

EFFECT OF DIFFERENT PARAMETERS AND STORAGE CONDITIONS ON LIQUID JAGGERY WITHOUT ADDING PRESERVATIVES

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Abstract

Jaggery industry is a cottage industry in India. In today's world liquid jaggery has been gaining a much importance due to its nutritional value. Studies were conducted to investigate the parameters affecting shelf life such pH, colour, brix, moisture content and range of temperatures on the concentration of reducing sugars. The variety Co86032 was selected to observe the effect of storage period on quality characteristics of liquid jaggery. Samples were stored at three different conditions i.e. room temperature (27°C), refrigeration (7°C) and high temperature (37°C) in pre-sterilized PET bottles for 90 days. In order to optimize the changes in properties physico-chemical tests were evaluated during storage. The pH decreased significantly, whereas, moisture content and reducing sugar increased significantly during storage. The changes in different attributes were significantly higher at 37°C temperature as compared to room temperature and refrigeration temperature. The results revealed that change in chemical composition was lower in case of refrigerated sample. Refrigerated sample was found more acceptable among other two samples after storage period of three months in terms of its chemical properties.

Keywords: Liquid jaggery, without preservatives, Shelf life, Storage.

1. INTRODUCTION

Sugarcane belongs to the genus saccharum of the grass family which is used as a raw material for manufacturing of jaggery [1]. There are three types of jaggery namely solid jaggery, liquid jaggery and granular jaggery. Out of the total production of jaggery in India 20% jaggery is produced in liquid and granular form and 80% is produced in solid form[2]. Liquid jaggery is alternative source to honey. Sugarcane crushing is the first step in liquid jaggery manufacturing process. It is an intermediate product collected during jaggery manufacturing and striking temperature of it ranges from 105°C to 108°C or generally it depends upon the varieties of sugarcane used. The composition of liquid jaggery per 100gm is: water 30-35gm, invert sugar 15-25 gm, sucrose 40-60 gm, fat 0.1 gm, protein 0.5 gm and total minerals 0.75 gm. Calorific value of liquid jaggery is 300Kcal/100gm.[3] To increase the shelf life of liquid jaggery preservatives like 0.1% of potassium met bisulphate or 0.5% of benzoic acid is added. Liquid jaggery is used as sweetening agent in daily diet in Maharashtra, Tamilnadu, Gujrat, Andhrapradesh, Kerala.[4]

2. MATERIALS AND METHODS

The variety Co86032 was selected from promising varieties of sugarcane to study shelf life of liquid jaggery. Samples of liquid jaggery were stored at room temperature (27°C) refrigeration (7°C) and 37°C temperature in pre-sterilized PET bottles and analysed for physico-chemical properties at every 15 days of interval for 90 days.

2.1 Methods of Analysis of Quality Parameters

Moisture Content

The moisture content of the sample was determined using vacuum oven method. 10 g of the sample was weighed and placed into a pre-weighed crucible and then dried at 105°C till the dryness occurs.

Brix

A hand held refractometer with 0 to 90 brix scale was used for brix measurement. 1-2 drops of liquid jaggery was placed onto a prism and value of brix was recorded.

pH

pH meter was used for pH measurements. The pH meter was calibrated using pH 7 and pH 4 standard solutions.

Reducing Sugar

The reducing sugar was determined by DNSA method, using DNS reagent (1g of dinitrosalicylic acid; 70 ml of NaOH at 0.5 N; 30g of Potassium Sodium tartarate tetra hydrate) With working standard 1mg/ml (50mg dextrose/50ml distilled water) and measured the absorbance at 540nm. Standard graph was plotted as shown in chart 1.

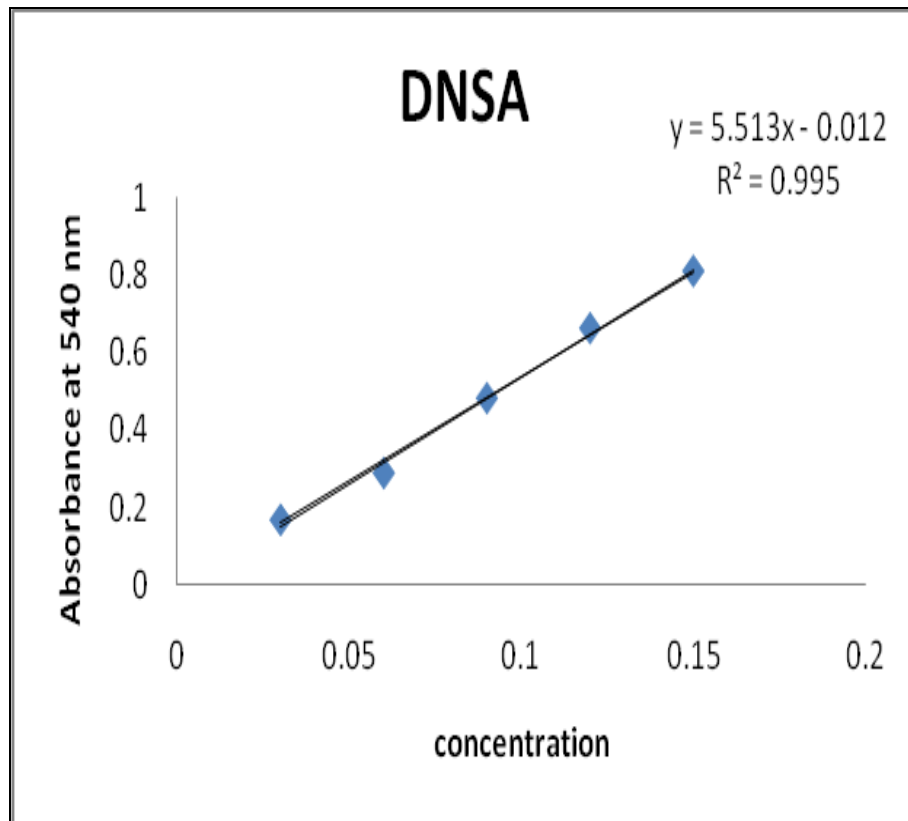


Chart-1: Standard graph for DNSA method

Colour

Hunter L, a, and b colour scale was selected for all measurements. Samples were kept on the specimen port (95mm diameter) to cover the full exposed area of the port to the light. All measurements were replicated thrice and the mean readings were taken. The L , a and b values are three dimensions of a measured colour which gives specific colour value of the material. Colour difference (ΔE) indicates the degree of overall colour change of a sample in comparison to colour values of an standard sample having colour values of L^* , a^* , and b^* . The colours of the samples represents in terms of L (whiteness/darkness), a (redness/greenness), b (yellowness/blueness). Colour difference was calculated using equation 1,

$$\Delta E = \sqrt{(L - L^*)^2 + (a - a^*)^2 + (b - b^*)^2} \quad (1)$$

3. RESULTS AND DISCUSSION

3.1 Chemical Composition of Liquid Jaggery

The chemical composition of liquid jaggery (var.Co 86032) was determined in Table 1. Fresh liquid jaggery was analyzed for physic-chemical evaluation before storage. On estimation, liquid jaggery was found to contain 19% moisture content, 4.91 pH, 71 brix and 13% reducing sugar. Maximum colour difference was observed in sample at 37°C temperature.

Table -1: Chemical composition of liquid jaggery

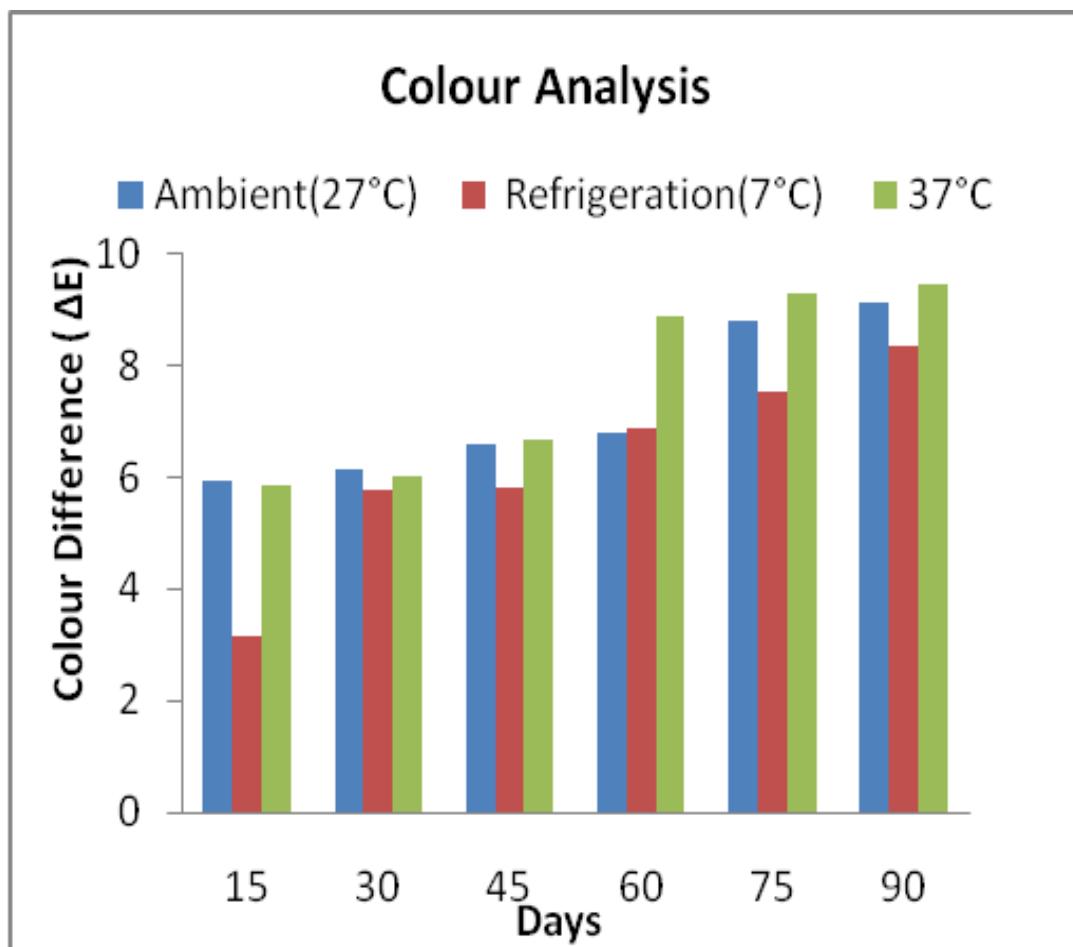
Properties	Value
Moisture content%	19
pH	4.91
Brix	71
reducing sugar %	13
Density (g/cm ³)	1.34

3.2 Effect of Parameters on Chemical Properties of Liquid Jaggery on Storage

The data of effect of parameters on liquid jaggery during storage on moisture content, pH, brix, reducing sugar and colour of liquid jaggery is depicted in Table 2. The results revealed that moisture content of liquid jaggery significantly increased during storage period. This may be due to the high water vapour transmission rate of PET bottles due to which there was increase in moisture content of liquid jaggery. The moisture content of liquid jaggery ranged from 19 to 20.9 per cent. Maximum moisture was observed at 37°C temperature stored for 90 days while minimum water absorption after 90 days of storage was observed at refrigeration temperature. There was no significant change observed in brix. The content of reducing sugar increased significantly during storage in liquid jaggery at room, refrigeration, 37°C temperature may be due to the hydrolysis of sugars, however, the decrease was lesser at refrigeration temperature. The pH of liquid jaggery samples decreased significantly and it found to be reversibly related to storage period. This decrease in pH may be due to change in chemical properties which are affected by storage condition.

Table - 2: Effect of different parameters and storage on physic-chemical properties of liquid jaggery

Sr No	Parameter	Temperature	Days						
			0	15	30	45	60	75	90
1	Moisture	Room(27°C)	19	19.2	19.6	19.7	19.9	20.2	20.5
		Refrigeration(7°C)	19	19.1	19.3	19.4	19.7	19.9	20.1
		(37°C)	19	19.5	19.8	19.9	20.3	20.7	20.9
2	pH	Room(27°C)	5.28	5.27	5.26	5.15	5.02	4.91	4.8
		Refrigeration(7°C)	5.28	5.23	5.20	5.13	5.07	5.04	5
		(37°C)	5.28	5.22	5.17	5.10	5.01	4.85	4.7
3	Brix	Room(27°C)	71	71	71	71	71	70	70
		Refrigeration(7°C)	71	71	71	71	71	71	71
		(37°C)	71	71	71	70	70	70	69
4	Reducing sugar	Room(27°C)	13	13.3	14.2	14.8	15.3	16	16.5
		Refrigeration(7°C)	13	12.9	13.2	13.7	14.1	14.6	14.9
		(37°C)	13	13.5	14.1	14.9	15.5	16.2	16.8
5	L Colour a b	Room(27°C)	11.81	5.98	5.66	7.85	3.11	3.05	2.80
			-1.58	-0.49	-1.29	-1.40	-0.55	-1.47	-0.35
			0.83	-0.79	0.87	0.61	1.38	1.37	0.25
	L Colour a b	Refrigeration(7°C)	11.81	8.68	4.65	6.08	6.33	5.05	3.49
			-1.58	-1.13	-0.15	-0.91	-2.77	-1.20	-0.90
			0.83	0.6	-1	0.29	2.41	1.96	0.51
	L Colour a b	(37°C)	11.81	6.32	7.51	5.45	3.10	2.49	2.53
			-1.58	-0.16	-1.33	-0.05	0.21	-0.45	-0.85
			0.83	-0.6	0.85	-0.43	0.56	-0.21	0.67

**Chart-2:** Colour difference of liquid jaggery during storage.

Colour is one of the important quality factor that determines the consumer's acceptability. There was a significant effect of storage condition and period on colour of liquid jaggery (Chart 2). Samples stored at refrigeration had the lighter colour; whereas at 37°C was observed as darken in colour.

4. CONCLUSION

It can be concluded from the facts stated above that liquid jaggery without adding preservatives at refrigeration found to desirable amongst all the samples and can be stored up to 90 days without having much affect on its physico-chemical properties. We can predict that increasing reducing sugar and absorption of moisture set up favorable condition for inversion. From the results of the study, refrigeration temperature helps to extend the shelf life of liquid jaggery without adding preservatives

ABBREVIATIONS AND NOMENCLATURE

PET- Polyethylene terephthalate
DNSA-Dinitrosalicylic acid

ACKNOWLEDGEMENTS

At this moment of accomplishment, I pay thanks to my guide, Dr.S.V Anekar, Chemical Engineering Department, Tatyasaheb Kore Institute of Engineering and Technology, Warnanagar, Kolhapur. This work would not have been possible without his valuable guidance, support and encouragement. Under his guidance I successfully overcame many difficulties and learned a lot. His energy and clear way of thinking were the driving force for me at all stages.

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