REPORT

DIURETIC AND ANALGESIC EFFECTS OF THE METHANOL EXTRACT OF *PHOENIX SYLVESTRIS* ROOT

M.A.B. HOWLADER, S.C. BACHAR*, F. BEGUM AND A.S.S. ROUF*

Department of Pharmacology & Clinical Pharmacy, University of Dhaka, Dhaka 1000, Bangladesh
**Department of Pharmaceutical Technology, University of Dhaka, Dhaka –1000, Bangladesh*

ABSTRACT

The analgesic and diuretic activities of the methanol extract of *Phoenix sylvestris* root on Swiss *albino* mice were observed. The extract showed significant ($p<0.001$) analgesic activity by reduction of percent inhibition of writhing induced by acetic acid (0.5% v/v) in 20.07% and 32.57% at a dose level of 150 mg/kg and 300-mg/kg body weights respectively. The methanol extract also showed diuretic effect at 1st hour of the study at 300-mg/kg and 2nd and 4th hour of the study at 150-mg/kg-body weight on swiss *albino* mice. The onset of diuretic effect was faster at a dose of 300-mg/kg body weights than 150 mg/kg body weight. The obtained results may give a clue for extensive phytochemical investigation of the plant for the development of herbal medicine.

Keywords: Phoenix sylvestris, diuretics, analgesic.

INTRODUCTION

The use of plant products is increasing in many segment of the population (Eisenberg, 1993). At present, thousands of plant metabolites are being successfully used in the treatment of variety of diseases. According to an estimate, 80% of the world's population relied upon plants for their medication (Akerele, 1993.). The use of the medicinal plants is increasing in many countries where 35% of drugs contain natural products (Sofowora, 1982). More than 47% of all drugs, used in Russia are obtained from plant sources ((Lyle and James, 1986). In Bangladesh about 250 plant species are used as herbal medicine.

The use of plants as traditional medicine has been increased with the age of civilization. Herbal medicines are still in use in many societies. Although most of the modern medicines are synthetic compounds, but in many cases modern drugs have originated from the nature, more especially from the plant, animal and mineral sources. Plants are considered as natural chemical factory (Frits, 1980), because synthetic process in biological systems particularly in plants is going on by nature's ordinary temperature and pressure. The laboratory synthesis of anti-malarial drug quinine requires an intensive work extending over half a century but *Cinchona* plant can do it every day without difficulty. The presence of diversified chemical compounds as steroids, terpenoids, flavonoids, chalcones, alkaloids and glycosides in plants has already been reported. Clinically used plant metabolites such as taxol (Kirtikar, 1980) isolated from *Taxus brevifolia*, Vincristine and Vinblastine obtained from *Vinca rosea* (Linn.) and digitalis (Satoshkar, 1980) derived from *Digitalis purpura* are only a few of the many striking examples of developing life saving drugs from plant sources.

Phoenix sylvetris (family: Palmae) is widely spread over open forest and grassland areas of Bangladesh. The fruit of the plant has been traditionally used as cardiotonic, constipatic, antipyretic etc. The juice obtained from the tree is considered to be a cooling beverage. The roots are used to stop toothache. The fruit pounded and mixed with almonds, quince seeds, pistachio nuts and sugar, from a restorative remedy (Kirtikar and Basu, 1935). The central tender part of the plant is used in gonorrhea (Watt, 1892).

Present study was aimed to elucidate the analgesic and diuretic activity of methanol extract of *Phoenix sylvetris* root.

MATERIALS AND METHODS

Animals

Swiss albino mice (20±2 gm) of either sex were obtained from the animal house of International Center for Diarrhoeal Diseases and Research, Bangladesh (ICDDR,B). The mice were divided into several groups containing five or six animals in each group. The animals were given standard mouse feed developed by ICDDR,B and water *ad libitium* and kept in the laboratory environment for seven days. They were fasted overnight and weighed before the experiments.

Preparation of plant extract

The root of the plant *Phoenix sylvestris* was collected from an authentic source during April, 2002, sun-dried (22 d) and then pulverized by grinding.

**Corresponding author:* Email: rouf321@yahoo.com

The coarse powder *phoenix sylvestris* root (500 g) was extracted with methanol by cold extraction process. After which the methanol extract was filtered off and evaporated in vacuum at low temperature (<40°) by a rotary evaporator which yielded crude extract (10.0 gm; 2.0%).

The suspensions of the methanol extract of *Phoenix sylvestris* root in saline water-DMSO (5%) and administered to the test animal at doses of 150 mg/kg and 300 mg/kg body weight respectively. Aminopyrine was suspended in saline water-DMSO (5%) and Tween 80 (0.3%) and administered to the animal at a dose of 30 mg/kg body weight. Urea was dissolved in saline and administered to the animal at a dose of 750 mg/Kg body weight. Furoesemide powder was made solution in saline water and administered at a dose of 4 mg/kg body weight.

Study of analgesic activity

The analgesic activity of the methanol extract of *Phoenix sylvestris* root was studied by acetic acid induced writhing reflex method using the standard drug aminopyrine. Four groups of mice, each consisting of six, were taken (table 1). Group I was kept as control giving only saline. Group II was treated with aminopyrine at a dose of 30 mg/kg body weight. Group III and IV were given the methanol extract of the plant *Phoenix sylvestris* at a dose of 150 mg/kg and 300 mg/kg body weight orally. One hour after drug treatment, mice were injected *i.p*. with 0.5% (v/v) acetic acid (0.1 ml/10g). Five minutes after treatment, the number of writhing induced by acetic acid was counted for an 1 hour.

Study of diuretic activity

Swiss albino mice of either sex weighing 20±2 gm. were employed. They were not given any food and water for the preceding 12 hours and were divided into five groups, containing five mice in each group (table 2). Group I was provided with saline solution i.e. control group. Group II was given urea at a dose of 750 mg/Kg body weight and was considered as positive control group. Group III was provided with standard diuretic drug Furosemide at a dose of 4 mg/Kg body weight. Group IV and group V received methanol extract, at doses of 150 mg/Kg and 300 mg/Kg body weight respectively. After oral administration, the animals were placed in special metabolic cages and remained there without food and water for the action of the experiment. The urinary output of each group was recorded at different time intervals from the graduated urine chamber of metabolic cage. At the end of four hours, the animals were taken out of the cages and the total volume of urine excreted by each group was noted. Since in the process of feeding, the animals lose all their urine, it was considered important at the end of the experiment to expel the urine from the bladder by pulling at the base of the tail.

$$\text{U.E.} = \frac{\text{Total urinary output}}{\text{Total liquid administered}} \times 100$$

The ratio of urinary excretion (U.E.) in test group and control group was denoted as Diuretic action which as the measure of the degree of diuresis.

$$\text{Diuretic action} = \frac{\text{U.E. in test group}}{\text{U.E. in control group}}$$

$$\text{Diuretic activity} \frac{\text{Diuretic action of drug}}{\text{Diuretic action of urea}}$$

RESULT AND DISCUSSION

***Analgesic activity of the methanol extract of Phoenix sylvestris* root**

Analgesic activity of the methanol extract of the plant *Phoenix sylvestris* studied in different doses (150 and 300 mg/Kg bodt weight) levels using acetic acid induced writhing. In the study, it was observed that the methanol extract showed 20.07 % and 32.57 % inhibition of writhings at 150 and 300 mg/Kg body weight respectively in comparison to control (table 3 and table 4).

The methanol extract of the plant root showed significant ($p<0.001$) analgesic activity in dose dependent manner. Acetic acid induced writhing is produced by peripheral stimulation of nerve endings. As the pain produced by the acetic acid induced writhing were inhibited by the plant extract at different doses, so it can be concluded that the analgesic activity of the plant is expected to be observed due to inhibition of peripheral nerve endings.

Diuretic activity of the methanol extract of Phoenix sylvestris

The methanol extract of the plant *Phoenix sylvestris* root on urination was investigated in swiss albino mice. The urinary output at different hours of study has been presented (table 5 and table 6). The result of the experiment revealed that the diuretic activity of the methanol extract at a dose of 150 mg/Kg and 300 mg/Kg body weight were comparable to that of reference standard furosemide at a dose of 3 mg/Kg body weight. The maximum diuretic activity at 300 mg/Kg body weight was observed at the 1st hour of the study. At 150 mg/Kg body weight the maximum activity was observed at 2nd hour and 4th hour of the study almost in similar manner.

The diuretic activity of a drug is considered to be good if it is above 1.50, moderate if it is within 1.00 ~ 1.50, little if it is between 0.72~1.00 and nil if it is less than 0.72 (Gujral M.L. 1995).

Diuretics are the drugs that increase the rate of urine flow and the clinically useful diuretics increase the rate of excretion of sodium ion (Na^+) together with chloride ion

(Cl^-). Sodium chloride (NaCl) is the major determinant of the extracellular fluid volume in the body. The most clinically useful diuretics are directed towards reducing extracellular fluid volume by decreasing total sodium chloride (NaCl) content. The mode of action of diuretic activity of the methanol extract of the plant root may be related to the increase rate of Na^+ and Cl^- excretion followed by the movement of water in the tubular lumen by the inhibition of carbonic acid anhydrase (CA) or the inhibition of Na^+-K^+-$2Cl^-$ seaport like loop diuretics or the by the inhibition of Na^+-Cl^- symport like thiazide diuretics or the reduction of antidiuretic hormone (ADH) secretion (Alfred Gooman Gilmann). As the exact mechanism of antidiuretic action is not clear a further study is required. The moderate delayed action at 150 mg/Kg body weight following 2 and 4 hours of study may be due to biotransformation of the plant metabolites turning into active constituents, which exhibit the diuretic activity of the plant.

CONCLUSION

In conclusion, it is revealed that the methanol extract of the plant root exhibited statistically significant ($p<0.001$) analgesic activity in a dose dependent manner and moderate diuretic activity at 300 mg/kg body weight. The exact dynamics of the respective exhibited pharmacological activities of the extract can only be established by extensive phytochemical investigation of the extract followed by screening of analgesic and diuretic activity of the isolated pure constituents in a wide range of experimental models.

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