A Brief Study of Pharmacological Efficacy & Nutritional Value of Kulattha (Dolichos Biflorus)

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Abstract

As we all know "prevention is better than cure".the most important aim of Ayurveda is too "*swasthasya swathya rakshnama,aturasya vicar prashmananam*". For these in Ayurveda many medicinal plants are described as dietiery supplements or as in medicine, kulattha is one among the medicinal plant which have various nutritional value and as well as medicinal value. Horse gram is an excellent source of protein, carbohydrates,fat, vitamins, minerals and good amount of soluble fibers. Extract of these seeds shows potent anti-hyperglycemic anti-hypercholesterolemic activities.In this study we attempt an elaborated study of kulattha.

Keywords: Kulattha, dolichos biflorus

Introduction:

it is commonly called as horse gram (Dolichos biflorus linn. /Macrotyma uniflorum(lam)) belongs to family fabaceae(leguminose). In bhavprakash nighantu this drug mentioned in dhanyavarga. It's found in Asia and Africa. In India, Kultha is popularly referred to as Kulattha or Kulatthika in Sanskrit and its general name is Horse gram. In Ayurveda the properties of Kulattha are mentioned such as Kashaya Rasa, Laghu, Ruksha, Tikshna Guna, UshnaVeerya and KatuVipaka.[1] Because the drug is predominant of Kashaya rasa, it's Kaphavata shamaka(reduces the vitiated kapha and vata) and Raktapitta kopaka(increases the Rakta and Pitta dosha). .

Different species identified as Kulattha are -

1. Dolichos biflorus Linn.

2. Dolichos uniflorum

3. Dolichos unguiculata

4. Macrotyma uniflorum (Lamk.) Verdc.,

5. Vigna unguiculata (Linn.) Walp.

6. Vigna sinensis

Varieties: According to certain Nighantukaras, Kulattha is of two types as:

1. Kulattha (Dolichos biflorus)

2. Vana kulattha/aranya kulattha (Cassia absus)

Rasa-panchaka[2,3,4] – Table no.1

Property	**Description**
Rasa	Kashasya , Madhura
Guna	Laghu, Ruksha, Teekshna, Ushna
Veerya	Ushna
Vipaka	Katu
Prabhav	Bhedana
Dosh-karma	Kapha-vata shamaka

Gun-Karma of Kulattha According To Ayurved:[2,3,4]

- Krimighna
- Ashmarinasha
- Swedakaraka
- Mutrakaraka
- Artavajanana
- Kaphaghna
- Jvaraghna
- Chakshushya
- Lekhana
- hikka-shwas nashaka

Ganas/Vargas of Kulattha[2,3,4,5,6,7,8] –Table no.2

Samhita/ Nighantu	**Ganas/ Vargas**
Charaka samhita	Swedopaga gana, Dhanyavarga
Sushruta samhita	Artavajanaka dravyas, Dhanyavarga
Ashtanga samgraha	Dhanyavarga
Ashtanga hrudaya	Dhanyavarga
Bhavaprakasha nighantu	Dhanyavarga
Dhanwantari nighantu	Suvarnadi varga
Raja nighantu	Shalyadi varga
Kaiyyadeva nighantu	Dhanya varga
Shaligram nighantu	Dhanyavarga
Dravyaguna samgraha	Dhanyavarga
Sodhala nighantu	Shimbidhanya varga
Madanapala nighantu	Dhanyavarga
Priya nighantu	Pippalyadi varga

Nutritional value:

D. biflorus seeds are known as the poor man's pulse crop in Asian countries, especially India. It is usually used for both food and fodder. The application of dry seeds of horse gram is restricted due to their poor cooking quality. newly, the US National Academy of Sciences recognized this legume as an upcoming potential food resource.[9]

1)Protein content: Horse gram is the most protein-rich lentil found on the planet. The seeds have twice the protein content as of cereal grains. Mean protein value of horse gram seeds is almost equivalent to winged bean (Psophocarpus tetragonolobus), gram (Cicer arietinum) and soybean

(Glycine max) [10].

2)Carbohydrate (CHO) content: M. uniflorum seeds contain common and abundant forms of CHO, viz sugars,fibers, and starches. The digestibility of starches as a legume is lower than that of cereal. Contain less carbohydrate (55-65%) and energy compared to cereals. CHO available in M.uniflorum seeds has low glycemic index [11].

3)Fatty acid content: Saturated fatty acids level in the seeds of M. uniflorum is considerably low. It is about 72.49% unprocessed seeds and about 71.99% in toasted seeds. Seeds are rich sources of Linoleic acid, an essential fatty acid. Raw seeds contain 45.58% and toasted seeds contain 40.33% of Linoleic acid [12].

4)Dietary fiber content: Whole grains are the best sources to get fiber into a balance diet. Fibers are of two types, soluble and insoluble. Horse gram seed contains 28.8% total dietary fibers, mainly insoluble dietary fiber (IDF) 27.82% and soluble dietary fiber (SDF) 1.13% with IDF:

SDF 24.6 [13]. Horse gram flour contains 16.3% total dietary fiber (14.9% insoluble and 1.4% soluble and 2.2% resistant starch) . Seeds of M. uniflorum contain more insolubledietary fiber than kidney bean (Phaseolus aconitifolius) [14].

5)Micronutrient content: Horse gram has the highest calcium content among pulses. As a legume, Horse gram is deficient in methionine and tryptophan, though it is an excellent source of iron and molybdenum [15,16].

Chemical constituents[17,18,19]:

Urease, strepogenin, B-sitosterol, genestein, 2'-hydroxygenestein, dalbergioidin, kievitone, phaseollidin, isoferrreirin, coumestrol, psoralidin, 5-O-A-Lrhamnopyranosyl (1-> 2)-O-B-D- glucopyranoside, phytohaemagglutinins, B-N-acetyl glucosaminidase, A & B-galactosidases, A- mannosides, B-glucosides, 5-hydroxy-7,3'4'-trimethoxy-8-methoxy-methyl isoflavone-5- neohesperidoside, D-glucose, Dgalactose, L-rhamnose, D-arabinose and L-ascorbic acid, aminoacids viz.-glycine, alanine, cysteine, serine as well as aspartic acid (seeds); genistein, 2'- hydroxygenistein, dalberioidin, keivitone, phaseollidin, coumesterol, psoralidin, lectin similar to glycoprotein (leaves and stem); dolichin A and dolichin B (leaves); isoferreirin(5,7,4'- trihydroxy-2'-methoxy isoflavanone) (plant).

Pharmacological activities:

Anti-hypercholesterolemic effect: Kumar, et al[20] demonstrated that M. uniflorum extracts have strong activities against hypercholesterolemia and obesity. Antihypercholesterolemic effect of M. uniflorum extract is examined in rats by assessing its effects on food consumption, weight gain, serum lipid profile, serum glutamate oxaloacetate transamianse (SGOT), serum glutamate pyruvate transaminase (SGPT) and body fat.[20] Researchers reported that the consumption of ethanol and water extract of the plant for 5 weeks resulted a significant decrease ($p < 0.01$) of whole cholesterol (TC), triglycerides, low-density lipoprotein (LDL), very low density lipoprotein (VLDL) SGOT and SGPT levels. There was a significant increase in high-density lipoprotein (HDL) ($p < 0.01$). They also discovered ethanol extract-treated group has exposed a significantly higher fecal excretion of cholesterol level than those treated

with water extract. Body weight of rats in the water extract-treated group was radically lower than that in the ethanol extract-treated group.

1)Anti-helmintic activity: The seeds of D. biflorus have anthelmintic activity which may be beneficial in eliminating worms.[21] Philip, et al. tested he alcohol extracts of M. uniflorum seeds for their anthelmintic activity. These extracts exhibited potent anthelmintic activity in opposition to Pheretima posthuma and its activity was comparable with that of the standard, albendazole.[22]

2)Analgesics and anti-inflammatory effect: Giresha et al., assayed the aqueous extracts of D. biflorus coat as well as pulp by in-vitro method for inhibition of human secretory phospholipase A2 (sPLA2) as a meaning of anti-inflammatory activity. The extract effectively neutralized indirect hemolytic activity and showed similar potency in neutralizing the in vivos PLA2 induced mouse paw edema.[23]

3)Anti-diabetic activity: Gupta et al., investigated the antidiabetic effect of α-amylase inhibitor isolated from the seeds of D. biflorus in streptozotocin- nicotinamide bring diabetic mice. They have determined the biochemical parameters such as serum total cholesterol, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels.[24] Purwar, et al., found that M. uniflorum α-amylase inhibitor (MUAI) inhibited both the mouse pancreaticin adding to human salivary α-amylase. MUAI condensed the serum glucose level in the treated diabetic mice. Histological findings revealed minimum pathological changes in the treated diabetic mice as compared to the diabetic control.[24]

4)Anti-choliolithic activity: Bigonia, et al. found that D. biflorus seed exerted antilithogenic power by decreasing the configuration of lithogenic bile in mice. Both the methanolic and acetone extracts (ME and AE) were capable of decreasing cholesterol hyper-secretion addicted to bile and increasing the bile acid output. The maximum effect was create in the AE as it decreased the papillary proliferation of gallbladder and hepatic fatty degeneration. Antioxidant property of polyphenol and tannin in AE may provide its potential antilithogenic effect.[25]

5)Anti-urolithiatic activity: D. biflorus was found to be effective in preventing the deposition of the stones in experimental rats. Chaitanya, et al. reported the antiurolithiatic activity of aqueous and alcohol extracts of D. biflorus seed on ethylene glycol induced urolithiasis in albino rats.[26] Das, et al. noticed an excessive urinary excretion of oxalate, calcium along with phosphate was resulted after the feeding of ethylene glycol.[27] As per their findings of Atodariya, et al. and Bijarnia, et al. the seeds of D. biflorus are endowed with significant antiurolithiatic activity and the alcoholic extract of D. biflorus prove better anti urolithiatic activity than aqueous extract.[28,29]

6)Diuretic activity: Ravishankar, et al. explored the diuretic outcome of ethanolic seed extracts of D. biflorus in albino rats. The urine volume, Sodium, Potassium, Chloride and Bicarbonate contents were measured after the oral administration of extracts at doses of 200mg/kg and 400mg/kg. Diuretic effect was significant in experimental animals treated with of D. biflorus extracts compared to the control, Furosemide (5mg/kg).[30]

7)Hemolytic activity: The 1-butanol extract demonstrate the significant hemolytic activity by mouse erythrocytes. Kawsar, et al. details the presence of compounds such as methyl ester of hexadecanoic, ethyl ester of hexadecanoic acid mixture and n-hexadecanoic could be constituted a possible chemotaxonomic marker.[31]

8)Hepatoprotective activity: Parmar, et al. showing the significant hepatoprotactive properties of M. uniflorum seeds against D-Galctosamine and paracetamol induced hepatotoxicity in rats.[32]

Therapeutic uses of kulattha:

1) The decoction of dry seeds of *M. uniflorum* is used in traditional medicine for amenorrhea, with rock salt for urolithiasis, bile stones, conjunctivitis, rheumatism, piles, with rock salt for diabetes mellitus, dysuria, colic and flatulence (with Asafoetida), oedema, with pepper for mumps, goiter and phlegmatic conditions [21].

2) Decoction of seeds is also useful in the management of postpartum syndrome or to promote the discharge of lochia [33].
3) Infusion of whole seed is an excellent remedy for rheumatic pain and hypertension. Infusion of seeds with cow's milk is useful in the management of helminthes disorders [22].
4) Kanji of dry seeds with jaggery is a remedy for jaundice.[23]
5) Anjana (collyrium) made with powder of seeds is applied for conjunctivitis. Dhumapana (inhalation of the smoke) is beneficial for patients suffering from hiccough.[23]
6) In case of excessive perspiration, fine powder of parched Horse gram is rubbed on different parts of the body.[34]
7) Kulatthadya ghrutha and kulatthadya guda are prescribed in urinary calculus, hiccough and breathing problem.[35,36]

Conclusion:

Kulattha Seeds are having scientifically proven bioactivities such as anti-diabetic, antihyperlipidemic, diuretic, antioxidant and chemo modulatory. Therefore it can be beneficial in the management of the diseases such as diabetes mellitus, hyperlipidaemia, hypertension and due to its ayurvedic pharmacodynamics properties it pacifies elevated Kapha Dosha, due to Kashaya Rasa, Laghu Guna, Ruksha guna as well as ushna virya. Administration of horse gram can be used as a multifaceted treatment as well as a wholesome food that should be included in our diet on a regular basis. This review will be helpful to generate interest towards the plant and may be useful in developing new medicinal formulations which are more effective and have more therapeutic values.

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