Bangladesh J. Sugarcane, 32 : 87-92 *April, 2011*

Quality Assessment of Gur in Cold Storage

M. S. Arefin, M. A. Jabber, M. R. Alam, M. K. Begum, M. A. Kader and A. S. M. Amnaullah
Bangladesh Sugarcane Research Institute,
Ishurdi, Pabna.

ABSTRACT

Studies were conducted at Physiology and Sugar Chemistry Laboratory under Bangladesh Sugarcane Research Institute (BSRI) and Ishurdi cold storage to study the storage qualities of different types of gur at normal environmental conditions and in cold storage. Different types of gur e.g. solid, semi-solid and granular forms were produced in the laboratory for the purposes. All types of gur were produced maintaining hygienic conditions at different stages of gur processing. During clarification of cane juice hazardous chemical clanficants for human health were avoided. In case of granular gur packaging and sun drying for 2 days after its preparation were completed .Granular gur was packed in air tight polyethylene bags and preserved at room temperature in a well ventilated room and in cold storage. Semi-solid gur was kept in earthen pitchers covering with lids. Earthen pitchers were wrapped by gunny bags and preserved in same way. Block gur was packed in moisture proof polyethylene bag and kept for storage after wrapping with gunny bags. The physical and chemical properties of all types stored gur were evaluated before and after storage. The over all quality of granular gur was found unchanged before and after preservation throughout the year at different storage conditions. In case of block (solid), semi-solid (earthen pitcher) and granular gur preserved in cold storage, the qualities of all types of gur have been found excellent during the period of preservation. The rate of deterioration was faster in preserved semi-solid gur during high humid period. Gur preserved at normal environmental conditions in block (Solid) and granular forms showed less deterioration effects in comparison with semi-solid (Earthen pitcher) gur.

Key words: Gur manufacture, cold storage, quality assessment.

INTRODUCTION

The average sugarcane production in Bangladesh is around 6.8 million metric tons and 3.7 million metric tons of sugarcane is used to produce 0.40 million metric tons of gur annually. Even today gur continues to be the most important village and cottage industries in the country as it occupies a prominent place in rural economy. Gur is still the sweetening agent for the majority of the people and more nutritious than white sugar. In rural areas gur is an everyday article of food and a sweetening agent. The manufacture of gur is confined to the cold months extending from to the middle of April. Early gur manufacture has also been noticed in month of August/September and the product has to be stored for consumption during the remaining part of the year. Gur under storage is liable to undergo deterioration in quality and quantity. But due to lack of appropriate storage facilities, problem of gur storage is of paramount importance. Storage of gur has not been satisfactory during the history of its production and considerable wastage (50%) has occurred (Rao *et al.,* 1983).

During storage, fermentation sets in gur imparting an unpleasant taste and colour gets darkened. It is reported that gur stored at low temperature (1.5 ^{0}C) maintaining 50-60% relative humidity in godowns retains quality for a longer period and incur only 1-2% losses. In India, special godowns have been built for storage of gur. The burning of paddy husk on the floor of the godowns during the rainy season reduces humidity, thereby leading to better preservation retains the shape and its colour improves slightly. However, owing to the draining of the molasses as a result of smoking,

the solidity of the gur gets affected slightly. The godowns have been proved very effective for storage of gur with a minimum loss of only 1-2% (Rao *et al.*, 1983). In our country, about 30% wastage takes place during the period of storage in monsoon (Jabber *et el.*, 2005).

For centuries gur manufacture had been carried out on in a crude and inefficient manner and remarkable loss of gur has occurred during storage. A gur storage structure should be such that it keeps gur away from dust, insects, pests etc. and also in sound condition through the summer and monsoon seasons. Partial loss in colour and flavour of gur is natural under storage in tropical and sub-tropical climate (Bengali Baboo, 1993).

Gur storage is a great problem when the humidity is high i.e. especially in rainy season. Deterioration sets in with the gur becoming soft and sticky. Fermentation sets in gradually imparting an unpleasant taste and smell to the gur. The colour gets darkened on small scale gur is stored by keeping in earthen pots covered by lid. Use of air-tight earthen pots, gunny bags, closed rooms, bhusa (furnace ash) and other methods have been in use for years. All the above methods are considered imperfect. The main causes for the deterioration of gur are i) its hygroscopic nature, absorbing moisture from the atmosphere, and ii) larger amounts of invert sugars. Research work has indicated that the initial moisture in gur samples meant for storage should not exceed 6%. The optimum relative humidity at room temperature of 31°C for preservation of gur. There appears to exist an optimum relative humidity between 50 and 60% for any types of gur to keep well without changing the physical form. Keeping in view the above requirements, research indications are that gur may be store in a closed room, galvanized iron drum, tins and alkathene-lined gunny bags, with desiccating agents such as fused calcium chloride or calcium oxide in sufficient quantities for checking ingress of atmospheric moisture. If gur wrapped in alkathened lined gunny bags is placed in bhusa, it is preserved longer (Rao *et al.*, 1983).

MATERIALS AND METHODS

During 2005-07 crushing season, an experiment was conducted to observe storage condition of stored gur in cold storage. The temperature and relative humidity maintained inside the cold storage were 3-4°C and 85% respectively (Anon., 2006-07). Gur was manufactured in the month of December and January by open pan boiling method without adding any chemical clarificants at Physiology and Sugar Chemistry Division in Bangladesh Sugarcane Research Institute (BSRI). Plant extract of wild okra was added to clarify cane juice as an alternate of hydrose which was hazardous for human health. Gur was manufactured manually maintaining hygienic condition in block granular forms.

Granular gur was sun dried for 2 days after its preparation and packed in air tight polythene bag and preserved at room temperature in well ventilated room and cold storage. Semi-solid gur was kept in earthen pitcher and covered by earthen lids. Earthen pitcher gur was wrapped by gunny bag and stored in room temperature and cold storage. Block gur was packed in moisture proof polythene packet and wrapped by gunny bag. This type of gur was preserved in well ventilated normal room and cold storage. Details chemical analyses have been performed before and after preservation of gur. Physical and chemical properties of prepared different types of gur for its sucrose, colour transmittance (at 0.25N solution), pH and reducing sugars were determined by following method of Roy (1954). Data on sucrose, colour, pH, moisture% and reducing sugars per cent of gur before and after storage was recorded. Recorded data have been presented graphically for discussion in Figures 1-5.

RESULTS AND DISCUSSION

From the graph (Fig.1) it was observed that granular gur preserved in cold storage and at normal atmospheric condition, sucrose content of different preserved gur samples were unchanged. No difference in colour transmittance was observed in different types of preserved gur. In case of block and earthen pitcher gur, there was no change in sucrose level in preserved gur in cold storage. When gur was preserved in normal atmospheric temperature and relative humidity, the sucrose percent level was changed due to moisture absorption from the surrounding and fermentation occurred in gur. From figure 2, it was observed that reducing sugars percent of block and earthen pitcher gur was almost similar when gur was preserved in cold storage (3-4°C) and relative humidity (85%). The reducing sugars content of the same was changed due to absorption of moisture and gur was fermented when preserved at normal room temperature and relative humidity. The reducing percent was unchanged in granular gur due to low level of moisture content. There was chance of fermentation when gur was preserved in cold storage and at normal atmospheric temperature and relative humidity. The similar results obtained by Gaur *et al.* (1979) who reported that a good quality gur should have high sucrose and low reducing sugars content and quality remains unchanged without any deterioration. Gur containing higher percent of reducing sugars level is normally discouraged for preservation; because reducing sugars are hygroscopic nature pick up moisture from environment and lead to poor keeping quality and low self-life.

From Fig. 3, the pH (5.6) value of granular gur was same and it indicated that there was no chance of moisture migration from the surrounding when gur was preserved in cold storage and at normal atmospheric temperature and relative humidity condition. No fermentation was occurred in different types of preserved gur in cold storage due to low level of moisture content (< 2%), low temperature (3-4°C) and relative humidity (85%). In case of earthen pitcher and block gur, the pH level (5.8) of both types of gur remained unchanged when the same was preserved in cold storage. But at room temperature, the lower pH value was observed due to presence of higher temperature and relative humidity during the period of monsoon. This was happened due to moisture migration from the surrounding and fermentation took place.

In case of granular gur, it was seen from Fig. 4 that colour transmittance was same (62%) before and after preservation. This indicated that the keeping quality of preserved gur was excellent without any deterioration because no fermentation occurred due to low moisture per cent present in granular gur when preserved in cold storage. Colour transmittance of block and earthen pitcher gur preserved at normal atmospheric temperature and relative humidity, deteriorated faster due to moisture absorption and fermentation occurred but colour have almost similar when preserve in cold storage and relative humidity. This finding was agreed with the results of Sarker *et al.*, (1985). Sarker, *et al.* (1985) also reported that light coloured gur is always preferred by consumers for eating purpose and good quality gur is characterized by its colour.

It was found from the graph (Fig. 5) that no moisture migration of granular preserved gur in cold storage and at normal atmospheric temperature and relative humidity. Though after storage moisture per cent of this type gur remained unchanged but in some packets of gur were slightly sticky during the period of monsoon .The cause may be the leakage of polyethylene bags during packaging. In case of block and earthen pitcher gur, there was no change in moisture per cent during preservation in cold storage. The moisture per cent was changed when the same types of gur was preserved at normal atmospheric temperature and relative humidity. Similar finding was reported by Gaur *et al.* (1979) and said that higher percentage of moisture containing gur is not suitable for long term preservation. It may be concluded that granular gur can be preserved throughout the year at

normal atmospheric temperature and relative humidity without any deterioration. Granular gur was very popular to the gur consumers. Prepared granular gur was attractive in colour. The quality of granular gur remained excellent which was easily transportable, packagable and storable.

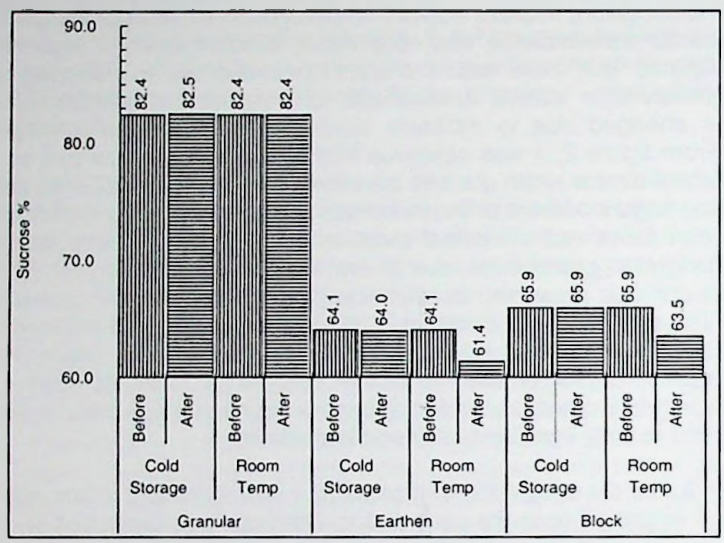

Figure 1. Sucrose% of different types gur before and after preservation

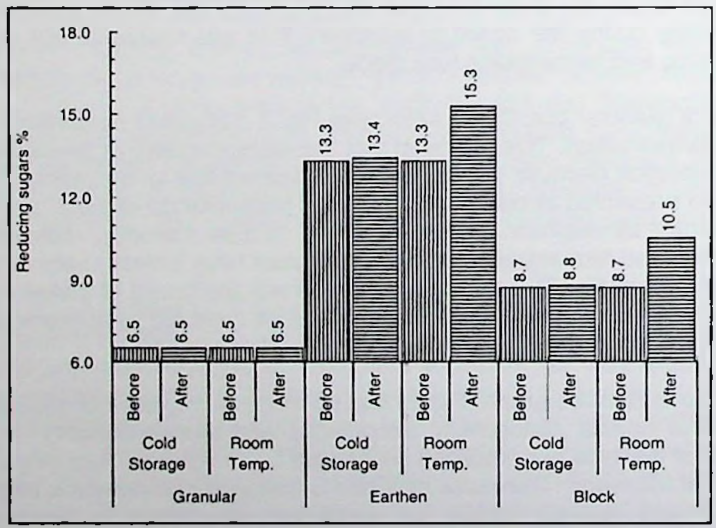

Figure 2. Reducing sugars% of different types gur before and after preservation

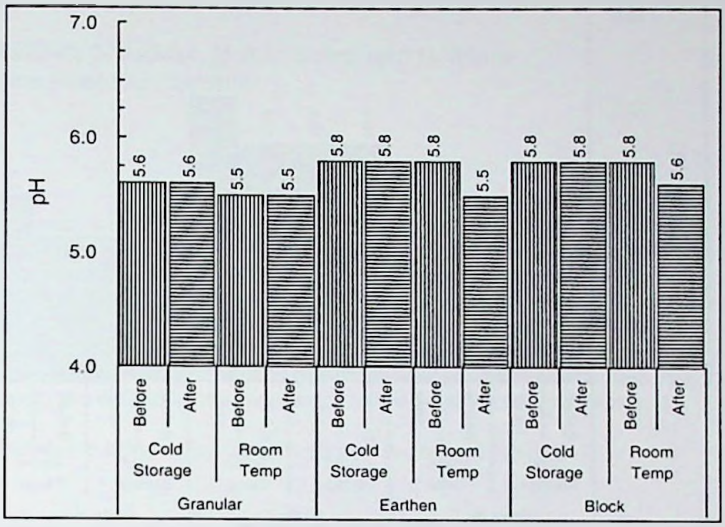

Figure 3. pH of different types gur before and after preservation

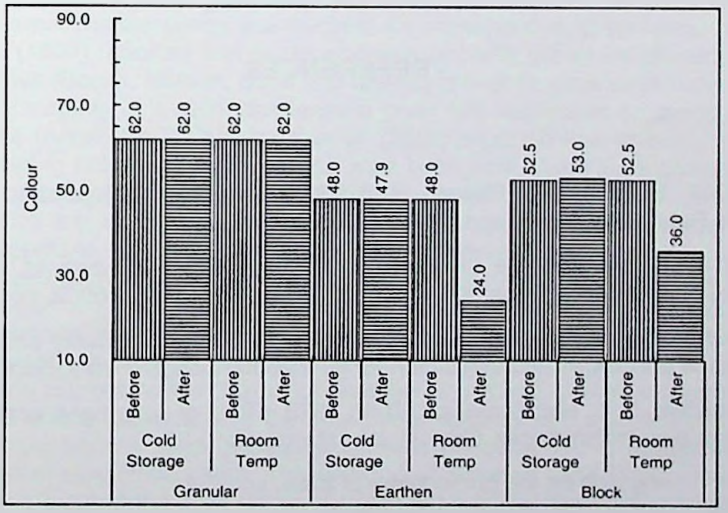

Figure 4. Colour of different types gur before and after preservation

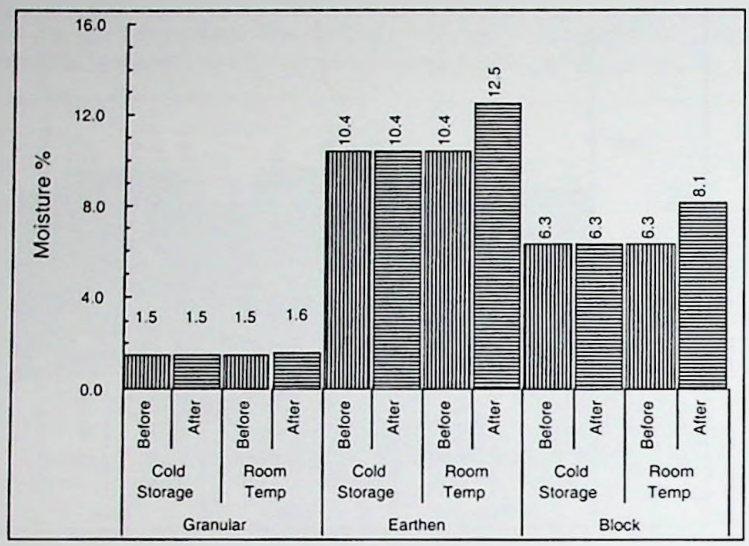

Figure 5. Moisture% of different types gur before and after preservation

REFERENCES

Anonymous, 2009. BSRI Annual Report. 2005-2006, Bangladesh Sugarcane Research Institute, Ishurdi, Pabna, Annual Report, 2005-2006. pp : 80.

Bengali Baboo. 1993. Manufacture of good quality gur (Jaggery) and its safe storage. Indian Institute of Sugarcane Research, Raebareli Road, Lucknow-226002. pp : 295-310.

Jabber, M. A.; Ghafur, M. A.; Begum, M. K. and Arefin, M. S. 2005. Maturity status of new promising sugarcane genotypes and evaluation for gur quality. *Bangladesh J. Sugarcane,* **24-27**: 41-46

Gaur, S. L.; Ranadive, S. L. and Jawalekar, D. V. 1979. Effect of sugarcane varieties on the keeping quality of gur. *Indian Sugar. Crop J.*, Jan.-March, pp18-20.

Roy, S. C. 1954. Monograph on the gur industry of India. pp 55-64.

Sarker, M. A. A.; Jabber, M. A.; Alam, M. R. and Hoque, J. 1985. Sugarcane variety for gur production. *Bangladesh J. Sugarcane*, **7** : 76-78.

Rao, J. T.; Nataranjan, B. V. and Bhagyalakshmi, K. V. 1983. *Sugarcane.* ICAR, New Delhi. pp : 92-103.