Original Research Paper

Volume - 16 | Issue - 07 | July - 2026 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Ayurveda

A COMPARATIVE EVALUATION OF PHYSICO-CHEMICAL AND NUTRITIONAL PROFILES OF NAVEEN GUD (NEW JAGGERY) AND PURAANA GUD (OLD JAGGERY)

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ABSTRACT **Context & Aims:** Jaggery (Guda), a traditional sweetener derived from sugarcane juice, is widely recognized in Ayurveda for its nutritional and therapeutic relevance. Classical texts distinguish freshly prepared jaggery (Naveen Guda) from aged jaggery (Purāna Guda), attributing unique properties to each. This study aimed to compare physico-chemical, nutritional, microbiological, and Ayurvedic organoleptic profiles of fresh and aged jaggery, thereby substantiating traditional claims with modern scientific evidence. **Methods:** Commercially sourced samples—freshly prepared and stored for over two years—were subjected to Ayurvedic organoleptic assessment and laboratory evaluation. Parameters included pH, ash values, moisture, extractive values, sugar fractions, protein, fat, carbohydrate, caloric content, and microbial load. **Results:** Organoleptic analysis revealed distinct differences: fresh jaggery exhibited yellow-brown coloration, caramel aroma, and powdery fracture, while aged jaggery showed dark brown coloration, earthy odour, and conchoidal fracture, reflecting structural reorganization and Maillard reactions. Physico-chemical findings indicated increased moisture (5.42 to 7.93 g/100 g) and ash values, with reductions in total sugar (95.25% to 92.85%) and protein (1.75 to 0.93 g/100 g). Nutritional evaluation demonstrated decreased caloric yield in aged jaggery (375.18 to 365.28 kcal/100 g). Microbiological counts rose but remained within permissible limits. **Conclusion:** Correlation with Ayurvedic principles confirmed aged jaggery's characterization as laghu, pathya (wholesome), and anabhishyandi (non-obstructive), aligning with reduced fat and carbohydrate fractions and improved digestibility. Findings suggest aged jaggery as a preferable sweetening agent for individuals with metabolic concerns, warranting clinical validation of its hypoglycaemic and hypolipidaemic potential.

KEYWORDS : Ayurveda, Jaggery, Naveen Guda, Purāna Guda, Nutrition, Metabolism

INTRODUCTION

Jaggery (Guda) is one of the most widely used natural sweetening substances mentioned in Ayurvedic classics. It is obtained from the juice of sugarcane (Ikshu rasa) and considered an important Dravya due to its nutritional value and therapeutic significance. Ayurveda differentiates freshly prepared jaggery (Naveen Guda) from aged jaggery (Jīrna/Purā a Guda), emphasizing that the transformation occurring during storage induces distinct changes in its Rasa, Guna, Virya, Vipāka, and Karma. Charaka and other classical authorities state that Guda becomes "Sa skāra-anugata," meaning its properties evolve over time due to natural maturation processes. This aspect plays an important role in its pharmacological suitability for different Rogavasthā and Doshika conditions.

Purāna Guda is described to possess Pathya, Laghu, anabhishyandi guna,[1] making it beneficial in conditions associated with Medo-Dushti, Kapha-Prakopa, and Āma. In contrast, Nava Guda is considered Guru, Snigdha, Sara, and Pittakara, often producing Kapha-vriddhi and Ama-upcaya when consumed excessively. Puran guda is pandu & prameha nashak (useful in anaemia & diabetes).[2] Puran guda act as rasayan also as per Dhanwantri Nighantu.[3]

Gud after one year of its preparation & storage is known as puran gud. It is more wholesome & have better properties. Gud after three years of its preparation and storage is known as prapuran gud. It is best one & useful in all diseases [4] Gud stored after preparation of four years should not be used as it loses its potency. Although these qualitative descriptions are well documented, systematic and controlled. But comparative physicochemical analysis of Puran Guda and Jeerna Guda is limited in contemporary research.

MATERIAL & METHODS

Commercially prepared sugarcane jaggery was sourced from a single local unit in Narnaul to ensure uniformity. Local crude drug shopkeepers stock freshly prepared jaggery for years as aged jaggery is in demand for use by local people. So, both types of jaggery were collected from local shop. Freshly prepared jaggery & jaggery of more than two years of storage was collected for this study. This study adopts a two-phase design: (1) Ayurvedic organoleptic assessment of old & new jaggery using Dravyaguna methodology, and (2) Modern physicochemical, nutritional & microbiological evaluation of jaggery samples. Analytical parameters included moisture content, pH, extractive value, ash value, sucrose, reducing sugar, fat content, protein, carbohydrate and total energy content.

NAVEEN GUD (FRESH JAGGERY)

PURAAN GUD (OLD JAGGERY)

RESULTS

For reproducibility, tests were conducted in triplicate & were carried out at SR Labs, Jaipur.

Organoleptic Evaluation

Characteristics	Fresh Jaggery	Old jaggery
Colour	Yellow brown	Dark brown
Appearance	Creamish white striations in between	Very dark brown striations in between
Taste	Sweet & sour	Sweet
Odour	Caramel like aroma	Earthy smell
Touch	Coarse	Coarse
Fracture	Powdery fracture	Conchoidal fracture

Physico-chemical & Nutritional Evaluation

S. No.	Test parameter	Limits	Unit	Results Fresh jaggery	Results Old jaggery (≥ 1 years)
Physico-chemical evaluation					
1.	pH (2% w/v Aq. Sol.)			3.84	3.87
2.	Total Ash	NMT* 6	%W/W	1.79	1.87
3.	Acid insoluble Ash	NMT 0.5	%W/W	0.01	0.03
4.	Sulphated Ash	NMT 3.5	%W/W	1.84	1.53
5.	Water insoluble Extractive	NMT 2	%W/W	1.69	1.91
6.	Moisture	NMT 10	g/100gm	5.42	7.93
7.	Total Sugar	NLT **90	%W/W	95.25	92.85
8.	Sucrose	NLT 60	%W/W	74.57	74.85
9.	Reducing Sugars	NMT 10	%W/W	16.76	14.06
Nutritional evaluation					
1.	Protein	NS***	g/100gm	1.75	0.93
2.	Total Fat	NS	g/100gm	0.90	0.80
3.	Total Carbohydrate	NS	g/100gm	90.24	89.30
4.	Total Energy (Calories)	NS	Kcal****/ 100gm	375.18	365.28
Microbiological evaluation					
1.	Total bacterial count	NMT100000	Cfu***** /g	80	240
2.	Total fungal count	NMT1000	cfu/g	≤ 10	30

* Not more than ** Not less than *** Not specified **** Kilo calories ***** Colony formation per unit

DISCUSSION

Organoleptic Evaluation

Colour & appearance changes from yellow brown to dark brown. These changes may be due to non-enzymatic browning [5] & oxidation process [6] which occurred due to temperature and storage conditions. 10-40^{0}C temperatures are favourable for non-enzymatic browning.

Taste changes from sweet & sour to sweet tastes. Change in taste occurs due to mallard's reaction & lipid oxidation processes. Maillard reactions and the lipid oxidation could contribute to the development of sensory active substances such as aldehydes, ketones, alcohols, acids etc.[7] which produces change in taste as well as change in smell.

Smell changes from caramel smell to earthy smell. This may be due to storage containers which may have smell. It may also be due to production of aldehydes, ketones, alcohols.

Fracture of jaggery changes from powdered fracture to conchoidal fracture. The difference in fracture pattern is mainly due to crystallization & structural organization of sugars over time. During storage, sucrose recrystallizes and reorganizes into a more ordered structure which makes jaggery denser & more homogenous. With time, internal structures of old jaggery becomes more denser & more cohesive, resembling a semi-crystalline or glassy solid. This structural consolidation leads to conchoidal fracture pattern.[8]

Physico-chemical Evaluation

pH of jaggery changes from 3.84 to 3.87 on storage. A little bit change in pH is due to moisture absorption and sucrose inversion during storage.[9]

Total ash value changes from 1.79 to 1.87. Acid insoluble ash changes from 0.01 to 0.03. Sulphated ash value changes from 1.84 to 1.53. But all these values are in desired range as per API which is less than 6.[4] These are not exceeding maximum limits. Ash values are used to ensure qualities of a drug & to assess non-volatile inorganic impurities. On storage, not a major difference in ash value is seen. Little bit change may be due to moisture absorption and various chemical process which occurred during storage like oxidation etc.

Moisture content changes from 5.42 to 7.93 during storage. Old jaggery contained more moisture than fresh one. But it is also in consumable desirable limits as per API which is less than 10.[4] Moisture contents of products generally depend on weather conditions. When temperature rise with increase of relative humidity. Products can absorb moisture. If temperature is high with dryness in environment, products lose their moisture.[6] This sample was collected in beginning of march, when temperature was rising and rains were also there in February and march, with raised humidity. So, sample absorbed moisture.

Water soluble extractive value was 1.69 in fresh jaggery and it was 1.91 in old jaggery. It also raised a little bit but also in desirable range as per API. This limit should not be more than 2 as per API.[4]

Initially total sugar was 95.25, but on storage it reduced to 92.85. Similary sucrose value changes from 74.57 to 74.85. Reducing sugars also get reduced from 16.76 to 14.06. Decrease in total sugar contents is due to hydrolysis of sugars in small sugars like monosaccharides.[6] Hydrolysis is more on room temperatures which may have increased sucrose amount in sored jaggery. Reducing sugars amount is little bit decreased in old jaggery that may be due to oxidation of reducing sugars on room temperatures.

Nutritional Evaluation

Total fat content is also decreasing from 0.90gm/100gm to 0.80gm/100gm, which is a little bit change. It is due to lipid oxidation process which generally occurs on room temperature.

Total carbohydrate content also decreased from 90.24 gm/100gm to 89.30 gm/100gm. This is also a minor change. Maillard reactions and hydrolysis of sugars are responsible for these changes in old jaggery.

100gm of fresh jaggery provides 375.18 kilocalories while 100gm of old jaggery provides 365.28 kilocalories which is a difference of 10 kilocalories. Partial inversion of sucrose & maillard reactions generate high molecular weight melanoidins & polymerized phenolic compounds. These transformations may slightly reduce the fraction of readily digestible carbohydrates & thereby marginally lower the calculated metabolizable energy.

Total protein content also decreased on storage 1.75gm/100gm to 0.93 gm/100gm. Maillard reactions and Strecker degradation catabolize proteins in to small amino acids which decreases protein content and increase in amino acid contents which is also responsible for sensory changes during storage.[10]

Microbiological Evaluation

Total bacterial count increased on storage. It was 80cfu/gm (Colony formation per unit per gram) in fresh jaggery and in stored jaggery, it was found to be 240cfu/gm. Total fungal count has also increased from 10 to 30 cfu/gm. During storage, moisture also increases which makes favourable environment for growth of microbes and fungi. Humidity and storage conditions like storage in open containers are responsible for this microbial and fungal growth. But these growths are under the limit range as per API. It should not be more than 100000cfu/gm for microbes and 1000cfu/gm for fungal growth.[11] Increased values which were found in old jaggery were in edible range. So jaggery can be taken orally.

Corelation with Ayurveda

In Bhav Prakash Nighantu, old jaggery (purana guda) is described as laghu (light/easy to digest), pathya (wholesome), and anabhishyandi (non-obstructive to bodily channels). Modern laboratory analyses support these features: with aging, jaggery demonstrates a reduction in total fat and carbohydrate fractions, accompanied by a decline in caloric yield upon consumption. This biochemical reduction enhances gastrointestinal digestibility, aligning with its characterization as laghu and pathya.

The diminished fat content reduces adipose deposition within channels (srotas), aligning with the Ayurvedic property of anabhishyandi. Furthermore, stored jaggery exhibits lower concentrations of sucrose,

reducing sugars, and overall caloric release, suggesting its potential utility as a sweetening agent for individuals with prediabetes or borderline glycemic indices. In patients with obesity, aged jaggery may serve as a preferable alternative to reduce craving for sweets without exacerbating metabolic risk.

From a pharmaceutico-therapeutic perspective, aged jaggery can be more advantageous in the preparation of classical Ayurvedic formulations such as āsava, ari a, and avaleha, where guda is traditionally employed. Its altered biochemical profile may enhance both palatability and therapeutic compatibility in such compound preparations.

CONCLUSION

As per these lab analysis and Ayurveda, it can be concluded that old jaggery is much better sweetening agent option as it is laghu & pathya. But its worth in medodushti & prameha can't be claimed on basis of these lab findings. Only clinical trials on hypoglycaemic & hypolipidaemic actions of old jaggery can prove its utility in above said diseases.

Financial Disclosure

All the expenditure of this study including lab test charges were borne by authors themselves.

Conflict of Interest

There is no conflict of interest.

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