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Investigations on BTTT as Qualitative Tool for Identification of Different Brands of Groundnut Oils Available in Markets of India

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Abstract:- In the present research paper, different brands of groundnut oils which are available in local markets of India are used to analyze purity by applying qualitative tool as bellier turbidity temperature test (BTTT). Samples of the groundnut oils such as filtered groundnut oil (Fgn, Snehdrop), Filtered groundnut oil (Fgn1, Swadeshi), groundnut oil (Gn, Dhanlaxmi),groundnut oil (Gn1,Ahar) , groundnut oil (Gn2,GS Gold) and groundnut oil(Gn3,Smart swad) from different parts of India are used and they are examined for the influence of geographical variations on BTTT. The BTTT values are exhibited in the range of 40.3 to 40.90C.Hence it is observed that there is no imposition of BTT values are to raise the issue pertaining to the discrepancy in BTT for the presence of other vegetable oils (admixture of oils) in groundnut oils. The statistically standard mean error is in between 0.1-0.21 in case of BTT.

Keywords:- *Edible Oils, Different Brands of Groundnut Oils, BTTT*

I. INTRODUCTION AND OBJECTIVE

Vegetable oils are widely consumed domestically in Nigeria. It is used primarily as a cooking and salad oil. Studies have shown that groundnut oil contains much potassium than sodium and is a good source for calcium, phosphorus and magnesium. It also contains thiamine, vitamin E, selenium, zinc and arginine[1-3].

The commonly used variety of cooking oil in rural India are refined sunflower oil, Palm oil, Ground nut oil, Groundnut oil, Coconut oil and others[4].Many literature quotes refined Sunflower oil is one of the healthiest and cheapest oils compared with that of other oils[5].Even though other refined vegetable oils are as harmful as sunflower oil due to its omega 6 fatty acid consumption and oxidation[6].there are not much studies comparing the effects of sunflower oil versus other oil consumers altogether[7].

The quality of fats and oils is dictated by several physical such as texture, density, pacific gravity, colour, refractive index etc and chemical parameters such as acid value, iodine value, saponification value, unsaponifable matter BTT etc are dependent on the source of oil; geographic, climatic, and agronomic variables of growth. Thus one must assess quantitatively the influence of these variables on characteristics of oils and fats; in present case on characteristics of groundnut oil, **Bellier Turbidity Temperature Test** (BTTT) (acetic acid method), based on insolubility of Arachidic acid is used as a qualitative method for identification of pure groundnut oil.The BTTT method is cheaper, easier, requires little laboratory infrastructure and recognised as a convenient qualitative tool for identification of different variety of oils. Sometimes it is observed that groundnut oil fulfils all specifications of refined oil but fails to pass BTTT. The imposition of BTT values to raise the issue pertaining to the discrepancy in BTT for the presence of other vegetable oils (admixture of oils) in groundnut oil. Moreover Groundnut from different geographical locations differs in oil content. The Bellier figure or the temperature at which turbidity appears in a specified and neutralised oil sample under specified conditions was first proposed by Bellier and modified by several workers including Franz and Adler. According to Ever in 1912, the addition of sufficient acetic acid used instated of 1% hydrochloric acid succeeding modifications in the BTT. This had been adopted by several workers and gives satisfactory results for sufficient to judge the purity of peanut oil and admixture of oils. In most cases the Bellier figure increases with the % of peanut oil in the mixture. The increase is not proportional and there is a steep rise for the % of peanut oil below 25 %[17].

The objective of the present studies was to investigate the applicability of BTTT to different brands of groundnut oils obtained from different parts of India and thereby examine the influence of geographical variations on BTTT as tool for identification of groundnut oil. Assessing the quality and compared the assessed value with existing standards of BTTT for the respective oils as per Food safety and standards (food products and additives) Regulation 2011.

II. LITERATURE REVIEW

India is the largest producer of groundnut in the world. About 88% of the groundnut area and production in India is concentrated in five states: Andhra Pradesh, Gujarat, Karnataka, Tamil Nadu, and Maharashtra. Nearly 83% of the total area is under rainy-season groundnut and the other 17% is cultivated during the post rainy season[10]. India possesses varying climatic conditions results in cultivation of a wide range oil bearing crops trees and nuts. Peanuts make an important contribution to the diet in many countries. Peanut seeds are a good source of protein, lipid and fatty acids for human nutrition[16]. The oil content of groundnut differs in quantity, the relative proportion of

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fatty acids, geographical location, seasons and growing conditions[8].The reported changes on the chemical composition as a result of processing. However, little information on the effect of traditional processing on peanuts quality was reported. The chemical and properties of oils are amongst the most important properties that determine the quality and help to describe the present condition of oils[9].

Peanut are rich in oil, naturally containing from 47 to 50 %. The oil is pale yellow and has the characteristic odour and flavour of peanuts. Oil quality and its stability is therefore very important for the consumers. The composition of peanut and its oil of several cultivars of Arachis hypogaea and peanut species have been studied[16].

The solubility of oils in various solvents is a constant, depending on the nature of the glycerides composing the oil. Fryer and Weston found that a mixture of equal volume of 92% ethyl alcohol and pure amyl alcohol used as a solvent for turbidity. In Valenta test, acetic acid was used as a solvent, the results are affected by the presence of moisture in the oil and free fatty acid which lower the turbidity temperature, increasing the solubility of the oils, which raises the turbidity temperature[17].

The modified BTT test has been used by Ever for judging the purity of oils and has been found simple, rapid and fairly accurate for routine analysis as compared to the results obtained by Valenta test. Moreover, it can be conveniently used in the analysis of soap and commercial fatty acids and also for determining the % of two mixed oils. Others workers have also successfully used the same test for determining adulteration of groundnut oil in some edible oils and also suggested its analytical importance. Besides the turbidity temperatures obtained with fatty acids by the method of fryer and Weston are different from those for the respective oils, depending on the difference in the solubility of the glycerides of the oil and its fatty acids in the same solvent [12].

BTT test is useful to check purity of groundnut oil. BTT values for arachis (groundnut) oil depend on the relative insolubility of arachidic acid (C20:0) in 70% ethyl alcohol (1:2). The high BTT values of groundnut oil compared with the other vegetable oils is due to the insolubility of arachidic acid but due to the lignoceric acid (C24:0) present in the groundnut oil. They concluded that there is no direct relationship between the added lignoceric acid in groundnut oil which is responsible for the high BTT value. However, higher concentrations of lignoceric acid present in oil improve the perception of turbidity[15].

III. MATERIAL AND EXPERIMENTAL PROCEDURES

➢ *Materials*

All the chemicals and reagents were analytical grade and used as received. Six groundnut oils of different brands such as filtered groundnut oil (39.5) (fgn, Snehdrop), Filtered groundnut oil (39.8) (Fgn1,Swadeshi), groundnut oil(39.8) (gn1,Dhanlaxmi),groundnut oil (39.9) (gn2,Ahar) , groundnut oil(40.2) (gn3,GS Gold) and groundnut oil (gn4,Smart swad) were gathered from super market of different places of India and all these brands were in different forms of packaging while some were in poly packs ,jar, tin and tetra pack. Since these six groundnut oils were easily available for procurement. These different groundnut oils are used in the investigations on BTTT in this research study as per the Food product Standard and food additives Regulation 2011.

➢ *Experimental Procedures*

- *Determination of Bellier turbidity temperature acetic acid Method*

Pipette out one ml of the filtered sample of oil in a flat-bottom 100 ml round flask, add 5ml of 1.5 N alcoholic potash heating over a boiling water bath using an air condenser After complete saponification cooling, neutralised by adding carefully dilute acetic acid and then add an extra amount of 0.4 ml of accurately measured dilute acetic acid using phenolphthalein indicator. Add 50 ml of 70% alcohol and mixed well. Heat and allow the flask to cool in air with frequent shaking. Note the temperature by using digital calibrated thermometer at which the first distinct turbidity appears which is the turbidity temperature. This turbidity temperature is confirmed by a little further cooling which results in deposition of the precipitate. Dissolve the precipitate by heating the contents to 50°C over water bath, again cool as desiccated above and make a triplicate determination of the turbidity temperature[11,14].

Sr. No	Item no	Vegetable oil	BTT limits
1	2.2.1.2	Cotton seed oil	19.0 -21.0^{0}C
2	**2.2.1.3**	**Groundnut oil**	**39.0-41.0^{0}C**
3	2.2.1.6	Rape seed oil /Mustard oil (toria oil)	23.0-27.5 ^{0}C
4	2.2.1.7	Rape seed oil or Mustard oil-Low erucic acid	Not more than 19.0^{0}C
5	2.2.1.8	Virgin olive oil	17.0^{0}C Max
		Refined olive oil	17.0^{0}C Max
6	2.2.1.10	Safflower seed oil (barrey ka tel)	Not more than 16.0^{0}C
7	2.2.1.12	Til oil (Gingelly/sesame oil)	Not more than 22.0^{0}C
8	2.2.1.13	Niger seed oil (sargiya ka tel)	25.0-29.0^{0}C
9	2.2.1.17	Almond oil	Not more than 60.0^{0}C

Table 1:- Shows BTT standards/values for some edible vegetable oils under 2.2: Fats, oils and Fat emulsions as per FSSA 2006[13] Source FSSA2006

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The following table shows that the imposition of BTT values to raise the issue pertaining to the discrepancy in BTT for the presence of other vegetable oils (Admixtures of oils) in groundnut oil[18]

Sr. No	Name of Oil	Prosecution name	Year	Under PFA/FSSA Parameter to fail	BTT
1	Groundnut oil	State of Gujrat verses Navalkishore Damodardas Patel	1974	BTT and others	Below the minimum requirement
2	Groundnut oil	State of Gujrat verses Kantilal chimanlal	1979	BTT and others	Below the minimum requirement
3	Groundnut oil	State of M.P. verses Chetumal	1981	BTT and others	Below the minimum requirement
4	Groundnut oil	S.G. Shiva murthyl verses State of Andhra Pradesh	1986	BTT and others	Below the minimum requirement
5	Groundnut oil	State of Rajshathan verses Bajrang lal	1989	BTT and others	Below the minimum requirement
6	Groundnut oil	Sri Bheema oil mills verses state of A.P.	1998	BTT and others	Below the minimum requirement
7	Groundnut oil	Sajjan singh jain and others verses State of Rajasthan	2000	BTT and others	Below the minimum requirement
8	Groundnut oil	Sh. Sanjay sangwan , New Delhi verses food inspectors, New Delhi	2013	BTT and others	Below the minimum requirement
9	Groundnut oil	State of Maharashtra verses Ashok Dalumal Hemanani	2017	BTT and others	Below the minimum requirement

All the above groundnut oil sample did not conform to the standards laid down for the groundnut oil under Prevention of food Adulteration Act 1954 and rules and Food safety standards Act2006 and rules and regulations, thereof, in that BTT values falls below the minimum requirement of 39^0C.

- *Material And Experimental Method*

Sr.No	Name of oil	Brand name	Code	BTTT*	SD	CV%	SEM
1	Filtered groundnut oil	Sneh drop	Fgn	40.5	0.2	0.49	0.12
2	Filtered groundnut oil	Swadeshi	Fgn1	40.5	0.26	0.65	0.15
3	Groundnut oil	Dhanlaxmi	Gn	40.3	0.36	0.89	0.21
4	Groundnut oil	Ahar	Gn1	40.9	0.17	0.42	0.1
5	Groundnut oil	GS gold	Gn2	40.8	0.2	0.49	0.12
6	Groundnut oil	Smart swad	Gn3	40.4	0.22	0.55	0.13

Table 3:- BTTT of different groundnut oils with accuracy on BTT

* Each value is averages of three measurements, SD-standard deviation, CV-coefficient of variance, SEM-standard mean error. All the above brands tested having shelf life of oil between 6months and 12 months.
Descriptive Statistics of different brands of filtered groundnut oils from different parts of India as shown in figure1and 2

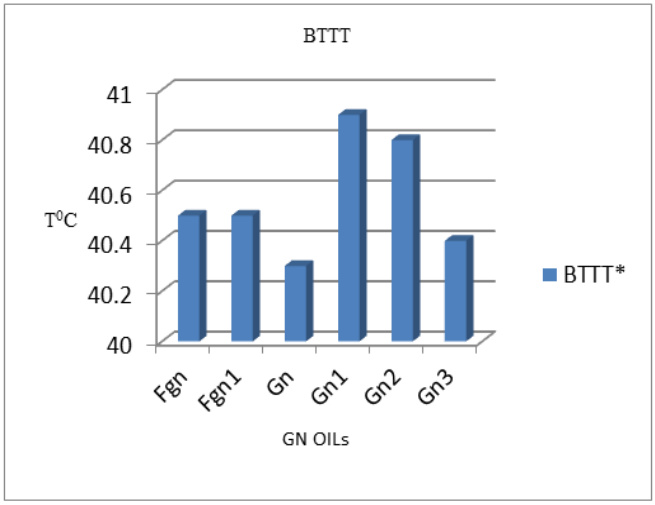

Fig. 1:- shows the BTTT values for different groundnut oil

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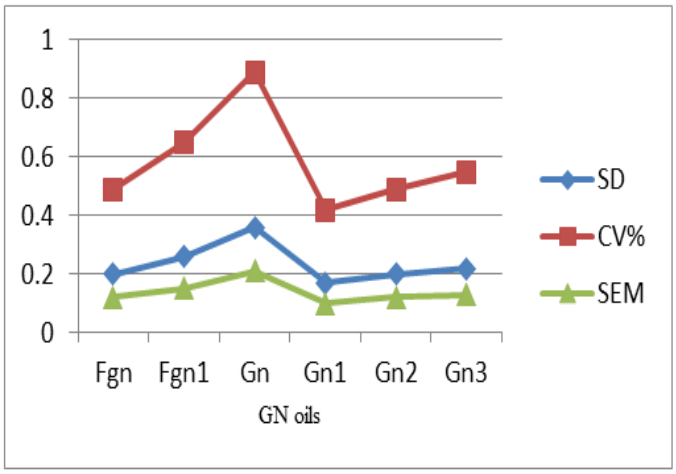

Fig. 2:- shows the statistical parameters for different groundnut oil

IV. STATISTICAL ANALYSIS

The data obtained from the experimental measurements and accuracy of BTTT for different brands of refined Groundnut oils have been analyzed and the Statistical parameter like standard deviation, coefficient of variance and standard mean error were calculated for both the parameters. All the experiment was carried out in triplicate and the results are presented as the mean SD, CV and SEM. Descriptive Statistics of different groundnut varieties from different parts of India as shown in figure1 and 2.

V. RESULT AND DISCUSSION

BTT standards/values for some edible vegetable oils under 2.2: Fats, oils and Fat emulsions as per Food Safety and Standard Act 2006 and food product standards and food additives Regulation 2011 as shown in table1[13].The prescription of the BTT test created some example of prosecution under prevention of food adulteration act 1954 and food safety act, rules and regulations 2011 and shows that the imposition of BTT values to raise the issue pertaining to the discrepancy in BTT for the presence of other vegetable oils (Admixtures of oils) in groundnut oil[11] The results obtained for BTTT for the groundnut oils from five different brands of groundnut oil from different places of India are shown in **Table3**. Fgn (40.5),Fgn1(40.5),Gn(40.3),Gn1(40.9),Gn2(40.8)and Gn3(40.4) displayed BTT in the range of 40.3 to 40.9°C.As all the reported BTTT values are average of three readings, the results have demonstrated the reproducibility of the analysis data. Thus the present investigations prove with due certainty the applicability of BTTT to all eight groundnut oils. **Table 3** shows the accuracy, In case of the standard deviation and variation coefficient is in the range of 0.17-0.36 and 0.42-0.89.

VI. CONCLUSION

In this study BTTT is applied on groundnut oils and found that BTTT can be easily used as qualitative tool for identification of purity of groundnut oil from different places of India. The present investigations prove with due certainty about applicability of BTTT to all five groundnut oils. This study also confirms prove reliability, reproducibility and diverse applicability of BTTT.

LIMITATION

BTTT is qualitative tool for identification of purity of different vegetable oils and due to seasonal variations on BTTT, Hence Quantitative test should be essential and BTTT analysis can be easily supplemented with GC and HPLC analysis, which provide the quantitative data on presence of high molecular weight fatty acids in groundnut oils.

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