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Research Article

DIURETIC ACTIVITY OF *BUTEA MONOSPERMA* FLOWERS EXTRACT

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ABSTRACT
Kidney, as excretory organ of our body serves important function of excretion of waste products, regulation of fluid volume and electrolyte content etc. Damage to kidney can lead to severe life threatening complications. Diuretics are drugs capable of increasing levels of urine. Aqueous and alcoholic extracts of *Butea monosperma* flowers were tested for diuretic activity in rats. The parameters studied on individual rat were body weight before and after test period, total urine volume urine concentration of Na^+, K^+ and Cl^-. In the present study alcoholic and aqueous extracts of was investigated. *Butea monosperma* flowers (100 mg/kg of body weight) showed increase in urine volume, cation and anion excretion. Furosemide was used as reference diuretic.
Keywords: Diuretic activity, Furosemide, *Butea monosperma* flowers.

INTRODUCTION

Diuretics are drugs that increase the rate of urine flow, sodium excretion and are used to adjust the volume and composition of body fluids in a variety of clinical situations. Drug-induced diuresis is beneficial in many life threatening disease conditions such as congestive heart failure, nephritic syndrome, cirrhosis, renal failure, hypertension, and pregnancy toxaemia[1]. Most diuretic drugs have the adverse effect on quality of life including impotence, fatigue, and weakness. Naturally occurring diuretics include caffeine in coffee, tea, and cola, which inhibit Na + re absorption and alcohol in beer, wine and mixed drinks, which inhibit secretion of ADH[2,3]. Although most of the diuretics proved to be very effective in promoting sodium excretion, all cause potassium loss and prompted the search for potassium sparing diuretic. Hence search for a new Diuretic agent that retains therapeutic efficacy and yet devoid of potassium loss is justified[4]. In traditional medicine , there are many natural crude drugs that have the potential to treat many disease and disorders one of them is *Butea monosperma* (Lam.) Taub (Syn. *Butea frondosa*; Family Fabaceae) popularly known as 'dhak' or 'palas', commonly known as 'Flame of forest', palash, mutthuga, bijasneha, khakara, chichara, Bastard teak, Bengal kino[5]. They comprise one of the largest families of flowering plants, numbering 630 genera and 18,000 species[6]. This is a moderate sized deciduous tree which is widely distributed throughout India, Burma and Ceylon extending in the Northwest Himalayas as far as Jhelum except in very acrid parts[7]. It is one of the most beautiful tree has been put to some useful purpose. *Butea monosperma* is an erect medium sized dry season-deciduous tree, growing to 15 m tall. The leaves are pinnate, with an 8–16 cm petiole and three leaflets large and stipulate, each leaflet 10 – 20 cm long. The flowers are 2.5 cm long, bright orange-red, and produced in racemes up to 15 cm long. The fruit is a pod 15–20 cm long and 4–5 cm broad. It is capable of growing in water logged situations, black cotton soils, saline, alkaline, swampy badly drained soils and on barren lands except in arid regions. *Butea monosperma* is extensible used in Ayurveda, Unani and Homeopathic medicine and has become a cynosure of modern medicine. The plants of this genus are well known for their coloring matters. Commonly *Butea monosperma* is used as tonic, astringent, aphrodisiac and diuretics[8,9]. Roots are useful in filariasis, night blindness, helminthiasis, piles, ulcer and tumours. It is reported to possess anti fertility, aphrodisiac and analgesic activities. Flowers are useful in diarrhoea, astringent, diuretic, depurative and tonic[10]. The stem bark is useful in indigenous medicine for the treatment of dyspepsia, diarrhoea, dysentery, ulcer, sore throat and snake bite. Besides medicinal uses it is also having the economic use such as leaves are used for making platters, cups, bowls and beedi wrappers Bark fibres are used for making cordage. Wood is used for well curbs and water scoop. It is a cheap board wood. Wood pulp is suitable for newsprint manufacturing[11] *Butea* is also a host to the Lac insect, which produces natural lacquer. No systematic studies have been reported for its diuretic activity. Hence an effort has been made to establish the diuretic activity of aqueous and alcoholic extracts of *Butea monosperma* flowers.

MATERIALS AND METHOD

Collection and preparation of Plant Extract

The *Butea monosperma* flowers were collected in the month of October from the local market of Etawah, Uttar Pradesh state, India, and authenticated by Dr. Harish K. Sharma, Ayurvedic Medical College, Davangere, Karnataka, India. A voucher specimen was submitted at Institute's herbarium department for future reference (AN 1042). Dried flowers were ground to coarse powder. Powder was first defatted with pet. ether and then extracted with ethanol which is further evaporated to dryness to obtain alcoholic extract.

Extraction and phytochemical screening of plant

The powdered plant materials (500 g) were extracted with petroleum ether at 40-60^{0}C, by continuous hot percolation using soxhlet apparatus. The extraction was carried out by using solvent of increasing polarity starting from petroleum ether and methanol respectively. The extraction was carried out for 72 hours. The petroleum ether extract was filtered and concentrated to dry mass by using vacuum distillation. A dark greenish brown residue was obtained. The marc left, after petroleum ether extraction was taken and then subsequently extracted with methanol for 72 hours. The methanolic extract was then filtered and concentrated to dry

mass. A dark greenish residue was obtained. Phyto chemical screening was performed using standard procedures[12,13].

Experimental animals

In bred colony strains of Wistar rats of either sex weighing 150 - 250 g procured from the animal house were used for the study. The animals were maintained in polypropylene cages of standard dimensions at a temperature of 28 ± 1°C and standard 12 hour: 12 hour day night rhythm. The animals were fed with standard rodent pellet diet (Hindustan Lever Ltd) and water *ad libitum*. Prior to the experiment the animals were acclimatized to the laboratory conditions. All animal experiments conducted during the present study got prior permission from Institutional Animal Ethics Committee (IAEC) and followed the guidelines of IAEC.

Drug

Furosemide tablet was collected from local market of Etawah, U.P., India was used as known Diuretic agent. The standard solution was prepared by dissolving the tablet in the solvent. The dose of was Furosemide maintained 100 mg/kg body weight.

Acute Toxicity Study

Acute toxicity study was carried out by using graded doses of drug were administered intra peritoneally in graded doses (200 to 1000 mg/kg body weight). They were observed continuously for the first 2 h for toxic symptoms and up to 24 h for mortality[14].

Diuretic Activity

Male rats (Wister albino strain) weighing 150 to 180 g were maintained under standard condition of temperature and humidity. The method of Lipschitz *et al*[15,16] was employed for the assessment of diuretic activity. The experimental protocols have been approved by the Institutional Animal Ethical Committee. Four groups of six rats in each and were fasted and deprived of water for eighteen hours prior to the experiment. The first group of animals serving as control, received normal saline (25 ml/Kg,p.o.); the second group received furosemide (100 mg/Kg,i.p.) in saline; the third, fourth groups received the Alcohol and Aqueous extract at the doses of 100 mg/Kg, respectively, in normal saline. Immediately after administration the animals were placed in metabolic cages (2 per cage), specially designed to separate urine and feaces, kept at room temperature of 25 ± 0.5ºC throughout the experiment. The urine was collected in measuring cylinders up to 3 h after dosing. During this period, no food or water was made available to animals. The parameters taken for individual rat were body weight before and after test period, total concentration of Na+, K+, and Cl- in the urine. Na+, K+ concentrations were measured by Flame photometry [17] and Cl- concentration was estimated by titration[18] with silver nitrate solution (N/50) using three drop of 5 % potassium chromate solution as indicator. Furosemide sodium salt was given by stomach tube. Optimal dose activity relation was found to be 20 mg/Kg of furosemide per kg body weight in series of supportive experiments. Results are reported as mean ± SD, the test of significance ($p < 0.01$ and $p < 0.05$) was statically.

Statistical Analysis

All the results are expressed as mean ± standard error. The data was analyzed statistically using ANOVA[19] at a probability level of $P < 0.001$.

Table 1: Diuretic activity of *Butea monosperma* flowers extracts

Extract	Dose	Electrolytic Labels		
		Na^+	K^+	Cl^-
Aqueous	250 mg/kg b.w	113.8 ± 2.042**	66.60 ± 0.6429*	127.3 ± 1.868**
Aqueous	500 mg/kg b.w	127.8 ± 0.9849**	73.60 ± 0.5196**	155.6 ± 2.218**
Alcohol	250 mg/kg b.w	120.5 ± 0.5196**	71.20 ± 0.5033**	147.5 ± 1.637**
Alcohol	500 mg/kg b.w	136.2 ± 1.222**	89.13 ± 0.2906**	170.5 ± 1.947**
Furosemide	20 mg/kg p.o	145.2 ± 2.470**	87.67 ± 1.782**	174.3 ± 2.634**
Normal saline	25 ml/kg p.o	85.10 ± 2.892	59.03 ± 1.302	97.83 ± 1.126

Each Value represents the mean ± SEM of six rats. $P < 0.05$*, $P < 0.01$**, $P < 0.001$***

RESULTS AND DISCUSSIONS

The preliminary phytochemical screening of the ethenolic fraction showed the presence of steroids, tannins and flavonoids. In acute toxicity study, it was found to be safe and no mortality was observed to a dose as high as 800 mg/kg. Present study shows that the aqueous and alcoholic extract of *Butea monosperma* flowers possess good diuretic activity. Urine volume, cation and anion excretion were increased, Na+/K+ ratio of 2.04 and 2.18 were obtained for aqueous and alcoholic extract respectively. The normal value for Na+/K+ ratio is reported to be 2.05 – 2.83. The concentration of aldosterone is found to be dependent on Na+/K+ ratio. If the Na+/K+ ratio falls below the normal in plasma the aldosterone secretion will be decreased and if the ratio rises above the normal value the aldosterone secretion will be increased. Significant increase in Na+, K+ and Clion excretion was observed in aqueous and alcoholic extract treated animals but it was less than the furosemide control. Further studies are required to assess the medicinal value of *Butea monosperma* flowers as a potential diuretic agent (Table 1). Diuretics relive pulmonary congestion and peripheral edema. These agents are useful in reducing the syndrome of volume overload, decreases cardiac workload, oxygen demand and plasma volume, thus decreasing blood pressure[20]. Thus, diuretics play an important role in hypertensive patients. In present study, we can demonstrate that ethanol and aqueous extract may produce diuretic effect by increasing the excretion of Sodium, Potassium and Chloride. The control of plasma sodium is important in the regulation of blood volume and pressure; the control of plasma potassium is required to maintain proper function of cardiac and skeletal muscles[21]. The regulation of Sodium, Potassium balance is also intimately related to renal control of acid-base balance. The Potassium loss that occurs with many diuretics may lead to hypokalemia. For this reason, generally potassium-sparing diuretics are recommended[22]. In present study aqueous and alcohol extracts showed elevated levels of Potassium in urine, which may increase risk of hypokalemia and hence its potassium sparing capacity has to be investigated. Active principles such as flavanoids,

saponins, Results of present investigation showed that ethanol is most effective in increasing urinary electrolyte concentration of all the ions i.e. Sodium, Potassium and Chloride followed by alcohol and aqueous extracts while other extracts did not show significant increase in urinary electrolyte concentration. A complex set of interrelationships exists among the cardiovascular system, the kidneys, the central nervous system (Na+, appetite, thirst regulation) and the tissue capillary beds (distribution of extracellular fluid volume), so that perturbation at one of these sites can affect all the remaining sites. A primary law of the kidneys is that Na+ excretion is a steep function of mean arterial blood pressure (MABP) such that small increase in MABP cause marked increase in Na+ excretion[23]. One of the earliest strategies for the management of hypertension was to alter Na+ balance by restriction of salt in the diet. Diuretic agents having antihypertensive effects were used alone and had greater efficacy than all other antihypertensive drugs. In this study pharmacological evaluation of diuretic action of aqueous and alcoholic extracts of *Butea monosperma* flowers was evaluated using furosemide under controlled laboratory condition. As diuretic therapy may lead to number of life threatening electrolytic disorder and toxicities, so safety profile studies are carried out following a sub chronic administration of extracts.

CONCLUSION

The extracts of *Butea monosperma* flowers have diuretic effect supporting the ethnopharmacological use as diuretics. This effect may be explored in the use of the plant in the management of inhibit bacterial growth.

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