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Chemical and Physico-Chemical Evaluation of Sesame Brittle Produced with Date Syrup

Nwosu, Adaora Ngozi*[1], Aniagor, Ebele Nwamaka[1], Amonyeze, Ahunna Onyinyechi[1], Mamah, Emmanuel Ekwumchi[1]

[1]Department of Food Science and Technology. University of Nigeria, Nsukka
adaora.nwosu@unn.edu.ng, Ebele.aniagor@unn.edu.ng, Ahunna.amonyeze@unn.edu.ng, emmanuelmamah@yahoo.com

Corresponding Author: adaora.nwosu@unn.edu.ng

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Abstract
Sesame brittle is a crunchy traditional popular snack in Nigeria, especially in the North. Sesame seeds were processed by winnowing, sorting, washing, draining, drying, toasting, cooling and packaging. Date syrup was produced from date fruits, which were sorted, washed, soaked in water for 2hours, deseeded, boiled, filtered, squeezed, heated to evapourate excess water until a thick consistency was formed. Sesame brittle was produced by incorporation of toasted sesame seed into the already prepared syrup, followed by, molding, cooling, cutting and packaging. Four samples of sesame brittle were produced three samples comprised of sesame seeds and date syrup in the following ratios 200:150,150:150, 100:150 designated as SBBA2, SBBB3 and SBBC4 respectively and a control sample made from sugar syrup: sesame seed (200:150) (SBA1) The chemical composition and physico- chemical, properties of sesame brittle were determined. Proximate composition of sesame brittle showed significant ($p<0.05$) differences existed among samples. Protein content ranged from 4.22-8.76%, carbohydrate content ranged from 52.24- 70.14%, and the energy levels ranged from 230.78-348.47kcal/100g. PH ranged from 5.10-6.00, total sugar 5.21-5.98%, and reducing sugar 3.31-3.55%, with significant ($p<0.05$) differences. In phytochemical composition significant ($p<0.05$) differences existed, phenol content ranged from 3.91-9.17g/100g, flavonoids ranged from 15.15-23.10g/100g, and phospholipids ranged 1.65-2.06g/100g.

Keywords: Sesame brittle, Date, Syrup, Sugar, Phytochemical

Introduction
The growing concern of populace for health and wellness has increased demand for foods lower in calories (Manickvasagan *et al*., 2017). For this reason, a lot of inventions have concentrated on substituting refined sugar, or table sugar with natural sugars like honey, date, jaggery, among others. These may be utilized in foods that are liquid, semi-solid, or solid. Natural sugars (unrefined sugar) contain a number of bioactive substances that improve endothelial function and reduce inflammation. Therefore, the use of sugar from natural sources such as date syrup, jaggery, corn syrup, marple syrup among others is being encouraged since they have demonstrated to be healthier in contrast to refined

sugars (Arshad *et al*., 2022).

A natural sweetener made from date fruit is date syrup it is a concentrated liquid form of date sugar (Shahein *et al*., 2022). In food processing, dates are increasingly being used in place of refined sugar. Date syrup, which is made from date fruit, is used to a variety of food items, make including jams, marmalades, concentrated drinks, chocolates, ice cream, and snacks. Date syrups are low in fat and protein but abundant in sugars, primarily fructose and glucose, and antioxidants. Numerous minerals, including potassium, phosphorus, magnesium, salt, iron, and calcium, are also abundant in it.

The tiny, flat, oval seeds of sesame (*Sesamum indicum*) have a nutty flavour. It is a significant oil seed that is said to have come from Africa. In Nigeria, sesame is often called 'Ridi' in Hausa, 'Ekuku' in Igbo, and 'Isasa' in Yoruba. It serves as a staple food for numerous ethnic groups in Nigeria and is widely cultivated across much of the Middle Belt as well as in several northern states. The seeds are eaten fresh, toasted or dried. It is also processed into a paste that is incorporated into certain traditional soups. Sesame is categorized into white, black, and yellow varieties, with black and white types being the most prevalent and extensively cultivated. The black variety is characterized by strong growth potential and drought tolerance, whereas the white variety is distinguished by its high oil content and the widest area of cultivation and distribution (Banerjee and Kole, 2009).

Sesame brittle, is a candy made by heating sugar syrup and combining it with sesame seed (Yadav, 2019). It is a crunchy sweet snack. In Nigeria, it is a popular traditional snack especially in the north and it has a unique taste and flavour. (Anon, 2023). Sesame brittle is nutritionally beneficial. It plays vital role in bowl movement, supporting immune system against infection and equally helps in healthy bone formation (Godwin, 2022), This study seeks to investigate the potentials of date syrup as a replacer of artificial sugar in sesame brittle production.

Materials and Methods

Sample Collection

Sesame seeds and date fruit, were purchased from Aliade main market in Kogi State, Nigeria. Other ingredients such as baking soda and salt were purchased from Ogige market in Nsukka, Enugu State.

Sample Processing

Processing Sesame Seeds

Sesame seeds (2kg) were winnowed manually to reduce dust, then sorted to remove other extraneous materials, then washed, drained and sun dried (4hours) then toasted using a manual grain toaster at 40°C for 3 minutes, cooled and packaged in air tight jars before use.

Production of Date Syrup

This date syrup was made using Ghimin *et al.* (2017) approach. Mature date fruits, (3kg) free from physical damage was selected. The dates were washed and allowed to soak in four liters of water for two hours to soften. After two hours, the soaked dates were deseeded and transferred into a stainless pot and boiled at 100°C for 15 minutes and then left to simmer for 30 minutes. After which the cooked date was filtered through a cheese cloth and hand pressed to remove the liquid. The liquid was returned to the saucepan and excess water was allowed to evapourate until a thick consistency was formed.

Production of Sesame Brittle

The toasted sesame seeds (150g) were added to the different proportions of date syrup (200ml, 150ml and 100ml) while for the control sample 150g of sesame seeds was added to 200mls of sugar syrup. Other ingredients such as salt (4g) and baking powder (5g) were also added to each. The hot mixture was then poured into stainless tray lined with baking paper and leveled using a rolling pin. The formed sesame brittle was allowed to cool for 2hrs to harden, and then cut using a knife. The final products were then packaged in zip lock bags stored in covered bucket for analysis. Tables 1 shows the formulation table for sesame seeds and date syrup. Table 2 shows the recipe for the production of sesame brittle.

Chemical Analysis

Proximate Analysis

The proximate composition was analyzed using the standard procedures outlined by the Association of Official Analytical Chemists (AOAC, 2010).

Physico-chemical Analysis of Date Syrup

Determination pH

pH was measured in duplicate using a digital pH meter (MP230, Mettler Toledo, Switzerland) (Jung *et al*., 2012).

Determination of Total Titratable Acidity (TTA)

Total titratable acidity was examined by technique outlined by AOAC (2010).

Determination of Total Soluble Solids (TSS)

According to Onwuka (2018), a handheld refractometer was used to measure the total soluble solids.

Determination of Total Sugars, Reducing Sugars and Non-Reducing Sugar

Total sugars, reducing sugars and non-reducing sugar was examined according to the techniques stated by AOAC (2010).

Phytochemical Analysis

Determination of Phenols

Phenolic content of the sample was examined using the technique of Singleton *et al.* (1999).

Determination of Flavonoids

Flavonoids were examined according to the technique outlined by Gudej and Tomczyk (2004)

Determination of Phospholipids

The technique outlined by Tsai *et al*. (1984) was used to examine phospholipids.

Experimental Design and Statistical Analysis

The experiments were conducted using a Completely Randomized Design (CRD). The data collected were analyzed through analysis of variance (ANOVA) with the Statistical Package for the Service Solution (SPSS), version 23.0. Duncan's New Multiple Range Test (DNMRT) was employed to compare mean differences among the evaluated parameters, and statistical significance was considered at $p < 0.05$ (Steel and Torrie, 1980).

Table 1: Formulation of sesame seeds and date Syrup for sesame brittle production

Sample	Sugar Syrup (ml)	Date Syrup (ml)	Sesame Seeds (g)
SBA(Control)	200	-	150
SBBA	-	200	150
SBBB	-	150	150
SBBC	-	100	150

Key: SBA1=200:150 sugar syrup and sesame seed, SBBA2=200:150 sugar syrup and sesame seed, SBBB3=200:150 Date syrup and sesame seed, SBBC4=100:150 Date syrup and sesame seed

Table 2: Recipe for Sesame Brittle Production

Ingredients	Quantity(g)
Sesame seed	150
Date syrup	200
Baking soda	5
Salt	4

Table 3: Proximate composition (%) and energy level of sesame brittle produced using date syrup

SAMPLE	MOISTURE	FAT	ASH	CRUDE FIBRE	PROTEIN	CHO	ENERGY LEVEL(kcal/100g)
SBA1	5.35^{a}±2.62	3.65 ^{a}± 2.33	2.95^{a}± 0.78	17.66^{a}±0.76	8.76^{b}±0.96	70.14^{a}±1.35	348.47^{a}±11.74
SBBA2	7.85^{a}±1.34	0.30^{a}± 0.00	4.40^{ab}±0.00	31.86^{a}±8.88	6.36^{ab}±1.19	55.30^{a}±10.13	249.37^{a}±35.78
SBBB3	8.53^{a}±1.20	1.200^{a}±1.13	5.25^{b}±0.78	18.03^{a}±10.88	5.54^{a}± 1.27	67.40^{a}±11.16	296.29^{a}± 50.99
SBBC4	7.80^{a}±2.97	0.55^{a}± 0.21	4.00^{ab}±0.57	35.01^{a}±13.28	4.22^{a}± 0.44	52.24^{a}±16.66	230.78^{a}±70.32

Values are means ± SD of two replications. Means with different superscripts within the column were significantly ($p<0.05$) different.
Key: SBA1= 150g of sesame seed and 200ml of sugar syrup(control)
SBBA2= 150g of sesame seed and 200ml of date syrup
SBBB3=150g of sesame seed and 150ml of date syrup and **SBBC**=150g of sesame seed and 100ml of date syrup
CHO = Carbohydrate

Table 4: Physico-chemical composition of sesame brittle produced with date syrup

SAMPLE	PH	TTA (%)	TSS (g)	TS(g)	RS(%)	NRS(%)
SBA1	6.00^{a}± 0.56	0.01^{a}± 0.00	64.75^{a}±2.61	5.98^{a}±0.00	3.55^{a}±0.00	1.73^{a}±0.00
SBBA2	5.25^{a}±0.70	0.03^{a}± 0.01	74.60^{b}±4.52	5.32^{b}±0.01	3.62^{b}±0.00	1.43^{b}± 0.00
SBBB3	5.10^{a}±0.00	0.01^{a}±0.00	74.25^{b}±1.77	5.43^{c}± 0.00	3.38^{c}± 0.00	1.40^{c}± 0.00
SBBC4	5.20^{a}±0.00	0.02^{a}± 0.01	74.30^{b}±1.98	5.21^{d}± 0.00	3.31^{d}± 0.00	1.30^{d}±0.00

Values are means ± SD of two replications. Means with different superscripts within the column were significantly ($p<0.05$) different.
Key1: SBA1= 150g of sesame seed and 200ml of sugar syrup (control)
SBBA2= 150g of sesame seed and 200ml of date syrup
SBBB3=150g of sesame seed and 150ml of date syrup and **SBBC4**=150g of sesame seed and 100ml of date syrup
TTA =Total titratable acid,
TSS-=Total soluble solid
TS= Total sugar
RS-=Reducing sugar
NRS=Non-reducing sugar

Table 5 : Phytochemical composition (mg/100g) of sesame brittle produced using date syrup

Sample	Phenols	Flavonoids	Phospholipids
SBA1	9.17^{b}± 1.76	23.10^{b}± 2.69	1.74^{b}±0.01
SBBA2	4.59^{a}±0.00	22.35^{b}± 1.20	2.06^{d}±0.01
SBBB3	3.96^{a}±0.00	19.15^{ab}±1.34	1.83^{c}±0.00
SBBC4	3.91^{a}±0.00	15.15^{a}± 0.92	1.65^{a}±0.00

Values are means ± SD of two replications. Means with different superscripts within the column were significantly ($p<0.05$) different.
Key: SBA1= 150g of sesame seed and 200ml of sugar syrup(control) **SBBA2**=
150g of sesame seed and 200ml of date syrup **SBBB3**=150g of sesame seed and
150ml of date syrup
SBBC4=150g of sesame seed and 100ml of date syrup

Discussion

The moisture content of the sesame brittle ranged from sample (SBA1) 5.35 % to 8.53 % (SBB3). These values were low when compared with the moisture content of a snack bar and candies according to USDA standard that is maximum, of 11.40%. This shows that sesame brittle produced will be shelf stable and will not encourage the growth of bacteria and molds. There was no significant (p>0.05) difference in moisture content of the samples. The difference in the values of the moisture content was due to variations in the quantity of sesame seed, and date syrup, used during production. The moisture content of the sesame brittle is greatly influenced by ingredients used. In this analysis, the resulting sesame brittle has a lower moisture content compared to the previous research by Rane *et al.* (2018) which produced snack bars and candies from flaked lentils and groundnut with an average moisture content of 17.70%. Snack bars often have higher moisture content compared to sesame brittle. For example: Granola bars typically have a moisture content around 10-15%. Protein bars have a moisture content of 15-20%, energy bars often have a moisture content of 12-18%. The lower moisture content of the sesame brittle ranging from 5.35% to 8.55%, contributes to their crisp and crunchy texture compared to the chewier, softer texture of many snack bars. (Rane *et al.*, 2018).

Fat content of samples ranged from 0.30% (SBBA2) to 3.65% (SBA1). The fat contents of the samples did not differ significantly (p>0.05). The fat content of the sesame brittle obtained in this research is lower than the fat content of candies reported by Manjula and Suneetha (2014) which is 11.4%, this might be explained by the variations in the basic materials. The fat content of the sesame brittle still shows that it is below the recommended standard for healthy living. The percentage of fat for healthy living is 20-35% of total daily calories, with a focus on consuming more unsaturated fats and limiting saturated fat intake to less than 10% of calories. The fat content of the sample (SBA1) was high compared to other samples. The fat content in sesame seeds is approximately 61.7%. Sesame seeds are rich in fat. The fat in sesame seeds consists mainly of unsaturated fatty acids, with sesame oil containing around 80% unsaturated fatty acids and a small amount of saturated fatty acids. The elevated levels of unsaturated fats in sesame seeds contribute to lowering cholesterol and reducing the risk of cardiovascular diseases. High fat content can however be a threat to the shelf stability of the products due to the promotion of rancidity and it is highly undesirable (Akaerue and Onwuka 2013). However, low fat content in sesame brittle produced using date syrup helps in extending the shelf life and also plays a role in preventing spoilage.

Ash content of the samples ranged from 2.95 % (SBA1) to 5.25 % (SBBC4) and significant (p<0.05) differences existed among samples. The results obtained in this study were higher than those obtained by Obasi *et al.* (2013) on candy production from date nuts and groundnut which ranged from 1.49-1.80. A food product with high ash content indicates that it contains a lot of mineral elements. Therefore, the ash content values found in this research were considerably high and imply that the sesame brittle has an appreciable mineral content. The presence of these minerals can contribute to the overall nutritional value of sesame brittle, providing consumers with important nutrients that support various bodily functions and overall health. The difference in ash content was due to the difference in composition of date syrup, which were used in different proportions during production.

Crude fibre of the sesame brittle ranged from 17.66 % (SBA1) to 35.01 % (SBBC4) and the samples did not differ significantly (p>0.05). The crude fibre content of sesame brittle reflects its fibre-rich composition, which contribute to a balanced diet and potentially support digestive health and disease prevention. Incorporating ingredients like date syrup can enhance the fiber content of sesame brittle, making it a nutritious and beneficial snack option (Jabeen *et al.,* 2020).

Protein content of sesame brittle ranged from 4.22% (SBBC4) to 8.76% (SBA1). The control, which is the sesame brittle formulated with sugar syrup and sesame seed had the highest protein content of 8.76% and it differed significantly (p<0.05) from the other samples. It was noticed that, there was an increase in the mean protein content in each sample as the proportion of syrups, increased. The protein values obtained from the studies were lower than the range (4.17-14.02%) reported by Obasi *et al*. (2013) on candy production. This implies that the low protein content of the samples will not contributes significantly to the daily human protein requirement. As such should be complimented by other more protein rich foods.

Carbohydrate content of the sesame brittle ranged from 52.24%-70.14% with sample (SBA1) control, having the biggest value and sample (SBBC4) having the least value. There were no significant (p>0.05) differences among the samples and the values reported in this finding were lesser than the values reported by Obasi *et al.* (2013) (75.70-81.77%) on candy production, which might be attributed to variations in the raw materials used. Carbohydrates are the primary source of energy to the body, and their presence in food products contributes to their caloric content. Monitoring and controlling the carbohydrate content of sesame brittle is essential for ensuring that the product aligns with dietary requirements and preferences. High carbohydrate content in food products like sesame brittle, snack bars, and candies indicates their energy density. The low carbohydrate content in sesame brittle produced with date syrup when compared with the one with sugar syrup suggests that it has a lower glycemic index, making it a potentially healthier snack choice, especially for individuals concerned about blood sugar management, weight management, or seeking a more balanced nutritional profile in their snacks.

Energy level differs from each other with values ranging from 348.47 kcal (SBA1) sample, which had the largest value to sample (SBBC4) which had the least value 230.70kcal. The findings indicated that the sesame brittles are good source of energy. The increase in energy value of some of the samples might result from the high fat and protein composition sesame brittle, whereas the samples with lower energy value were observed to contain lower values of fat and protein (Akaerue and Onwuka,2013). There were no significant (p>0.05) differences among the samples. The implication of a high energy value in sesame brittle is that it can offer a concentrated source of calories. It may be advantageous for energy needs but may need to be consumed in moderation, especially for individuals watching their weight or managing specific health conditions like diabetes.

Physico-Chemical Composition of Sesame Brittle Produced Using Date Syrup

pH is a measure of the acidity or alkalinity of a solution, specifically a measure of the concentration of hydrogen ions (H+) in a solution. It is a logarithmic scale that ranges from 0 to 14, with a pH of 7 being neutral, (Sadler and Murphy 2010). The pH values of the sesame brittle produced ranged from 5.10 for sample SBBC4 to 6.00 for sample SBA1. The sample did not differ in any significant way (p>0.05). Sesame brittle produced with date syrup was slightly acidic when compared with the one produced with sugar syrup. This is due to the inherent acidity of the date fruit used in the production of date syrup (Baliga *et al.,* 2011). The samples with low pH values can keep longer since low pH aids food preservation.

Total titratable acidity is a measure of the amount of acid present in a solution or amount of acid present in a food sample (Sadler and Murphy 2010). The titratable acidity of the samples ranged from 0.01% of sample to 0.03%. There were no significant (p>0.05) differences among the samples. Sample SBBA2 had the highest (0.03%) total titratable acid when compared with other samples. High total titratable acid can enhance the flavour profile of sesame brittle, providing a desirable level of acidity that balances the sweetness and other flavours present in the brittle. Additionally, total titratable acid plays a vital role in determining the sensory properties of the sesame brittle, influencing factors such as aroma, colour intensity, and overall sensory experience (Shen *et al.,* 2021). It can impact the shelf life and stability of the sesame brittle, ensuring that the product maintains its quality over time.

The total soluble solid ranged from 64.75 to 74.60. Sample SBA1 differed significantly (p<0.05) from the rest of the sample. Total soluble content is associated with the amount of sugar dissolved in a product. The total soluble solid content is often linked to the quality and nutritional value of the product. In sesame brittle produced, the high total soluble solid present in some samples indicates a concentrated source of natural sugars and potentially other nutrients present in dates.

Total sugar of sesame brittle ranged from 5.21 of sample to 5.98 of sample SBA1 value. The sample differed significantly ($p<0.05$) from each other. The total sugar in a food product refers to the sum of all sugars present in that product, including both naturally occurring sugars and any added sugars (Ventura *et al*., 2011). It is seen that sample SBA1 contributes to increased caloric intake, unlike the low total sugar, found in the sesame brittle produced with date syrup which may be beneficial for individuals aiming to manage overall calorie consumption.

Reducing sugar of the sesame brittle produced using date syrup ranged from 3.31% of sample SBBC4 to 3.62% of sample SBA1.The quantity of reducing sugar in sesame brittle decreased as the proportion of syrups used during production decreased. There was a significant difference ($p<0.05$) between the samples. A carbohydrate with a free aldehyde or ketone group is known as reducing sugar. It can oxidize other molecules to donate electrons to them. Lactose, fructose, and glucose are a few examples of reducing sugars. The higher reducing sugar content in sesame brittle produced with date syrup in sample (SBBA2) compared to sesame brittle produced with sugar syrup in sample (SBA1) can be attributed to the composition of date syrup. Date syrup contains a higher concentration of reducing sugars, such as glucose and fructose, compared to sugar syrup, which primarily consists of sucrose. This difference in sugar composition leads to a higher level of reducing sugars in the final product when date syrup is used in the production of sesame brittle. The presence of these reducing sugars can impact the texture, flavour, and overall characteristics of the sesame brittle, providing a different sensory experience for consumers.

Non -reducing sugar of the sesame brittle produced using date syrup ranged from 1.30% of sample SBBC4 to 1.73% sample SBBA2.The quantity of non-reducing sugar in sesame brittle reduces as the proportion of syrups used during production decreases. Samples differed significantly ($p<0.05$) from each other. Sample (SBA1) which is sesame brittle produced with sugar syrup has a high level of non-reducing sugar when compared with other samples produced with date syrup, due to the fact that sugar syrup is predominantly a non – reducing sugar with a very little reducing sugar content. A non-reducing sugar is a kind of carbohydrate that cannot donate electrons to other molecules to operate as a reducing agent since it does not have a free aldehyde or ketone group (Kondaveeti *et al*., 2024). Non-reducing sugars, such as sucrose, lack the ability to be oxidized by weak oxidizing agents that typically oxidize aldehydes. The non-reducing sugar, such as sucrose, plays a crucial role in developing the desired texture, flavour, and preservative properties of the sesame brittle. And also, non- reducing sugar can help to balance the natural bitterness or nutty flavour of the sesame seeds, providing an optimal sweet-savory taste profile.

Phytochemical Composition of Sesame Brittle Produced Using Date Syrup

Phenolic compositions of the sesame brittle produced with date syrup ranged from 3.91mg/100g (SBBC4) to 9.17mg/100g (SBA1). Phenolic content in sesame brittle decreased as the proportion of syrups used during production decreased. Sample SBA1 showed a significant difference ($p < 0.05$) compared with the other three samples. Phenolic compounds constitute a diverse group of secondary metabolites produced during plant metabolic processes (Rahman *et al*., 2021). These compounds play essential roles in defense mechanisms, exhibiting activities such as antioxidant, anti-inflammatory, antiproliferative, and anti-aging effects.

Flavonoid content of the sesame brittle produced using date syrup ranged from15.15mg/100g of sample SBBC4 to 23.10mg/100g of sample SBA1. The samples differed significantly ($p<0.05$) from each other. Again, it was observed that the flavonoid content of the sesame brittle samples decreased as the quantity of syrups were reduced. Flavonoids are heterocyclic compounds composed of two aromatic rings connected via an oxygen bridge. They are classified into flavones, flavonols, anthocyanins, and isoflavones, based on the degree of hydrogenation and the nature of heterocyclic substitutions. In most cases, flavonoids occur in the form of glycosides (Ullah *et al.,* 2020). Flavonoids are plant-derived compounds with antioxidant properties that can contribute to numerous health benefits. Sesame seeds have been found to contain flavonoids, along with other nutrients like phenolics, lignans, and vitamins, making them a valuable addition to a healthy diet. The presence of flavonoids in sesame seeds adds to their overall health-promoting properties, making them a nutritious and beneficial food choice. Flavonoids have been associated with numerous health benefits, including "antioxidant, anti-inflammatory, anti-cancer, anti-diabetic, neuroprotective, and cardio- protective properties". It is strongly advised to incorporate various forms of flavonoids into the daily diet of individuals in order to preserve excellent health and reduce the risk of life-threatening diseases. Flavonoids can also help manage symptoms of inflammation, high blood pressure, and may even promote brain health by improving cognitive function and memory (Wei *et al.,* 2022).

Phospholipids content of the sesame brittle produced using date syrup ranged from 1.65mg/100g (SBBC4) to 2.06mg/100g (SBBA2). The quantity of phospholipids in sesame brittle reduced as the proportion of syrups used during production decreased. The samples differed significantly ($p<0.05$) from each other. Sesame brittle produced with date syrup had the highest phospholipids content which is found in the sample SBBA2. The stability, shelf-life, and general quality of sesame brittle, including its smoothness and mouthfeel, are all improved by phospholipids, which are made up of phosphatidic acid and phosphatidylcholine, which are recognized antioxidant enhancers (Asghar *et al*., 2014). Phospholipids serve a variety of functions in the body which includes acting as a signaling molecules, regulating a variety of cellular processes, such as metabolism, inflammation and immunity, they are also involved in the synthesis and degradation of fats, which is essential for energy production and storage.

Conclusion

Chemical composition of the samples showed that sample SBBC4 which contained 150g of sesame seed and 100ml of date syrup had the lowest carbohydrate content, moisture content, fat, protein content and energy level. Sample SBBC4 had the most acceptable physico-chemical properties such as "the total sugar, reducing sugar and non-reducing sugar". Phytochemical evaluation, shows that sample SBBA2 had a higher content of phenol, flavonoids and phospholipids, thereby contributes to overall health-promoting properties

Nutritionally, sesame brittle produced with date syrup are healthier when compared with the one produced with sugar syrup. Sample SBBC4, containing 150g of sesame seed and 100ml of date syrup should be produced in commercial quantity since it is low in carbohydrate content when compared with other samples.

Recommendations

1. It is recommended that chemical and physico-chemical constituents of the sesame seeds and date syrup be determined for better comparison.
2. Further research is recommended to evaluate the shelf stability of sesame brittle produced using date syrup, using adequate packaging materials
3. It is also recommended that the level of date syrup be kept constant in further studies, while quantities of sesame seeds be varied in order to get a better physical profile of sesame brittle.

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