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STUDIES ON THE CHEMICAL CHARACTERISTICS OF GROUNDNUT OIL

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ABSTRACT

Vegetable oil had made an important contribution to the diet in many countries. Its constitute one of the essential components of balanced diet as good source of energy. The chemical and physical properties of oils are amongst the most important properties that determine the quality and help to describe the present condition of oils. The groundnut oil from different manufactures was bought at a local market in Rajkot city, Gujarat and it was analyzed for chemical properties, such as: iodine, acid, saponification value and minerals. The chemical analysis of the iodine values shows that sample 1 was slightly higher compared to others. The saponification value ranged from 86 to 139 mgKOH/gm. The study indicated that groundnut oil, those from the Gujarat area may have a higher shelf life, nutritional value and industrial applications.

Keywords: Analysis, Chemical properties, Groundnut oil.

INTRODUCTION

Oils from nut are both edible and non-edible depending on the type. These oils are often available as raw materials for chemical and industrial applications. Nuts provide an interesting nutritional supply due to their high nutritive and energetic value. However, their high fatty content makes them unattractive for new consumers demanding “light”, low-fatty foods. Among nuts, almonds have a significant economic importance [1]. A groundnut (*Arachis hypogaea*) is a legume which is widely grown as a food crop. It is an herbaceous plant of which there are different varieties such as Boro light, Boro Red, Mokwa, Campala, Guta and Ela [2]. Peanut is an important source of edible oil for millions of people living in the tropics. Edible oils from plant sources are of interest in various food and application industries. They provide characteristics flavours and textures to food as integral diet components [3]. And can also serve as a source of oleo chemicals [4]. Beside income for farmers, groundnut provides an inexpensive source of high dietary protein and oil. The special taste and flavor of foods containing groundnut is important in the acceptance of these food preparations [5]. The oil content of groundnut differs in quantity, the relative proportion of fatty acids, geographical location, seasons and growing conditions [6]. Groundnut seed contains 44 to 56 % oil and 22 to 30 % protein on a dry seed basis and is a rich source of minerals (phosphorus, calcium, Magnesium and potassium) and vitamins E, K and B group [7].

Groundnut protein is increasingly becoming

important as food and feed sources, especially in developing countries where protein from animal sources are not within the means of the majority of the populace [8]. Groundnut seeds are reported to contain 9.5 to 19.0 % total carbohydrates as both soluble and insoluble carbohydrate [9,10]. The chemical composition of groundnut seeds has been evaluated in relation to protein level [11] and fatty acid composition [12] in several countries.

Vegetable oil had made an important contribution to the diet in many countries, serving as a good source of protein, lipid and fatty acids for human nutrition including the repair of worn out tissue, new cells formation as well as a useful source of energy [13]. Vegetable oils are in high demand due to diseases associated with fat from animal origin. The seed has several such as peanut butter, oil, and other products. The groundnut cake has several uses in feed and infant food formulations [5]. The literature has reported many health benefits associated with consumption of peanuts including cancer inhibition. This benefit is mainly attributed to micronutrients such as α -tocopherol, folate, minerals and health promoting phytochemicals, particularly resveratrol, ferulic acid and other phenolic compounds [14], Barku et al [1] have 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 aim of this study was to investigate the nutritional composition and chemical composition in Groundnut oil.

METHODOLOGY

Sample collection

The groundnut oil from different manufactures was bought at a local market in Rajkot city, Gujarat and transported to the Laboratory for further analysis. The groundnut oil was divided into three samples each from three different varieties.

Determination of the Chemical Characteristics of the oils

The Groundnut oil was analyzed for chemical properties, such as: iodine, acid, saponification value and minerals.

Acid value

Acid value was determined by titrametric method of Pearson [15]. 5 gm of oil sample was weighted and 75 ml of hot neutral alcohol was added with a few drops of phenolphthalein. The mixture was shaken vigorously and titrated with 0.1 M NaOH solution with constant shaking until the pink coloration remains permanent. Acid value was calculated using the formula

$$\text{Acid value} = \frac{V \times 5.6}{\text{Weight of sample}}$$

Where V = titration end point value

Iodine value

The iodine value of an oil/fat is the number of grams of iodine absorbed by 100g of the oil/fat, when determined by using Wijs solution. Iodine value was determined according to the titrimetric method of Pearson [16]. 2 gm of oil sample was weighted into a dry glass stopper bottle of 250 ml capacity and 10 ml of carbon tetrachloride was added to oil. About 20 ml of Wij's solution was then added and allowed to stand in dark for 30 minutes. 15 ml of (10 %) Potassium Iodide and 100 ml of water was added and then titrated with 0.1 M Sodium thiosulphate solution using starch as indicator just before the end point. A blank was also prepared alongside the oil samples. Iodine was calculated using formula

$$\text{Iodine value} = \frac{(V_2 - V_1) \times 1.269}{\text{Weight of sample}}$$

Where, V_2 = titrated value for blank, V_1 = titrated value for sample

Saponification value

The saponification value was determined according to the titrimetric method of Pearson [15]. 2 gm of sample was weighted into a conical flask and 25 ml of alcoholic potassium hydroxide was added. Solution was heated in boiling water for 1 hrs. 1 ml of 1 % Phenolphthalein was added and titrated with 0.5 N HCl. A blank was also prepared alongside the oil samples. The saponification value was calculated by the formula

$$\text{Saponification value} = 56.1 N (A - B) / W$$

Where, N = Normality of HCl acid used, A = volume of H_2SO_4 for blank, B = volume of H_2SO_4 for sample, 56.1 = equivalent weight of potassium hydroxide, W = weight of oil used.

Determination of the presence of mineral

The presence of mineral oil in vegetable oil was carried out according to Pearson [15]. 10 ml of the sample and 0.5 M alcoholic KOH was added into 5 ml testtube. It was then heated in a boiling waater bath with frequent agitation to ensure complete reaction. 0.5 ml of water was added to the hot solution at a time and until 10 ml had been added altogether.

RESULT AND DISCUSSION

Vegetable oil now constitutes a major component of daily diet consumption and growth in market is now considered on the basis of functionality, economy and acceptability [2]. The results of chemical analysis of groundnut oil are shown in Table 1. The determination of physical and chemical values is often used as a general indication of the condition and edibility of oil. The acid value is defined as the number of milligrams of potassium hydroxide required to neutralize the free fatty acids present in one gram of fat. It is a relative measure of rancidity as free fatty acids are normally formed during decomposition of oil glycerides. The value is also expressed as percent of free fatty acids calculated as oleic acid. Acid values are used to measure the extent to which glyceride in the oil has been decomposed by lipase and other actions such as light and heat. The chemical analysis of the iodine values shows that sample 1 was slightly higher compared to others (Table 1). The high iodine value denotes high degree of unsaturation of the oil caused by the extent of oxidation and degree of heat treatment during oil processing [17].

From the present investigation, highest saponification value was found in sample 1. The saponification value ranged from 86 to 139 mg KOH/gm. High saponification value indicated the presence of greater number of ester bonds, suggesting that the fat molecules were intact [18]. The refined oils had significantly low saponification value compared to locally produced oils. It was also reported from the present study that there was no rancidity of oil sample in the course of this study while minerals were present in all the samples. The good availability of minerals such as calcium, magnesium, phosphorus is a good indicator that the groundnut is rich in the minerals for bone formation. Calcium is very essential in blood clotting, muscles contraction and in certain enzymes in metabolic processes. Groundnut oil samples analyzed have good and nutritional valuable minerals whose importance had already been emphasized [19, 20]. However, the availability of these nutrients after ingestion depends on the antinutritional factors present in the food.

Table 1. Chemical analysis of Ground nut oil

Parameter	Unit	Groundnut oil		
		Sample 1	Sample 2	Sample 3
Acid value	mgKOH/g	1.683	1.348	1.436
Iodine value	wij's	0.5076	0.5025	0.499
Saponification	mgKOH/g	139	102	86
Mineral	-	Present	Present	Present

CONCLUSION

This study indicated that ground nut oil, those from the Gujarat area may have a higher shelf life, nutritional value and industrial applications. Groundnut oil can be used for different purposes such as nutritional, medicinal and industrial only if correctly treated and selected. Since, some

treatments for groundnut oil does not decreased the levels of the mineral elements but it rather increases the levels of said elements, therefore groundnut oil is a good source of protein and minerals which can be used in diets to prevent against some mineral deficiencies.

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