DIURETIC ACTIVITY OF WHOLE PLANT OF *COMMELINA DIFFUSA BURM.*

*K. Bhanu Prasad*

*School of Pharmaceutical Sciences & Technology, JNTU Kakinada, India 533003.

ABSTRACT

*Commelina diffusa burm.* (Family: Commelinaceae) is a common weed found in damp pastures, wet forest, drains, swampy areas and other wet places of Pacific and Tropical Asia. According to Ayurveda, *Commelina diffusa burm.* is used for the treatment of fractured bones; as a diuretic and to aid digestion; to treat eye irritation and rashes. The present study was undertaken to investigate diuretic effect of petroleum ether extract of the *Commelina diffusa burm.* (PECD) in albino rats. Acute oral toxicity study was performed as per OECD guidelines. In acute oral toxicity study, mortality was not observed up to 2000 mg/kg bodyweight. PECD were administered at the doses of 250 and 500 mg/kg, p.o. Furosemide (500 mg/kg, p.o) was used as positive control in study. The diuretic effect of the extract was evaluated by measuring urine volume, sodium and potassium content. Urine volume is significantly increased at two doses of PECD 250 & 500 mg/kg body wt in treated rats. The excretion of sodium, Potassium levels was also increased by the PECD. The diuretic effect of the extract was similar to furosemide. The PECD had the additional advantage of chloride conserving effect. This study concludes that PECD produced notable diuretic effect which appeared to be comparable to that produced by the standard diuretic furosemide. The present study provides a quantitative basis for explaining the folkloric use of *Commelina diffusa burm.* as a diuretic agent.

Key words: *Commelina diffusa burm.*, Diuretic activity, urine output, Flame Photometry, diuretic index, lipschitz value.

INTRODUCTION

Diuretic compounds that stimulate the excretion of water are potentially useful in many disorders including most of those exhibiting oedema such as congestive heart diseases, nephritis, toxemia of pregnancy, premenstrual tension, hypertension. And also play an important role in hypertensive patients & pulmonary congestion [1]. Diuretics like mannitol, thiazides, frusemide, and ethacrinic acid are used in now days. Among these diuretics had some toxic effects. These synthetic diuretics typically inhibit potassium secretion and leads to potassium retention [2].

Plants may serve as the alternative sources for the development of new diuretic agents due to their biological activities. Several plants used for the treatment of diuresis in different systems of traditional medicine have shown diuretic activity when tested on animal models. *commelina diffusa burm.* (Commelinaceae) is a sprawling, rhizomatous herb with jointed succulent, ascending stems growing to 75 cm tall. Leaves alternate, mostly without petioles, parallel-veined. On the basis of the traditional use of the plant as a diuretic, but no previous pharmacological (or) clinical study was carried out to test the diuretic activity of this plant [3-7]. Since the diuretic effect of *Commelina diffusa burm.* has never been experimentally confirmed, the main aim of the present investigation was to evaluate the claimed diuretic activity of *Commelina diffusa burm.* in rats.
MATERIALS AND METHODS

Plant material

The whole plant of *Commelina diffusa* Burm. was collected from Tirupati, Talakona, Tirumala, Andhra Pradesh, India. The whole plant were dried under shade, powdered and stored in an air tight container.

Preparation of extract

The collected whole plant was dried at room temperature, pulverized by a mechanical grinder, sieved through 40 mesh. About 120g of powdered materials were extracted with petroleum ether (60°-80°C) using soxhlet apparatus. The extraction was carried out until the extractive becomes colourless. The extracts is then concentrated and dried under reduced pressure. The solvent free semisolid mass thus obtained is dissolved in normal saline and used for the experiment. The percentage yield of prepared extract was around 8.3% w/w.

Preliminary Phytochemical analysis

The petroleum ether extract of *Commelina diffusa* burm. was subjected to qualitative analysis for the various phyto-constituents. Standard methods were used for preliminary qualitative phytochemical analysis of extract [8].

Animals

Wister albino rats weighing between 150-200gm each were used for this experiment. They were procured from School of Pharmaceutical Sciences & Technology, JNTU Kakinada. The animals were kept under standard condition in an animal house approved by committee for the purpose of control and supervision of experiments on animals (CPCSEA). They were housed in polypropylene cages and maintained at 27±2°C; The animals were given standard diet. Ethical committee clearance was obtained from IAEC (Institutional Animal Ethics Committee) of CPCSEA.

Acute toxicity study

Acute toxicity study of pet.ether extract of *Commelina diffusa* burm.f. was determined by acute toxic class method of OECD guidelines. In acute oral toxicity study mortality was not observed up to 2000mg/kg body weight [9].

Evaluation of diuretic activity

The methods of Lipschitz et al., (1943), Mukherjee et al., (1996) and Murugesan et al., (2000) [10-12] were followed for the evaluation of diuretic activity. The animals were divided into four groups. Group-I was received only with saline solution. i.e., Normal control. Group-II was received furosemide at a dose of 500 mg/kg, p.o. and it was considered as positive control group. Group-III & Group-IV received the PECED, at doses of 250 and 500mg/kg, (p.o) respectively. Twenty–four hours prior to the experiment, the test animals were placed into metabolic cages with total withdrawal of food and water. After oral administration of PECED, the urinary output of each group was recorded at different time intervals from the graduated urine chamber at metabolic cage. Urine samples were analyzed for Na⁺ and K⁺ concentration by flame photometric method.

Experimental design

Animals were deprived of food and water 18 h before the experiment. They were hydrated with 5ml/kg of water prior to drug/extract administration. Immediately after dosing, animals were placed in metabolic cages (2 in one cage), specially designed to separate urine and faeces. The urine was collected in measuring cylinder up to 5 h after dosing. During this period, animals were deprived of food and water. The parameters measured were total urine volume, urine concentration of Na⁺, K⁺ and Cl⁻. Concentration of Na⁺ and K⁺ were determined using Flame photometer while Cl⁻ concentration was estimated titrimetrically using 0.02N AgNO₃ with 5% potassium chromate as indicator. Appearance of brick red precipitate was taken as the end point.

Statistical analysis

The data were expressed as Mean ± S.E.M. and statistically analyzed using one way ANOVA followed by Tukey-Kramer’s Multiple comparison test, p<0.05 was considered significant.

RESULTS

Preliminary Phytochemical analysis

The petroleum ether extract of *Commelina diffusa* burm.f. revealed the presence of steroids, Alkaloids, Reducing sugars, tannins, gums, flavonoids.

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Mean urine volume (ml)</th>
<th>Electrolyte Na⁺ (m eq/l)</th>
<th>Concentration (m eq/l) K⁺ Na⁺/K⁺ ratio</th>
<th>Diuretic index</th>
<th>Lipschitz value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Normal saline (5 ml/kg, p.o)</td>
<td>4.52±0.12</td>
<td>71.5 ± 0.52</td>
<td>514.21 ± 0.34</td>
<td>15.14</td>
<td>---</td>
</tr>
<tr>
<td>II</td>
<td>Furosemide (5mg/kg, p.o)</td>
<td>9.84 ±0.23**</td>
<td>172.24 ±0.21**</td>
<td>875.24 ± 1.20**</td>
<td>19.54</td>
<td>2.17</td>
</tr>
<tr>
<td>III</td>
<td>PECED (250mg/kg, p.o)</td>
<td>6.54 ±0.05</td>
<td>82.82 ± 0.21</td>
<td>529.32 ± 1.18</td>
<td>14.32</td>
<td>1.44</td>
</tr>
<tr>
<td>IV</td>
<td>PECED (500mg/kg, p.o)</td>
<td>8.12 ± 0.25</td>
<td>105.12 ±0.16**</td>
<td>635.36 ±1.05**</td>
<td>15.44</td>
<td>1.80</td>
</tr>
</tbody>
</table>

Values expressed as Mean ± S.E.M. One way ANOVA: p<0.01 (urine volume, electrolyte concentration) considered extremely significant. Tukey-Kramer’s multiple comparison test *p<0.05, **p<0.01; when compared with the control group.

- Diuretic Index=Mean urine volume of test/Mean urine volume of control.
- Lipschitz value = Mean urine volume of test/Mean urine volume of standard.
DISCUSSION AND CONCLUSION

The diuretic activities of the extracts were significant ($P < 0.05$) when as compared to control. The graded doses of the PECD in normal saline showed a very significant increase in diuresis, natriuresis, kaliuresis, GFR (Table 1). All the extracts cause increase urine elimination and increase in Na+, K+ and Cl+ excretion as compared to normal saline. The extracts possibly act by the synergistic action mechanism of the $[\text{HCO}_3^- - /\text{Cl}^->]$, $[\text{HCO}_3^+ /\text{H}^+]$ [13] exchangers and the $[\text{Na}+/\text{H}^+]$ antiporter, to cause diuresis. There was an increase in the ratio of concentration of excreted sodium and potassium ions after PECD treatment. This indicates that the extract increases sodium excretion to larger extent than potassium, which is a very quality of diuretic with lesser hyperkalaemic side effect.

The *Commelina diffusa burm.f.* extract exerted its diuretic activity possibly by inhibiting tubular reabsorption of water and accompanying anions, as such action has been hypothesized for some other plant species [14]. Therefore *Commelina diffusa burm.f.* extract significantly increased the GFR due to (a) A detergent like interaction with structural components of glomeruluar membranes. (b) A decrease in renal perfusion pressure, attributable to decrease in the resistance of the afferent arteriole and/or an increase in the resistance of the efferent arteriole and/or. (c) The direct effect on the arteriole wall affecting glomerular blood flow [15].

As emphasized, diuretic properties of PECD could be due to other active principles such as flavonoids, saponins, and organic acids [16]. It is also possible that diuretic effect of the water PECD could be due to other secondary active(s) metabolites(s) [17]. The other possibility for the observed diuretic effect of PECD water could be due to indirect changes of some physiological parameters before blood filtration step [18] and/or the consequence of the observed glycosuria [19].

The observed decrease of urine osmolality could be explained by a marked increase in urinary flow, which seemed to be more important than the possible urinary electrolytes excretion. Administration of the PECD caused a diuretic response, which was accompanied with a slight increase in GFR. This finding suggests different mechanisms of action, like a direct effect on arterial pressure which could affect GFR or glomerular blood flow or by decreasing renal perfusion pressure [20,18].

PECD caused diuresis by a mechanism quantitatively similar to that of furosemide and more than one mechanism seems to be involved. The PECD did not affect plasma urea levels, urine pH, plasma osmolarity and hematocrit indicating that the rapid physiological regulation of these important parameters was not altered after RR infusion.

On basis of the above results, we can conclude that PECD treatment produced a marked diuresis when rats were acutely treated. In our study, no lethality was observed at least for the dose and duration used. However, advanced toxicological studies remain to be performed in mice and rats. It remains necessary to study eventual adverse effect(s) of this plant such as alteration of some neural, metabolic and hormonal parameters, which are undetermined in this study, before its recommendation to clinical use. The precise site(s) and the molecular and cellular mechanism(s) of PECD action remain to be elucidated in further studies.

REFERENCES


