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RESEARCH ARTICLE

ANTI-HYPERGLYCEMIC ACTIVITY OF *MADHUCA LONGIFOLIA KOENG.* BARKS

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Abstract:

Madhuca longifolia Koeng. is a widely used traditional medicine in many parts of the world for the treatment of various diseases viz. tonic, aphrodisiac, rheumatism, ulcers, and tonsillitis pharyngitis as well as bronchitis It is claimed in traditional medicine that the barks of the plant are used in the treatment of Diabetes mellitus, which are more common in Madhya Pradesh and Chattisgarh states of India. In the present study, the aqueous extract of b*arks* of Madhuca longifolia Koeng. was screened for its Antihyperglycemic activity using alloxan induced hyperglycemia model. The aqueous extract at the dose of 500 mg/kg exhibited significant Anti-hyperglycemic activity in alloxan induced hyperglycemia model ($p<0.01$) indicating that test sample significantly lowered the blood glucose level in Diabetic albino rats, but no effect on normal healthy albino rats. These results have established a pharmacological evidence for the folklore claim of the drug to be used as an anti hyperglycemic agent.

Key words: Anti-hyperglycemic, Madhuca longifolia Koeng*, Traditional medicine.

INTRODUCTION:

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia and alterations in carbohydrate, fat and protein metabolism, associated with absolute or relative deficiencies in insulin secretion and/or insulin action. Though different types of oral hypoglycemic agents are available along with insulin for the treatment of diabetes mellitus, there is a growing interest in herbal remedies, due to the side effects associated with these therapeutic agents. Because of perceived effectiveness, minimal side effects in clinical experience and relatively low cost, herbal drugs are widely prescribed even when their biologically active compounds are unknown. [1]So, the diabetes mellitus can be commonly treated with herbal extracts. Such treatment may be of considerable benefit especially during the early stages of the illness. The plant Madhuca longifolia Koeng. (Mahua) which belongs to Sapotaceae family[(1)] and its bark is traditionally used to treat diabetes mellitus [(2)]. It is a deciduous tree with dark coloured, cracked bark and rusty-tomentose, brannchlets and elliptic leaves, flowers are white in colour and fascicled. It is widely distributed in throughout the India. Its seeds are the source of mahua oil, used in inflammation, skin infections and as a laxative. Mahua flowers have been traditionally used as cooling agent, tonic, aphrodisiac, astringent, and demulcent. Mahua barks are also used in the treatment of rheumatism, ulcers, and tonsillitis. Madhuca longifolia Koeng bark contains lupeol acetate, β-amyrin acetate, α-spinasterol, erthrodiolmonocaprylate, betulinic and oleanolic acids, caprylates, xylose, rhamnose, glucose and galactose. Leaves contains β-sitosterols, myricetin. Seeds contain saponins, Mi-saponin A, Mi-saponin B. Seed kernel contains protobassic acid, prosapogenol, Mi-saponin C [3,4,5,6].

Material and method:

Plant material

The Barks of Madhuca longifolia Koeng. were collected from the local areas of Hubli, Karnataka, and authenticated by Dr. B.D. Huddar, Head, Department of Botany, H.S.K. Science Institute, Hubli, India. A specimen voucher of this plant was deposited in the herbarium at KLES, College of Pharmacy, Hubli, Karnataka. The bark was cut or sliced into small pieces and air-dried in the shade. The dried samples were then ground into powder.

Extraction of crude drug

One hundred grams of barks powder were mixed with 400 ml of distilled water and stirred magnetically overnight (12 hours) at room temperature. This was repeated three consecutive

times. The residue was removed by filtration and the extract evaporated to dryness at a lower temperature (<40°C) under reduced pressure in a rotary evaporator. The residual extract was dissolved in saline and used in the study. The yield of the extract was 2.3% w:w. [7]

Animals

Albino rats of Wistar strains of either sex between 150-200g were provided by KLES college of Pharnacy, Hubli. The animals were kept on Gold Mohar rat pellet diet, Lipton India Ltd., Bangalore diet India and water ad libitum. They were housed in polypropylene cages maintained under standard conditions.

Preparation of sample

The aqueous extract was suspended in Tween 80 (0.5%) in normal saline (vehicle) and was used for anti hyperglycemic activity studies. Tween 80 (0.5%) was used as it is the commonly used suspending agent in earlier reported studies.

Acute toxicity study:

Acute toxicity studies were carried out as per fixed dose OECD guidelines No: 420 using albino Mice. In brief, albino mice of either sex weighing between 20-30g were used for acute toxicity study. The animals were fasted over night prior to the experimental procedure. The animals were kept for fasting overnight providing only water, after which the extracts were administered orally at the dose level of 5 mg/kg body weight and observed for 7 days. If mortality was observed in 2 out of 3 animals, then the dose administered was assigned as toxic dose. If mortality was observed in 1 animal, then the same dose was repeated again to confirm the toxic dose. If mortality was not observed, the procedure was repeated for further higher doses such as 50, 300 and 2000 mg/kg body weight[8].

Evaluation of hyperglycemia activity:

The anti hyperglycemic activity were evaluated using alloxan induced hyperglycemia model. The ethical clearance was obtained by the Institutional Animal Ethics Committee (Registration No:126/1999/CPCSEA) before carrying out the experiment.

Alloxan induced hyperglycemia:

Diabetes was induced in rats by intraperitoneal administration of 150 mg/kg of alloxan monohydrate. After 2 weeks, animals with moderate diabetes having glycosuria (indicated by Benedict's test for urine) and hyperglycaemia, i.e. with blood glucose levels of 200–280 mg per

100 ml were taken for the investigation. Blood was collected from eyes (venous pool). They were divided into four groups of six rats each: group I (normal rats); group II (normal rats treated with 0.5 g/kg of aqueous extract of Madhuca longifolia bark); group III (diabetic untreated rats); and group IV (diabetic rats treated with 0.5 g/kg of aqueous extract of Madhuca longifolia bark) Fasting blood was collected for blood glucose estimation before starting the treatment on the first day. The rats in groups II and IV were given daily 0.5 g/kg of aqueous extract of Madhuca longifolia bark by gastric gavage for a period of 6 weeks, while the rats in groups I and III were fed distilled water alone.On the last day of the treatment blood samples were collected from tail vein of all the groups of rats or blood sugar estimations. Body weights of all the animals were recorded prior to the treatment [9].

Table: 1: Alloxn model induced hyperglycemia

SL.	Group of rats	Fasting blood glucose (mg/dl)		Change in body	Urine sugar
		Before treatment	After treatment	After treatment	
I.	Untreated normals	73.5±7.2	73±6.6	39.5±3.4	–
II.	Treated normals	69.5±10.5	70.3±10.6	26±2.8	–
III.	Untreated diabetics	255.6±7.5*	273.8±5.03	-15.6±3.2*	+++
IV.	Treated diabetics	270±10.9*	110.3±14.26**	6.3±1.4***	+

**P*-0.001 compared to the blood glucose in normals.
***P*-0.001 compared to the initial blood glucose in treated diabetics and also final blood glucose in untreated diabetics.

STATISTICAL ANALYSIS

The experimental data were expressed as the mean ± SE. The standard error of the mean (SEM) is the standard deviation of the sample mean estimate of a population mean. SEM is estimated by the sample estimate of the population standard deviation (sample standard deviation) divided by the square root of the sample size. Statistical analysis was carried out using one- way analysis of variance followed by Dunnett's Multiple Comparison Test and p values implied significance($p<0.001$).

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