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ATOMIC ABSORPTION SPECTROSCOPIC ESTIMATION FOR HEAVY METAL CONTENT FROM YELLOW AND GREEN COLORED JELLY SAMPLES AND ITS PHYSICO – CHEMICAL CHARACTERISTICS

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ABSTRACT

Yellow and green colored jellies of different forms and brands were analyses for their physical characteristics such as pH, loss on drying, refractive index and acidity calculated as citric acid and tannin. The heavy metal such as, Fe, Cu, Zn &Pb were analyses by atomic absorption spectrophotometer (AAS). Copper was found to be below detectable limit in the three brands and was present in only one brand. Iron was present in maximum amount and all the other elements were present in variable concentration at ppm level below permissible limits.

Key words: - Characteristics, colored jellies, AAS, Heavy metal

INTRODUCTION

Jelly and jam are an excellent way to preserve fruits. These are made from fruits, preserved by fruit acid & sugar and thickened or gelled to some extent. Jelly is made by filtering out the pulp after the initial heating. Jellies come in dozens of flavours and varieties. Jelly is popular among kids as well as adult. It boasts quick energy, delicious flavours and low calories i.e. only 48 calories per tablespoon and they contain zero fat.

Natural fruits are rich in carbohydrates, vitamins, minerals etc, but are seasonal and perishable. The processed forms of the same like jam, jelly, juice and marmalade can be readily available round the year but run the risk of getting contaminated with some trace elements during processing. The environmental pollution, handling, processing, containers and packing materials used for storage etc are possible sources for the elements like Fe, Cu, Zn, Pb etc. to enter in traces in these food products.

Jelly is a processed form of food product, which is available in different colours having different flavours, lovely taste and in attractive package. It is nutritious and can be carried hygienically from one place to another.

Various colours of jellies constitute different fruit juices or by using pectin gel and appropriate fruit flavour. In selecting fruit for jelly, a mixture of slightly under ripe fruit should be used. A minimum of water and cooking is done to extract the juice and preserve the characteristic flavour of the fruit.

A good jelly has an excellent colour, it is transparent and retain its shape when removed from the mould. It contains sugar, vitamins and various trace metals. Food colours also contribute to the trace elements in the final product. The metal toxicity from the food product is very well documented in literature.[1,2] Trace metal are desirable only when they are present within permissible limits. Hence, it is essential to monitor the level of trace metal and also the physico – chemical characteristics of different coloured jelly available in local Indian Market.

EXPERIMENTAL

Various forms and brands of Indian as well as imported jellies consumed by local population are available in Indian market. The different forms of jellies selected were Mougli Ice Tube, Gold fish jelly, Hi – Po jelly and fiber jelly were purchased from local market. They are available in different packingsie. Wrapped in plastic paper in chocolate form or sealed in plastic scoops or it may be packed in different attractive shaped plastics.

All the apparatus used were of "Borosil" make. All the chemical & solvents used for analysis were of A.R. grade. Burettes, pipettes volumetric flask etc were calibrated by standard methods[3]. Each sample was labeled and preserved for analysis by following the analytical methods[4]. The samples were then analyzed for moisture content in the form of loss on drying at 105^0 C , pH, Acidity, refractive index , content of tannin and estimation of trace elements such as: Iron, Copper, Zinc, lead

Moisture content in the form of loss on drying at 105^o C was found by weighing about 2.0 g sample in a loss on drying bottle and dried in an oven at 105^o C for 24 hours. Then it was removed from the oven and kept in desiccators to attain the room temp & weighted till constant weight.

pH was determined by dissolving 5 g of jelly sample in a small amount to boiled & cooled distilled water, by little warming and the volume was made to 100 ml by using distilled water . The pH was recorded on a pH meter at room temperature.

Acidity was calculated as citric acid by weighing 2 g samples and dissolving in 50 ml of distilled water and titrated against 0.I N sodium hydroxide using phenolphthalein solution as an indicator. From the titration burette reading was added and calculated by using the formula.

B.R X N of NaOHXeq.wt X100 g/ 100g Wt. of sample in (g) X1000

Refractive index was found by thoroughly mixing the sample of jelly to attain the appropriate temperature and then the little homogenous sample was placed on the refractometer prism and the reading was read on refractive index scale.

To prepare the ash, jelly sample was mixed properly with a glass rod. About 2 g of jelly sample was accurately weighted in a dry silica crucible and dried in an oven at about 200° C for 3 hours and the charred mass was incinerated about 520° C in muffle furnace under controlled temperature[5]. The ash obtained was cooled to room temperature in a desiccator and weighed till constant weight and was stored properly for estimation of metal content of trace elements was found out by AAS.

The ash of jelly samples obtained was dissolved in 40 ml of aqua regia. It was digested at low temperatures on hot plate and concentrated to about 20 ml and diluted to appropriate dilution. After attaining the room temperature, it was filtered through filter paper No 1. The absorbance reading was taken on Atomic Absorption Spectrophotometer (AAS) at respective wavelengths by using appropriate Hollow Cathode lamp. Working standard was prepared from 1000 PPM stock standards of individual metal ions supplied by M/s Merck Index the instrument reading directly displayed the concentration of metal ion in the unknown solution on the basis of previously recorded calibration curve. The concentration of elements in the sample was calculated in PPM

RESULT AND DISCUSSION

Different shades of yellow and green ie: dull yellow and bright yellow and light green and dark green. Mahadevia*et al*[5]. have reported that colour variation in the final product is due to significant loss of carotenoid pigment. Various processing methods are responsible for such loss of carotenoid pigment, which results in different shades of colour in different brands of jellies. The results of experimental findings are detailed in Table 1 and 2

The pH of 5% w/v solution has value in the range of 4.15 to 6.20. Low pH is Mougli Ice tube jelly indicates its acidic nature as compared to their brands.

Loss on drying at 105°c shows greater variation from brand to brand. It ranges from 70.09 % to 89.50 % the highest loss on drying is observed in Mougli Ice tube which indicate its softness.

Lowest Refractive index value is 1.338 which is for Mougli Ice tube which suggest less solid particles.

Dryden & Hill[6] reported that optimum sugar acid ratio is important for bringing out the olfactory element in flavor.

Acidity calculated in term of citric acid shows value of 0.06 g/100gm in Mougli Ice tube and highest value in fiber jelly, which is 0.14g/100gm. The higher value of acidity indicates more amount of citric acid added in the product.

Tannin content ranges from 0.3 ppm to 20.0 ppm. Manchado[7] reported condensed tannin is most abundant in fresh skin of litchi. The variation in tannin content is a shown is graph no. 5

Variation is metal content of jelly may be observed due to the environment, different quality of fruits, colors and artificial flavors used, equipment and containers used for manufacturing and different storage method.

Iron was found to be present in larger amount as compared to other metals in all brands. According to Barwal and Kalia[8] the possible reason might be that iron gets extracted is juices and concentrated during evaporation.

Copper content was below detectable limit in three brands and it was 0.0490 ppm in Hi-Po jelly. Zinc was highest in gold fish jelly ie. 0.8774 ppm. These metals probably enter into the product through containers used in the manufacturing process. Poweri*etal*[9] have reported that copper and zinc find a passage into the food products through containers made of aluminum alloys.

Lead is found to be present in many row materials. It can enter into the fruits through the lead contaminated soil, which nourishes the trees, and fruits.

The physico-Chemical, parameters, the quality analysed and mineral composition estimated there with allows the product for consumption. Hence yellow and green coloured jellies of all brands can be recommended for consumption.

TABLE 1

PHYSICO - CHEMICAL CHARACTERISTICS OF YELLOW AND GREEN JELLY

Brands	Color	pH of 5% w/v sol in water	Loss on drying at 105°c (%)	Refractive Index at 20°c	Acidity calculated as citric acid in g/100gm	Tannin content in ppm
Mougli Ice Tube	Yellow	4.15	89.50	1.339	0.06	0.30
	Green	4.22	88.25	1.338	0.06	0.65
Gold fish Jelly	Yellow	6.07	76.25	1.376	0.12	1.1
	Green	6.22	73.30	1.359	0.08	1.2
Hi-PO Jelly	Yellow	6.34	81.25	1.369	0.10	16.5
	Green	6.20	80.50	1.368	0.10	20.0
Fiber Jelly	Yellow	6.17	73.15	1.375	0.14	2.10
	Green	6.12	70.09	1.375	0.12	0.25

TABLE 2

TRACE METAL CONTENT IN YELLOW AND GREEN JELLY

Brands	Color	Iron (ppm)	Copper (ppm)	Zinc (ppm)	Lead (ppm)
Mougli Ice Tube	Yellow	2.2340	BDL	0.5894	0.2571
	Green	2.2630	BDL	0.5644	0.2781
Gold fish Jelly	Yellow	1.8749	BDL	0.8774	0.0236
	Green	1.8399	BDL	0.8554	0.0276
Hi-PO Jelly	Yellow	4.3645	0.0490	0.6359	0.2431
	Green	4.3895	0.0480	0.6189	0.2761
Fiber Jelly	Yellow	1.5644	BDL	0.6419	0.4256
	Green	1.5854	BDL	0.6209	0.4046

BDL : Below detectable limit

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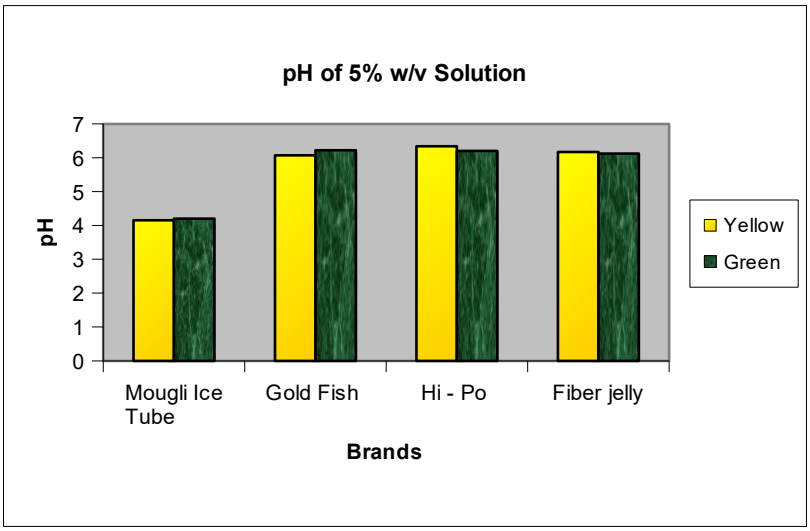
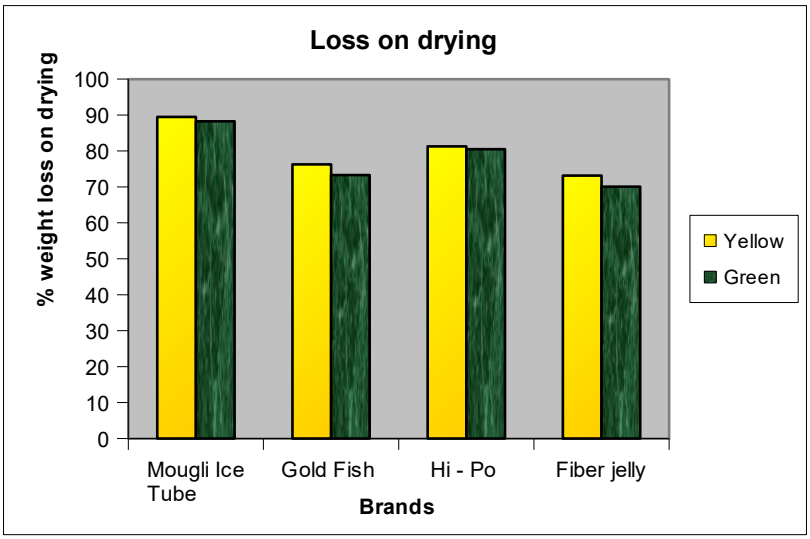
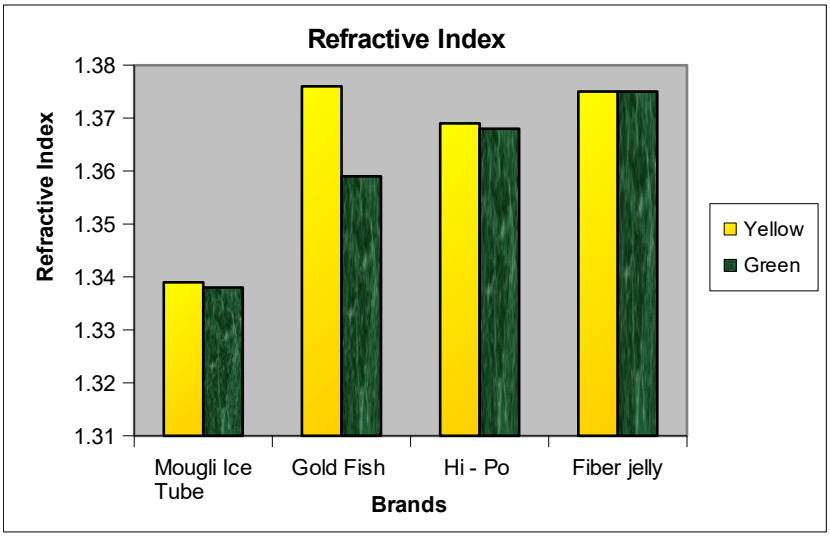
Graph no. 1



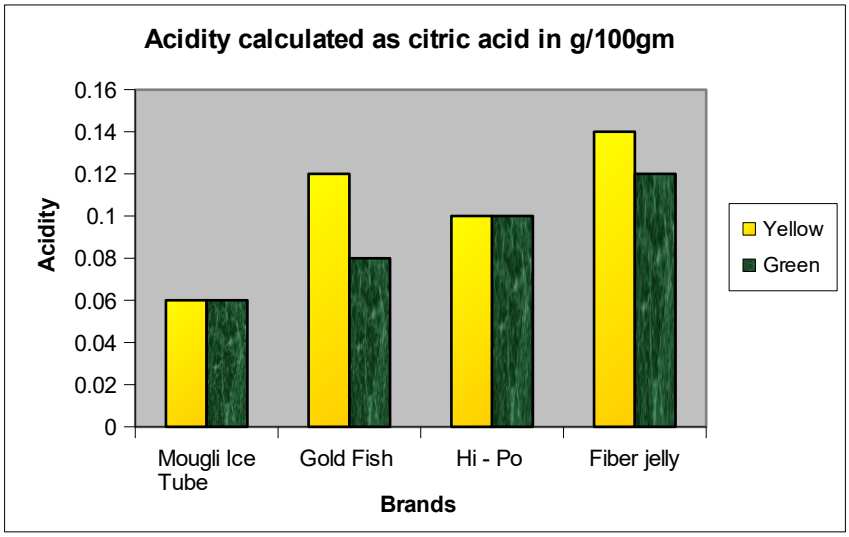
Graph no. 2



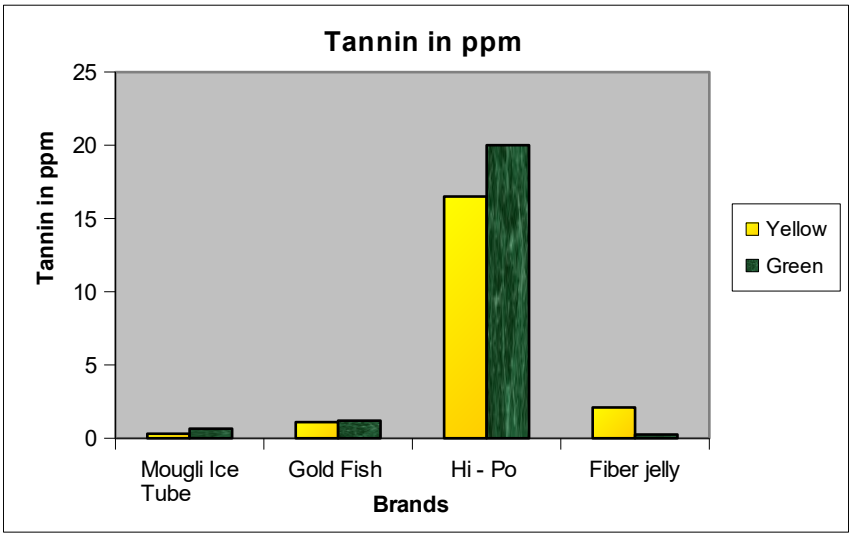
Graph no .3


Refractive Index
Refractive Index
1.38
1.37
1.36
1.35
1.34
1.33
1.32
1.31
Mougli Ice Tube
Gold Fish
Hi - Po
Fiber jelly
Brands
Yellow
Green

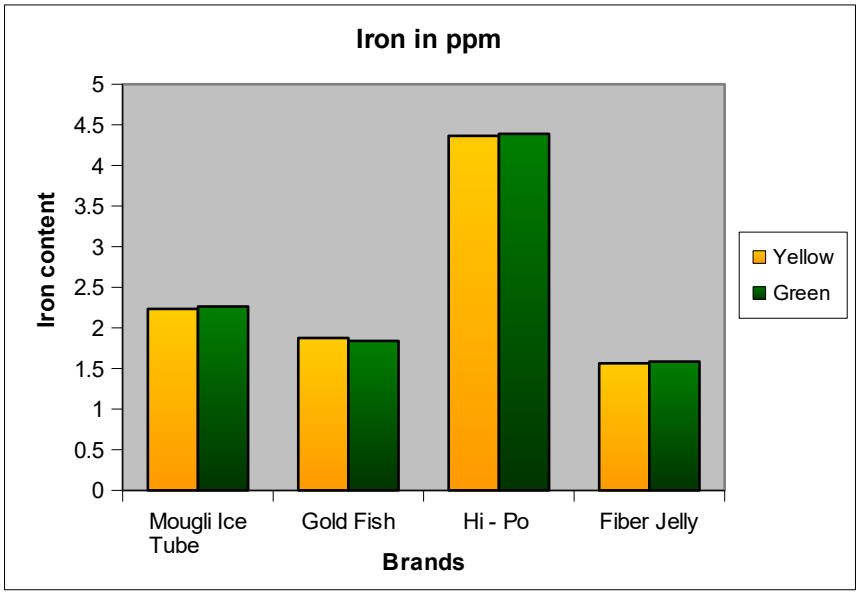
Graph no. 4


Acidity calculated as citric acid in g/100gm
Acidity
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Mougli Ice Tube
Gold Fish
Hi - Po
Fiber jelly
Brands
Yellow
Green

Graph no. 5



Graph no. 6



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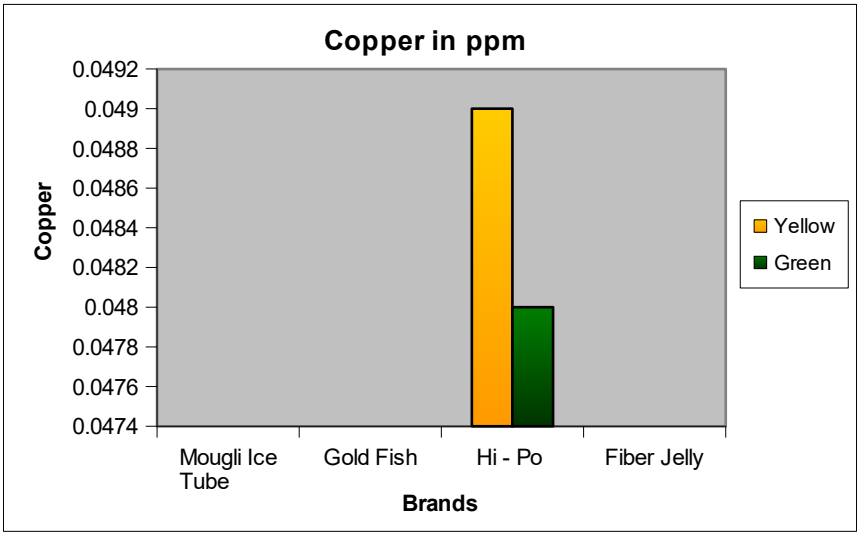
Graph no. 7



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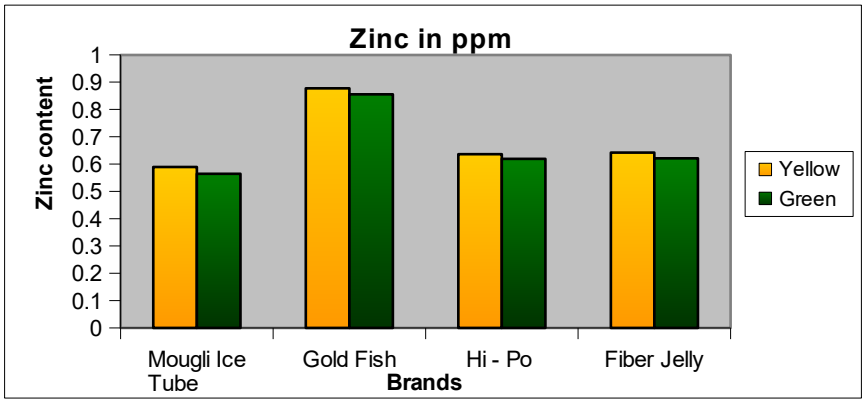

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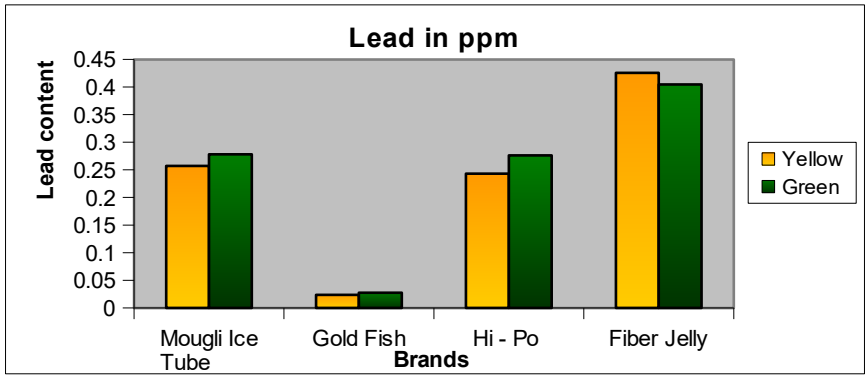

REFERENCES

1) ISI 93, Indian Standards, Jam, Jellies and Marmalades Specifications, First revision 5861 (1993), Bureau of Indian Standards, New Delhi, India (1993)

2) FAO/ WHO Food standards, Codex Alimentarius Commission, Recommended International Standard for Jam and jellies and recommended International Standards for citrus Marmalades, World Health Organisation, Italy |(1976)

3) G. H. Jeffery, J. Bassett, J. Medham, R.C. Denny, Vogel's textbook of quantitative chemical analysis, 5thed, Longman Scientific & Technical , p – 87 (1989)

4) AOAC , Methods of analysis, 14thed, Association of analytical chemists, Washington DC (1984)

5) M. Mahadevia, K.S. Sheshadri, R.V. Gowramma and J. K. Crown, Indian Food Packers, 4, 23 (1994)

6) E. C. Dryden and C. H. Hills, Food Technology, 11, 589 (1957)

7) P. S. Manchado, E. L. Roux, C.L. Guernave, Y. Lozano and V. Cheynier, J. Agri Food Chem. 48,5995 (2000)

8) V. Barwal and M. Kalia, Indian Food Packers, 2, 7 (1998)

9) A. Powari, M. Mahadeviah& R. V. Gowramma, Indian Food Packers, 4, 33 (1997)