

Diuretic Activity of Alcoholic Extract of *Musa sapientum* L. Flower

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ABSTRACT

The present study was designed to investigate the diuretic activity of *Musa sapientum* L. (family- Musaceae) flowers. The dried powder of the flower was subjected to Soxhlet extraction with alcohol and this extract was used for diuretic activity in Wistar albino rats using Lipschitz method. The diuretic activity was assessed in terms of urine output and, concentration of Sodium, Potassium and Chloride ions in urine. The result obtained revealed that the alcoholic extract showed significant diuretic activity at a dose of 250 and 500 mg/kg body weight by increasing the total volume of urine and, concentration of Sodium, Potassium and Chloride ions with respect to standard drug furosemide.

Key words: Diuretic, Sodium, Potassium, Lipschitz method, Furosemide.

INTRODUCTION

The modern era of diuretic therapy began in 1949 when sulphanilamide was discovered to possess diuretic and natriuretic properties. A diuretic is an agent that increases the rate of urination thereby decreasing body fluid, especially the extracellular fluid. Diuretics play an important role in situations of fluid overload, like acute and chronic renal failure, hypercalciuria, cirrhosis of liver and also act as an antihypertensive agent.^[1] A number of diuretics like mannitol, thiazides, furosemide, ethacrynic acid are used in practice. Still there is a need for more effective and less toxic diuretic.

That's why there is a great need to search of safer and less toxic diuretic drug from natural resources. There are so many natural diuretic herbs like Aadraka (*Zingiber officinale*), Brahmi (*Centella asiatica*), Gokshura (*Tribulus terrestris*), Ikshuraka (*Saccharum officinarum*), Kantakaari (*Solanum xanthocarpum*), Punarnava (*Boerhavia diffusa*), Sariba (*Ichnocarpus frutescens*), Satavari (*Asparagus racemosus*), Vacha (*Acorus calamus*), Banana (*Musa sapientum*) etc. reported in different traditional literature and practices by natural healers.

Musa sapientum is a tree like perennial herb that grows 5-9 m in height, with tuberous rhizome, hard, long pseudo stem.

The inflorescence is big with a reddish brown bract and is eaten as vegetables. The ripe fruits are sweet, juicy and full of seeds and the peel is thicker than other banana.^[2]

The fruit *M. sapientum* is traditionally used in diarrhoea (unripe), dysentery, intestinal lesions in ulcerative colitis, diabetes (unripe), in sprue, uremia, nephritis, gout, hypertension, cardiac disease.^[3,4] It is also used in the treatment of excess menstruation with *Canna indica* L. var. *speciosa*.^[5] Banana leaves (ashes) are used in eczema,^[6] as cool dressings for blister and burns.^[3] Flowers are used in dysentery and menorrhagia. Stem juice of fruited plant is used for treating diarrhoea, dysentery, cholera, otalgia, haemoptysis, dysentery, diabetes and menorrhagia.^[3] The root is used as anthelmintic,^[4] blood disorders, venereal diseases.^[3] The plant is also used in inflammation, pain and snakebite.^[7]

Banana has played interesting and important roles in the history of human civilizations. Banana is very rich in carbohydrates, vitamin C, A, B and several important minerals, including potassium, copper, magnesium, calcium, and iron. The banana "tree" grows in humid lowland to upland tropical areas; these plants die if they are exposed to cold temperatures.^[8] Carbohydrates have been isolated from *M. sapientum*.^[9] Catecholamines such as norepinephrine, serotonin, dopamine,^[10,11] tryptophan, indole compounds,^[12] pectin have been found in the pulp. Several flavonoids and related compounds (Leucocyanidin, quercetin and its 3-O-galactoside, 3-O-glucoside, and 3-O-rhamnosyl glucoside) were isolated from the unripe pulp of

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plantain.^[13,14,15] Serotonin, nor-epinephrine, tryptophan, indole compounds, tannin, starch, iron, crystallisable and non-crystallisable sugars, vitamin C, B-vitamins, albuminoids, fats, mineral salts have been found in the fruit pulp of *M. paradisiaca* and *M. sapientum*.^[3]

The review of the scientific literature did not expose any data on the diuretic activity of banana flower. In this study, an attempt was made to assess the efficacy of this indigenous plant for its diuretic activity in terms of urine output and Sodium, Potassium and Chloride ions concentration in experimental animals with respect to standard.

MATERIALS AND METHODS

Materials

Wistar albino rats 150-170 gms, 36; Standard Furosemide (20 mg/kg); Control Normal Saline (5 ml/kg); Test Solution Alcoholic extract of *M. sapientum* flower (500 mg/kg).

Collection and Authentication of plant

The flower was identified and authenticated as a flower of *Musa sapientum* L. by Dr. Netrabhanu Pradhan Botanist, Prof. and H.O.D. Dept. of Botany, Panchayat College, Bargarh, Orissa and a specimen of flower was deposited in the Herbarium museum of college.

Musa sapientum L. flowers were collected in the month of Nov.-Dec. 2008 from the cultivar of Dularpali, Mahasamund Chhattisgarh. Care was taken to obtain best condition of *M. sapientum* flowers and it was subjected to dry under shade, powdered with laboratory mixer and sieved.

Methods

Extraction

The dried flower powder was Soxhlet extracted with alcohol. The obtained solvent extract was concentrated using rotary vacuum evaporator and dried in desiccators.

Animal

Healthy Wistar albino rats of either sex approximately of same age and weighed about 150-170 g were used for the study. They were fed with standard Indian diet and water

ad libitum. The animals were housed in polypropylene cages maintained under environmental conditions (12 h light and 12 h dark cycle; $25 \pm 3^\circ\text{C}$). The animals were treated strictly according to the CPCSEA guidelines.

Acute toxicity

The rats were fasted overnight, divided into groups ($n = 3$) and were orally fed with increasing doses (250, 500, 750 and 1000 mg/kg body weight) of alcoholic extract suspended in Tween 80. After administration of the extracts, the animals were observed during first 3 h for their gross behavioral changes and once in 30 min for next 5 h, then once in 24 h for next 72 h to find out percentage mortality.^[16,17,18]

Diuretic activity in rats

The diuretic activity of the extract was assessed by the method previously described by Lipschitz *et al.* for the assessment of diuretic activity, the urine output, sodium, potassium and chloride ion concentration in urine were measured. The animals were divided into four groups each group containing three animals. The animals were deprived of food and water for 12 h prior to the experiment.^[16] Before the oral administration of test drugs, the animals were dosed with 25 ml/kg body weight of normal saline. Among the four groups of animals, Group I received Tween 80 (control, vehicle for the extracts) and Group II received the standard diuretic drug Furosemide at 20 mg/kg body weight. Alcoholic extract was studied at two concentrations. Group III received 250 mg/kg and Group IV received 500 mg/kg body weight of alcoholic extract in Tween 80.^[19]

Immediately after administration, the animals were placed in fabricated metabolic cages individually to allow separation of urine and faeces. The bottom of the metabolic cage was fixed with a glass funnel inserted into a measuring cylinder containing mineral oil. The presence of mineral oil in the measuring cylinders prevents loss of urine through evaporation. The urine was collected for six hours after administration of control, standard and extract. The bladder was emptied by pulling the base of tail of each rat.^[20] Diuretic assay parameters were observed for each rat. The observed parameters were total urine volume, sodium, potassium and chloride ions concentrations. The concentrations of

Table 1: Diuretic activity of *M. sapientum* flower

Name of the Drug/Extract	Dose (mg/kg)	Urine volume (ml)	Concentration of ions (mEq/l)		
			Sodium	Potassium	Chloride
Tween 80	5 ml/kg	0.74 ± 0.47	51.75 ± 1.67	10.84 ± 0.47	52 ± 1.45
Furosemide	20	2.80 ± 0.60*	71.33 ± 2.31	12.87 ± 0.19	92 ± 2.38
Alcoholic extract	250	1.40 ± 0.10*	56.69 ± 0.92	11.42 ± 0.09	51.42 ± 1.26
Alcoholic extract	500	1.93 ± 0.49*	64.32 ± 0.96	11.93 ± 0.25	53.02 ± 2.40

* $P > 0.05$, Values are mean ± SEM, $n = 3$

sodium and potassium ions were measured by flame photometry and chloride ion concentration was estimated by titration with silver nitrate solution (N/50) using 5% potassium chromate as indicator.

Statistical analysis

The results were presented as mean \pm SEM. "One-way Anova with Dunnett's post t-test was performed using Graph Pad Prism version 3.00 for windows. Graph Pad Software, San Diego California USA, $P < 0.05$ were considered significance.

RESULTS AND DISCUSSIONS

In acute toxicity study, all the animals were found to be surviving after 72 h. This indicates that the extract was found to be safe up to the dose level studied. Since, all the animals survived at a dose of 1000 mg/kg body weight, the LD₅₀ of the extract will be >1000 mg/kg body weight. No major behavioral changes were observed during this period of study.

The result of diuretic activity of *M. sapientum* flower showed significant as compared to the standard drug Furosemide and control. The higher dose of extract (500 mg/kg) showed more significant activity as compared to the lower dose of extract (250 mg/kg).

The diuretic activity of the *M. sapientum* flower can be attributed to its presence of amino acids and proteins^[21] that plays an important role in the human body urea cycle, which removes nitrogen from the blood and help it to convert into urine.^[16]

Determination of urinary electrolyte concentration revealed that alcoholic extract 500 mg/kg body weight was effective in increasing urinary electrolyte concentration for all the ions tested (Sodium, Potassium and Chloride) in comparison to 250 mg/kg dose and control.

CONCLUSION

On the basis of above results it can be concluded that the alcoholic extract produce dose dependent diuretic effect. The present data support the ethnomedical application of *M. sapientum* flower as diuretic.

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