.66±6.09**	35±5.06**	56.25

Note:

- Values are expressed in MEAN±S.E.M of six animals
- The superscript *, **, *** denotes statistical significance at $p<0.05$, $p<0.01$ and $p<0.001$ in comparison to group-1.

Table-2: Hypoglycemic activity of aqueous extracts of barks of *Alangium salvifolium* in Alloxan induced Hyperglycemic rats in oral route.

Group No.	Treatment	0hrs	1hrs	3hrs	6hrs	8hrs	%age decrease at the end of 8hrs
I	Solvent(Normal Saline-2ml/kg)	187.5±8.69	191.83±8.54	201.5±9.31	209.33±9.35	212.27±7.34	
II	Standard (Glibenclamide 2.5mg/kg)	177.66±8.80	159.83±9.05*	127.83±9.05**	74.83±5.34***	63.0±3.12**	64.53
V	Aqueous ext.50mg/kg	177.5±8.96	171.5±2.92*	157±8.82*	131.83±8.78**	98±9.42***	44.78
VI	Aqueous ext.100mg/kg	194±9.03	189.5±8.69*	161±1.88**	125.83±3.96***	83±7.17**	57.21

Note:

- Values are expressed in MEAN±S.E.M of six animals
- The superscript *, **, *** denotes statistical significance at p<0.05, p<0.01 and p<0.001 in comparison to group-1.

Table-3: Effect of aqueous extracts of barks of *Alangium salvifolium* in single dose treatment in Glucose loaded Hyperglycemic rats in oral route.

Group No.	Treatment	0hrs	1hrs	2hrs	4hrs
I	Solvent(Normal Saline-2ml/kg)	65±6.36	107.16±9.55	126±8.77	134±8.75
II	Standard (Glibenclamide 2.5mg/kg)	52±1.13	79.16±4.83*	70.66±7.85**	60±3.53***
V	Aqueous ext.50mg/kg	53.5±5.42	79.66±4.63*	73.66±7.85**	70.66±8.38***
VI	Aqueous ext.100mg/kg	62.33±5.86	77.6±4.97*	78.83±8.06**	70.34±8.59**

Note:

- Values are expressed in MEAN±S.E.M of six animals
- The superscript *, **, *** denotes statistical significance at p<0.05,p<0.01 and p<0.001 in comparison to group-1.

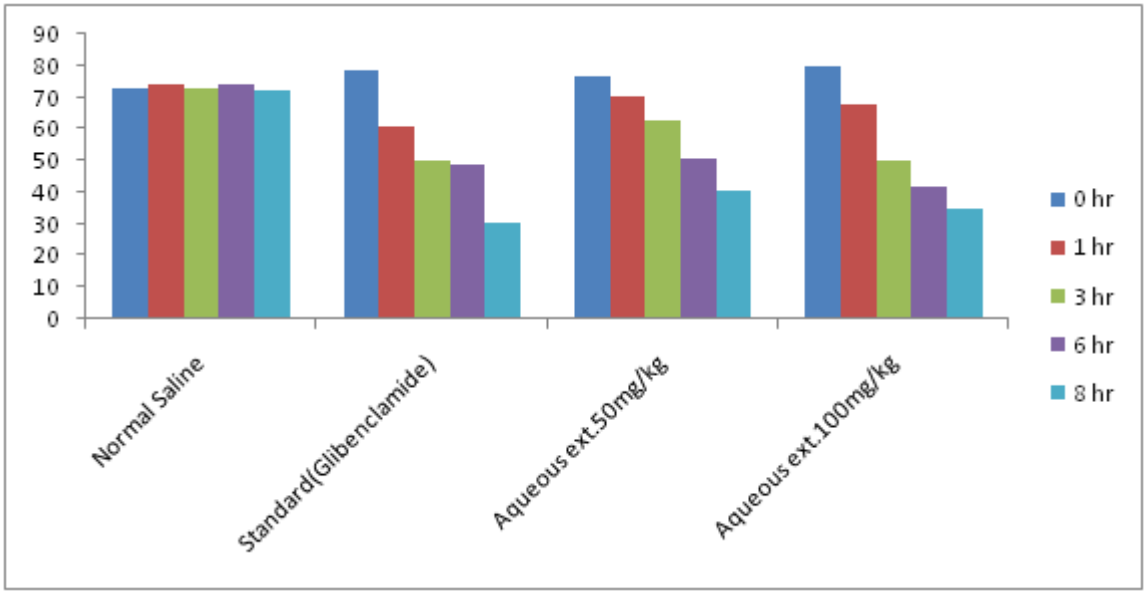

Figure -1: Hypoglycemic activity of aqueous extracts of barks of *Alangium salvifolium* in Normoglycemic rats.

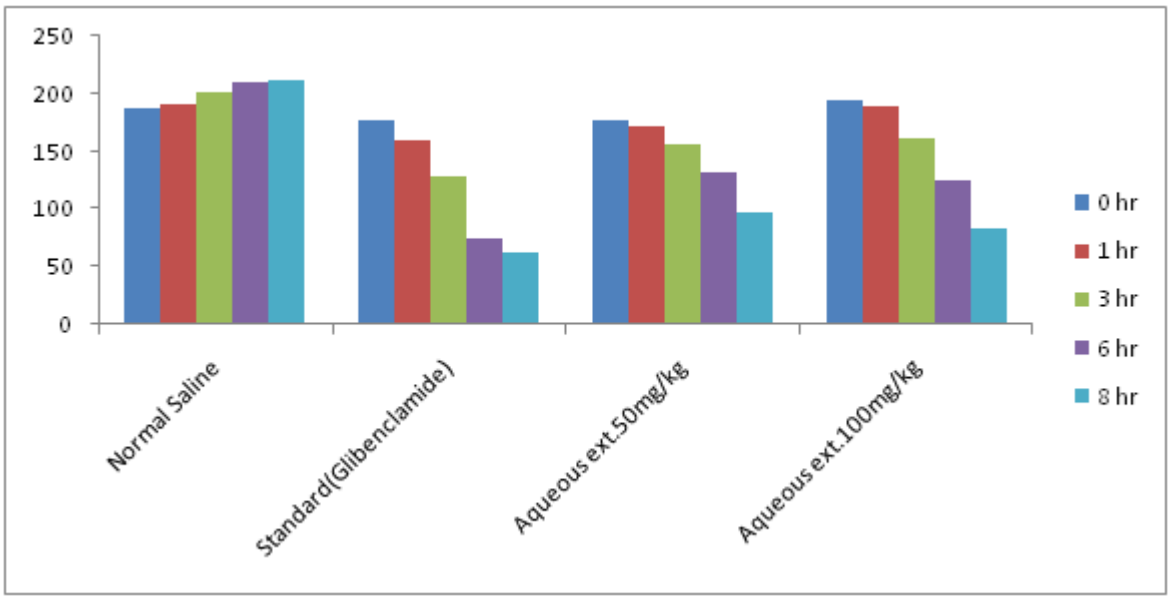

Figure -2: Hypoglycemic activity of aqueous extracts of barks of *Alangium salvifolium* in Alloxan induced Hyperglycemic rats in oral route.

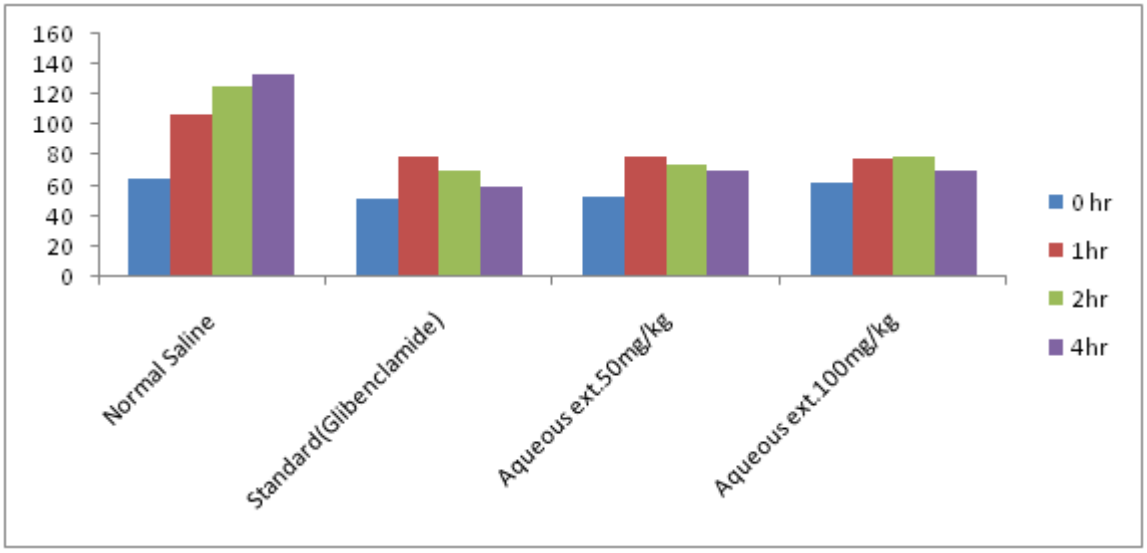

Figure-3: Effect of aqueous extracts of barks of *Alangium salvifolium* in single dose treatment in Glucose loaded Hyperglycemic rats in oral route.

DISCUSSIONS:

The study reports the hypoglycemic activity of aqueous extract of *Alangium salvifoliumWang*. If the active principle(s) are identified, it can lead to the development of a potent allopathic medicine. Further, it is interesting to note that the drug exhibited significant hypoglycemic activity both in normal and alloxan induced diabetic animals. Alloxan induces diabetes by destroying β-cells of pancreas, through production of reactive oxygen species. Therefore, unlike the clinically used oral sulphonylurease, this herbal drug does not seem to work by stimulating β-cells and releasing insulin. This suggests that its main mechanism of action is not the potentiation of insulin release from pancreatic β-cells and therefore the drug is effective in insulin independent, type II diabetes mellitus also.

The present study demonstrates that aqueous extract of *Alangium salvifolium Wang* decrease glucose level in normal and alloxan induced diabetic animal. Further studies required to elucidate in detail the actual mechanism of the action of this drug at the cellular and molecular levels.

Conclusion:

The present investigation by the author indicates that the aqueous extracts of barks of *Alangium salvifolium* results maximum yield value than that of petroleum ether extract, chloroform extract and methanolic extract through successive extraction process which was considered for experimental purpose and showed relevant maximum control of blood sugar in hyperglycemic wister rats than other experimental extracts. The test extract also reduces the blood sugar level to a maximum extent in case of normal animals. Toxicological study revealed that the aqueous

extracts of barks of *Alangium salvifolium* were safe and does not alter normal physiological and behavioral effect even at a higher dose level of 1000mg/kg body weight. Administration of aqueous extract significantly reduces the elevated glucose level in Alloxan induced diabetic rats confirms its antidiabetic activity followed by reduction of normal glucose level, which reveals the hypoglycemic property.

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