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Chronic diuretic effect of the Bahirdhum Padhati Mashi (BPM) of unripe *Cocos nucifera* husk in normal rats.

Akshay M. Baheti [a], K. R. Khandelwal [b], Suvarna P.Ingale [a], Shikha A.Baheti [c]

[a]*MAEER'S Maharashtra Institute of Pharmacy, Pune, 411038, India*
[b]*JSPM's Rajarshi Shahu College of Pharmacy and Research, Tathawade, Pune, India.*
[c]*Nabira Mahavidyala, Katol, Nagpur*
***Author for correspondence:** akshaybaheti@rediffmail.com*

ABSTRACT

The purpose of this study was to examine the chronic diuretic effect of the Bahirdhum Padhati Mashi (BPM) of unripe *Cocos nucifera* husk (Coconut husk) at different doses (100, 200 and 400 mg/kg) in normal rats. Daily oral administration of the BPM was tested for 4 weeks. Urinary water and electrolytes excretion were determined weekly. Oral administration of the BPM at different doses produced a significant and dose dependent diuresis and increase in electrolytes excretion. The highest dose (400mg/kg) of BPM enhanced urine output from 10.20 ± 0.08 ml/24 h at the start to 23.25± 0.20 ml/24 h after the 4 weeks ($p<0.001$). It also produced significant increase in urinary excretion of Na^+ ($p<0.001$), K^+ ($p<0.001$) & Cl^- ($p<0.001$). Slight increase in glomelular filtration rate was also observed ($p<0.001$) for all the doses of BPM. It is concluded that the BPM of unripe coconut husk has a significant diuretic effect in rats.

KEYWORDS: BPM, Coconut, Husk, Diuretic activity, Unripe,

INTRODUCTION

Plant medicine was commonly used for traditional treatment of some renal diseases and lots of plants were reported to show significant diuretic activity (1). Many investigators demonstrated that studies of herbal plant used in traditional medicine as diuretic were in progressive elevation in the last decades (2) and might be a precious tool used in human pathology treatment.

Cocos nucifera Linn (Family: Palmae, English: Coconut Palm) is extensively cultivated in southern India and Ceylon. Every Part of the tree is being used for some purpose like food, fuel or timber hence it is called as Kalpravriksha(3). Ayurvedic practitioners use coconut husk mashi for antiemetic (4) and diuretic activity without much scientific basis of its therapeutic effect.

Since diuresis is one of the treatment option for hypertensive patients, our purpose in this study was to assess the diuretic effect of Bahirdhum Padhati Mashi of unripe coconut husk in normal rats with chronic treatment.

MATERIAL AND METHODS

Plant Material

Cocos nucifera husk was collected from Pune region and identified by Pharmacognosy Department of MAEER's Maharashtra Institute of Pharmacy, Pune. A voucher specimen (hp/Cocos/01) was earlier deposited at the MAEER's Maharashtra Institute of Pharmacy, Pune.

Preparation of the Bahirdhum Padhati Mashi (BPM)

Husk was collected and dried under shade. BPM were prepared following the recommendation of Ayurvedic practitioners. Unripe coconut husk were heated in earthen pot at 145-155^{0}C. With continuous stirring till the white fumes ceases to come out. 100 gm of the husk gave 6gm of BPM. Mashi (The burnt black powder) were then given orally at doses of 100, 200 and 400mg/kg.

Experimental methods

Male Wister rats weighing (180-240g) (National toxicology center, Pune) housed at a room temperature with 12h light cycle were used in the present study. Animals were maintained on standard rat diet and tap water ad libitum. The animals were individually placed in standard metabolism cages after oral administration. They were randomly assigned to five different groups containing six rats each.

Rats received solutions by force feeding and were treated once daily for 4 weeks as follows: the first group received distilled water (5ml/kg) and served as a control group, three other groups received orally the BPM at doses 100, 200 and 400 mg/kg respectively. The 5th group was treated with furosemide as a reference drug at a dose of 10mg/kg. Urine was collected daily in

graduated cylinders, filtered and conserved at –80^{0}C until parameter determination. Blood samples for plasma creatinine were obtained by tail puncture at 0, 1, 2, 3 and 4 weeks after oral administration of BPM. Institutional Animal Ethical committee has approved the experimental work.

Parameters

Urine sodium and potassium concentrations were determined using Flame photometry (Systronics), according to the standard methods (5). Creatinine level in plasma and urine samples was evaluated by colorimetric methods using a spectrophotometer (Perkin Elmer, Lambda EZ201). Potassium content of BPM was also determined using Atomic absorption spectrophotometer.

Statistical analysis

Values were expressed as mean ± S.E.M. Statistical analysis was performed using a Student *t* test. A p value higher than 0.05 was considered insignificant.

RESULTS

Diuretic activity- Repeated oral administration of the BPM increased the urinary flow in a dose dependent manner. The lowest dose (100mg/kg) increased the urine flow from 9.25 ± 0.11 to 19.04 ± 0.19 ml/24h after 1 month of treatment ($p<0.001$). After 4 weeks of treatment, the extracts at doses of 200 and 400mg/kg increased urine output ($p<0.001$) considerably from 10.00 ± 0.25 and 10.41 ± 0.17 ml/24 h respectively, to 20.23 ± 0.15 and 24.10 ± 0.12 ml/24 h ($p<0.001$) respectively (Table 1).

The highest dose (400mg/kg) showed a cumulative diuretic effect similar to furosemide at a dose of 10mg/kg.

Effects on electrolyte excretion

All the doses had significant effect on the urinary excretion of sodium ($p<0.001$), potassium ($p<0.001$) and chloride ($p<0.001$). The highest dose (400mg/kg) showed urinary excretion of Na^+ (142.30 ± 0.55), K^+ (88.31 ± 0.23), Cl^- (88.31 ± 0.20) similar to furosemide Na^+ (140.54 ± 0.30), K^+ (87.79 ± 0.21), Cl^- (88.04 ± 0.28) [Table 2,3 and 4]

Table 1: Effect of oral administration of Bahirdhum Padhati Mashi (BPM) on the urine volume

Treatment Intervals	Distilled water (5ml/kg)	BPM (100mg/kg)	BPM (200mg/kg)	BPM (400mg/kg)	Furosemide (10mg/kg)
1 week	5.09±0.08	9.25±0.11*	10.00±0.25*	10.41±0.17*	10.27±0.08*
2 week	6.07±0.07	12.30±0.15*	14.69±0.15*	15.86±0.17*	16.81±0.11*
3 week	6.28±0.05	15.24±0.13*	16.81±0.18*	20.06±0.15*	20.12±0.14*
4 week	7.12±0.07	19.04±0.19*	20.23±0.15*	24.10±0.12*	23.25±0.20*

*Values are mean±S.E.M. of six rats in each group; * p<0.001 compared with control group*

Table 2: Effect of oral administration of Bahirdhum Padhati Mashi (BPM) on urinary excretion of sodium

Treatment Intervals	Distilled water (5ml/kg)	BPM (100mg/kg)	BPM (200mg/kg)	BPM (400mg/kg)	Furosemide (10mg/kg)
1 week	98.77±0.15	120.06±0.29*	125.16±0.21*	129.68±0.43*	126.81±0.31*
2 week	102.19±0.12	125.13± 0.09*	129.49± 0.32*	133.68± 0.25*	130.94± 0.39*
3 week	104.08±0.43	128.33±0.18*	132.83±0.27*	139.69±0.25*	136.46±0.42*
4 week	105.27±0.30	128.39±0.18*	134.46±0.36*	142.38±0.55*	140.54±0.30*

*Values are mean±S.E.M. of six rats in each group; * p<0.001 compared with control group*

Table 3: Effect of oral administration of Bahirdhum Padhati Mashi (BPM) on urinary excretion of potassium

Treatment Intervals	Distilled water (5ml/kg)	BPM (100mg/kg)	BPM (200mg/kg)	BPM (400mg/kg)	Furosemide (10mg/kg)
1 week	45.39±0.31	57.40±0.34*	60.46±0.21*	73.89±0.17*	75.84±0.29*
2 week	46.98±0.22	61.89±0.42*	64.26±0.14*	77.17±0.27*	78.84±0.18*
3 week	48.31±0.24	62.33±0.23*	75.79±0.19*	83.65±0.32*	82.66±0.17*
4 week	48.45±0.16	63.31±0.17*	77.30±0.41*	88.31±0.23*	87.79±0.21*

*Values are mean±S.E.M. of six rats in each group; * p<0.001 compared with control group*

Table 4: Effect of oral administration of Bahirdhum Padhati Mashi (BPM) on urinary excretion of chloride

Treatment Intervals	Distilled water (5ml/kg)	BPM (100mg/kg)	BPM (200mg/kg)	BPM (400mg/kg)	Furosemide (10mg/kg)
1 week	95.19±0.28	98.62±0.24*	101.50±0.22*	74.15±0.16*	75.53±0.20*
2 week	97.54±0.36	104.79±0.21*	105.48±0.28*	77.75±0.26*	78.13±0.57*
3 week	98.52±0.11	107.73±0.18*	109.44±0.29*	83.34±0.28*	82.37±0.23*
4 week	101.84±0.26	110.92±0.19*	112.83±0.05*	88.31±0.20*	88.04±0.28*

*Values are mean±S.E.M. of six rats in each group; * p<0.001 compared with control group*

Effect on glomerular filtration rate (GFR)

After the fourth week of treatment, GFR was increased significantly: 8.98 ± 0.39 ml/min/kg ($p<0.001$) for the dose of 100 mg/kg, 9.06 ± 0.70 ml/min/kg ($p<0.001$) for the dose of 200 mg/kg, 9.12 ± 0.56 ml/min/kg ($p<0.001$) for the dose of 400 mg/kg. On the other hand furosemide did not alter the GFR.

K^+ content of the BPM

The K^+ content of the BPM used in this experiment was 12.08 %.

DISCUSSION

The present study had indicated that the BPM at doses ranging from 100 to 400 mg/kg caused a significant and dose dependent increase in urinary water and electrolyte excretion in normal rats. It was also noted that BPM caused increase in both water and electrolyte excretion qualitatively similar to furosemide which is a potent saluretic & diuretic effects (6).

It is also possible that K^+ content of BPM of coconut husk exerted its diuretic activity, as K^+ content of BPM is high. Diuretic activity could also be due to other active principles such as flavonoids, tannins (7).

Oral administration of BPM caused a diuretic response, which was accompanied with a slight increase in GFR for all the three doses (100, 200 and 400 mg/kg).

It appears that BPM caused diuretic and enhanced electrolytes excretion through mechanisms qualitatively similar to that of furosemide and more than one mechanism seem to be involved.

Our earlier toxicological studies have shown that BPM was free from toxic effects at the doses used in this study.

CONCLUSION

On the basis of the above results we can conclude that BPM produced a marked diuresis and increased electrolytes urine excretion when rats were chronically treated. This is in accordance with traditional use of this plant in renal failure

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