

EFFECT OF KIDNEY BIOCHEMICAL ENZYMES IN ETHYLENE GLYCOL INDUCED UROLITHIATIC RATS TREATED WITH *SCOPARIADULCIS* (LEAF)

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ABSTRACT

Scopariadulcis has long held a place in herbal medicine in every tropical country where it grows, and its use by indigenous peoples is well documented. The decoction of the entire plant is recommended for upper respiratory problems, biliary colic or congestion, menstrual disorders, and fever; the leaf juice is still employed externally for wounds and hemorrhoids. In Brazilian herbal medicine the plant is used to reduce fever, lower blood sugar and blood pressure, and as an expectorant for coughs and lung congestion. A tea is prepared from the leaves or aerial parts of the plant for fevers and urinary tract diseases, upper respiratory disorders, bronchitis, coughs, menstrual disorders, and hypertension. The *Scopariadulcis* have active biological properties, including its anti-cancerous properties, are attributed to the phytochemicals. Many studies report that this phytochemical has powerful anticancerous, antitumorous, antileukemic, and antiviral (including HIV) properties. This potent phytochemical has displayed selective cytotoxic activity against malignant brain tumors, bone cancer, and melanomas (without harming healthy cells). The present study focussing on the effect of the ethanolic leaf extract of *Scopariadulcis* on the urolithiatic and control kidney marker enzymes. The urolithiatic condition on the experimental animal is induced by 30 days oral administration of 0.75% of Ethylene glycol. Then the ethanolic leaf extract of the plant were administered in 250 mg/kg body weight of rats orally for 30 days to the toxic group as a treatment. The variations in the kidney biochemical parameters in this urolithiatic study shows decrease level of the marker enzymes (Acid phosphatase, Alkalinephosphatase, Aspartatetrasaminase & Alanine trasaminase). On treatment with the plant extract, the normal levels are approximately regained. This study concluded that the ethanolic leaf extract of *Scopariadulcis* can be able to recover the kidney marker enzymes level of urolithiatic toxic rats. This will give a hope for the formulation of Antiurolithiatic drug using *Scopariadulcis* by analyzing other parameters simultaneously.

Keywords: Urolithiasis, *Scopariadulcis*, Ethylene glycol.

INTRODUCTION

Plant used in traditional medicine constitutes a very important source of new biologically active compounds. In India, utilization of plants for medicinal purposes has been documented long back in ancient literature. The threat to natural population of medicinal plants has increased because in India more than 90% of plant raw material used in herbal industries and also exported from natural habitat. Due to

deposition of calcium, phosphates and oxalates a large population of India suffers from urinary tract and kidney stones, formed. The chemicals start accumulating over a nucleus, which progressively takes the shape of stone. Though the treatment of urinary tract kidney stones has been revolutionized by the development of non invasive methods of stone disruption but the patients always try to refrain from surgical procedures.¹

Plants have been an important source of precursors and products used in a variety of industries, including those of pharmaceuticals, food, cosmetics and agrochemicals. The continuing search for new drugs has seen researchers looking to the natural world for potential products. The traditional medicines are enjoying an upsurge in popularity because of their low or no residual toxicity. Initially the plants are the main part of folk medicines. Gradually the folk medicines led to the rise of traditional system of medicines. It is very important to show an interest in indigenous system of medicine and traditional herbal remedies which are regarded as quite safe with no side effects and should be cost effective, readily available and easily affordable too. People those are living in interior and inaccessible remote rural areas have excellent knowledge about medicinal importance of the local flora. People in such areas of the district have been traditionally using indigenous folk remedies to cure Urolithiasis for generation.²

The prevalence of Kidney stones and urinary disorders are 1-5%. Many modern medicinal therapies like surgical techniques, shock waves and medicines are available for the treatment of this disease but they are very expensive and having many side effects. Kidney stones and urinary disorders are most painful conditions. A large population of India suffers from urinary tract and Kidney stones, formed due to deposition of Calcium, Phosphate and oxalates. These stones may persist for indefinite time, lead to secondary complications causing serious consequences to patient life. It is very painful and proper cure is needed to get rid of the problem. Depending on where they are located, kidney stones are known as Urinary calculi, Urinary tract stone disease, renal calculi, Nephrolithiasis, Ureterolithiasis and Urolithiasis.²

Scopariadulcis.Linn (Sweet Broomweed) Family Scrophulariaceae. Indigenous to tropical America and introduced to India; commonly found as a weed in many parts of India, particularly in West Bengal, Karnataka, Tamilnadu and Kerala. A tough, glabrous, leafy-branched, herbaceous plant upto 90cm high, leaves are opposite or whorled, lanceolate, coarsely serrate, 0.5-2cm long. Flowers are small, white, in small 2-4 or 5 flowered inflorescences, capsules glabrous, 3-4mm in diameter. An infusion of the leaf is used in fever, cough and bronchitis and as gargle for toothache. A hot infusion is a diuretic. An infusion of roots leaves and tops are useful in diarrhoea and dysentery. All parts of the plant are useful as emetic. An infusion of seeds

obtained by soaking them in water overnight is a cooling drink.³

Scopariadulcis medicinally used in Paraguay as crude drug namely "TpychaKuratu" to improve digestion and protect the stomach. In Taiwan, the same plant is used as cure for hypertension and in India for toothache, blenorhagia and stomach troubles. An anti-diabetic compound, Amellin, has been reported in the leaf and stem of fresh green plant. Leaves of *Scopariadulcis*. Linn were reported to contain flavonoids scutellarein, 7-methylscutellarein and Scutellarin. A flavones circitakaoside was extracted from *Scopariadulcis*.Linn. An ethanolic extract of *Scopariadulcis*.Linn was found to exhibit sympathomimetic activity.³

Herbs and herbal drugs have created interest among the people by its clinically proven effects. Also, the overuse of synthetic drugs, which results in higher incidence of adverse drug reactions, has motivated humans to return to nature for safe remedies. The origins, according to many, can be sourced to the World Health Organization's Canberre conference in 1976, which promoted the concept of 'Traditional' medicines for the developing countries. The problem of urinary stones or calculi is a very ancient one and many remedies have been employed during the ages these stones are found in all parts of the urinary tract, the kidney, the ureters and the urinary bladder and may vary considerably in size. Diet containing low amounts of inferior quality proteins and high intake of animal proteins might augment the risk of stone formation. The incidence of urolithiasis is very common in Northern India compared to southern state. It is speculated that higher incidence may be due to wheat diets. People living in rocky areas, where the climate is hot and dry, seem to be more to urinary calculi disease.⁴

MATERIALS AND METHODS

Collection of Plant Species

The leaves of *Scopariadulcis* were collected from Thenkurissi, Palakkad, Kerala and were shade dried and powdered and used for the analysis.

Preparation of Leaf extract

The fresh leaves collected were washed with distilled water and shade dried. The dried plant material was powdered and extracted with ethanol by immersing for 72 hours. The extract was filtered and air dried to obtain the residue. The residue was suspended in water and administered orally (250mg per Kg body

weight was administrated at the rate of 1 ml/rat/day).

Animal Model Used

Male albino white rats of wistar strain with an average weight of 130-150 grams were purchased from RVS College of Pharmacy, Sulur, Coimbatore. The rats were then housed in large spacious cages. The animal room was ventilated. The temperature was maintained between 20° to 30°C.

Experimental Design

Ethylene glycol induced hyperoxaluria model was used to assess the antiurolithiatic activity in albino rats. Animals were divided into four groups containing six animals in each. Group I served as control and received regular rat food and drinking water. The urolithiasis were induced in group II & Group III by oral administration of 0.75% of Ethylene glycol. After 30 days of toxic administration the Group III rats were treated with the Ethanolic leaf extract of *Scopariadulcis* (250 mg/ Kg body weight) by oral administration for 30 days at the rate of 1.0 ml / rat / day. The Preventive Group IV is on administrated by *Scopariadulcis* leaf extract (250 mg / Kg weight administrated at the rate of 1.0 ml / rat / day) for 30 days.

Kidney Homogenate Analysis

The abdomen was cut open to remove both kidneys from each animal. Isolated kidneys were cleaned off extraneous tissue and preserved in 10% neutral formalin. The kidneys were dried at 80°C in a hot air oven. A sample of 100mg of the dried kidney was boiled in 10ml of 1N hydrochloric acid for 30min and homogenized, and Alkaline phosphatase, Acid phosphatase, Aspartate amino transferase and Alanine amino transferase was assessed.⁶

Statistical Analysis

All values were expressed as Mean \pm Standard Deviation. While analysis of students t test was used to analyze the extent of variation between groups and values significant at 5% ($P < 0.05$), 1% ($P < 0.01$), 0.1% ($P < 0.001$), levels were found.

RESULT AND DISCUSSION

Herbal therapy is one of the most common ways people are utilizing for taking care of their urinary tract infections, whenever it is safe. The issue with urinary tract infections is that they tend to be chronic in nature. One urinary tract infection clears just in time for another infection to begin. The first infection weakens the urinary tract and makes it easier for bacteria to move in and cause the second urinary tract infection. The third makes it even easier for the fourth and so on. Recurrent UTIs can be managed with combined herbal therapy.⁷

Urinary super-saturation with respect to stone-forming constituents is generally considered to be one of the causative factors in calculogenesis. Evidence from the previous studies indicates that in response ethylene glycol administration, young male albino rats form renal calculi composed mainly of calcium oxalate. The biochemical mechanisms for this process are related to an increase in the urinary concentration of oxalate. Stone formation in ethylene glycol fed animals is caused by hyperoxaluria, which causes increased renal retention and excretion of oxalate.⁸

In the present study male rats were chosen because they have a resemblance to human urinary system and some previous studies have also shown that the amount of stone deposition in female rats was significantly less. Long-term administration of ethylene glycol induced urolithiasis and related oxidative changes in these rats.⁹

While choosing an herbal remedy, it is better to use only those of high quality and authentic formula extracts to avoid synthetic content to bind or fill. Most herbs can be taken as tea, in capsule form, or as a tincture diluted in water. When taken with care and with one's doctor's approval, herbs can be a gentle and effective alternative to conventional treatment.⁷

The present study focuses on the antiurolithiatic properties of the formulation "*Scopariadulcis*" against Ethylene glycol induced Urolithiatic rats. The alteration shows in the kidney enzymes in urolithiatic rats showed the decreased levels of the ACP, ALP, AST, and ALT.

Table 1: Effect of *Scopariadulcis* in Kidney Biochemical Parameters

Group	ACP	ALP	AST	ALT
I	8.02 ± 0.17	8.97 ± 0.13	11.55 ± 0.21	14.57 ± 0.13
II	5.21 ± 0.18a*	4.22 ± 0.17a*	7.72 ± 0.21a*	8.12 ± 0.15a*
III	7.97 ± 0.11b*	8.20 ± 0.18b*	11.43 ± 0.17b*	13.91 ± 0.19b*
IV	8.01 ± 0.12c ^{ns}	8.25 ± 0.12c ^{ns}	11.01 ± 0.17c ^{ns}	13.68 ± 0.19c

Values are expressed as mean ± standard deviation of six animals each

Treatment of Groups are as in Table 1

Units are expressed as: ACP, ALP : μ moles of phenols liberated per liter

AST, ALT : μ moles of pyruvate liberated per liter

The comparison between groups and the statistical significance are as follows:

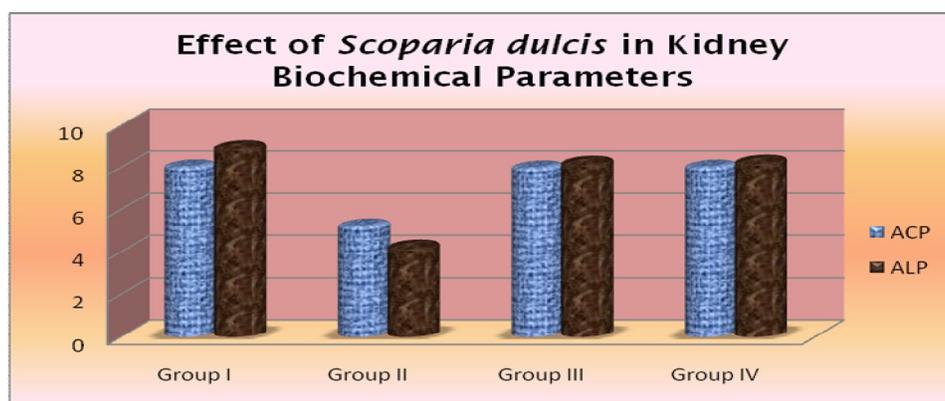
a represents the comparison between Group II and Group I

b represents the comparison between Group III and Group II

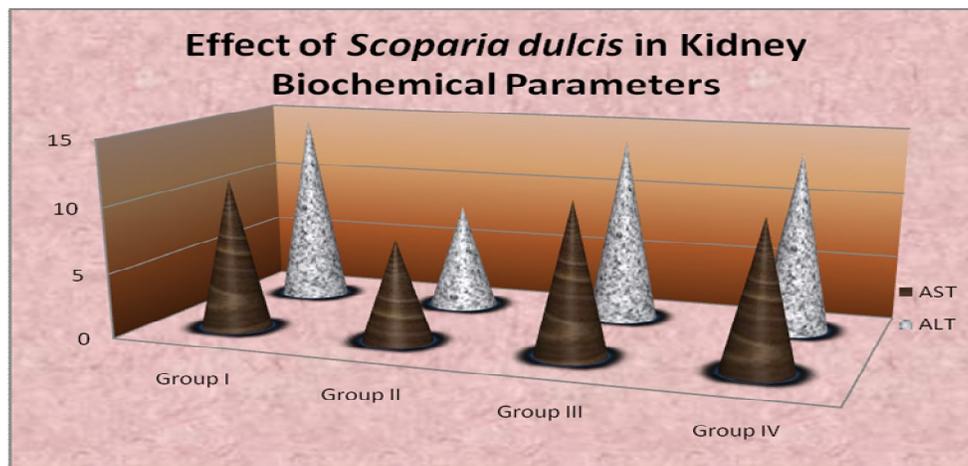
c represents the comparison between Group IV and Group I

Symbols of statistical significance:

*P < 0.01; **p < 0.05; \$p < 0.001; ns- not significant



Graph. 1: Effect of *Scopariadulcis* in Kidney Biochemical parameters (ACP, ALP)



Graph. 2: Effect of *Scopariadulcis* in Kidney Biochemical parameters (ALT, AST)

From the above graphs, the level of the enzymes ACP, ALP, AST&ALT in kidney was decreased because of the formation of calculi in it. There was a clear variation in values of control group (Group I) and the toxic group (Group II). The graphical representation also

results the regaining the near normal value of these enzymes after treating the urolithiatic rats with the *Scopariadulcis* plant extract. The effect of the plant leaf extract doesn't show any variation of values of enzymes of the control group I rats.

Reduced AST, ALT, ACP, and ALP activity in renal tissue of ethylene glycol induced Urolithiatic rats. This is because of leakage of enzyme into the general circulation. The stone formation may block the ureter reading to an increasing pressure in the renal pelvis and damage of the tubular cells.

Thus the result of our present study indicate that the treatment with *Scopariadulcis* is capable of counteracting the toxic effect caused by Ethylene glycol in serum and it can be used as an anti Urolithiatic drug. It shows the *Scopariadulcis* has an Antiurolithiatic activity in ethanolic extract ethylene glycol induced rats. Further long-term studies are warranted to clarify the mechanism and *Scopariadulcis* can play a vital role in urolithiasis therapy.

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