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A STUDY OF ANTIOXIDANT ACTIVITY OF KALANCHOE PINNATA (LAM) PERS. LEAVES

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ABSTRACT
It has been shown that K. pinnata leaf extract is effective in treating urinary insufficiency and stone diseases when administered in traditional and ethnomedicinal settings. Tribes from Muzaffarnagar (Uttar Pradesh), Midnapur and Murshidabad districts of West Bengal, Aurangabad (Maharashtra) Nath people, and Sonowal kacharis of Bhekulajan village in Dibrugarh district of Assam use the fresh leaf juice or in combination with the powder of 2-3 black peppers (Piper nigrum Linn.) to treat kidney and gall bladder stones. There was no mention of a successful preparation of this plant in the scientific literature for urolithiasis, however. The practice of using fresh plant components in traditional and tribal medicines provided the inspiration for this. However, many plants are utilized in the dry form (or as an aqueous extract) by traditional healers, hence plants are often air dried to a consistent weight before extraction to account for changes in water content within various plant tissues. Two K. pinnata leaves are chewed once a day, as recommended by the social network Herbpathy.com. Decoction of the entire plant, 40-50 ml twice day, for kidney stones.

KEYWORDS: Antioxidant Activity, Kalanchoe Pinnata, K. pinnata leaf, stone diseases

INTRODUCTION

Stones may develop in the kidney, ureter, urinary bladder, or urethra, and this condition is known as urolithiasis. Ouron (urine) + lithos (stone) = urolithiasis. Urolithiasis is a significant cause of morbidity and one of the most common urinary tract illnesses. Approximately 12% of the world's population suffers from stone formation, making it one of the most common painful urologic illnesses; the recurrence rate is 70-81% in men and 47-60% in females (Soundararajan, 2006). Urinary stones affect around 120-140 men and women per 1 million each year (Turk et al., 2011).

Urolithiasis

The prevalence of urinary stone disease is estimated to affect at least 10% of the population in the developed countries. Renal calculi are less common in the south compared to the north and the west (Rana et al., 2010). Due to the opposing effects of testosterone and estrogen on stone development, males are three times more likely to develop kidney stones than women. Due to the complexity of its causes and the frequency with which stones develop, treating them is a significant medical challenge. An imbalance between promoters and inhibitors has also been linked to stone formation (Rana et al., 2010). Inadequate urinary drainage, foreign bodies in the urinary tract, microbial infections, a diet high in oxalates and calcium, vitamin abnormalities like a deficiency in vitamin A or an excess of vitamin D, and metabolic diseases like hyperthyroidism, cystinuria, gout, intestinal dysfunction, etc.

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are all common causes of kidney stones (Mekap et al., 2011).

Types of Urolithiasis

There are a number of ways to categorize urinary stones, including their size, where they're located, what they look like on an X-ray, what causes them to develop, what minerals they're made of, and whether or not they're likely to form again.

The name of the stone comes from the minerals that make it up (Turk et al., 2011). Very seldom, stones may develop as a consequence of a buildup of chemicals in the urine caused by the use of certain drugs or herbal supplements. Loop diuretics, acetazolamide, topiramate, zonisamide, laxatives (when misused), ciprofloxacin, sulfa drugs, triamterene, indinavir, ephedrine, guaifenesin, and silica-based products are just a few examples.

High risk stone formers

General factors

- Urolithiasis developing at a young age (often in kids and teens)
- Familial stone formation
- CaHPO4.2H2O (calcium hydrogen phosphate) brushite-containing stones.
- Stones composed of uric acid and urate
- Infection stones

Having a single kidney does not raise your chance of developing kidney stones, but avoiding future stone development is of utmost significance.

Diseases associated with stone formation

- Hyperparathyroidism
- Nephrocalcinosis
- Malabsorptive problems; inflammatory bowel illness; Crohn's disease; jejuno-ileal bypass surgery
- Sarcoidosis

Genetically determined stone formation

- Cystinuria (type A, B, AB)
- Primary hyperoxaluria (PH)
- Renal tubular acidosis (RTA) type I
- 2,8-dihydroxyadenine
- Xanthinuria
- Lesh-Nyhan-Syndrome
- Cystic fibrosis

Anatomical abnormalities associated with stone formation

- Medullary sponge kidney (tubular ectasia)
- UPJ obstruction
- Calyceal diverticulum, calyceal cyst
- Ureteral stricture
- Vesico-uretero-renal reflux
- Horseshoe kidney
- Ureterocele
- Urinary diversion (via enteric hyperoxaluria)
- Neurogenic bladder dysfunction

Role of Herbal Medicines in Antiurolithiatic activity

Because of the expensive expense of pharmaceuticals and also because the traditional medicines are typically more acceptable from a cultural and spiritual standpoint, more than 80% of the world's population uses plants as their major source of therapeutic agents (Cordell, 1995). About 40% of the population reports using herbs to treat medical ailment (Bent and Ko, 2004), and this number is rising gradually. There has been a rise in the usage and research of medicinal plants and their components in recent decades due to their potential therapeutic benefits

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(Araujo et al., 2015). According to centuries' worth of information, plant extracts have been used to cure illness, and it is common knowledge that many plants produce poisonous compounds as a defensive mechanism against pathogens, insects, and herbivores.

In India, especially in Gujarat, there are many medicinal plants in practice for the treatment of kidney stone which includes Tribulus terrestris (Gokhru), Phyllanthus emblica (Amla), Tinospora cordifolia (Guduchi), Terminalia chebula (Harde), Macrotyloma uniflorum (Kulthi), Rhizoma Picrorhizae (Kutki), Solanum nigrum (Makoy), Kalanchoe pinnata (Patthar pan) and Boerhaavia diffusa (Punarnava) etc. The raw material, dry powder, or decoction forms of these plants are administered to patients, either alone or in combination, as drugs. Each of these plants is useful for medicine in its own special way. The therapy is more successful when the drugs are combined, and the poisonous impact of one plant is mitigated by another. However, individual drugs might have undesirable side effects. After reviewing the literature and learning more about these plants, we zeroed in on Kalanchoe pinnata (Patthar pan) because of its widespread use in traditional medicine to treat urolithiasis in Gujarat.

There have been several reports of successful use of this herb in the treatment of stones.

There was substantial antiurolithiatic action in alcoholic K. pinnata (Jain and Argal, 2013). Crystallization of calcium oxalate was also observed to be affected by an indigenous plant extract, K. pinnata, by Yasir and Waqar (2011). Different doses of K. pinnata extracts demonstrated strong efficacy against calcium oxalate crystallization. According to research by Tiwari et al. (2012), K. pinnata is an effective therapy for kidney stones. Shukla et al. (2014) found that K. pinnata is useful for both preventing and treating ethylene glycol-induced urolithiasis. The ethnomedical usage of K. pinnata leaves to treat urinary issues was recently validated by a study that found the leaves reduced the risk of renal calculi forming.

Figure 1: *Kalanchoe pinnata* plant

Introduction to Plant

One of the plants known as Pashanbhed (from the Sanskrit for "stone breaker") is Kalanchoe pinnata (Lam) Pers.

Taxonomy

- Domain: Eukaryota
- Kingdom: Plantae
- Phylum: Spermatophyta
- Subphylum: Angiospermae
- Class: Dicotyledonae
- Order: Rosales
- Family: Crassulaceae
- Genus: *Kalanchoe*
- Species: *Kalanchoe pinnata*

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Preferred Scientific Name

- *Kalanchoe pinnata* (Lam.) Pers. (1805)

Common Names

- Cathedral bells, life plant, air plant (Mexican), love plant, etc.

Synonyms

1. *Bryophyllum pinnatum*
2. *Bryophyllum Calycinum salib* etc.

Vernacular Names

Hin: Jakhm-e-hayat
Guj: Panfuti
San: Parnabijah, Pashanbhed
Eng: Cathedral bells

Distribution

There are over 200 different species of Kalanchoe, but the only places you'll find them outside of India and South America are in Africa, Madagascar, China, and Java.

Anatomy

This attractive herb is a succulent with glabrous leaves and may thrive in both indoor and outdoor settings. It has obtusely four-angled stems and varied, decussate leaves and may grow to heights of 0.3 m to 1.2 m. Lower leaves may be simple or complex, whereas upper leaves often include 3-5 or 7 folliolate, long petiole (joined by a ridge around the stem). The ovate or elliptic leaflets are either crenate or serrate. Flowers are borne on long, thin pedicels and arranged in enormous, spreading panicles on opposing, thick branches. Calyxes range in length from 2.5 to 3.8 cm and are striped red and green at the bottom and a paler green at the top. The corolla is reddish purple with a constricted centre and triangular lobes, and it is enlarged and octagonal at the base. Anthers are hastate and black, while the filaments are green at the base. Greenish scaly hypogyny, with subquadrate scales that may or may not cling to the carpels. Continual papery calyx and corolla protect fruit. (Wealth of India, 1997; Nadkarni, 2005; Kirtikar and Basu, 1933) The seeds are tiny, oblongellipsoid, smooth, and hardly striate.

Chemistry

Alkaloids, phenolics, tannins, macroelements (magnesium, calcium, potassium, phosphorus, salt), microelements (iron, zinc), vitamins (ascorbic acid, riboflavin, thiamine, niacin) are all found in the plant (Okwu, 2006). Astragalin, rutin, kaempferol, and Quercetin may all be found in the leaves (Kamboj, 2009). Three novel plant elements, bryophyllol, bryophollone, and bryophollenone, have been discovered in recently harvested plant leaves. There are also three novel chemicals found, including bryophynol and two phenanthrenes (Siddiqui, 1989). Bryophyllin A and Bryophyllin C, two insecticidal bufadienolides, were identified from a methanolic extract of leaves. The plant's active ingredient is bufadienolides. Thiamine, pyridoxine, ascorbic acid, glycone, cysteine, casein, and nicotinamide are only some of the amino acids that may be found in the leaf. Sugars such raffinose, lactose, sucrose, and glucose, as well as minerals like sodium, calcium, potassium, phosphorus, magnesium, ferrous, copper, and zinc, are also found in food. Alkaloids, bufadienolides, flavonoids, glycosides, steroids, organic acids, etc. have all been identified as active components.

CONCLUSION

Urolithiasis is a chronic condition that affects many people. While there are a plethora of therapies at a doctor's disposal today, not all of them are helpful, and some even have undesirable side effects. Right now, the best option is to stick with the tried-and-true methods of traditional medicine. Ayurvedic treatments are slow, but they eliminate illness at the source, with no or few lingering symptoms that need time to heal. The WHO, OECD, ICH, and NCI all recommend doing scientific validation of these herbs for quality control and safety analyses. One of the herbs used in urolithiasis therapy in ayurvedic medicine is Kalanchoe pinnata (Lam) Pers. The pharmacological characteristics of Kalanchoe pinnata (Lam.) Pers. (K. pinnata) are diverse and include, among others, anticancer, antidiabetic, insecticidal, antibacterial, antioxidant, and anti-urolithiatic effects.

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