

A Comprehensive Study of Ancient Fortified Buttermilk, 'Gouri-Takra': A Noteworthy Research

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Abstract

The current pilot research was based on buttermilk as per the ancient *Vedic* manuscript '*Kshemakutuhalam*' which was penned down in the 18th century in Indian *Vedic* history. The aim was to test *in vitro* the anti-hyperglycemic/anti-diabetic activity (alpha amylase inhibition) and anti-oxidant activity of the same fortified buttermilk termed as '*Gouri-takra*' in *Kshemakutuhalam* compared with the control sample (plain buttermilk without fortification) '*Takra*'. The preparation of test sample '*Gouri takra*' and control sample '*takra*' was carried out as per the standard procedure mentioned in ancient *Vedic* text, '*Kshemakutuhalam*'. Both the samples were further carried forward to various analyses such as nutritional, sensory and anti-oxidant assay. The results exhibited excellent anti-hyperglycaemic activity, antioxidant activity and nutritional content of the test sample; '*Gauri takra*' as compared to the control sample. A statistically significant difference was observed in the results. Hence, it was concluded that consumption of *Gouri takra* was better than just normal buttermilk consumption for blood glucose level control and for overall health maintenance. Also, it demonstrates that the ancient Indian dietetics science of *Ayurveda* should be reintroduced in the therapeutic modalities.

Keywords: Anti-Hyperglycemic, Antioxidant, *Ayurveda*, Buttermilk, Fortification

1. Introduction

Ayurveda which is appropriately called as science of life is a well-known traditional Indian System of Medicine, which has been in practice for more than 2000 years. Ayurvedic treatments are holistic, and personalized and include not just natural medicines but also diet, exercise and appropriate lifestyle directions.

It recognises "health" as not the mere absence of disease but a complete homeostasis between physical, mental, and spiritual health. This time-tested life science emphasises the importance of the right kind of food for the formation and sustenance of the human body. *Charakmuni* (the ancient Indian physician, principal contributor to *Ayurveda*), says that the body is the product of food and humans attain pleasure and sorrow (health and disease) because of wholesomeness and unwholesomeness of the diet¹.

Ancient Indian wisdom; *Ayurveda* considers many foods as well-being ornamental but among all those foods, this medicinal system considers traditionally prepared 'buttermilk/ *takra*' as an elixir of life². It has

played a significant role in the social, cultural, medical and religious history of India since *Vedic* eons. This buttermilk/*takra* is also found in *Vedas* where it is mentioned that Almighty received immortality due to pious drink in heaven, i.e., *Amrit* and humans can get longevity due to buttermilk (*Takra*) on earth as quoted in *Vaidyakiya Subhashit Sahityam*³.

Many varieties of buttermilk are found around the globe but in India, buttermilk is traditionally prepared by churning the fresh curd. Thus buttermilk is an *Ayurvedic* probiotic in nature. In classical *Ayurvedic* texts, buttermilk is prepared in many varieties depending on the dilution of curd with water in various proportions. Accordingly, buttermilk can be prepared in a total of five different types such as *ghol*, *mathita*, *takra*, *udaswith*, and *chhachhika*. All of these varieties have their specific therapeutic roles mentioned in these classical *Ayurvedic* texts.

Similarly, there is one more unique version of buttermilk mentioned in a similar classical text of *Ayurveda* viz. *Kshemakutuhalam* and that is '*Gouri takra*' which is a speciality fortified buttermilk.

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2. Gouri-Takra (Unique Fortified Buttermilk)

Gouri-takra is a modified, fortified and exclusive version of traditionally prepared Indian buttermilk prepared by churning freshly set cow's milk curd and mixed with certain functional ingredients such as dried ginger powder (*sunth*), cumin seed powder (*jeerepud*), black pepper powder (*miripud*), asafoetida (*hing*), orange peel powder, rock salt (*saindhav*) and cow's ghee (*goghrita*).

2.1 Ingredients with their Significance

Due to these special ingredients, this soothing probiotic drink has many advantages in consumption. These are as under.

- a. **Cow's milk curd:** Cow's milk is the most suitable milk for the human race from a therapeutic point of view. Cow's milk contains more proteins, more retinol, vitamin D, B complex vitamins and fewer fats as compared to all other milk types. Thus the curd obtained from cow's milk has a similar and even enhanced nutritional profile due to the presence of Lactic Acid Bacteria (LAB) and *Bifidobacteria*. This helps in a variety of therapeutic properties such as antihypertensive, anticarcinogenic, antihyperlipidemic, natural antacid trait, etc.
- b. **Dried ginger powder/Sunth:** Ginger powder contains up to 3% of essential oil that causes the aroma of the spice⁴. *Gingerol* from the same increases the motility of the gastrointestinal tract and has analgesic, sedative and antibacterial properties⁵. Dried ginger powder possesses medicinal properties. It stimulates the production of saliva⁴. It promotes the release of bile^{6,7}. It is used as a stimulant and carminative and also for dyspepsia and colic⁴. It may also decrease joint pain from arthritis, may have blood thinning and cholesterol-lowering properties and may be useful for the treatment of heart diseases and lung diseases^{6,7}. It is effective for treating nausea caused by seasickness, morning sickness and chemotherapy⁸.
- c. **Cumin seed powder:** It is a well-known ethno medicine used worldwide. Apiaceae rich in antioxidants, predominantly phenolic acids and flavonoids have many therapeutic benefits. Cumin seeds have been used as a common household medicinal remedy for various health conditions such as indigestion,

constipation, hypertension, cardiovascular diseases, appendicitis, kidney stones, stomach ailments, abdominal pain, and acidity and also to stimulate appetite. Many recent studies have reported cumin seeds are a good source of bioactive phytochemicals with potent antioxidant, antibacterial, antibiotic or antimicrobial, and anti-inflammatory properties, antidiabetic, anticarcinogenic, cardioprotective, antihyperglycemic, hypolipidemic effects among others. It exhibits antibactericidal activity against Gram-negative bacteria such as *E. coli* and *Bordetella bronchiseptica*⁹.

- d. **Black pepper powder: *Piper nigrum* L.** is considered the king of spices throughout the world due to its pungent principle piperine. Biologically *Piper nigrum* is a very important specie. The biological role of this species is explained in different experiments that peppercorn and secondary metabolites of *Piper nigrum* and can be used as antiapoptotic, antibacterial, anti-Colon toxin, antidepressant, antifungal, antidiarrhoeal, anti-inflammatory, antimutagenic, anti-metastatic activity, antioxidative, antispasmodic, antitumor, antithyroid, hepatoprotective, insecticidal activity and larvicidal activity¹⁰.
- e. **Asafoetida/Hing:** Asafoetida is not only used as a culinary spice but also traditionally used to treat various diseases, including asthma, gastrointestinal disorders, intestinal parasites, etc. This oleo-gum-resin has been known to possess antifungal, anti-diabetic, anti-inflammatory, anti-mutagenic and antiviral activities¹¹.
- f. **Orange peel powder:** Orange peel has a better nutritional profile than orange pulp. Its citrus content is better than fruit. Even with dehydration, no significant loss of nutrients is observed in the commercial sector. Moreover, its phenolic content especially the characteristic flavanone glycosides, mainly naringin, hesperidin, narirutin, and neohesperidin renders it many unique medicinal properties such as antioxidant, anticancer, antiviral and anti-inflammatory and antihypertensive properties¹².
- g. **Cow's ghee/Goghrita:** Modern science now verified, what Ayurvedic health science has said since thousands of years ago: Cow's *ghee* is a health booster, offers cooking benefits and is good for the mind and spirit. It is rich in the oil soluble vitamins A and E and also rich in vitamin K2 and CLA (Conjugated Linoleic Acid); an antioxidant with anti-viral and anti-cancer

properties. *Ghee* is nutritionally superior to other oils/fats because of its Medium Chain Fatty Acids (MCFAs) content, which are absorbed directly by the liver and burned to provide energy. *Ghee* (unlike other oils) exclusively contains butyric acid which provides anticarcinogenic properties to the colon. In addition, *ghee-based* formulations are well-scripted in the *Ayurvedic* system of medicines used for wound healing purposes. *Ayurvedic* physicians have been using *ghee* enemas for centuries to decrease inflammation¹³.

Thus the current pilot study aimed to analyse the efficacy of this specialty buttermilk for anti-hyperglycaemic and antioxidant effects. *Gouri-takra* (test sample) prepared by using these functional ingredients was carried forward to the basic proximate analysis and alpha-amylase inhibition and antioxidant assay in comparison with the control sample of simple buttermilk.

2.2 Alpha Amylase Inhibition

Alpha amylase is a protein enzyme EC3.2.1.1 that hydrolyses alpha 1,4 glycosidic bonds of large alpha-linked polysaccharides such as starch and glycogen yielding glucose and maltose. It is the major form of amylase found in humans and other mammals. Although found in many tissues it is most prominent in pancreatic secretion (pancreatic amylase) and saliva (salivary amylase/ptyalin). Inhibition of this enzyme results in lesser availability of simple sugars for absorption thus resulting in controlled blood glucose levels. Hence alpha-amylase inhibition activity of the control and test samples was tested.

2.3 Antioxidant Assay/Free Radical Test

Free radicals are atoms or groups of atoms with an unpaired number of electrons and can be formed after oxidation reactions. Once formed they are highly reactive and cause damage to cellular components such as DNA/cell membranes. To prevent damage from these, the body has a defence system of antioxidants.

One of the major free radicals in the human body is (2,2-diphenylpicrylhydrazyl) DPPH free radical. DPPH assay is widely carried out in plant biochemistry to test the free radical scavenging activity of the plant constituent. A similar property is used in this research.

3. Materials and Methods

- a. **Procurement of raw materials:** Cow's milk and cow's *ghee* were procured from a local milkman situated in Pune and it was made sure that the milk and *ghee* were of good quality and unadulterated. Other functional ingredients such as pepper powder, cumin powder, orange peel powder, dried ginger powder, asafoetida and rock salt were procured from authentic local *Ayurvedic* shops in Pune.
- b. **Preparation of Gouri-takra:** *Gouri-takra* (test sample) was prepared by adhering to the method provided in *Kshemakutuhalam* text. As per the classic text, freshly set 50 gm of churned cow's milk curd was mixed with 200 ml water and mixed thoroughly. To the above mixture, 0.625 gm (1/8th tsp) of each of the other ingredients such as cumin powder, dry ginger powder, orange peel powder, black pepper powder and rock salt were added and combined. This cold probiotic drink was tempered with 1.25 gm (1/4 tsp) *ghee* and (one pinch) asafoetida. Simple buttermilk/*takra* (control sample) was also prepared by the same procedure using 50 gm cow's milk curd with 200 ml water and 1/4th tsp rock salt. These samples were further subjected to proximate analysis, sensory analysis and very significant *in vitro* analysis for antioxidant activity assay and alpha-amylase inhibition assay.
- c. **Sensory analysis:** *Gouritakra* and *takra* samples were scored for their taste, flavour, mouthfeel, overall appearance and acceptability by 10 semi-trained panellists on a five-point hedonic scale using a scorecard.
- d. **Proximate analysis:** Proximate analysis was carried out by standard methods of AOAC (1995) for evaluating carbohydrates, proteins, fats and vitamin C and calculated total energy content.
- e. **Alpha amylase inhibition assay:** This assay was carried out in the laboratory of NRIBAS (National Research Institute of Basic *Ayurvedic* Sciences), Pune. Percentage inhibition of alpha-amylase was calculated for control and test samples.
- f. **Antioxidant assay (Free radical):** This assay also was carried out in the laboratory of NRIBAS (National Research Institute of Basic *Ayurvedic* Sciences), Pune. In this, antioxidant activity was tested against DPPH free radical by absorbance method (Spectrophotometric measurement). A decrease in the

absorbance of the test mixture (due to quenching of DPPH free radicals) was measured at 517 nm and the percentage inhibition was calculated for control and test samples.

The formula used was: $(A_0 - A_s)/A_0$.

4. Results and Discussions

- a. **Gouritakra preparation:** This ancient mentioned buttermilk was prepared as per the recipe from *Kshemakutuhalam*. Thus 200 ml (approximately 1 glass) of *Gouritakra* renders benefits of 50 gm cow's milk curd, 0.625 gm (approximately 1/8th tsp) of orange peel powder, black pepper powder, cumin powder, dry ginger powder and rock salt. Also, it contained 1/4th tsp (1.25 gm) cow's ghee and a small pinch of asafoetida as a tempering.
- b. **Sensory evaluation:** Sensory analysis of test and control samples exhibited better overall acceptability of the test sample (*Gouritakra*) due to the addition of orange peel powder and another ingredient (Table 1). *Gouritakra* was better preferred over normal *takra* due to better taste, flavour and mouthfeel of the same as compared to simple *takra*.
- c. **Proximate composition:** When analyzed for proximate composition, the test sample (*Gouritakra*) exhibited richer carbohydrate, protein and fat content when compared with normal *takra*. Also, it was observed that 100 ml of the test sample provided 1.8 mg of ascorbate (Vitamin C), mostly due to the addition of orange peel powder which was absent in the control (simple *takra*) sample (Table 2).
- d. **Alpha amylase inhibition assay:** Alpha amylase inhibition assay revealed a superior inhibitory effect

Table 1. Sensory analysis of control and test samples

Treatment Sample	Taste	Flavour	Mouthfeel	Appearance	Overall acceptability (Mean)
Control (<i>Takra</i>)	4.1	3.9	3	3.5	3.6
Test (<i>Gouritakra</i>)	4.4	4.2	4.1	3.7	4.1

Table 2. Proximate analysis of control and test samples

Sample	Quality tested	Total Energy (Kcal)	Carbohydrates (gm)	Proteins (gm)	Fats (gm)	Vitamin C (Total ascorbate) (mg)
Control (<i>Takra</i>)	100 ml	36	2.47	1.63	2.24	-
Test (<i>Gouritakra</i>)	100 ml	46	2.59	1.88	3.12	1.8

Table 3. Alpha amylase inhibition assay

Sample	% inhibition of alpha-amylase
Control (<i>takra</i>)	1.89%
Test sample (<i>Gouritakra</i>)	4.33%

This means that consumption of *Gouritakra* yields better postprandial blood glucose control; which will surely be beneficial for diabetics.

of the test sample (4.33%) over the control sample (1.89%) (Table 3).

- e. **Antioxidant activity assay (DPPH assay):** The results demonstrated better-quality scavenging of DPPH by the test sample (0.513) as compared to the control sample (0.244) (Table 4).

Table 4. Antioxidant activity by DPPH method

Sample	Absorbance (triplicate)			Mean Absorbance	Anti-oxidant Activity
DPPH Solution without sample	0.733	0.701	0.817	0.75	-
Control (<i>takra</i>)	0.398	0.658	0.644	0.567	0.244
Test sample (<i>Gouritakra</i>)	0.348	0.331	0.381	0.365	0.513

This signifies that the test sample of *Gouritakra* has the potential to render an antioxidant effect in the system after consumption. This effect must be due to the addition of other functional ingredients such as orange-peel powder, black pepper powder, dried ginger powder, and cumin powder; all of which have a superior potential of protection against oxidant damage.

5. Conclusion

From the above research data, it can be concluded that the ancient mentioned fortified buttermilk (*Gouritakra*) can serve as a fine hypoglycaemic probiotic with superior antioxidant activity than simple buttermilk.

It should be freshly prepared and should be consumed to conclude major meals of the day to render the best results and smoothening effect as well as mentioned in vast research earlier.

Further *in vitro* studies for hypoglycaemic effects and antioxidant effects on specific cell lines can prove valuable for the convincing use of this ancient probiotic drink as a therapeutic drink in human subjects.

6. References

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