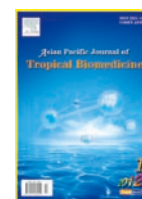




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Antidiabetic activity and chemical characterization of aqueous/ethanol prop roots extracts of *Pandanus fascicularis* Lam in streptozotocin-induced diabetic rats

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ABSTRACT

Objective: To evaluate antidiabetic activity and chemical characterization of aqueous and ethanolic extracts of prop roots of *Pandanus fascicularis* Lam (*P. fascicularis*) in streptozotocin (STZ) induced diabetic rats. **Methods:** Ethanol and aqueous extracts were prepared from *P. fascicularis* by percolation and cold maturation, respectively. Anti diabetic activity of prop roots of *P. fascicularis* at the dose of 250 mg/kg in STZ (i.p / 60mg/kg body weight) induced diabetic rats. The fasting blood glucose levels were measured at 0, 1, 2 and 3 hrs after the treatment of ethanol and aqueous extracts. The ethanol fraction was then subjected to chromatographic analysis and a compound has been isolated and characterized by IR, ¹H-NMR and Mass Spectroscopy. **Results:** The reduced blood glucose level was significant ($P < 0.001$) in the dose of 250 mg/kg of ethanol and aqueous extracts of *P. fascicularis*, when compared with control. The blood glucose level of diabetic control animals after 3 h was (226.00 ± 1.78) mg/kg, whereas it were (102.00 ± 1.73) mg/kg and (131.00 ± 1.92) mg/kg for the groups treated with aqueous extract and ethanol extract, respectively. The ethanol fraction was then subjected to chromatographic analysis and a compound has been isolated. The structure of the isolated compound is may be characterized as Hepta deca-5-ene-1-ol by analysis it's IR, ¹H NMR and Mass spectroscopy data. **Conclusion:** These results demonstrated that aqueous/ethanol extracts of prop roots of *P. fascicularis* showed significant anti-diabetic activity, consequently this plant might be of value in diabetes treatment.

1. Introduction

Diabetes mellitus is a chronic and major endocrine disorder caused by inherited and/or acquired deficiency in the production of insulin by the pancreas, or by the ineffectiveness of the insulin produced. It is a growing health problem in most countries and its incidence is considered to be high all over the world[1]. It is also associated with long-term complications, including

retinopathy, nephropathy, neuropathy and angiopathy and several others [2]. Excessive oxidative stress has been implicated in the pathology and complications of diabetes mellitus[3].

According to WHO projections, the prevalence of diabetes is likely to increase by 35%. Currently there are over 150 million diabetic patients worldwide. Recent estimates project that the number of patients diagnosed with Type II diabetes will more than double to 300 million before 2025. India has more than 30 million people with diabetics. It is estimated that by 2025, the number of diabetics will rise to 57 million in India, the highest number of diabetics in the world[4].

There are several drugs in clinical practice for the treatment of diabetes mellitus. Many of these oral anti-

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diabetic agents have been reported to show serious adverse effect such as liver problems, lactic acidosis and diarrhea[5]. In addition, they are not suitable for use during pregnancy. It is apparent that due to the side effects of the currently used drugs, there is a need for a potent drug with minimal adverse effects, which can be taken for long durations. Plant materials which are being used as traditional medicine for the treatment of diabetes are considered one of the good sources for a new drug or a lead to make a new drug[6]. Throughout the world many traditional plant treatments for diabetes exist. However, few have received scientific or medical scrutiny and the WHO has recommended that traditional plant treatments for diabetes warrant further evaluation[7–9].

Pandanus fascicularis Lam. (Synonyms – *Pandanus odoratissimus*, family – Pandanaceae) commonly referred to as screw pines are palm-like evergreen trees or shrubs belong to the genus *Pandanus*, order Pandanales, class Liliopsida, and division Mangoliophyta. Vernacular names of this plant are: Sanskrit–ketaki, Hindi–keura, Kewda, Ketki, Gagandhul, Tamil–Tazhai, Telugu–Mugali, Kannada–tale mara, English–screw pine. *Pandanus* comprises 500–600 species and is distributed mainly in subtropical and tropical regions. *P. fascicularis* is native to South Asia and has a significant presence particularly in mangrove swamps[10]. Although India has the tradition of alternative therapies there are no procedures to test the safety and efficacy of traditional remedies and to standardize their effective cure. For these reasons it is essential to increase our efforts in the area of medicinal plant research and exploit it efficiently for the benefit of humanity.

The leaf extract of *Pandanus amaryfollius* (*P. amaryfollius*) showed hypoglycemic effects in the STZ–diabetic rats[11]. However, there are no scientific studies available on the anti diabetic effects of prop roots of *P. fascicularis* extract although this plant is widely used as a folk remedy for the treatment of diabetes in India. Therefore, the anti–diabetic effects of prop roots of *P. fascicularis* extracts were investigated by experimentally STZ– induced diabetic in rats.

2. Materials and methods

2.1 Chemicals

Streptozotocin was purchased from Sigma–Aldrich Pvt. Ltd (New Delhi, India). Tolbutamide was obtained from Sun Pharmaceuticals Ltd., (Baroda, India). All chemicals used including the solvents, were of analytical grade.

2.2 Collection of plant material

The prop roots of *P. fascicularis* were collected from Theni District in Tamil Nadu, India during the month of June 2005.

The plant was identified and authenticated by Mr. G.V.S. Murthy, Joint Di–rector, Scientist, C–I/C, Botanical survey of India, Tamil Nadu Agricultural University Campus, Coimbatore bearing the reference number BSI/SC/5/23/05–06/TECH/447. A voucher specimen (Herbarium No: RTL–54) has been deposited at the Vinayaka mission's college of pharmacy herbarium for future reference.

2.3 Preparation of extracts

2.3.1 Aqueous extract

Prop roots of *P. fascicularis* were dried in shade and powdered. The aqueous extract was prepared by cold maceration. The powder was soaked in equal amount of distilled water and stirred intermittently and then left overnight. The macerated pulps were then filtered through a coarse sieve and the filtrate was dried at reduced pressure in the rotor evaporator (Buchi Rotavapor R–114) and finally freeze dried. These extracts were used for further studies. The yield of the aqueous extract was 4.5 % w/w.

2.3.2 Ethanolic extract

Ethanolic extract was prepared from a powder of the prop roots of *P. fascicularis* prepared in an electric grinder. The 500 g powder was extracted with ethanol (95% v/v) in a soxhlet apparatus. The extract was evaporated to dryness under vacuum and dried in a vacuum desiccator (5.5% w/w).

2.4 Preliminary phytochemical screening

The presence of various phytochemical constituents in the extract was determined using standard screening tests[12].

2.5 Animals

Male Albino rats (150–175 g) of Wistar strain were used in the pharmacological studies. Before and during the experiment the animals were maintained in well–ventilated room at room temperature with natural day–night cycle in polypropylene cages lined with husk in standard environmental conditions (temperature (25±2) °C, relative humidity (55±10) % and 12:12 light:dark cycle). The rats were fed on a standard pellet diet adlibium and had free access to water. The experiments were performed after approval of the protocol by the Institutional Animal Ethics committee (IAEC) and were carried out in accordance with the current guidelines for the care of laboratory animals.

2.6 Acute toxicity studies

The animals were randomly divided into three groups ($n = 6$). A control group having carboxymethylcellulose 10 ml/kg by oral route was compared with single dose (5 g/kg; p.o.) of aqueous and ethanolic extracts of *P. fascicularis*. Access to food and water, toxic symptoms and the general behavior of

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