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## ANTIDIURETIC ACTIVITY OF AQUEOUS AND ETHANOLIC EXTRACTS OF PROP ROOTS OF *PANDANUS FASCICULARIS* LAM.

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### ABSTRACT

#### Keywords:

*Pandanus fascicularis* Lam,  
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Aqueous extract,  
Ethanol extract,  
Furosemide,  
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The extracts of the prop roots of *Pandanus fascicularis* Lam (Family: Pandanaceae) is claimed as an antidiuretic by some traditional practitioners. However, the validity of this claim has not been scientifically proven or refuted. The aim of this study was to evaluate the antidiuretic potential of ethanol and aqueous extracts of prop roots of *P. fascicularis* in rats following oral administration. Ethanol and aqueous extracts were prepared from *P. fascicularis* by percolation and cold maturation, respectively. Furosemide was used as a diuretic agent to induce diuresis. Vasopressin (ADH) was used as a standard. The results demonstrated both the ethanol and aqueous extracts of *P. fascicularis* and ADH significantly impaired the total urine output. However, antidiuretic potential of ethanolic extract was similar to that of ADH. The extracts caused a significant decrease in natriuresis and kaliuresis. From this study, we can conclude that ethanol extract of prop roots of *Pandanus fascicularis* has beneficial effects on anti diuretic activity. It has the potential to impart therapeutic effect in diuretic.

**INTRODUCTION:** Antidiuretic hormone test also called the vasopressin test, is a test for antidiuretic hormone (ADH), which is released from the pituitary gland and acts on the kidneys to increase their reabsorption of water into the blood. Anti-diuretic hormone release helps to maintain the optimum amount of water in the body, when there is an increase in the concentration of the blood serum (or) a decrease in blood volume, physical stress, surgery and high levels of anxiety can also stimulate ADH. Various factors such as the ethanol consumption reduces ADH production in a temporarily increase in the production of urine. This may also occur in diabetes insipidus, when the pituitary gland produces insufficient ADH, or rarely, when the kidneys fail to respond to ADH<sup>1</sup>.

In the allopathic system of medicine a need exist for novel, orally active, potent and selective antidiuretics to be used in the treatment of pituitary diabetes insipidus, nephrogenic diabetes insipidus, polyuria, nocturia or bed wetting. Currently available anti diuretic drugs are vasopressin or ADH and its analogue lypressin or desmopressin, thiazide related diuretic chlopropamide and antiepileptic, carbamazepine. The circumstance is not better with traditional medicine where several plants are claimed to possess antidiuretic properties but rarely avowed by scientific experimentation<sup>2</sup>. Plants represent still a large untapped source of structurally novel compounds that might serve as lead for the development of novel drug<sup>3</sup>.

It is therefore essential that efforts should be made to introduce new medicinal plants to develop cheaper and effective drugs<sup>4</sup>.

*Pandanus fascicularis* Lam (syn. *P. odoratissimus*) commonly referred as screw pines are palm-like evergreen trees or shrubs belong to the genus *Pandanus*, order Pandanales, class Liliopsida, and division Mangoliophyta. *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<sup>5</sup>.

Individual plants can reach a height of 20 meters supported by aerial roots. Patients and medical practitioners deemed the root and rhizome to be effective against diabetes<sup>6, 7</sup>. The decoction of the *P. odoratus* root and rhizome has been traditionally used in treating diabetic patients without much specific evidence and also this plant has been used for anti-rheumatic, anti-spasmodic and anti-diuretic. The present study was designed to determine whether the prop roots extracts of *P. fascicularis* were effective in controlling water diuresis (a rare form of diabetic insipidus).

## MATERIALS AND METHODS:

**Drugs and Chemicals:** Furosemide (diuretic) and vasopressin (anti-diuretic) was purchased from Sigma-Aldrich Pvt. Ltd. (New Delhi, India). All other chemicals, reagents used were of analytical grade.

**Animals:** Male Albino rats (150-175 g) of Wistar strain were used for the study. Before and during the experiment rats were housed 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 ad libitum 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.

**Preparation of Extracts:** 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 pulp was 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. Ethanolic extract was prepared by extracted with ethanol (95% v/v) in a Soxhlet apparatus. The extract was evaporated to dryness under vacuum and dried in vacuum desiccators.

## Pharmacological study on Antidiuretic Activity:

Different groups of rats were used to study the effect of aqueous and ethanol extracts of *Pandanus fascicularis*. Diuresis has been induced to all groups of animals by Furosemide 20mg/kg. The animals were divided into four groups (I–IV) each of six animals: group (I) received with normal saline solution (25ml/kg), group (II) received vasopressin (3-5 milli unit), group (III) and group IV received the ethanolic and aqueous extracts of *P. fascicularis* at 250mg/kg body weight, respectively. After oral administration, each animal was placed in an individual metabolic cage specially designed to separate faeces and urine at room temperature.

The volume of urine collected was measured at the end of 5 hr and the total urine volume and concentrations of Na<sup>+</sup>, K<sup>+</sup>, and Cl<sup>-</sup> in the urine were determined. The concentrations of the electrolytes in urine were expressed in terms of mmol/L and the urine volume was expressed in ml/5h. Na<sup>+</sup> and K<sup>+</sup> concentrations were measured by Flame photometer and Cl<sup>-</sup> concentration was estimated by titration with silver nitrate solution (N/50) using 3-5 drops of 5% potassium chromate as an indicator<sup>8,9</sup>.

**Statistical Analysis:** The values were expressed as mean ± SEM. The results were analyzed by using ANOVA followed by Dunnett's t-test. Statistical significance on comparison with standard drug and control group are indicated by \*mark \*P<0.05, was considered significant.

**RESULTS:** The present study establishes the antidiuretic activity of the aqueous and ethanol extracts in rats. The results of different anti diuretic parameters are shown in **Table 1**. Furosemide followed by vasopressin treated animals significantly (p < 0.001) decreased the urinary output (1 ml) and electrolyte excretion of Na<sup>+</sup>, K<sup>+</sup>, and Cl<sup>-</sup> when compared to control.

Ethanol extract treated animals significantly ( $p < 0.001$ ) decreased the urinary output (1.25 ml) and electrolytic excretion of  $\text{Na}^+$  and  $\text{K}^+$ , without significant renal excretion of  $\text{Cl}^-$  when compared to control. Aqueous extract treated animals significantly ( $p < 0.05$ ) decreased the urinary output (3ml) and electrolytic excretion of  $\text{Na}^+$  and  $\text{K}^+$  without significant renal excretion of  $\text{Cl}^-$  when compared to control. The antidiuretic responses of the both extracts were highly

significant in comparison with the control animals. The same trend was observed for the electrolyte excretion potency of the extracts. Ethanol extract, the excretion of electrolytes and the volume of urine decrease was approximately similar to that of standard antidiuretic, vasopressin (3-5 miliunits). Between two extracts, ethanol extract shows maximum activity when compared to aqueous extract.

**TABLE 1: ANTIDIURETIC EFFECT OF ETHANOL AND AQUEOUS EXTRACTS OF *PANDANUS FASCICULARIS* LAM AND VASOPRESSIN ON FUROSEMIDE INDUCED DIURESIS IN ALBINO RATS.**

Design of treatment	Dose	Urine Volume ml/rat	Eletrolyte excretion (mM/L)		
			Sodium	Potassium	Chloride
Control	25ml/kg	5±0.95	5.65±1.24	2.13±0.16	3.57±4.31
vasopressin	3-5 miliunits	1±0.31**	3.26±0.64**	1.26±0.27	2.50±3.64
Ethanolic extract	250 mg/kg	1.25±0.27**	3.91±0.73**	1.31±0.13	2.83±4.26
Aqueous extract	250 mg/kg	3±0.76*	4.35±1.03*	1.53±0.16	3.20±5.13

\* $p < 0.05$ , \*\* $p < 0.001$  compared to control (n=6); Students *t*-test

**DISCUSSION:** According to ethnopharmacological survey carried out in the plant of *Pandanus* group, they have healthful properties including antidiabetic, anti-inflammatory, antiviral, anti-allergy, antiplatelet, antioxidant and antitumor<sup>10,11</sup>. The role of vasopressin as the principal factor regulating renal water handling is supported by experience with ADH receptor antagonists. However, that experience also indicates the emerging significance of autocoids, and other synergistic factors, to affect ADH receptor/effector mechanisms and to modulate renal ADH responses<sup>12</sup>.

The anti diuretic effects of both extracts were indicated by decrease in both water excretion and excretion of sodium and potassium. The active principles responsible for the anti-diuretic effects of the extracts of this plant have not yet been elucidated but preliminary phytochemical analysis of the extracts revealed the presence of compounds such as phenolics and flavonoids<sup>13</sup>.

These compounds could act separately or synergistically to cause the anti-diuretic effect. On the above results, it can be suggested that the extracts produces anti- diuretic effect with decrease in electrolyte concentration in urine. Further studies are necessary to identify and isolate the active constituents responsible for the anti-diuretic activity. These findings may provide a lead for further investigations of the overall pharmacological actions of *P. fascicularis* in more appropriate model.

**CONCLUSION:** In conclusion, from above the results, it can be suggested that the ethanol extract of prop roots of *P. fascicularis* is an effective anti diuretic activity, which supports the claim that the plant can be used anti-diuretic. The present study also provides basis for the traditional use of *P. fascicularis* Lam. in treatment of diabetes insipidus.

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**Conflicts of Interest Statement:** We hereby declare that we have no conflicts of interest.

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