International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 08, August-2019

Estimation of Genuinity of Different Brands of Groundnut Oil Available in Markets of India using Bellier Turbidity Temperature Test (BTTT)

Dr. Shashikant Pardeshi
Scientific officer and Food analyst,
D.P.H.L., Jalgaon, Maharashtra,
India

***Abstract*— In this study an attempt has been made to investigate the applicability of BTTT to groundnut oils obtained from different parts of India and thereby examine the influence of geographical variations on BTTT. In the present work, different brands of filtered groundnut oils used for analysis, such as Filtered groundnut oil (Fgn, Pankaj), Filtered groundnut oil(Fgn1,Gulab), Filtered groundnut oil(Fgn2,Maruti),groundnut oil (Gn, Patanjali), groundnut oil(Gn1, Natureland) and groundnut oil(Gn2, KTC) exhibited BTT in the range of 40 to 40.8^{0}C. *The* result have demonstrated the reproducibility through the analyzed data. Hence It is observed that groundnut oil fulfils BTTT values as per Regulation (Food Products and Standards) 2011 of Food Safety Standards and Act 2006. The standard mean error is in between 0.12-0.23 in case of BTT. BTT values prescribed for the certain vegetable oils comes under the mandatory food laws in some countries but due to development towards hybridization in oil seeds, reconsideration in laws is required.**

***Keywords*— Vegetable oil, groundnut seed oil, BTTT**

I. INTRODUCTION AND OBJECTIVE

A groundnut (which is also a legume) is part of the economy of many countries such as the United States, India, China, Russia and Mexico, among others. Most of the peanut crop is processed into peanut butter, salted peanuts, candies and snacks. The peanut grain is converted into oil and cake in other countries, such as some in Africa in addition to India and China, where most of the world's peanut cultivation is performed[1]. The storage and nutritional quality (and flavor) of peanuts can be affected by the fatty acid composition of its oil. The oleicto-linoleic acid ratio is considered to be an indicator of peanut oil stability, and it is a shelf-life index for industrial applications[2-3]. The higher the oleic/linoleic ratio, the more stable the oil. A negative correlation between oleic and linoleic acids has been reported in peanuts[7].Variations in climatic conditions affect the oleic/linoleic acid ratio. The oil composition is affected by the production location, cultivar and climate (primarily the soil humidity and temperature)[4-6].

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, unsaponifiable 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. 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 neutralized 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 filtered 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 fatty acids, geographical location, seasons and growing conditions[8].The reported changes on the chemical composition as a result of

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 08, August-2019

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].

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. Eight groundnut oils of different brands such as Refined groundnut oil (Rgn, fortune, goldnut), Refined groundnut oil (Rgn1,Dalda), Refined groundnut oil (Rgn2,RRO primio),Refined groundnut oil (Rgn3,Postman), Refined groundnut oil (Rgn4, Vimal),groundnut oil (Gn, Patanjali), groundnut oil (Gn1, Natureland) and groundnut oil (Gn2, KTC) 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 and tetra pack. Since these nine 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].

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

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

Source FSSA2006

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	Ground nut oil	M/S Madan mohan Damma ltd verses state of West Bengal	1961	BTT and others	Below the minimum requirement
2	Ground nut oil	S.G. Shiva murthyl verses State of Andhra Pradesh	1986	BTT and others	Below the minimum requirement
3	Ground nut oil	Sajjan singh jain and others verses State of Rajasthan	2000	BTT and others	Below the minimum requirement

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 08, August-2019

4	Ground nut oil	State of Maharashtra verses Ashok Dalumal Hemanani	2003	BTT and others	Below the minimum requirement
5	Ground nut oil	Sh. Sanjay sangwan , New Delhi verses food inspectors, New Delhi	2013	BTT and others	Below the minimum requirement

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

Sr. no	*Name of oil*	*Brand name*	*Code*	*BTT T**	*SD*	*CV %*	*SEM*
1	Filtered groundnut oil	Pankaj	Fgn	40.2	0.35	0.86	0.2
2	Filtered groundnut oil	Maruti	Fgn1	40.5	0.4	0.98	0.23
3	Filtered groundnut oil	Gulab	Fgn2	40	0.26	0.66	0.15
4	Filtered groundnut oil	Postman	Fgn3	40.1	0.36	0.89	0.2
5	Filtered groundnut oil	Vimal	Fgn4	40.2	0.36	0.86	0.2
6	Groundnut oil	Patanjali	Gn	40.8	0.35	0.86	0.2
7	Groundnut oil	Naturel and	Gn1	40.6	0.2	0.49	0.12
8	Groundnut oil	KTC	Gn2	40.4	0.26	0.64	0.15

All the above brands tested having shelf life of oil between 6months and 12 months * each value is averages of three measurements, SD-standard deviation, CV-coefficient of variance, SEM-standard mean error.

Descriptive Statistics of different brands of filtered groundnut oils from different parts of India as shown in figure1and 2

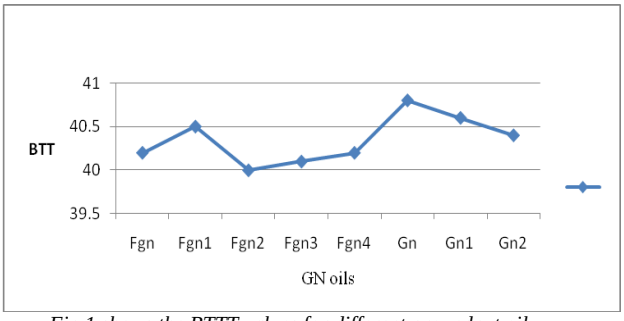

Fig.1 shows the BTTT values for different groundnut oil

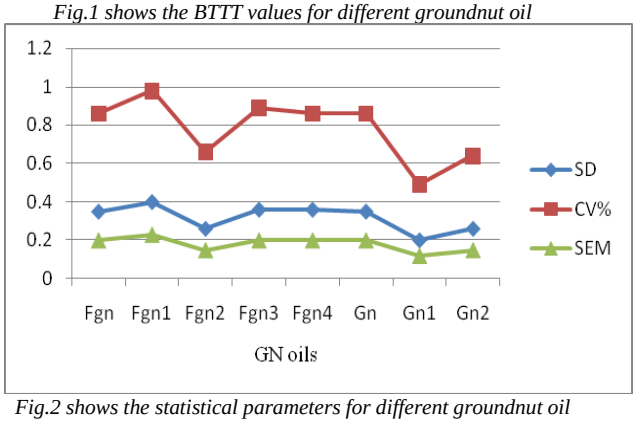

Fig.2 shows the statistical parameters for different groundnut oil

IV. STATISTICAL ANALYSIS

The data obtained from the experimental measurements and accuracy of BTTT for different brands of filtered 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 eight different brands of groundnut oil from different places of India are shown in **Table3**. Rgn(40.2),Rgn1(40.5),Rgn2(40.0),Rgn3(40.1),Rgn4(40.2),Gn(40.8),Gn1(40.6) and Gn2(40.4) displayed BTT in the range of 40.0 to 40.8°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 0.2-0.4 and 0.49-0.98.

VI. FUTURE PROSPECTS

Wherever required, BTTT analysis Quantitative test should essential and 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. because BTTT depends on the presence of arachidic acid and other higher acids in groundnut oil.

VII. CONCLUSION

The BTTT method is cheaper, easier, requires little laboratory infrastructure and recognised as a convenient qualitative tool for identification of different variety of oils. 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 eight groundnut oils. This study also confirms prove reliability, reproducibility and diverse applicability of BTTT.

REFERENCES

[1] R Ortega and Ochoa, R.,El cacahuate y su potencial productive en México [The peanuts and their potential production in Mexico].Claridades Agropecuarias, 4, 3–15, 2003.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 08, August-2019

[2] Campos-Mondragón, M. G., Calderón de la Barca, A. M., Durán-Prado, A., Campos-Reyes, L. C., Oliart-Ros, R. M., Ortega- García, J.,Angulo, Nutritional composition of new peanut (Arachis hypogaea) cultivars. Grasas y Aceites,60, 161–167, 2009.

[3] G. E.Bolton & Sanders, T. H., Effect of roasting oil composition on the stability of roasted high-oleic peanuts. Journal of the American Oil Chemists' Society, 79, 129–132, 2002.

[4] N. R Grosso & Guzman, C. A., Chemical composition of aboriginal peanut (Arachis hypogaea L.) seeds from Peru. Journal of Agricultural and Food Chemistry, 43, 102–105, 1995.

[5] N. R.Grosso, Lamarque, A., Maestri, D. M., Zygadlo, J. A., & Guzman, C. A. Fatty acid variation of runner peanut (Arachis hypogaea L.) among geographic localities from Córdoba (Argentina). Journal of the American Oil Chemists Society, 91, 541–542, 1994.

[6] Rosalva Mora-Escobedo, Patricia Hernández-Luna, Ignacio C. Joaquín-Torres, Alicia Ortiz-Moreno & María del Carmen Robles-Ramírez Physicochemical properties and fatty acid profile of eight peanut varieties grown in Mexico, CyTA - Journal of Food, 13:2, 300-304, 2015.

[7] F. U. Hassan & Ahmed, M., Oil and fatty acid composition of peanut cultivars grown in Pakistan, Pakistan Journal of Botany, 44, 627–630, 2012.

[8] A. Adeyeye and Ajewole K Chemical Composition and Fatty acid profiles of cereals in Nigeria. Food Chem. 44: 41-44, 1992.

[9] V.Y Barku., Nyarko, H. D., and Dordunu, P.,Studies on the Physicochemical Characteristics, Microbial Load and Storage Stability of Oil from Indian Almond Nut (Terminalia Catappal.), Food Science and Quality Management, 8, 9-17, 2012.

[10] CMIE**,** India's agricultural sector: A Compendium of statistics, Bombay, India: Centre for Monitoring Indian Economy Pvt. Ltd, 2000.

[11] DGHS**,** Directorate General of Health Services, Manual of methods of analysis of foods (Oils and Fats) Food Safety and Standards Authority of India.(**FSSAI**), Ministry of health and family Welfare, Government of India, New Delhi, 2012.

[12] C.M. Desai, Turbidity Temperature of oils as determines by Belier's Test and Its significance as an Analytical constant, current science, 16(3), 92-94, 1947.

[13] FSSA 2006**,**Food safety and standards Act 2006, Rules 2008, Regulations 2011, 8th edition , Professional book publishers, New Delhi, India, 2014.

[14] I.S.I., Indian Institution of standards, Bellier Turbidity Test, Handbook of food analysis and (part XIII)90, 1984.

[15] M.N. Krishnamurthy ,S. Rajlaxshmi ,O.P. Kapur Influence of higher saturated fatty acids on the BTTT values of vegetable oils .,Journal of American oil chemists socoity,62(11),1606, 1985.

[16] Musa Özcan and Serap Seven., Physical and chemical analysis and fatty acid composition of peanut, peanut oil and peanut butter from ÇOM and NC-7 cultivars, Grasas y Aceites ,54(1),12-18, 2003.

[17] Norman Evers., The detection of archis oil in olive and almond oil, Analyst 62:96, 1936.

[18] www.indian kanoon.com, Court cases under PFA/FSSA regarding belier turbidity test w. r. to groundnut oil in India assessed on www Google.com.