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Anti-diabetic activity of heart wood of *Pterocarpus marsupium* Roxb

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Abstract
Different parts of *Pterocarpus marsupium* Roxb has been widely used as indigenous medicine as well as systematic medicine in different herbal pharmacopeia. Aqueous and non aqueous extraction method is used to extract actual chemical constituents from the plant. In our present work we have used methanol extract of heart wood of the plant to estimate the anti-diabetic effects of that extracts on type l and type ll diabetics. Metformin is used as a standard drug. Different dosages of extracts are used. It is confirmed that extract having dose 100 mg per kg body weight shows the maximum effects on type ll diabetics.

Keywords: Hypoglycemic activity, Extracts, heart wood, *Pterocarpus marsupium* Roxb

Introduction
Pterocarpus marsupium Roxb is widely used as indigenous medicine as well as systematic medicine in different herbal pharmacopeia. Aqueous and non aqueous extraction method is used to extract actual chemical constituents from the plant. Extraction of heart wool of *Pterocarpus marsupium* Roxb is used as anti diabetic medicine as ethnomedicine in different countries. It is also observed that the patient will be cure from diabetics if he takes water from a glass or container which is made up heart wood from *Pterocarpus marsupium* Roxb [1].
The plant *Pterocarpus marsupium* Roxb belongs under categories Plantae (Kingdom), Fabales (Order), Fabaceae (Family), *Pterocarpus* (Genus) and *Marsupium* (Species).
Common name of *Pterocarpus marsupium* Roxb is Indian Kino tree or Vijayasar
Pterocarpus marsupium Roxb is a large tree with long spreading branches. Its' height is upto 33 meters. It is grown in evergreen forests of central, western and southern regions of India, mostly in Gujrat, Madhya Pradesh, Bihar and Odisha. Different parts of *Pterocarpus marsupium* Roxb such as wood, leaves, flowers and bark are used in different medicinal purpose. *Pterocarpus marsupium* Roxb plant has astringent, bitter, acrid, anti-inflammatory, anthelmintic and anodyne property. The extract of different parts of plant is used for the treatment of elephantiasis, leucoderma, diarrhoea, dysentery, rectalgia, cough and greyness of hair [2, 3].
The aqueous extract of bark has astringent property and it is used to relieve toothache. The paste of leaves is used as external applications for the treatment of boils, sores and skin diseases. *Pterocarpus marsupium* Roxb is widely used and popular in Ayurveda as Rasayana to cure of various metabolic disorders such as hyperlipidemia. The bark of *Pterocarpus marsupium* Roxb is a god source of natural anti oxidants for free radical mediated ailments [4].

Materials and Equipments
Materials
Streptozotocin, Nicotinamide and EDTA were purchased from Virat Labs, Hyderabad, India Methanol was purchased from E-Merk, Mumbai, India. Normal saline from Claris Life Sciences, Ahmadabad, India. Fasting glucose measuring kits were purchased from Randox, Germany. Metformin as standard drug was purchased from MSN Formulations, Hyderabad, India. Dried *Pterocarpus marsupium* Roxb was procured from Trade India, Hyderabad, India. Other chemicals were purchased from local market.

Equipments
Centrifuge of Remiequipments Pvt, Ltd, Hyd, India, Shimadzuelectronic balance of Toshvin Analytical Pvt. Ltd, India, Shimadzu UV-spectrophotometer of Toshvin Analytical Pvt. Ltd, Mumbai, India and Inverted microscope of Boeckl + co, Hamburg were used.

Methodology

Extraction of Plant Material

First the heart wood of the plant is grinded in to a coarse powder with the help of suitable grinder. Then it is extracted by cold extraction method.

In this work the cold extraction process was done with the help of methanol. About 200gms of powdered material was taken in a clean, flat bottomed glass container and soaked in 750 ml of methanol. The container with its contents were sealed and kept for period of 7 days accompanied by continuous shaking with the shaker. The whole mixture then went under a coarse filtration by a piece of a clean, white cotton wool.

Evaporation of Solvent

The filtrates (methanol extract) obtained were evaporated using Rotary evaporator in a porcelain dish. They rendered a gummy concentrate of greenish black. The extract was kept in vaccum desiccator for 7 days [5].

Percentage of Yield value of Methanol Extract from Aerial Parts of *P. marsupium* Plant

Powder taken for extraction = 200gm
Weight of the empty china dish = 53.70gm
Weight of the china dish with extract = 73.24gm
Weight of the extract obtained = (73.24-48.70) gm
= 24.54 gm
% yield of methanol extract = (weight of extract)/(powder taken for extraction) × 100
= 24.54/200 ×100 = 12.27%.

Experimental Animals

Healthy Adult Male wistar rabbits of 8-10 weeks old with Average weight in the range of 150-180gms were selected. Animals are housed 4 per cage in temperature controlled (27 ^{0}C ±3 ^{0}C) room with light/dark cycle in a ratio of 12:12 hrs is to be maintained. The Animals are allowed to acclimatize to the environment for seven days and are supplied with a standard diet and water *ad libitum*. The prior permission was sought from the Institutional Animal Ethics Committee (IAEC) for conducting the study [6].

Experimental Design

A total of 90 Rabbits were divided into three groups:

Group A: Normal Rabbits (Normal control) receiving 1.5 ml of physiological saline per day orally (n = 10).

Group B: Streptozotocin-induced diabetic rabbits; they were further divided into four groups (n =10 each)

Group B-I: Diabetic control receiving 1.5 ml of physiological saline per day orally.

Group B-II: Diabetic rabbits treated with Metformin (450 mg/kg b.w./day) in saline.

Group B-III: Diabetic rabbits treated with Mthanol Extract of *Pterocarpus marsupium* Roxb (50 mg/kg b.w./day orally) in physiological saline.

Group B-IV: Diabetic rabbits treated with Methanol Extract of *Pterocarpus marsupium* Roxb (100 mg/kg b.w./day orally) in physiological saline.

Group C: Nicotinamide-streptozotocin-induced diabetic rabbits; they were also further
divided into four (C-I to C-IV) groups as described above (n =10 each). Induction of Experimental Diabetes [7]

Streptozotocin-induced diabete

A freshly prepared solution of streptozotocin (60 mg/kg) in 0.1 M citrate buffer, pH 4.5 was injected intraperitoneally. Hyperglycemia was confirmed by elevated blood glucose levels determined at 72 h and then on day 7 after injection. The rabbits with fasting blood glucose 200-300 mg/dl were used in the experiment.

Nicotinamide-streptozotocin-induced diabete

In group C, diabetes was induced by a single intraperitoneal injection of 60 mg/kg streptozotocin 15 min after the intraperitoneal administration of 120 mg kg $^{-1}$nicotinamide. Hyperglycemia was confirmed by elevated blood glucose levels determined at 72 h and then on day 7 after injection. The rabbits with fasting blood glucose 200-300 mg/dl were used in the experiment.

Collection of blood and analytical procedure

Blood samples (approx. 0.3 ml) were collected from the tail of each rat before treatment and 10th and 20th and 30th day of the treatment. The samples were collected into vials containing EDTA as anti-coagulant. They were stored at 4°C in a refrigerator until analyzed. Fasting blood glucose levels were measured by using commercially available kit manufactured by Randox, Germany.

Results

Table 1: Effect of aqueous and alcoholic extracts of *Pterocarpus marsupium* Roxb on fasting blood glucose levels (mg/dl) of streptozotocin-induced diabetic rabbits (mean ±SEM).

Treatment groups	Blood glucose at different days after treatment (mg/dl)			
Diabetic control (negative control)	Day 0	Day 10	Day 20	Day 30
	260.5 ± 1.7	268.8 ± 5.9	277.2 ± 3.7	288.8 ± 2.1
Metformin (450mg/kg) (positive control)	268.7 ± 2.2	210.6 ± 6.9*	140.6 ± 2.3*	80.8 ± 1.9*
Methanol extract (50mg/kg)	272.3 ± 6.1	264.1 ± 5.2	285.8 ± 2.5	276.4 ± 3.3
Methanol extract (100mg/kg)	290.1 ± 5.4	280.8 ± 4.7	271.7 ± 5.7	283.7 ± 5.5

* $P<0.01$ compared with the initial level of blood glucose of the rabbits (Day 0) in the respective group.

Table 2: Effect of aqueous and alcoholic extracts of *Pterocarpus marsupium* Roxb on fasting blood glucose levels (mg/dl) of nicotinamide-streptozotocin-induced diabetic rabbits (mean ±SEM).

Treatment groups	Blood glucose at different days after treatment (mg/dl)			
Diabetic control (negative control)	Day 0	Day 10	Day 20	Day 30
	288. 6 ± 1.5	283.9 ±1.9	294.4 ± 3.1	299.1 ± 3.1
Metformin (450mg/kg) (positive control)	284.4 ± 2.1	179.1 ± 2.2*	130.6 ± 2.4*	102.8 ± 4.3*
Methanol extract (50mg/kg)	278.2 ± 2.2	284.8 ± 3.1	290.4 ± 2.1	282.5 ± 3.2
Methanol extract (100mg/kg)	260.6 ± 2.1	180.4 ± 2.6*	102.4 ± 2.5*	65.2 ± 4.2*

* $P<0.01$ compared with the initial level of blood glucose of the rabbits (Day 0) in the respective group.

Effect of methanol extracts of *Pterocarpus marsupium* Roxb heart woods on fasting blood glucose levels (mg/kg body weight) of streptozotocin-induced diabetic rabbits is given in Table 1. There was no significant effect of changing of the dose i.e., 50 mg/ kg body weight and 100 mg/ kg body weight from methanol extract of *Pterocarpus marsupium* Roxb heart wood on fasting blood glucose levels, when compared with the diabetic control.

Effect of methanol extracts of *Pterocarpus marsupium* Roxb heart woods on fasting blood glucose levels (mg/kg body weight) of nicotinamide-streptozotocin-induced diabetic rabbits is given in Table 2. It is observed that animals treated with methanol extract of *Pterocarpus marsupium* Roxb with dose 100 mg per kg body weight showed highly significant reduction in blood glucose level.

Discussion

The heart wood of *Pterocarpus marsupium* Roxb is widely used for the treatment of diabetics in different countries by the traditional practitioners for over many centuries [8]. Streptozotocin induces results type I diabetes [9, 10] and nicotinamide-streptozotocin results in type II diabetes [11-13].

The present study indicates that the different dosage (50 mg/kg body weight and 100 mg/kg body weight) of methanol extract of *Pterocarpus marsupium* Roxb have no effect on fasting blood glucose levels of streptozotocin-induced diabetes.

But methanol extract of heart wood of *Pterocarpus marsupium* Roxb with dose 100 mg per kg body weight decreases the fasting blood glucose levels in nicotinamide-streptozotocin-induced diabetic rabbits. This indicates that the extract of *Pterocarpus marsupium* Roxb works on type ll diabetes.

Conclusion

By this study it is concluded that methanol extract of heart wood of *Pterocarpus marsupium* Roxb has hypoglycaemic activity on nicotinamide-streptozotocin-induced diabetic rabbits or on type ll diaetics.

References

1. Bhupendra C, Amrendra KC. Memory enhancing activity of methanolic extract of *Pterocarpus marsupium* Roxb. Phytopharmacol. 2012; 2(1):72-80.
2. Samy RP, Ignacimuthu S, Sen A. Screening of 34 Indian medicinal plants for antibacterial properties, Journal of Ethnopharmacology. 1998; 62(2):173-181.
3. Devasaganam A. Indian Herbs and Herbal Drugs used for the treatment of diabetes., Biochem, Nutr. 2007; 40:163-173.
4. Bhupendra C, Amrendra KC. Memory enhancing activity of methanolic extract of *Pterocarpus marsupium* Roxb. Phytopharmacol. 2012; 2(1):72-80.
5. Venkatesh P, Dinakar A, Senthilkumar N. Hepatoprotective activity of an ethanolic extract of stems of *Anisochilus carnosus* against carbon tetrachloride induced hepatotoxicity in rats. International Journal of Pharmacy and Pharmaceutical Sciences. 2011; 3:243-245.
6. Vanden Heuvel MJ, Dayan AD, Shillaker RO. Evaluation of the BTS approach to the testing of substances and preparations for their acute toxicity. Human Toxicol. 1987; 6:279-291.
7. Tehzeeb-ul-Nisa M, Imran Qadir, Salman Akbar Malik. Anti-Diabetic Activity of Inorganic Metals of *Eugenia jambolana* Lam. (Myrtaceae) Flowers., Pharmacologyonline 2010; 2:979-985
8. Deshpande DJ. A hand book of herbal remedies. Jodhpur India: Agrobios, 2008.
9. Pechhold K. Low dose streptozotocin-induced diabetes in rat insulin promoter CD80-transgenic mice is T cell autoantigen-specific and CD28 dependent. J Immunol. 2001; 166(4):2531-2539.
10. Rolandsson O, Haney MF, Hägg E, Biber B, Lernmark Å. Streptozotocin Induced Diabetes in Minipig: A Case Report of a Possible Model for Type 1 Diabetes? Autoimmunity. 2002; 35:261-264.
11. Novelli M, Fabregat ME, Fernandez-Alvarez J, Gomis R, Masiello P. Metabolic and functional studies on isolated islets in a new rat model of type 2 diabetes. Mol Cell Endocrinol. 2001; 175:57-66.
12. Rebel U, Larsen MO, Rolin B, Carr RD, Wilken M, Sturis J. NN221: A longacting glucagons-like peptide-1 derivative with antidiabetic in glucose tolerant pigs. Eur J Pharmacol. 2002; 451:217-225.
13. Larsen MO, Rolin B, Wilken M, Carr RD, Gotfredsen DF. Measurements of insulin secretory capacity and glucose intolerance to predict pancreatic ? cell mass in vivo in the nicotnamide/streptozotocin Göttingen mini pig, a model of moderate insulin deficiency and diabetes. Diabetes. 2003; 52:118-23.