



Anti-diabetic activity of *Thespesia lampas* Dalz & Gibs on alloxan induced rats

Jayakar B and Sangameswaran B*

Vinayaka Mission's of pharmacy, Vinayaka Missions University, Kondappanaickan patty, Salem-636 008, Tamil Nadu, India

Received for publication August 07, 2007; accepted June 24, 2008

SUMMARY

Anti-diabetic effect was observed with *Thespesia lampas* Dalz & Gibs (Family: Malvaceae) when given as a root extract in normal as well as alloxan induced diabetic rats. The effects, however, were more pronounced in diabetic animals in which administration of plant extract for 15 days after alloxan induced diabetes, significantly reduced blood glucose levels. After alloxan induced diabetes it was observed that both standard drug (glibenclamide) and aqueous extract of *Thespesia lampas* were significantly superior to control in reducing blood sugar on long term treatment (15 days). The aqueous extract of *T. lampas* (300 and 600 mg/kg) reduced the blood glucose levels from 349.2 ± 7.2 to 120.7 ± 4.6 and 346.3 ± 3.4 to 101.8 ± 6.3 , respectively. The data suggested that *T. lampas* could be of beneficial in diabetes mellitus in controlling blood sugar. The present investigation established pharmacological evidence to support the folklore claim as an anti-diabetic.

Key words: Anti-hyperglycemic, Alloxan, *Thespesia lampas* Dalz & Gibs

INTRODUCTION

Diabetes mellitus is a common metabolic and endocrine disorder, characterized by chronic hyperglycaemia and disturbance of carbohydrate, fat and protein metabolism associated with absolute or relative deficiency of insulin secretion and/or insulin action (Bennet, 1998). The dramatic increase in the prevalence of diabetes can be attributed to several factors. Globally, diabetes has showed the spread of 'modern life style' and can be linked to an increasingly overweight and sedentary population (Moller, 2001). Although, there are numerous traditional medicinal plants

reported to have hypoglycaemic properties (Aiman, 1970) many of them proved to be not very effective in lowering glucose levels in severe diabetes (Nagarajan *et al.*, 1987). Further, most of the hypoglycaemic agents used in allopathic medicine are reported to have side effects in the long run (Khan and Shechter, 1991). In folk/tribal medical practice many plants are used to treat diabetes mellitus in South India. Most of these medicinal plants are not scientifically validated for their therapeutic efficacy and safety. Scientific studies on these plants are likely to provide invaluable anti-diabetic drug.

MATERIALS AND METHODS

Plant material

The plant parts were collected from the foot hills of Yercaud, Salem, in the month of September 2005.

*Correspondence: Sangameswaran B, Vinayaka Mission's of pharmacy, Vinayaka Missions University, Kondappanaickan patty, Salem-636 008, Tamil Nadu, India. Tel: +914272400174; Fax: +91427 2400174; E-mail: sangar1970@yahoo.co.in

The plant was identified and authenticated by the experts in the department of Botany, Government Arts College, Salem, Tamil Nadu India. A voucher specimen (TL-12) has been kept in our museum for future reference. The plant material was collected and shade dried at room temperature for 10 days and coarsely powdered and the powder was passed through sieve No.60

Preparation of the Extract

The powdered material of root of *T. lampas* was extracted separately by cold maceration with distilled water. After extraction, the extract was concentrated under reduced pressure. The dried extract was subjected to various chemical tests to detect the presence of different phytoconstituents and was found the alkaloids, tannins, glycosides traces of flavonoids etc.

Animals

Male albino rats, 8 - 12 weeks old with average weight of 100 - 125 g were purchased from M/S Venkateshwara enterprises (P) Ltd, Bangalore and used for the study. They were housed in polypropylene cages and fed with standard chow diet and water *ad libitum*. The animals were exposed to alternate cycle of 12 h of darkness and light each. Before each test, the animals were fasted for at least 12 h. The experimental protocols were approved by the Institutional Animal Ethics Committee and were cleared by the same (IAEC NO: P.Cog-1/06).

Toxicity evaluation in mice (Ghosh, 1994)

To determine acute toxicity of a single oral administration of the aqueous extract of *T. lampas* different doses (200, 300, 400, 500, 600 and 700 mg/kg) were administered to different groups of mice. Mortality and general behavior of the animals were observed periodically for 48 h. The animals were observed continuously for the initial 4 h and intermittently for the next six h and then again at 24 h and 48 h following drug administration.

Alloxan-induced diabetic rats

The rats were administered alloxan monohydrate (S.D Fine chemicals Ltd., Boisar) dissolved in sterile normal saline at the dose of 150 mg/kg body weight i.p (Interaperitoneally). Since alloxan could evoke fatal hypoglycemia as a result of massive insulin release, rats were treated with 15 ml 20% glucose solution i.p, 6 h after alloxan treatment. The rats were then kept for next 24 h with free access to 5% glucose solution to prevent hypoglycemia. After a fortnight, alloxan monohydrate treated rats having hyperglycemia (evidenced by blood glucose range of 300 - 350 mg/100 ml) were selected for the experiment (Sheweita *et al.*, 2002). These diabetic rats were divided into 5 groups as follows. Group I, Normal control group of rats were given food and water; Group II (un treated) diabetic rats given 0.5 ml of 5% Tween 80; Group III, diabetic rats given 0.5 ml of 5% Tween 80 containing glibenclamide (500 µg/kg); Group IV and V diabetic rats were

Table 1. Diabetic activity of aqueous extract of *T. lampas* on alloxan induced rats

Treatment (mg/kg)	Changes in blood Glucose levels (mg/dl)				
	1 st day	4 th day	7 th day	10 th day	15 th day
Normal	95.3 ± 3.7	95.8 ± 2.6	95.5 ± 2.5	95.5 ± 2.3	95.6 ± 2.2
Alloxan 150 p.o.	346.2 ± 4.2	365.5 ± 4.1	374.2 ± 3.8	386.8 ± 3.5	402.0 ± 3.5
Glibenclamide 0.5	348.3 ± 7.2	335.8 ± 3.9	242.5 ± 3.6	202.3 ± 2.9**	114.3 ± 2.9
Aqueous extract 300	349.2 ± 7.1	339.0 ± 7.0**	259.3 ± 6.2**	215.5 ± 5.8**	120.7 ± 4.5**
Aqueous 600	346.3 ± 3.4	335.0 ± 14.6**	236.5 ± 6.3**	190.0 ± 8.0**	101.8 ± 6.3

Values are mean ± S.E.M. n = 6. When compared with diabetic control ***p* < 0.01 (One way ANOVA Followed by Dunnette multiple comparison test)

given (300 and 600 mg/kg) *T. lampas* (aqueous extract) in 0.5 ml 5% Tween 80, respectively.

The treatment continued daily for 15 days. In the untreated control (diabetic) group, 1 animal died on 5th day and 1 on the 7th day. Blood drop was collected from the tail, for glucose estimation just before drug administration on 1st day and 1 h after drug administration on days 1, 4, 7, 10 and 15 (Table 1).

Glucose tolerance test

Overnight fasted rats were divided into 4 groups. Group one was kept as normal control which received 5% Tween 80 (0.5 ml, p.o), Group II diabetic rats received standard drug (500 µg/kg) and groups III and IV diabetic rats received aqueous extract of *T. lampas* 300 and 600 mg/kg respectively. The rats of all the groups were loaded with glucose (3 g/kg, p.o) (Babu *et al.*, 2003). Thirty min after the administration of the standard and sample, blood samples were collected at 30, 60 and 120 min after the glucose loading and blood glucose levels were determined (Table 2).

Statistical evaluation (Woodson, 1987)

All the data are presented as mean ± S.E.M. The differences between group were evaluated by one-way analysis of variance (ANOVA) followed by the Dunnett multiple comparisons test. $P < 0.01$ were considered to be significant.

RESULTS

The hyperglycaemic animals showed significant

decrease in the glucose level on long term treatment for 15 days model at the doses of 300 mg/kg and 600 mg/kg of aqueous extract of *T. lampas* (Group-IV, V). The effect of the extract of *T. lampas* on glucose levels in alloxan induced diabetic rats is shown in Table 1. The initial blood glucose levels of the diabetic rats selected for the study were in the range of above 340 mg/100dl. In the aqueous extract (300 and 600 mg/kg) treated rats, the blood glucose levels steadily decreased and it was 120 and 101 mg/100dl respectively on the 15th day.

Oral glucose tolerance test

In single oral treatment, thirty min the blood glucose values increased above control with the extract and after thirty min values decreased steadily. The blood glucose levels were significantly higher at 30 min after glucose loaded in control as well as treated groups of animals. Thereafter, a decreased trend in the blood glucose values were recorded upto 120 min. At 120 min, the aqueous extract (300 and 600 mg/kg) treated animals, blood glucose level was significantly decreased from 240.2 ± 3.9 to 226.3 ± 4.3 and 240.2 ± 4.7 and 218.5 ± 3.8 (Table 2).

Body Weight

The body weight was slightly increased in the normal control rats compared to initial body weight whereas in the diabetic control rats there was a significantly decreased in the body weight. Glibenclamide (500 µg/kg) as well as aqueous extract of *T. lampas* (300 and 600 mg/kg) treatment

Table 2. Effects of *T. lampas* on oral glucose tolerance test in alloxan induced diabetic rats

Treatment (mg/kg, p.o.)	Changes in blood Glucose levels in (mg/dl) in mints			
	0	30	60	120
Normal 10 ml/kg	95.2 ± 2.9	169.2 ± 3.0	134.0 ± 2.6	110.5 ± 1.9
Diabetic control 10 ml/kg	312.3 ± 4.8	318.0 ± 4.5	320.5 ± 4.6	327.5 ± 4.7
Aqueous extract 300	240.2 ± 3.9**	236.5 ± 4.5**	227.8 ± 4.8	226.3 ± 4.3**
Aqueous extract 600	240.6 ± 4.7	230.2 ± 4.1**	233.2 ± 3.2**	218.5 ± 3.8**

Values are mean ± S.E.M. (n = 6) When compared with diabetic control ** $p < 0.01$ (One way ANOVA Followed by Dunnett multiple comparison test)

Table 3. Changes in Body weight in the treatment of aqueous extract of *T. lampas* on alloxan induced diabetic rats

Group	Change in body weight in gm		
	Initial	7 th Day	15 th Day
Normal	122 ± 0.2	143.0 ± 1.0	160.8 ± 2.2
Diabetic control	124 ± 0.2	101.7 ± 1.0	98.3 ± 1.7
Glibenclamide 500 µg/kg p.o	124 ± 0.4	136.7 ± 1.7**	146.2 ± 1.1**
Aqueous extract 300 mg/kg	121 ± 0.1	148.8 ± 1.4**	152.8 ± 1.4**
Aqueous extract 600 mg/kg	122 ± 0.1	162.2 ± 1.5**	178.0 ± 2.2**

Values are mean ± S.E.M. n = 6. When compared with diabetic control ***p* < 0.01 (One way ANOVA Followed by Dunnette multiple comparison test)

significantly prevent this reduction in body weight. However, the increasing in body weight was significant when compared to the final weight of normal control group (Table 3).

DISCUSSION

In the present study, the methanol and aqueous extracts of roots of *T. lampas* at doses of 300 and 600 mg/kg b.w. could produce a significant fall in blood glucose levels in diabetic rats, after 15 days treatment. The phytochemical screening of both the extracts of *T. lampas* revealed the presence of flavonoids, phenolic acids, triterpenoids and tannins. Flavonoids, steroids/ triterpenoids, and phenols are known to be bioactive anti-diabetic principles (Atta-Ur-Rhemann and Khurshid, 1989). Flavonoids are known to regenerate the damaged beta cells in the alloxan diabetic rats (Ivorra *et al.*, 1989).

The anti-diabetic effect of both the extracts of *T. lampas* may be due to the presence of more than one anti-hyperglycemic principle and their synergistic properties. In this study, the anti-hyperglycemic activity caused by glibenclamide in alloxan-induced diabetic rats is an indication of the presence of some beta cells, as glibenclamide is known to stimulate insulin secretion from beta cells. The extracts of *T. lampas* may have stimulating effect on the remnant beta cells. However, further experiments are required to elucidate the exact mechanism of action. Further studies will be focused on determination of the mechanism of action, as well as on the isolation of bioactive principles.

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