



**MACROTYLOMA UNIFLORUM: A LEGUME HAVING ANTI-LITHIATIC POTENTIAL OF UTTARAKHAND**

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**ABSTRACT**

*Macrotyloma uniflorum* (Lam.) frequently known as horse gram (HG) is a kind of legume of tropics and subtropics. Horse gram is a member of family *Fabaceae*. It requires normal annual temperature ranging from 18-27°C. HG is a short day and day neutral plant maturing 120-180 days after planting. Resources deprived farmers in insignificant, drought areas of India HG late in the rainy season. HG is one of the most important pulses growing in the dry regions of the Uttarakhand. Its medicinal uses are known to Ayurveda and Uttarakhand traditional physicians for centuries. Various medicinal preparations are mainly used as a tonic, astringent, diuretic and also recommended in rheumatism, neuralgia and other several diseases. Urolithiasis is a multifaceted process that occurs from series of quite a few physicochemical events including super saturation, nucleation, growth, aggregation and retention within the kidneys. Various plant species of *M. uniflorum* have been reported to possess antiurolithiatic property. HG seeds are rich in natural phenols; mostly phenolic acids, flavonoids and the major anti-oxidants. HG is considered as animal fodder and its full potential as a part of human diet has not been exploited completely. It can be consumed as seeds, as sprouts or as meal by itself. According to literatures HG is an excellent source of protein (22-24%). Seeds contain carbohydrates (57.2%), fat (1.1%), vitamins, minerals (3.2%) and good amount of soluble fibers. Extract of HG seeds shows potent anti-adipogenic, anti-hyperglycemic anti-hypercholesterolemic activities. It acts against oxidative stress. It is concluded that HG can be used as a comprehensive treatment as well as a nutritious food.

**KEYWORDS:** Horse gram; *Macrotyloma uniflorum*; Anti-lithiasis; Ayurveda.

**INTRODUCTION**

The aim of this review was to provide the collective and compiled information about *M. uniflorum*. Underutilized legumes may play a significant role to providing food security and nutrition as well as profits to resource-poor farmers. Orphan legumes have been largely deserted by both researchers and industry due to their limited economic effect in the Indian market. Orphan legumes are better adapted than the major legume crops to extreme soil and climatic conditions, with high tolerance to abiotic environmental stresses such as drought. Orphan legumes are therefore a likely source of significant traits for introduction into major crops to aid in combating the stresses linked with climate change. Modern large-scale genomics techniques are now being applied to many of these previously understudied crops, with the first successes reported in the genomics area. However, greater investment of resources and manpower are necessary if the potential of orphan legumes is to be unlocked and applied in the future. As a stress response they can also produce compounds with pharmaceutical value (Cullis and Kunert, 2017). In human urinary

stone is a common lithiatic problem. Urinary stone illness is an ailment that has afflicted human kind for many centuries. Nephrolithiasis is a significant clinical problem in everyday practice with a subsequent burden for the health system. Nephrolithiasis leftovers a chronic disease and our basic understanding of the pathogenesis of stones as well as their prevention and cure still remains rudimentary. Regardless of the fact that supersaturation of stone-forming salts in urine is essential; abundance of these salts by itself will not always result in stone formation. In most of the cases the normally happening stones are calcium oxalate or magnesium ammonium phosphate type. It helps in spontaneous passage of calculi by increasing urine volume, pH and anti-calcifying activity. Balance the inhibitor and promoter of the crystallization in urine and affects the crystal nucleation, aggregation and growth (Crystallization inhibition activity). Relieves the binding mucin of calculi (lithotriptic activity) improved renal function (Yadav et al., 2011). The pathogenesis of calcium oxalate stone collection is a multistep procedure and essentially includes nucleation, crystal growth,

crystal aggregation, and crystal retention. Various substances in the body have an effect on one or more of the above stone-forming processes, thereby influencing a person's ability to promote or prevent stone formation. Promoters make easy the stone formation while inhibitors prevent it. Besides low urine volume and low urine pH, high calcium, sodium, oxalate and urate are also known to promote calcium oxalate stone formation. A lot of inorganic (citrate, magnesium) and organic substances (Nephrocalcin, Urinary Prothrombin fragment-1, Osteopontin) are known to slow down stone formation. This review presents a comprehensive account of the mechanism of renal stone formation and the role of inhibitors/promoters in calcium oxalate crystallization (Aggarwal *et al.*, 2013). In a study Chaitanya *et al.*, 2010 shows that the seeds of alcoholic extract of *M. uniflorum* are endowed with significant antiurolithiatic activity.

### What is *Macrotyloma uniflorum*

In India, *Macrotyloma uniflorum* is also known as gahat, muthira, kulath or kulthi, hurali. The effect of oral administration of aqueous and alcohol extracts of *Macrotyloma uniflorum* (*Fabaceae*) seeds on calcium oxalate urolithiasis has been studied in male albino wistar rats. Ethylene glycol feeding resulted in hyperoxaluria as well as augmented renal flow of calcium and phosphate. Supplementation with aqueous and alcohol extract of *Macrotyloma uniflorum* seeds significantly reduced the elevated urinary oxalate showing a regulatory action on endogenous oxalate synthesis. The augmented deposition of mineral forming constituents in the kidneys of calculogenic rats was considerably lowered by remedial and preventive treatment using aqueous and alcohol extracts. The results indicate that the seeds of *M. uniflorum* are endowed with significant antiurolithiatic activity and it also indicate that the alcoholic extract of *M. uniflorum* shows better anti urolithiatic activity than aqueous extract (Chaitanya *et al.*, 2010).

### Botanical description

Scientific classification: Kingdom: Plantae, Family: Fabaceae, Subfamily: Faboideae, Tribe: Phaseolae, Sub tribe: Phaseolinae, Genus: *Macrotyloma*, Species: *uniflorum*, Synonym: *Dolichos biflorus* & *Dolichos uniflorus*. Parameters range of variations: Seed shape: Seeds are small and round, Color: Grey to brown with pale fawn in color, Ornamentation: Smooth and ovoid, Flowers: 6-12 mm long, cream –yellow with purple spot, Pod: Stipulate, slightly curved, Pod per plant: 18-23 pods, Seed per pod: Usually bear 6-7 seed per pod, Sowing: Last June- first week July, Flowering and fruiting: Flowers and fruits between Aug. to Oct. (Preeti Singh *et al.*, 2017). *Macrotyloma uniflorum* (Lam.) is an annual or perennial herb, slender, climbing, prostrate or rarely sub erect belong to family fabaceae (Blumenthal *et al.*, 1993). Hiking herb with slam up to 60 cm tall with a perennial stringy rhizome stem annual compactly covered with white hairs. The tap root nodules

containing nitrogen fixing bacteria. *Macrotyloma uniflorum* is an erect, sub-erect or trailing, densely hairy annual herb Compound, alternate, Trifoliolate, stipules lanceolate petiole 1-7 cm. long leaflet ovate elliptical apex rounded to acute base rounded lateral leaflets a symmetric hairy to glabrescent on both surfaces. Flower short only 6-12 mm. long. The flower is cream - yellow with purple spot in auxiliary racemes with 2 appendages at base. Flower zygomorphic, bisexual, Fruit is a linear oblong pod 3-8 cm.x4-8 mm. up curved towards apex acuminate, densely hairy. Seed size ranges 6-8 mm long and 3-4mm broad smooth of which 100 seed weight is recorded 4gm. seed trapezoidal oblong or somewhat rounded. Pale to dark reddish brown speckled or mottled with black and orange brown or all black. *Macrotyloma* comprises about 25 species most of which are restricted to Africa four varieties have been distinguished. *Macrotyloma uniflorum*, *M. stenocarpum*, *M. verrucosum* and *M. benadirianum*.

### Cultivation

Horse gram is propagated by seed. The sowing time of the seed is last week of June to first week of July. The plant attains flowers and fruits between Aug to Oct. The 1000 seed weight is 15-50 gm. The seed crop is sown broadcast or in rows 20-90 cm. Apart at a seed rate of 20-25 kg/hect. The sowing depth is 1-2.5 cm. (Blumenthal *et al.*, 1984). In India horse gram is usually sown as a sole crop, but sometime it is intercropped with maize ground nut or castor. In Kumaun it is grown as a kharif Crop mixed with maize or finger millet. It is also a valuable green fodder crop light grazing by sheep is permitted in the yield and green trimming are fed to cattle and sheep in some areas, Horse gram is grown with fodder and mixed crop and used as green feed. The crop comes into bearing in 4-6 months after sowing the leaves begin to dry and drop out the plant are uprooted dried and the seed threshed out by treading of bullocks and with the help of a stone roller. The seed are cleaned by winnowing and sifting. The average yield is 150-300 lb per acre a yield as high as 600 lb per acre has been obtained under favorable condition when grown for fodder as in north India it is harvested about 6 week after sowing. According to Khamgaonkar *et al.*, 2013, horse gram (Gahat) Area (ha): 12782, Production (Mt): 10449 Productivity (q/ha): 8.175.

### Biochemical properties

The globulins of Horse gram account for nearly 80% of Nitrogen. They contain arginine (6-7.1%) tryosian (6.68%) Lysine (7.64%) but are deficient in cystine and Tryptophan. at 10% level of protein intake the biological value and digestibility coefficient are 66 and 73 respectively (Hilth Bull, 1930, Niyogi *et al* 1931, Swaminathan 1937 Menon and Rao 1931). In a research Ravindran and Sundar (2009) were found that Composition of horse gram on dry matter basis (%) Total dry matter: 92.00, Crude protein: 22.05, Ether extract: 0.59, Crude fibre: 5.63, Total ash: 5.16, Nitrogen free extract: 66.57, Acid insoluble ash: 0.81, Calcium: 0.34,

Total Phosphorus: 0.27, Magnesium: 0.18, Manganese: 37.00, Zinc: 0.28, Copper: 19.00, Iron: 72.00, Sugars: 5.81, Starch: 31.86: Available Carbohydrate: 37.15, Calculated ME<sup>1</sup> (Kcal/kg): 2802, Tannin (%): 0.2, Trypsin inhibitor activity (mg/g): 8.63, Estimated ME (Kcal/kg): 2804, Estimated TME (Kcal/kg): 2885.

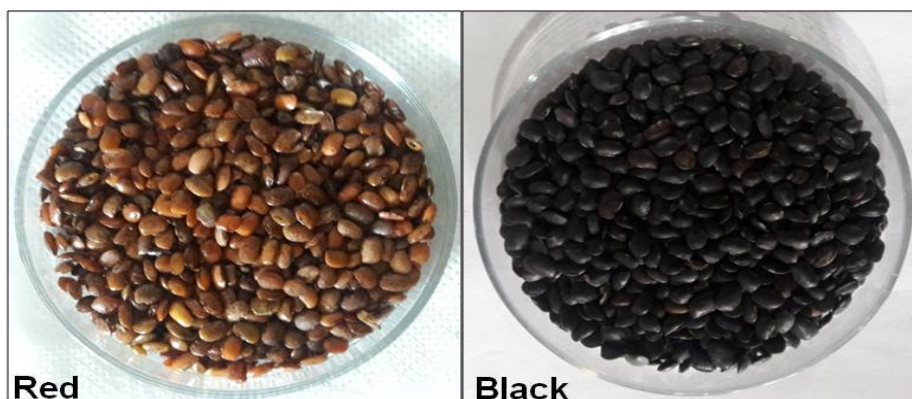
### Medicinal properties

HG is a popular pulse grown in many parts of India, particularly in Madras, Mysore, Mumbai, Orissa, Hyderabad and Uttarkhand. The use of this important pulse in Uttarkhand basically in anti lithiasis or can say in curing of kidney stones. Traditional uses of *M. uniflorum* L is also given into Ayurvedic books. The study have been undertaken to evaluate *M. uniflorum*. Linn different seeds extracts and cystone as a standard for their possible potential to dissolve experimental kidney stone using a modified in vitro model to isolate the chemical constituent responsible for the activity.

### Anti lithiatic potential of *M. uniflorum*

Kidney stones are solid particles that form in the urinary tract. In many cases, the stones are very small and can

pass out of the body without any problems. However, if a stone (even a small one) blocks the flow of urine, excruciating pain may result, and prompt medical treatment may be needed. Recurrent stone formation is a common part of the medical care of patients with stone disease. Calcium- containing stones, especially calcium oxalate monohydrate, calcium oxalate dihydrate and basic calcium phosphate are the most commonly occurring ones to an extent of 75-90% followed by magnesium (**Kidneystone, Wikipedia**). *M. uniflorum* is a branched, suberect and downing herb which belongs from fabaceae family. And it is native to most parts of India and is found up to altitudes of 1000 m. It is also known as kulthi beans or horse gram seeds. In Ayurveda, the seed is used in the treatment of piles, pain, constipation, wounds, urinary calculi, cough, edema, asthma etc (**Tropical fragrance. www.pi.csiro.au**). Different colored seed were found in Uttarakhand mainly red and black (**Figure1**). According to local survey of antilithiatic potential in Kumaun of *M. uniflorum* seeds and black colored seed found more promising and effective than others.



**Figure1: Black and Red colored *M. uniflorum* collected from Kumaun of Uttarakhand (Sharma et al., 2018).**

### CONCLUSION

Since earliest times, medicinal plants have wide acceptance due to a large number of reward such as slighter toxic effects, secure, effectual, despicable, less chances of recurrence of disease, easily available in rural areas. There is no proper medicine in allopathy for the treatment of urolithiasis, and allopathy drugs are having side effects. Furthermore the surgical treatment is another alternative but it has the more chances of reappearance. So, *M. uniflorum* is considered suitable for the treatment of kidney stones. The present review containing information of kidney stones and *M. uniflorum* used as antiurolithiasis agents, it will help in guiding the researcher to identify new source of drugs for this ever prevailing human ailment to overcome the various disadvantages faced by the wide range of population now-a-days and get relieve from the urolithiasis.

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