

## “Kulattha Yusha” – A Pathya in Diabetes mellitus: An *In-vitro* study

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### Abstract

Diabetes has reached epidemic proportions in many developing economies such as china and india specially in low and middle income groups. India has the prevalence-7.7% of diabetes and higher concentration found in urban areas. Being a chronic health condition, it needs a wayout that can be taken on most of the days in a year. Kulattha yusha (gruel prepared from horsegram) is one such food having its indication for prameha that can be correlated to diabetes mellitus. Analysis of in-vitro anti-diabetic marker enzymes like alpha amalyse, alpha glucosidase and radical scavanging activity and total phenolics in yusha preared from whole and broken grains of kulattha (*dolicus biflorus*) that which were soaked overnight were conducted. The findings and comparative results on the anti-diabetic property between the two forms of kulattha yusha showed no much significant changes in their inhibition activity the lowest being yusha from broken seed kulattha (alpha amylase-6.79µg/ml and alpha glucosidase-16.17µg/ml). Among the two forms, broken soaked kulattha yusha has higher anti-diabetic attributes due to its inhibiton activity on alpha amylase and alpha glucosidase. Hence it can be used as a food in the management of Diabetes.

**Key words :** *Kulattha yusha*, diabetes-mellitus, radical scavenging, alpha amylase, alpha glucosidase.

**K**ulattha [*Macrotyloma uniflorum* Lam. (Verdc.), previously *Dolichos biflorus*] is among the shimbi varga (group of pulses) has the attributes of ushna (hot in potency)

and ruksha (causes dryness) pacifying Vata and kapha; enhances pitta; said to be beneficial in the management of respiratory diseases like peenasa kasa, shvasa, metabolic disorders like meha, medo roga, arsha and so on<sup>6,7</sup>.

Ayurveda believes that the innate quality of a food material in its original form can be masked or enhanced when it is processed (samskara) with a specific combination or even process itself is enough to bring about a new quality all together. That is why it is said "Samskaro hi gunantaraadahanamuchyate"<sup>8</sup>. While treating a disease also various pathya are told to patients. While managing a yapyavyadhi, it becomes still more important that a patient consumes such foods those promote healing and bring the disease under control. Kulattha Yusha is one such food (Kritaanna) that is beneficial in prameha or madhumeha which is correlated to diabetes mellitus<sup>2</sup>. Hence it was planned to compare and evaluate the antidiabetic potential of Yusha prepared from Kulattha that was soaked overnight VS crushed and soaked overnight. For the preparation of the manuscript relevant literature<sup>1-8</sup> has been consulted.

*Materials:* Kulattha (Horsegram) was procured from Hosur village, KR Nagar taluk and Mandya District, Karnataka. All the chemicals and Standards used were of Analytical grade.

*Preparation of Kulattha yusha*<sup>3</sup>: Kulattha was pre-cleaned manually to remove stones and other foreign particles, known quantity of horse gram was washed thoroughly to remove dirt and other adhering particles and soaked separately for overnight (8-10 hours)

to prepare kulattha yusha. Another part was cleaned and crushed coarsely before soaking and later soaked overnight for preparing yusha. Both the varieties of yusha were used for analysis.

*Bioactive components, biological activity and enzyme assay:* The following analyses were done:

1. Total carotenoid
2. Flavonoids
3. Total phenolic content
4. Radical scavenging activity by DPPH method (Duh and Yen, 1997)
5. Alpha amylase inhibition assay (Miller *et al* 1959).
6. Alpha glucosidase inhibition assay (Li *et al* 2009)

*Total Carotenoids :*

Lutein was higher in yusha from soaked full grain (4.68mg/gm) when compared to yusha from soaked broken grain (3.79mg/g). Beta Carotenoids were more in yusha from soaked broken grain (87.49mg/g) than that from soaked full grain (79.07mg/g).

*Flavonoids:*

Flavonoids were negligibly more in yusha from soaked full grain (0.387mg/g) when compared to soaked broken grain (0.33mg/g).

*Total Phenolics (IC<sub>50</sub>):*

Total phenolics were negligibly high in yusha from soaked full grain (1.38±0.11mg/g), soaked broken grain (1.32±0.21mg/g). The minor differential level of phenols obtained in the present study was probably due to the extraction and processing procedure adopted is different.

Table-1. Table showing bioactive components of kulattha yusha variants in mg/g

| Sl. No | Yusha variant                  | Total Carotenoids |                  | Flavonoids | Total Phenolics (IC <sub>50</sub> ) |
|--------|--------------------------------|-------------------|------------------|------------|-------------------------------------|
|        |                                | Lutein            | Beta Carotenoids |            |                                     |
| 1      | Yusha from soaked full grain   | 4.68mg/g          | 87.49mg/g        | 0.387mg/g  | 1.38±0.11mg/g                       |
| 2      | Yusha from soaked broken grain | 3.79mg/g          | 79.07mg/g        | 0.33mg/g   | 1.32±0.21mg/g                       |

Table-2. Table showing the values of radical scavenging activity in %

|                         | Soaked full grain | Soaked broken grain |
|-------------------------|-------------------|---------------------|
| Scavenging activity (%) | 92.77             | 91.95               |

*Radical Scavenging Activity (DPPH):*

Radical Scavenging activity is almost same in yusha from soaked full grain (92.77%), and soaked broken grain (91.95%). The slightly higher radical scavenging activity in yusha from soaked full grain is due to higher total carotenoid, flavonoids and total phenolic content. The differential radical scavenging activity of differently processed horsegram may be attributing to changes in the phenolics, flavonols and carotenoid content.

*Alpha Amylase and Alpha Glucosidase [In vitro anti-diabetic potential (IC<sub>50</sub>):*

*In vitro* dose-dependent  $\alpha$ -amylase and  $\alpha$ -glucosidase inhibitory activities were investigated. They were expressed as IC<sub>50</sub> values. IC<sub>50</sub> is defined as the concentration of extract/compound required to inhibit 50% of

the enzyme activity<sup>1</sup>. The IC<sub>50</sub> values were obtained from the least-squares regression line of the plots of the logarithm of the sample concentration (log) versus the  $\alpha$ -amylase or  $\alpha$ -glucosidase activity (%).  $\alpha$ -Amylase inhibitory activities (IC<sub>50</sub> value) of yusha from soaked full grain and soaked broken grain preparation were found to be 7.61  $\mu$ g/ml and 6.79  $\mu$ g/ml, respectively. Similarly  $\alpha$ -glucosidase activity (IC<sub>50</sub> value) of yusha from soaked full grain and soaked broken grain were found to be 18  $\mu$ g/ml and 16.17  $\mu$ g/ml respectively. From these results, it is clearly evident that preparation of horse gram enhances the hypoglycemic effect.

*Total carotenoids :*

Both the variants of kulattha yusha exhibited good amount of total carotenoids. Supplementation of lutein helps boost immune

Table-3. Table showing the values of the samples of *in vitro* anti-diabetic potential

| Parameters ( $\mu$ g/ml) | Soaked full grain | Soaked broken grain |
|--------------------------|-------------------|---------------------|
| $\alpha$ -Amylase        | 7.61              | 6.79                |
| $\alpha$ -Glucosidase    | 18                | 16.17               |

system<sup>7</sup> in diabetics, beta carotene will help prevention of retinal damage<sup>4</sup>.

#### *Flavonoids :*

Flavonoids are important antioxidants those reduce oxidative stress. In diabetics flavonoids are shown to be effective in significantly up-regulating GLUT4 expression and glucose uptake, increase expression of p-Akt and increase the expression of AMPK phosphorylation (Thr172), indicative of the role of AMPK in inducing glucose uptake.

#### *Alpha Amylase and Alpha Glucosidase :*

$\alpha$ -Amylase inhibitory activities ( $IC_{50}$  value) of yusha from soaked full grain and soaked broken grain of kulattha was found to be 7.61  $\mu$ g/ml and 6.79  $\mu$ g/ml respectively. Similarly  $\alpha$ -glucosidase activity ( $IC_{50}$  value) yusha from soaked full grain and soaked broken grain of kulattha was found to be 18  $\mu$ g/ml and 16.17  $\mu$ g/ml respectively. From these results, it is clearly evident that both the variants of yusha enhance the hypoglycemic effect.

Hence kulattha yusha can be prescribed as food in diabetics. Interestingly there was also not much significant changes in inhibition activity, but when compared among the two samples, soaked full grain was having slight more inhibition capacity of both  $\alpha$ -amylase and  $\alpha$ -glucosidase  $IC_{50}$  values. Kulattha has tikshna and laghu guna which helps in clearing the obstruction in the channels and ushna and ruksha guna does dathu rukshana and shoshna as it is chirapaki it helps in weight loss and relieving the symptoms of sthaulya, as prameha is one of the complication of sthaulya it is helpful in treating prameha also. Many studies have shown that it prevents the hyper lipidemic atherosclerosis, and hyper

glycemic effects. And the above study has shown that it is a good inhibitor of alpha amylase and glucosidase.

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