



Aerva lanata: A potential medicinal herb for removal of renal calculi (Kidney stone)

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Abstract:

Nephrolithiasis (formation of renal stones) is becoming very common disease of forming stones in the kidney, bladder and urethra (urinary tract) in dehydrated persons. The suffering person feels most common symptom is severe pain in the side of the abdomen, urinary track and associated with nausea. Many of the proprietary composite herbal drugs are used as remedies for removal of kidney stone and lowering the abdominal pain. *Aerva lanata* (Linn.) Juss. ex Schult. has been reported for its potential phytochemicals effective on degradation and removal of renal calculi. In this regards, many of the traditional vendors advise the aqueous juice of whole plant of *Aerva lanata* along with a glass of butter milk in empty stomach; is seen to be more effective for removal of renal calculi (kidney stone). This formulation gives the best result in short period for treatment of nephrolithiasis. The proprietary formulation of this drug is needed to be formulated for effective use.

Key words: Herbal medicine, nephrolithiasis, urolithiasis.

1. Introduction:

Biodiversity is the vast reservoir of medicinal herbs used for the treatments of numerous ailments in modern era and ancient times. These potential medicinal herbs contain many phytochemicals & secondary metabolites having potential properties as remedies for beneficial effect on various diseases. According to latest reports by World Health Organization Up to 80% of peoples throughout the world depend on herbal medicines for some fraction of their primary health care (Adepu *et. al.*, 2013; Mandal & Swati, 2016). Herbal medicines are popular due to their low risk of side effects, effectiveness with chronic conditions, lower cost and easy availability. *Aerva lanata* (Linn.) Juss. ex Schult. is one of such wonder medicinal herb (**Fig.3**) It is a erect herb, usually found in agriculture field and barren lands as a common weed, belonging to Amaranthaceae family (Singh *et. al.*, 2001). Commonly this plant is known by various names like *Gorakshaganja*, *Pashanbhed*, *Satkabhedi*, *Aadaanpaak* in Sanskrit, *Kapurijadi* or *Gorakhabooti* in Hindi and Mountain knot grass in English (Nagaratna *et. al.*, 2014). In Ayurveda, *Aerva lanata* is commonly known by the name '*Pashanbheda*' and it is described as a diuretic (used to dissolve the stones in the urinary tract) with anti-inflammatory, antihelminthic, anti-bacterial and mild analgesic effects (Rajesh, 2011).

Nephrolithiasis (formation of renal stones) is becoming very common disease of forming stones in the kidney, bladder and urethra (urinary tract) in dehydrated persons. The suffering person feels most common symptom is severe pain in the side of the abdomen, urinary track and associated with nausea. A renal calculus (Kidney stone) is a small, hard deposit of minerals and acid salts that stick together in concentrated urine that forms in the pockets of kidneys (**Fig.1**). These Kidney stones are form when the urine contains more crystal-forming substances such as calcium, oxalate and uric acid. The molecules of such substances forming a complex crystal of mostly calcium oxalate (**Fig.2**) and also calcium phosphate, a combination of calcium oxalate and calcium phosphate, magnesium ammonium phosphate to form hard stones in pockets of kidney (Frassetto & Kohlstadt, 2011; Sakhaee *et al.*, 2012; Meschi *et al.*, 2012)

The stone formation is occurred when the urine contains low levels of citrate and high levels of calcium and either oxalate or uric acid. The struvite stones tend to grow quickly and become large, sometimes occupying the entire kidney in women's; forms certain types of urinary tract infections. The uric acid stones are more common in men tend to occur in people who don't drink enough water or have a high animal protein diet. Cystine stones are caused by a hereditary genetic disorder called cystinuria that can lead to excessive amounts of the amino acid cystine collecting in the urine. The stones can be painful when a large size becomes and passing through the urinary tract, may cause abnormalities in kidneys function. Most of the kidney stones are less than 6 mm in size and can be treated conventionally. Commonly, the stones treatment includes intake of pain relievers and drinking lots of water to help pass the stone.

Different medical procedures may be required to remove or break up larger stones (Frassetto & Kohlstadt, 2011). Moreover, the medicinal plants are used in preliminary stage in combating urinary stones mentioned in the ancient medical literature as well as Ayurvedic system of medicine. *Aerva lanata* (Linn.) Juss. ex Schult. (amily: Amaranthaceae) is one such efficient medicinal plant amongst the diverse pool of litholytic herbs (Vedavathy & Rao, 1990; Kakrani & Sulja, 1994; Joy *et al.*, 2012; Ramana & Vikram, 2015). Traditionally the plant extracts of *Aerva lanata* are also used to treat burns wounds and skin conditions, urinary and gall stones, nasal bleeding, cough and bronchitis, head ache, jaundice, cholera, reduce bleeding during normal deliveries, treating diarrhoea and dysentery, rheumatoid arthritis, fractures, scorpion stings and snake bites (Kakrani and Sulja,1994, Vedavathy & Rao, 1990; Gupta & Neeraj, 2004: Ramana & Vikram, 2015). Among these potential uses of *Aerva lanata*, the aquous extract of leaves with a glass of butter milk is preferably used to treat the kidney stone. Hence, the attention is focus on the potential use of *Aerva lanata* for removal of renal calculi (Kidney stone) in present paper.

2. Material & Methods:

2.1 Plant material: *Aerva lanata* (Linn.) Juss. ex Schult. (Family: Amaranthaceae)

2.2 Morphology: The *Aerva lanata* is commonly found along roadsides, waste places, agricultural field, on walls of old forts, under the shade of trees and in open cleared areas. It is mostly an erect and rarely prostrate annual herb, grows up to 90 cm in height (**Fig. 3**). Stem branched, cylindrical, pubescent at young branches. Tap root with numerous fibrous lateral roots. Leaves are simple, alternate, and elliptic to obovate or sub orbicular shape, along with obtuse or acute apex and tapering base and have white cottony hairs underneath. Flowering period is December to February. The inflorescence is of axillary heads or spike. Flowers are minute, sessile, bisexual, greenish white with spikes (**Fig. 4**). Perianth is 1.5-1.25 mm in length and petals are silky-hairy on the back, oblong to obtuse. The fruit is ovoid in shape with shining black and kidney bean like seed (Singh *et al.*, 2001).

2.3 Preparation of Plant Extract

The mature fresh & healthy entire plants preferably with its leaves are collected. The plant material is to be cleaned under tap water and cut it into small pieces (**Fig.5**). Grind the plant material with cleaned water in mixture grinder to make juice. Filter it with cloth to collect extract of the entire plant material. Preserve the plant extract in refrigerator for further use (**Fig. 6**). Drink a cup of plant extract (approximately 20 ml) in a glass of butter milk in early in the morning or at empty stomach for 5 to 6 day for adults.

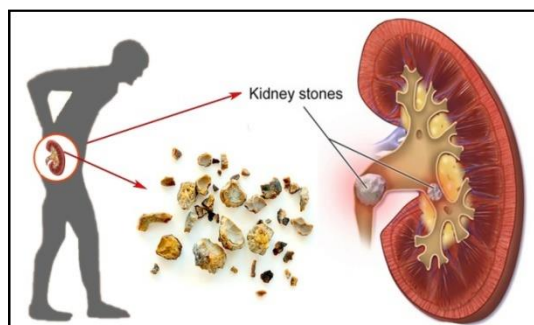


Fig.1. Renal calculi (Kidney Stones)



Fig. 2. Stone of Calcium oxalate crystals

Fig. 3. A habit & twig of *Aerva lanata*

Fig. 4. Inflorescence & Flowers



Fig. 5. Fresh plants chopped for grinding

Fig. 6. Plant extract

3. Discussion:

Deposition of crystal in the kidneys and formation of kidney stones is a common urological disorder. Nephrolithiasis (formation of renal stones) is one of the oldest known diseases; affect many of the peoples mainly to the males. Renal calculi are the main prevalent disorder in the urinary system of human beings. Renal calculi may cause obstruction, hydronephrosis, infection and hemorrhage in the kidneys & urinary tract system (Frassetto & Kohlstadt, 2011; Sakhaee *et al.*, 2012). Most kidney stones are comprised of calcium oxalate (CaOx) mixed with calcium phosphate (CaP) crystals. The medical procedures like, surgical operation, lithotripsy, ultrasound waves, high-power laser and calculus disrupting medicines are usually used to remove the calculi (Frassetto & Kohlstadt, 2011).

However, these procedures are highly expensive and with these procedures recurrence is quite common. Medicinal plant has potential in various ancient traditional system of medication with no side effects. The aqueous extract of *Aerva lanata* has widely used to treat three renal calculi (kidney stone) in local areas. The mature fresh & healthy entire plants are to be cut it into small pieces and grind it in mixture grinder to make juice. A cup of plant extract (approximately 20 ml) in a glass of butter milk is given for 5 to 6 day in early in the morning or at empty stomach for adults. It is observe that, the present treatment shows the lowering the pains due to renal calculi & small size stone will flush out with urine after few days. The plant extract may deteriorate the outer layer of kidney stone or break the bond between stone forming minerals. The plants extracts of *Aerva lanata*

was evaluated for its anti-oxidant properties, nephroprotective values, hepatoprotective properties, anti lithiatic activities (increased urinary excretion of calcium, oxalate and uric acid crystals), anti-diabetic/hypoglycaemic activities, anti-hyperlipidemic activities and anti-cancer properties (Dulaly, 2002; Deepak *et al.*, 2009; Agrawal, 2013).

Aerva lanata is also used traditionally to treat headache, jaundice, cholera, reduce bleeding during normal deliveries, treating burns wounds and skin conditions, urinary and gall stones, nasal bleeding, cough and bronchitis, diarrhoea and dysentery, rheumatoid arthritis, fractures, and scorpion stings and snake bites (Vedavathy and Rao, 1990; Gupta & Neeraj, 2004). The aqueous extract of the flowers showed a significant anti urolithiatic activity *in vitro* and *in vivo* studies as evidenced from the loss of crystalline nature of the calcium oxalate crystals, reduction in the amounts of urinary stone forming constituents (Mandal *et al.*, 2017). A polyherbal formulation of *Aerva lanata* with other herbs decreased the levels of calcium and phosphate in the urine, serum uric acid, creatinine, urea induced urolithic rats. It also enhanced the urine pH, volume and magnesium content. The anti-urolithic activity of *Aerva lanata* was also studied to observe decrease in the deposition of crystals in the kidney sections (Thangarathinam, 2013).

Preventive measure to avoid formation of Kidney stones:

- Kidney stones form when certain substances in urine, such as calcium and oxalate, become highly concentrated.
- **Stay Hydrated:** One of the best ways to prevent kidney stones is to drink more fluids, stay well hydrated, which dilutes your urine and prevents kidney stones from forming and growing (Winston, 2011).
- **Eat citrus fruits:** The appropriate citric level in blood does not allow to forming the crystal of calcium oxalate. The regular eating the citrus fruits, lactic acid contents like butter milk, curd prevent the formation of kidney stones (Assadi & Moghtaderi, 2017).
- **Eat Less Animal Protein:** Many people eat more animal protein than they need, which can lead to the development of kidney stones. Animal proteins content high amount of minerals which lead to formation of crystals in kidney. If you limit the consumption of animal based protein like beef, pork, poultry, or fish, and eating more fruits and vegetables can help to prevent stones from returning (Chen *et al.*, 2020; Taylor & Stampfer, 2004).
- **Limit your Salt Intake:** The consumption of more sodium, leads to more calcium in your urine. The amount of sodium can be reduce by limiting or avoiding fast food, salty snacks, and packaged, processed, or canned foods (Winston, 2011; Alelign & Petros, 2018).
- **Get Enough Dietary Calcium:** The human body needs calcium to help support bones, yet calcium supplements can actually increase the risk of kidney stones forming. Therefore, get enough dietary calcium from milk, yogurt & avoid consumption of calcium supplement (Curhan *et al.*, 1996, 2004; Winston, 2011).
- **Eat less foods contain high amount of Oxalate:** Calcium oxalate stones, the most common type of kidney stone, form when calcium and oxalate combine in the urine. Therefore, limiting the intake of foods that contain higher amounts of oxalate, such as beets, black pepper, black tea, chocolate, nuts, potatoes, rhubarb, soy products, and spinach (Winston, 2011).

Conclusion:

Along with the many of the proprietary composite herbal drugs, *Aerva lanata* (Linn.) Juss. ex Schult. is seems to be having more potential to used as remedies for removal of kidney stone and lowering the abdominal pain. Due to its phytochemical activities against the renal calculi (stones) many of the traditional venders advise the aqueous juice of whole plant of *Aerva lanata* with a glass of butter milk in empty stomach for removal of renal calculi (kidney stone). However, drinking much more water, fluids like ginger ale, fresh fruit juices, lemonade or buttermilk everyday can help to stay hydrated during summers & avoid stone formation. Water flushes out toxins from body along with residual salt and wastes that could remain clogged in the kidneys.

This formulation gives the best result in short period for treatment of nephrolithiasis. The proprietary formulation of this drug is needed to be formulated for effective use. There is a further scope of development of formulations that can be marketed and employed effectively in combating various disorders.

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