

# Assessing the purity of different brands of mustard oils available in markets of India through Bellier Turbidity Temperature Test (BTTT)

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**Abstract:** The BTTT method is cheaper and easier requires little laboratory infrastructure and represent a convenient tool can be easily used as qualitative tool for identification of purity of mustard oil from different places of mustard oils used for analysis, such as mustard oil (Mu, Krishna), Kacchi ghani mustard oil (Kgmu, Kisan) Kacchi ghani mustard oil (Kgmu1, Appu), Kacchi ghani mustard oil (Kgmu2, Saatwik) and Pure Kacchi ghani mustard oil (Pkgmu, Anjali gold) exhibited BTT in the range of 26.9 to 27.5 °C. In the present work, an attempt has been made to investigate the applicability of BTTT to mustard oils obtained from different parts of India and thereby examine the influence of geographical variations on BTTT. The result have demonstrated the reproducibility through the analyzed data. Hence It is observed that mustard 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 0.06-0.12 in case of BTT.

**Index Terms:** Vegetable oil, mustard seed oil, BTTT

## 1. INTRODUCTION AND OBJECTIVE

Edible oilseeds are an essential part of Indian agriculture and contribute more than 10 percent to agriculture GDP. Soybean, mustard and rapeseed-mustard are the major oilseed crops in India contributing nearly 79% and 88% to its total acreage and production, respectively. During 2012-13, rapeseed-mustard contributed 24.2 % to the total oilseeds production. Globally, India account for 19.29 % and 11.27% of the total area and production of mustard [1,2]. Vegetable oils consists primary a large molecules are called triglyceride of fatty acids. Triglycerides are insoluble in water and greasy to touch. They are extracted from seeds of plants such as sunflower, soybean, mustard and mustard oil. Vegetable oils are used for various purposes like for cooking, for industrial use, for pet food additive etc. In India vegetable oil are widely used in frying, baking and other types of cooking. It is also used in food preparation and flavoring such as salad dressing etc. So it is also term as edible oil. Cooking oil like sunflower, soybean oil, mustard oil, mustard oil containing polyunsaturated and monounsaturated fatty acids like linoleic acid, linolenic acid and oleic acid, although some oils that contains saturated fat, such as coconut oil, palm oil are solid. Lipid comprise a group of naturally occurring molecules that includes fats, waxes, sterols, fat soluble vitamins such as vitamin A, D, E and K, monoglycerides, diglycerides, triglycerides, phospholipids and others. Lipid may define as hydrophobic small molecules. Lipids also encompass molecules such as fatty acids and their derivatives including mono, di and triglycerides [3].

The characterisation of fats and oils is dictated by some distinct physical and chemical parameters like texture, density refractive index, specific gravity, iodine value, colour, essential content, unsaponifiable composition, acid value, Free fatty acid content, peroxide value, P-anisidine value and BTT etc are dependent on the source of oil; geographic, climatic, and agronomic variables of growth of the oil helps to determine its conformity as safe and standard edible oil by which the purity check of mustard oil can be done. Thus one must assess quantitatively the influence of these variables on characteristics of oils and fats; in present case on characteristics of mustard oil, **Bellier Turbidity Temperature Test (BTTT)** (acetic acid method), based on insolubility of Arachidic acid (1.13%) is used as a qualitative method for identification of pure mustard oil. Sometimes it is observed that mustard oil fulfils all specifications of refined oil but fails to pass BTTT. is used as a qualitative method for identification of pure mustard oil. Moreover mustard 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 instead 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 mustard oil in the mixture. The increase is not proportional and there is a steep rise for the % of mustard oil below 25 % [4].

The objective of the present studies was to investigate and assessing the purity with the applicability of BTTT to different brands of mustard oils obtained from different parts of India and thereby examine the influence of geographical variations on BTTT as tool for identification of mustard oil.

## 11. LITERATURE REVIEW

Mustard seed is the second most important oil seed crop in India after soybean. It accounts for nearly 20-22% of the total oilseeds produced in the country. Mustard seed is grown with a different consumption pattern in the country. Indian mustard is mainly used for extraction of mustard oil while black mustard is mainly used as a spice. Mustard oil processing in India is an unorganized business. There is 7,000-9,000 oil extracting units out of which only 20 per cent are registered in the organized sector. The industry has an installed capacity to process 23 lakh tonnes annually. Mustard oil consumption is increasing at a rate of 20 per cent every year. Demand for mustard oil comes from rural areas and is consistent owing to its multi-uses. The rapeseed-mustard varieties/hybrids contain 40-45 per cent oil. But its recovery, realized by the mechanical crushing processor (oil expeller) the largest segment of edible oil processing industries, is up to 35 per cent only. Under this process of oil extraction, substantial amount of oil (5-10 per cent) is left in the rapeseed-mustard seed meal. Even if 3-4 per cent of this leftover oil can be extracted by modernizing the mechanical crushing units, then at least 2-2.5 lakh tonnes additional edible oil could be made available. The industry requires modern technology and also appropriate technology to reduce the content of erucic acid and pungency to make the oil more acceptable among consumers and tap export potential[3,4].

Brassica juncea L seed has potential for use alternative source of industrial oil for shampoo, soap making and pharmaceutical creams, capsules, emulsions, fragrances, flavors, intramuscular injections, nasal sprays, ointments, plasters, and in a number of cosmetics. In addition they are also used in large quantities as raw material for bio-resources. The fatty acid profile of Brassica juncea L seed oils were determined while oleic and linoleic are most prominent fatty acids in these oils, they also contain significant amounts of saturated fatty acids [5].

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 [2].

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 mustard and mustard 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 [6].

Table-1 Shows BTT standards/values for some edible vegetable oils under 2.2: Fats, oils and Fat emulsions as per FSSA 2006[8]

Sr.no	Item no	Vegetable oil	BTT limits
1	2.2.1.2	Cotton seed oil	19.0 -21.0°C
2	2.2.1.3	Groundnut oil	39.0-41.0°C
3	2.2.1.6	<b>Rape seed oil Mustard oil (toria oil)</b>	<b>23.0-27.5 °C</b>
4	2.2.1.7	<b>Rape seed oil or Mustard oil-Low erucic acid</b>	<b>Not more than 19.0°C</b>
5	2.2.1.8	Virgin olive oil	17.0°C Max
		Refined olive oil	17.0°C Max
6	2.2.1.10	Safflower seed oil (barrey ka tel)	Not more than 16.0°C
7	2.2.1.12	Til oil (Gingelly/sesame oil)	Not more than 22.0°C
8	2.2.1.13	Niger seed oil (sargiya ka tel)	25.0-29.0°C
9	2.2.1.17	Almond oil	Not more than 60.0°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 mustard oil[10]

Sr. No	Name of Oil	Prosecution name	Year	Under PFA/FSSA Parameter to fail	BTT
1	Mustard oil	State of U.P. verses SatyaNarayan Umar	2015	BTT and others	Exceed the maximum requirement
2	Mustard oil	Balkrinshna verses state of Delhi administration	2014	BTT and others	Exceed the maximum requirement
3	Rapeseed oil	Rakeshkumar Arora verses State of Delhi administration	2014	BTT and others	Exceed the maximum requirement
4	Mustard oil	Mahindar Prakash , New Delhi administration	2014	BTT and others	Exceed the maximum requirement
5	Mustard oil	Gori Shankar verses states of Rajasthan	1974	BTT and others	Exceed the maximum requirement

All the above Mustard oil sample did not conform to the standards laid down for the mustard 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 above the maximum requirement of 27.5°C.

### III. MATERIAL AND EXPERIMENTAL PROCEDURES

#### Materials

All the chemicals and reagents were analytical grade and used as received. Five mustard oils of different brands such as mustard oil (Mu, Krishna), Kacchi ghani mustard oil (Kgm, Kisan) Kacchi ghani mustard oil (Kgm1, Appu), Kacchi ghani mustard oil (Kgm2, Saatwik) and Pure Kacchi ghani mustard oil (Pkgmu, Anjali gold) were gathered from super market of different places of India. all these brands were in different forms of packaging while some were in poly packs ,jar, tin and tetra pack. Since these five mustard oils were easily available for procurement. These different mustard oils are used in the investigations on BTTT in this research study.

#### Experimental methodology

##### 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 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 [7,9].

**Table 2: BTTT of different mustard oils with accuracy on BTT**

Sr.No	Name of oil	Brand name	Code	BTTT*	SD	CV	SEM
1	Mustard oil	Kcrishna	Mu	27.2	0.21	0.77	0.12
2	Kacchi ghani mustard oil	Kisan	Kgm	27.4	0.17	0.63	0.09
3	Kacchi ghani mustard oil	Appu	Kgm1	26.9	0.17	0.63	0.09
4	Kacchi ghani mustard oil	Saatwik	Kgm2	27.3	0.2	0.73	0.12
5	Pure Kacchi ghani mustard oil	Anjali gold	Pkgmu	27.5	0.1	0.36	0.06

\* Each value is averages of three measurements, SD-standard deviation, CV-coefficient of variance, SEM-standard mean error

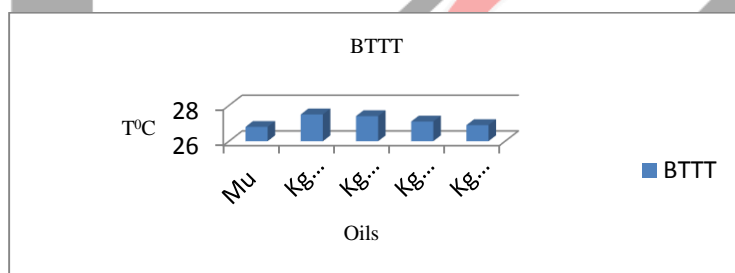


Fig.1 shows the BTTT values for different Mustard oil

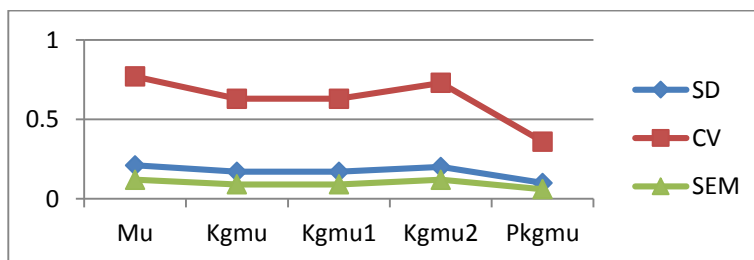


Fig.2 shows the Statistical values for different Mustard oil

#### IV. STATISTICAL ANALYSIS

The data obtained from the experimental measurements and accuracy of BTTT for different brands of mustard 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 mustard varieties from different parts of India as shown in figure1 and 2.

#### V. RESULT AND DISCUSSION

The results obtained for BTTT from the mustard oils obtained from different places of India are shown in **Table3**. 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 mustard oil [10]. The results obtained for BTTT for the mustard oils from five different brands of mustard oil from different places of India are shown in **Table3**. The data obtained from Mu(27.2), Kgmu (27.4), Kgmu1(26.9), Kgmu2(27.3) and Pkgmu (27.5) displayed BTT in the range of 26.9 to 27.5°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 seven mustard seed varieties. **Table 3** shows the accuracy, the standard deviation and coefficient is in between 0.1-0.21 and 0.36-0.77.

#### VI. RECOMMENDATION

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.

#### VII. CONCLUSION

The present investigations prove with due certainty about applicability of BTTT to all five mustard oils. This study also confirms prove reliability, reproducibility and diverse applicability of BTTT. Further investigations may be required to analyses the influence of seasonal variations on BTTT. Wherever required, 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 mustard oils.

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