Sahel Journal of Life Sciences FUDMA (SAJOLS)
March 2025 Vol. 3(1): 207-216
ISSN: 3027-0456 (Print)
ISSN: 1595-5915(Online)
DOI: https://doi.org/10.33003/sajols-2025-0301-25

Research Article

Sensory and Quality Evaluation of Sesame (*Sesamum indicum*) Seed-Based Salad Cream

***Ada F. Okwunakwe[1], Benjamin A. Anhwange[1,2], Peter A. Adie[1,2] and Charles C. Ariahu[1,3]**

[1]Centre for Food Technology and Research, Benue State University, Makurdi, Benue State, Nigeria.
[2]Department of Chemistry, Benue State University, Makurdi, Benue State, Nigeria.
[3]Department of Food Science and Technology, Joseph Sarwuan Tarka University, Makurdi, Benue State, Nigeria
****Corresponding Author's email***: adaokw@yahoo.com

ABSTRACT

Sensory and quality evaluation provides information on consumers' perception and nutritional composition of a food product. This study was carried out to determine the nutritional composition, viscosity and sensory qualities of sesame seed-based salad cream containing varied quantities of acetic acid and sugar. Preliminary sensory evaluation using the Hedonic test was carried out on 12 samples to obtain 3 best products for analyses. Proximate, vitamin, mineral salt, fatty acid, amino acid composition and viscosity were determined using standard methods. A Preliminary sensory evaluation showed that sesame seed-based salad cream containing 0% acetic acid and 6% sugar, 2% acetic acid and 6% sugar, and 4% acetic acid and 4% sugar were the first three preferred products. Proximate analysis showed that the sesame seed-based salad cream samples had high fat content and low moisture and protein content. The samples had higher vitamin B3, copper, iron, zinc, and manganese contents. The essential fatty acid, aspartate, and asparagine contents of the samples were significantly different ($P<0.05$) from the commercial sample. The viscosity of the samples decreased with increasing shear rate, depicting a pseudoplastic behaviour. No significant difference ($P>0.05$) was observed in the organoleptic properties of all the samples evaluated.

Keywords: Salad cream; Sesame seeds; Sensory evaluation; Nutritional composition; Acetic acid

Citation: Okwunakwe, A.F., Anhwange, B.A., Adie, P.A. & Ariahu, C.C. (2025). Sensory and Quality Evaluation of Sesame (*Sesamum indicum*) Seed-Based Salad Cream. *Sahel Journal of Life Sciences FUDMA*, 3(1): 206-217. DOI: https://doi.org/10.33003/sajols-2025-0301-25

INTRODUCTION

Sesame seed is an oil crop containing nutrients like magnesium, calcium, iron, potassium, sodium, manganese, copper, phosphorus, zinc, vitamin B1, vitamin B6, fibre, fat, carbohydrate and protein (Hadipour *et al*., 2023). It also contains high amounts of lignans, sesamin and sesamolin (Hadipour *et al*., 2023) which are responsible for its antioxidant property as reported by Cooney *et al*. (2001) who stated that "consumption of sesame seed increases plasma gamma-tocopherol and enhances bioavailability of vitamin E thereby prevents cancer and heart disease" (Cooney *et al*., 2001). Sesame seeds contain lecithin that may reduce the incidence of fatty liver caused by long-term parenteral nutrition and can be used for the treatment of eczema, psoriasis and dandruff (Jellin *et al*., 2000). It is known for its high protein content. Therefore, sesame seeds can be used to supplement protein in food products and might be used in food production to give a balanced diet (Abbas *et al*., 2022). Salad dressings such as mayonnaise and salad cream contain some amount of fat, although mayonnaise, an emulsion of oil and egg yolk, contains a higher percentage of fat than salad cream. According to Thai Industrial Standard No. 1402-2540, mayonnaise must contain fat not less than 65% by weight (Vatanasuchart & Stonsaovapak, 2000; Taslikh *et al*., 2021), whereas salad cream must contain fat not less than 30% (Vatanasuchart & Stonsaovapak, 2000). High consumption of fat can cause an accumulation of fat in blood vessels, leading to atherosclerosis, hypertriglyceridemia, hypercholesterolemia, hypertension, heart diseases and obesity (Duan *et al*., 2018). Thus, the production of sesame seed-based salad cream could provide an alternative means of decreasing dietary fat intake while at the same time, meeting nutritional requirements through the consumption of more raw vegetables, especially by children. This will introduce diversification in the use of sesame seed, thereby increasing the cultivation of the seed, reducing its postharvest loss by adding more value to its product and providing salad cream with health benefits that guarantee food security and provide solutions to nutrient deficiency. The notion, although not proven yet, that mayonnaise is preferred over salad cream due to the tangy flavour of salad creams gave rise to the need to determine the quantity of white vinegar and sugar that could be appealing to consumers' taste. Sensory and quality evaluation of a product reflects the value of the product, aids in making decisions about good eating habits, provides nutritional information for health, ensures safety and consumer satisfaction (Mihafu *et al*., 2020). There is a dearth of information on salad cream from sesame seed containing a desired quantity of vinegar and sugar. Therefore, this study aims to determine the nutritional composition, viscosity and sensory qualities of sesame seed-based salad cream containing varied quantities of acetic acid and sugar.

MATERIALS AND METHODS

Materials

Sugar, salt, egg, white vinegar, corn, Kings® vegetable oil and sesame seeds were purchased from Wurukum market, Makurdi, Benue State, while the chemicals used were of analytical grade.

Sample preparation

Sesame seeds: Clean and dried sesame seeds were milled into a paste according to the method described by (Akusu *et al*., 2020). The seeds were roasted in an oven (DHG) at 120 °C for 1 h. The roasted seeds were winnowed, milled into a creamy butter.

Corn starch: Corn starch was prepared according to the method described by (Dongmo *et al*., 2020). Corn grains free from dirt were soaked in water for 24 h with occasional changing of water to prevent fermentation. Then it was drained, milled, sieved with muslin cloth and allowed to sediment for 3 h. The filtered and sedimented starch was decanted and dried in an electric oven at 50 °C for 36 h. The dried corn starch was crushed using an electric blender and then sieved to obtain fine flour.

Eggs: Eggs were pasteurized according to the method of (Froning *et al*., 2019). Fresh eggs were placed in a saucepan containing cold water which was placed on an electric stove and allowed to reach a temperature of 60 °C. Using a thermometer, the temperature was maintained and the eggs were removed from the hot water after 5 min. The eggs were rinsed with cold water to prevent further cooking of the egg.

Production of sesame seed-based salad cream

Sesame seed-based salad cream was prepared according to the method described by (Nwosu & Eke-Ejiofor, 2021). It was produced by mixing measured quantities of 45 g corn starch, 5, 10 & 15 g sugar, 2.5 g salt, 60 & 120 mL white vinegar, and 70 mL distilled water. The mixture was heated at 121 °C for 5 min with continuous stirring to obtain a slurry. It was allowed to cool before adding 36 g pasteurized egg yolk, 90 mL vegetable oil (Kings®), 15 g sesame seed paste and 0.01 g riboflavin. Then it was homogenized using an electric blender until a consistent paste was formed.

The study includes initial production, obtained from a 3 × 4 randomised experimental design comprising 3 levels of acetic acid (0%, 2%, 4%) and 4 levels of sugar (0%, 2%, 4%, 6%) to give twelve samples: sample 367 (0% acetic acid + 0% sugar); sample 931 (0% acetic acid + 2% sugar); sample 183 (0% acetic acid + 4% sugar); sample 462 (0% acetic acid + 6% sugar); sample 273 (2% acetic acid + 0% sugar); sample 564 (2% acetic acid + 2% sugar); sample 815 (2% acetic acid + 4% sugar); sample 795 (2% acetic acid + 6% sugar); sample 648 (4% acetic acid + 0% sugar); sample 926 (4% acetic acid + 2% sugar); sample 852 (4% acetic acid + 4% sugar) and sample 319 (4% acetic acid + 6% sugar). Sensory evaluation was used to select the three best samples for chemical analyses in comparison to the commercial salad cream.

Sensory and chemical test

Hedonic test as described by Garcia-Gomez *et al*. (2022) was used to evaluate the organoleptic properties of the samples. Samples were presented in a randomized manner to thirty panellists, who were trained over some time on the organoleptic properties of salad cream and they comprise of members of the public in Makurdi, Benue State, Nigeria for sensory evaluation. The panellists were trained to determine whether or not the modified product meets up with commercial salad cream by testing for appearance, aroma, taste, mouthfeel and general acceptability using a 9-point hedonic scale (Garcia-Gomez *et al*., 2022). The degree of likeness was expressed as follows: Like extremely – 9, Like very much – 8, Like moderately – 7, Like slightly – 6, Neither like nor dislike – 5, Dislike slightly – 4, Dislike moderately – 3, Dislike very much – 2, Dislike extremely – 1.

Chemical analyses such as proximate composition (AOAC, 2016) calorific value (Oli *et al*., 2017), non-protein nitrogen (Sinaga *et al*., 2016), vitamins (AOAC, 2016), minerals (AOAC, 2016), fatty acids (AOAC, 2016), amino acids (Liyanaarachchi *et al*., 2020) and viscosity (Adeleke *et al*., 2020) were carried out on each sample.

Data Analysis

Analysis was conducted in triplicates. The results were expressed as mean ± standard deviation. Using the statistical package SPSS version 20 software, the difference in mean was determined using one-way analysis of variance (ANOVA) while differences between means were determined by Duncan's multiple range test. Values are considered statistically significant at P<0.05.

RESULTS AND DISCUSSIONS

Proximate composition of salad cream samples

The results for the proximate composition are presented in Table 1. Sample 795 had the lowest percentage moisture content (45.59%) which was significantly different (*P*<0.05) from the commercial sample (46.98%). Commercial salad cream was also reported by Ashaye *et al*. (2010) to be significantly higher in moisture content. The growth of microorganisms can occur in food samples with high moisture content, especially if not preserved adequately, and so this product will require the implementation of measures during storage that would combat this challenge. Sesame seed-based salad cream samples had the lowest percentage protein content (1.85% – 1.97%) when compared with the commercial sample (2.11%). Ashaye *et al*. (2010) also reported that commercial salad cream was significantly higher in protein content. Percentage fat content of the samples 462, 795, and 852 were significantly different (*P*<0.05) when compared to the percentage fat content of the commercial salad cream sample. Sesame seeds being an oil crop, explains why there is such a difference. The values of the percentage ash obtained for each sample indicate that the samples contained mineral salts. The presence of ash in these samples also agrees with the findings of Ashaye *et al*. (2010) who worked on the physicochemical, rheological and consumer acceptability of cassava starch salad cream. Sample 462 had the highest percentage carbohydrate value of 23.33%, which was significantly different (*P*<0.05) when compared with the commercial salad cream, sample 795 and sample 852.

Vitamin composition of salad cream samples

The results for the vitamin composition are presented in Table 2. The sesame seed-based salad cream was found to have higher vitamin B3 contents, which was significantly different (*P*<0.05) when compared to the commercial salad cream. Nicotinamide adenine dinucleotide and nicotinamide adenine dinucleotide phosphate are forms of vitamin B3 that play a role in protein, carbohydrate and fat metabolism and protect tissues against oxidative damage (Maqbool *et al*., 2017). The quantity of vitamin D, vitamin E and vitamin K in the samples was not significantly different (*P*>0.05) when compared to the commercial salad cream.

Mineral salt composition of salad cream samples

The results for the mineral salt composition are presented in Table 3. The sesame seed-based salad cream was found to have a higher amount of copper, iron, manganese and zinc, which was significantly different (*P*<0.05) when compared to the commercial salad cream. Copper has been proven to enhance the repair of inner walls of blood vessels and inhibit formation of blood clot in blood vessels (Wang *et al*., 2021). Iron is required for bioprocesses such as detoxification of reactive oxygen species, drugs and foreign materials, and the metabolism of various hormones, myelin, neurotransmitters, nucleic acids and heme (Grzeszczak *et al*., 2020). Manganese prevents excessive formation of reactive oxygen species and membrane oxidation (Jomova *et al*., 2022). Zinc is required for cellular response to oxidative stress; repair damaged deoxyribonucleic acid; to maintain homeostasis, immune response and deoxyribonucleic acid replication (Chasapis *et al*., 2020).

Fatty acid composition of salad cream samples

The results for the fatty acid composition are presented in Table 4. The percentage of unsaturated fatty acids present in the salad cream containing sesame seeds was higher than the saturated fatty acids, which is in agreement with the findings of Agidew *et al*. (2021) on fatty acid composition, total phenolic contents and antioxidant activity of white and black sesame seed varieties from different localities of Ethiopia. The salad cream is a good source of essential fatty acids (polyunsaturated fatty acids), linoleic acid (27.83% - 27.78%) and linoleic acid (2.82% - 2.81%), that cannot be synthesized by the human body and therefore must be gotten from the diet. Various research has shown that essential fatty acids prevent cancer, arthritis, hypertension, and diabetes mellitus (Kaur *et al*., 2014).

Table 1: Proximate composition of salad cream samples

Samples	Moisture (%)	Crude protein (%)	Fat (%)	Ash (%)	Crude fibre (%)	Carbohydrate (%)	Non-protein nitrogen (%)	Energy (kcal/100 g)
462	45.92^{c}±0.59	1.85^{d}±0.01	26.17^{a}±1.20	1.62^{c}±0.01	1.11^{b}±0.01	23.33^{a}±0.42	0.02^{b}±0.01	336.25^{b}±0.54
795	45.59^{d}±0.24	1.94^{c}±0.26	26.11^{a}±1.16	1.86^{a}±0.37	1.48^{a}±0.01	23.02^{c}±0.70	0.03^{ab}±0.01	334.83^{c}±0.71
852	46.14^{b}±0.99	1.97^{b}±0.02	26.47^{a}±1.23	1.59^{d}±0.07	1.03^{d}±0.01	22.80^{d}±1.16	0.04^{a}±0.01	337.31^{a}±0.80
734	46.98^{a}±1.45	2.11^{a}±0.01	24.99^{b}±0.08	1.66^{b}±0.04	1.09^{c}±0.01	23.17^{b}±1.58	0.02^{b}±0.01	326.03^{d}±0.56

Values are mean±standard deviation. Mean values within column with the same letters are not significantly different (P>0.05)

Key: 462 = 0% acetic acid + 6% sugar; 795 = 2% acetic acid + 6% sugar; 852 = 4% acetic acid + 4% sugar; 734 = commercial salad cream

Table 2: Vitamin composition of salad cream samples

Vitamin (mg/L)	462	795	852	734
Vitamin A	0.059^{b}±0.001	0.056^{c}±0.001	0.058^{b}±0.001	0.087^{a}±0.001
Vitamin D	0.004^{a}±0.001	0.003^{ab}±0.001	0.002^{b}±0.001	0.002^{b}±0.001
Vitamin E	0.380^{a}±0.020	0.381^{a}±0.010	0.382^{a}±0.012	0.378^{a}±0.013
Vitamin K	0.0003^{ab}±0.0001	0.0004^{a}±0.0001	0.0003^{ab}±0.0001	0.0002^{b}±0.0001
Vitamin B1	0.0262^{bc}±0.0011	0.0261^{c}±0.0120	0.0263^{b}±0.0001	0.0294^{a}±0.001
Vitamin B2	0.1682^{b}±0.0001	0.1680^{c}±0.0001	0.1683^{b}±0.0001	0.1695^{a}±0.0100
Vitamin B3	0.0276^{ab}±0.0021	0.0275^{b}±0.0100	0.0277^{a}±0.0010	0.0270^{c}±0.0010
Vitamin B5	0.5529^{b}±0.0100	0.5528^{b}±0.0100	0.5526^{c}±0.0001	0.6510^{a}±0.0001

Values are mean±standard deviation. Mean values within the same row with the same letters are not significantly different (P>0.05)

Key: 462 = 0% acetic acid + 6% sugar; 795 = 2% acetic acid + 6% sugar; 852 = 4% acetic acid + 4% sugar; 734 = commercial salad cream

Table 3: Mineral salt composition of salad cream samples

Mineral salts (mg/L)	462	795	852	734
Potasium	3.503^{c}±0.013	3.041^{d}±0.010	3.577^{b}±0.010	5.337^{a}±0.051
Sodium	119.098^{c}±0.012	119.003^{d}±0.010	119.286^{b}±0.010	135.378^{a}±0.010
Magnesium	1.500^{b}±0.002	1.523^{b}±0.001	1.501^{b}±0.001	1.749^{a}±0.001
Copper	0.151^{b}±0.001	0.158^{a}±0.001	0.152^{b}±0.001	0.013^{c}±0.001
Iron	3.510^{c}±0.020	3.711^{b}±0.130	3.880^{a}±0.010	2.139^{d}±0.010
Manganese	1.744^{b}±0.032	1.710^{c}±0.100	1.761^{a}±0.001	1.469^{d}±0.001
Zinc	5.083^{c}±0.150	5.520^{b}±0.100	5.678^{a}±0.004	3.309^{d}±0.002
Phosphorus	0.076^{b}±0.001	0.073^{c}±0.001	0.075^{b}±0.001	0.095^{a}±0.003

Values are mean±standard deviation. Mean values within the same row with the same letters are not significantly different (P>0.05).

Key: 462 = 0% acetic acid + 6% sugar; 795 = 2% acetic acid + 6% sugar; 852 = 4% acetic acid + 4% sugar; 734 = commercial salad cream

Table 4: Fatty acid composition of salad cream samples

Fatty acids (%)	462	795	852	734
Capric acid	1.63^{a}±0.01	1.61^{a}±0.01	1.61^{a}±0.04	1.20^{b}±0.01
Lauric acid	2.34^{a}±0.01	2.22^{a}±0.01	2.41^{a}±0.30	1.04^{b}±0.01
Myristic acid	1.46^{a}±0.01	1.46^{a}±0.01	1.47^{a}±0.01	1.07^{b}±0.01
Palmitic acid	17.15^{a}±0.01	17.14^{a}±0.01	17.34^{a}±0.01	14.51^{b}±0.01
Stearic acid	15.30^{a}±0.01	15.31^{a}±0.01	15.30^{a}±0.01	13.53^{b}±0.02
Oleic acid	59.23^{a}±0.01	59.21^{a}±0.01	59.20^{a}±0.01	31.57^{b}±0.01
Linoleic acid	27.83^{a}±0.01	27.86^{a}±0.01	27.78^{a}±0.05	17.78^{b}±0.01
Linolenic acid	2.82^{a}±0.01	2.81^{a}±0.01	2.82^{a}±0.01	1.36^{b}±0.01
Arachidic acid	0.91^{a}±0.01	0.92^{a}±0.01	0.93^{a}±0.01	0.36^{b}±0.01

Values are mean±standard deviation. Mean values within the saame row with the same letters are not significantly different (*P*>0.05).

Key: 462 = 0% acetic acid + 6% sugar; 795 = 2% acetic acid + 6% sugar; 852 = 4% acetic acid + 4% sugar; 734 = commercial salad cream

Amino acid composition of salad cream samples

The results for the amino acid composition are presented in Table 5. It was observed that most of the amino acids were higher in the commercial salad cream than in the samples except for arginine, asparagine, aspartate, cysteine and serine. The results are similar to the findings of Sá *et al*. (2022) on cold-pressed sesame seed meal as a protein source.

Organoleptic properties of salad cream samples

Preliminary sensory evaluation (Table 6) was carried out on twelve samples containing varied quantities of vinegar and sugar to choose the first three best samples. Sensory evaluation is usually used to measure the responses of people to a sample as perceived by the senses (sight, smell, taste, and feel) (Civille & Oftedal, 2012). Comparing the mean score of the samples, there were significant differences (*P*<0.05) in respect to the following parameters; appearance, aroma, taste, mouthfeel and general acceptability. For appearance, sample 852 containing 4% acetic acid and 4% sugar had the least value (6.30), having no significant difference (*P*>0.05) with sample 319 (4% acetic acid and 6% sugar), sample 926 (4% acetic acid and 2% sugar), sample 648 (4% acetic acid and 0% sugar), 795 (2% acetic acid and 6% sugar), 815 (2% acetic acid and 4% sugar), 564 (2% acetic acid and 2% sugar), 273 (2% acetic acid and 0% sugar) and sample 367 (0% acetic acid and 0% sugar), whose values were 6.40, 6.63, 6.30, 7.00, 7.00, 6.93, 6.90 and 6.80 respectively. Sample 462 containing 0% acetic acid and 6% sugar had the highest value for appearance (7.73), having no significant difference (*P*>0.05) with sample 795 (2% acetic acid and 6% sugar), 815 (2% acetic acid and 4% sugar), 564 (2% acetic acid and 2% sugar), 273 (2% acetic acid and 0% sugar), 183 (0% acetic acid and 4% sugar), 931 (0% acetic acid and 2% sugar) and sample 367 (0% acetic acid and 0% sugar), whose values were 7.00, 7.00, 6.93, 6.90, 7.60, 7.36 and 6.80 respectively. This implies that the presence of vinegar or the absence of sugar may have influenced the judgment of the panellists.

Sensory evaluation for aroma showed that sample 926 containing 4% acetic acid and 2% sugar had the least value (6.00), having no significant difference (*P*>0.05) with sample 319 (4% acetic acid and 6% sugar), sample 852 (4% acetic acid and 4% sugar), sample 648 (4% acetic acid and 0% sugar), 815 (2% acetic acid and 4% sugar), 564 (2% acetic acid and 2% sugar), 273 (2% acetic acid and 0% sugar), 931 (0% acetic acid and 2% sugar) and sample 367 (0% acetic acid and 0% sugar), whose values were 6.06, 6.03, 6.43, 6.76, 6.23, 6.36, 6.40 and 6.03 respectively. Sample 462 containing 0% acetic acid and 6% sugar had the highest value for aroma (7.30), having no significant difference (*P*>0.05) with sample 795 (2% acetic acid and 6% sugar), 815 (2% acetic acid and 4% sugar) and sample 183 (0% acetic acid and 4% sugar), whose values were 6.93, 6.76 and 7.16 respectively. This implies that the presence of vinegar or the absence of sugar may have influenced the judgment of the panellists.

The least values for taste (5.60) were sample 319 (4% acetic acid and 6% sugar) and 648 (4% acetic acid and 0% sugar). They were not significantly different (*P*>0.05) from samples 852 (4% acetic acid and 4% sugar), 926 (4% acetic acid and 2% sugar), 564 (2% acetic acid and 2% sugar), 273 (2% acetic acid and 0% sugar), 931 (0% acetic acid and 2% sugar) and 367 (0% acetic acid and 0% sugar), whose values were 6.36, 6.06, 5.90, 5.96, 6.03 and 5.90 respectively. Sample 462 containing 0% acetic acid and 6% sugar had the highest value for taste (7.63), having no significant difference (*P*>0.05) with sample 795 (2% acetic acid and 6% sugar), 815 (2% acetic acid and 4% sugar) and sample 183 (0% acetic acid and 4% sugar), whose values were 7.26, 7.03 and 7.30 respectively. This implies that the presence of vinegar or the absence of sugar may have influenced the judgment of the panellists.

The least value for mouthfeel (5.43) was sample 648 (4% acetic acid and 0% sugar), having no significant difference (*P*>0.05) with sample 319 (4% acetic acid and 6% sugar), sample 852 (4% acetic acid and 4% sugar), sample 926 (4% acetic acid and 2% sugar), 564 (2% acetic acid and 2% sugar), 273 (2% acetic acid and 0% sugar), 931 (0% acetic acid and 2% sugar) and sample 367 (0% acetic acid and 0% sugar), whose values were 5.90, 6.43, 6.00, 5.46, 5.50, 6.33 and 6.00 respectively. The sample with the highest value (7.50) for mouthfeel was 462 (0% acetic acid and 6% sugar), having no significant difference (*P*>0.05) with sample 183 (0% acetic acid and 4% sugar), 815 (2% acetic acid and 4% sugar) and 795 (2% acetic acid and 6% sugar), whose values were 7.23, 6.73 and 7.10. This implies that the presence of vinegar or the absence of sugar may have influenced the judgment of the panellists.

The sample with the least value (5.76) for general acceptance was 648 (4% acetic acid and 0% sugar), having no significant difference (*P*>0.05) with sample 319 (4% acetic acid and 6% sugar), 852 (4% acetic acid and 4% sugar), 926 (4% acetic acid and 2% sugar), 564 (2% acetic acid and 2% sugar), 273 (2% acetic acid and 0% sugar) and 367 (0% acetic acid and 0% sugar), whose values were 6.46, 6.56, 6.16, 6.16, 6.56 and 6.46 respectively. The most accepted sample (7.76), was sample 462 (0% acetic acid and 6% sugar) having no significant difference (*P*>0.05) with sample 795 (2% acetic acid and 6% sugar), 815 (2% acetic acid and 4% sugar), 183 (0% acetic acid and 4% sugar) and 931 (0% acetic acid and 2% sugar) whose values were 7.30, 7.23, 7.73 and 7.13 respectively.

It can be deduced that Sample 462 was most preferred due to its content (0% acetic acid and 6% sugar). The panellists must have preferred the sugary taste and the absence of sour taste in the sample. The least preferred samples were samples with low or no sugar content and high acetic acid content. This explains the general preference for mayonnaise over salad cream due to the tangy flavour of salad creams. According to Sadler & Murphy (2010), the perception of a tart flavour caused by organic acids is strongly influenced by the presence of sugars. Notwithstanding, samples with proportions of acetic acid and sugar were also accepted, such as sample 852 (4% acetic acid and 4% sugar), 795 (2% acetic acid and 6% sugar), 815 (2% acetic acid and 4% sugar) and sample 926 (4% acetic acid and 2% sugar). The first three most preferred samples from each of the percentage acetic acid groups (0%, 2%, and 4%) that were used for analyses are sample 462 (0% acetic acid and 6% sugar), 795 (2% acetic acid and 6% sugar) and sample 852 (4% acetic acid and 4% sugar), whose mean score for general acceptability were 7.76, 7.30 and 6.56 respectively. The acceptability of this salad cream shows that sesame seed could be used in the preparation of salad cream.

The results for the organoleptic properties are presented in Table 7. Comparing the mean score of the samples, there was no significant difference (*P*>0.05) for all the parameters. The sample with the highest value for taste was sample 795, having no significant difference (*P*>0.05) with samples 462, 852, and 734. Sample 795 was the most preferred for its taste, mouthfeel and was generally accepted by the panellists, while for aroma and appearance, it ranked second. Commercial salad cream sample might have ranked first in appearance due to the sophisticated industrial homogenizer that was used during its production. Comparing the mean scores of all the results obtained for all the samples, it can be deduced that sesame seed-based salad cream may be as good as the commercial salad cream.

Viscosity of salad creams at different rotational speeds

The results for the viscosity of salad creams at different rotational speeds are presented in Figure 1. The viscosities of the samples measured decreased with increasing shear rate, depicting a pseudoplastic behaviour (Non-Newtonian behaviour or shear-thinning behaviour). A pseudoplastic fluid has a variable viscosity which is dependent on applied stress. That is, the viscosity of the fluid can change when subjected to force. All the samples demonstrated a shear-thinning behaviour due to the lower viscosities that were obtained as the shear rate was increased (McClements, 2004). The pseudoplastic behaviour of salad creams observed in this study agrees with the findings of Adeleke *et al*. (2020), Ashaye *et al*. (2010) and Eke-Ejiofor & Owuno (2014).

Table 5: Amino acid composition of salad cream samples

Amino acids (mg/100g)	462	795	852	734
Tryptophan	1.66^{b}±0.02	1.65^{b}±0.03	1.65^{b}±0.01	1.95^{a}±0.01
Histidine	3.12^{b}±0.01	3.13^{b}±0.02	3.12^{b}±0.02	4.69^{a}±0.12
Leucine	3.81^{b}±0.01	3.84^{b}±0.03	3.82^{b}±0.01	5.49^{a}±0.24
Isoleucine	6.08^{b}±0.01	6.08^{b}±0.39	6.07^{b}±0.01	6.57^{a}±0.13
Phenylalanine	3.26^{b}±0.12	3.26^{b}±0.10	3.26^{b}±0.13	5.72^{a}±0.16
Valine	3.53^{b}±0.02	3.54^{b}±0.03	3.52^{b}±0.01	5.75^{a}±0.02
Lysine	3.75^{b}±0.01	3.73^{b}±0.03	3.73^{b}±0.02	4.52^{a}±0.01
Methionine	2.25^{b}±0.11	2.19^{b}±0.13	2.19^{b}±0.14	2.67^{a}±0.27
Threonine	5.86^{b}±0.06	5.93^{b}±0.01	5.90^{b}±0.07	7.21^{a}±0.16
Arginine	6.24^{a}±0.14	6.24^{a}±0.15	6.25^{a}±0.13	6.23^{a}±0.14
Asparagine	6.19^{a}±0.05	6.22^{a}±0.06	6.21^{a}±0.05	5.54^{b}±0.29
Alanine	4.61^{b}±0.19	4.62^{b}±0.19	4.61^{b}±0.20	5.17^{a}±0.02
Aspartate	4.69^{a}±0.07	4.69^{a}±0.09	4.69^{a}±0.07	3.52^{b}±0.11
Glutamate	3.31^{b}±0.16	3.43^{b}±0.18	3.42^{b}±0.17	4.66^{a}±0.03
Glycine	3.64^{b}±0.08	3.73^{b}±0.08	3.72^{b}±0.07	5.32^{a}±0.31
Tyrosine	3.63^{b}±0.09	3.63^{b}±0.10	3.67^{b}±0.09	4.34^{a}±0.16
Cysteine	3.60^{a}±0.40	3.60^{a}±0.39	3.69^{a}±0.23	4.12^{a}±0.01
Proline	4.60^{b}±0.05	4.60^{b}±0.04	4.57^{b}±0.01	6.34^{a}±0.01
Serine	3.80^{a}±0.11	3.79^{a}±0.12	3.87^{a}±0.01	3.85^{a}±0.16

Values are mean±standard deviation. Mean values within the same row with the same letters are not significantly different (*P*>0.05).

Key: 462 = 0% acetic acid + 6% sugar; 795 = 2% acetic acid + 6% sugar; 852 = 4% acetic acid + 4% sugar; 734 = commercial salad cream

Table 6: Preliminary sensory evaluation of sesame seed-based salad creams

Sample	Appearance	Aroma	Taste	Mouthfeel	General acceptability
367	6.80^{abc}±0.28	6.03^{cd}±0.23	5.90^{c}±0.40	6.00^{cd}±0.36	6.46^{bc}±0.31
931	7.36^{ab}±0.23	6.40^{bcd}±0.24	6.03^{c}±0.33	6.33^{bcd}±0.31	7.13^{ab}±0.27
183	7.60^{a}±0.20	7.16^{ab}±0.30	7.30^{ab}±0.28	7.23^{ab}±0.33	7.73^{a}±0.21
462	7.73^{a}±0.27	7.30^{a}±0.25	7.63^{a}±0.26	7.50^{a}±0.29	7.76^{a}±0.23
273	6.90^{abc}±0.28	6.36^{bcd}±0.27	5.96^{c}±0.32	5.50^{d}±0.34	6.56^{bc}±0.28
564	6.93^{abc}±0.25	6.23^{cd}±0.31	5.90^{c}±0.38	5.46^{d}±0.37	6.16^{c}±0.35
815	7.00^{abc}±0.29	6.76^{abcd}±0.29	7.03^{ab}±0.29	6.73^{abc}±0.30	7.23^{ab}±0.29
795	7.00^{abc}±0.32	6.93^{abc}±0.30	7.26^{ab}±0.27	7.10^{ab}±0.30	7.30^{ab}±0.22
648	6.30^{c}±0.35	6.43^{bcd}±0.27	5.60^{c}±0.31	5.43^{d}±0.39	5.76^{c}±0.36
926	6.63^{bc}±0.35	6.00^{d}±0.34	6.06^{c}±0.33	6.00^{cd}±0.34	6.16^{c}±0.35
852	6.30^{c}±0.38	6.03^{cd}±0.23	6.36^{bc}±0.21	6.43^{bcd}±0.21	6.56^{bc}±0.23
319	6.40^{c}±0.29	6.06^{cd}±0.30	5.60^{c}±0.34	5.90^{cd}±0.35	6.46^{bc}±0.34

Values are mean ± standard deviation (n=30). Mean values within column with the same letters are not significantly different (*P*>0.05).

Key: 367 = 0% acetic acid + 0% sugar; 931 = 0% acetic acid + 2% sugar; 183 = 0% acetic acid + 4% sugar; 462 = 0% acetic acid + 6% sugar; 273 = 2% acetic acid + 0% sugar; 564 = 2% acetic acid + 2% sugar; 815 = 2% acetic acid + 4% sugar; 795 = 2% acetic acid + 6% sugar; 648 = 4% acetic acid + 0% sugar; 926 = 4% acetic acid + 2% sugar; 852 = 4% acetic acid + 4% sugar; 319 = 4% acetic acid + 6% sugar

Table 7: Organoleptic properties of salad cream samples

Sample	Appearance	Aroma	Taste	Mouthfeel	General acceptability
462	6.97^{a}±0.31	6.83^{a}±0.31	6.93^{a}±0.27	6.73^{a}±0.33	6.90^{a}±0.38
795	7.27^{a}±0.29	6.93^{a}±0.26	7.10^{a}±0.28	7.20^{a}±0.29	7.13^{a}±0.30
852	6.90^{a}±0.38	7.17^{a}±0.25	6.97^{a}±0.27	7.00^{a}±0.28	7.10^{a}±0.27
734	7.67^{a}±0.28	6.87^{a}±0.33	7.03^{a}±0.31	6.93^{a}±0.29	7.07^{a}±0.34

Values are mean±standard deviation. Mean values within the saame row with the same letters are not significantly different (*P*>0.05)

Key: 462 = 0% acetic acid + 6% sugar; 795 = 2% acetic acid + 6% sugar; 852 = 4% acetic acid + 4% sugar; 734 = commercial salad cream

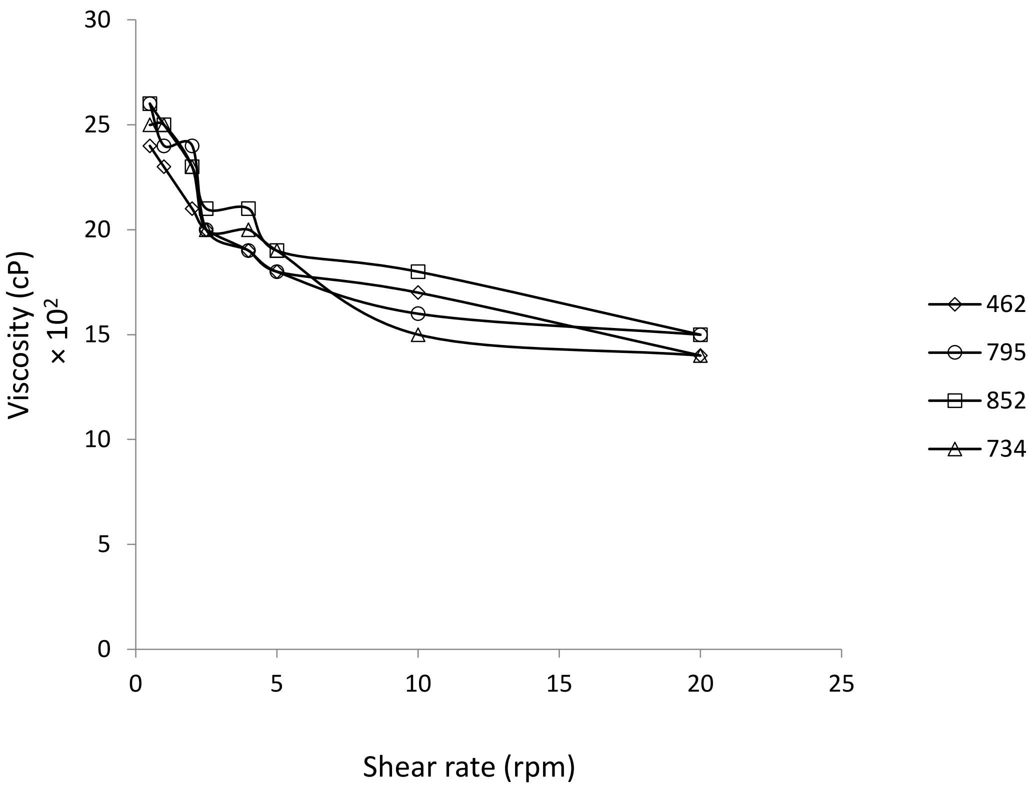

Figure 1: Viscosity of salad cream samples at different rotational speeds

Key: 462 = 0% acetic acid + 6% sugar; 795 = 2% acetic acid + 6% sugar; 852 = 4% acetic acid + 4% sugar; 734 = commercial salad cream

CONCLUSION

Palatable and nourishing salad cream can be produced from sesame seeds, thereby increasing the utilization of sesame seeds. Varied quantities of vinegar and sugar did not affect the quality and the organoleptic properties of sesame seed-based salad cream.

Conflict of Interest

The authors declare no conflict of interest.

Funding for the Project

The research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

REFERENCES

Abbas, S., Sharif, M. K., Sibt-e-Abbas, M., Teferra, T. F., Sultan, M. T. & Anwar, M. J. (2022). Nutritional and therapeutic potential of sesame seeds. *Journal of Food Quality*, 2022(1), 753. https://doi.org/10.1155/2022/6163753

Adeleke, D. M., Shittu, T. A., Abass, A. B., Awoyale, W., Awonorin, S. O., & Eromosele, C. O. (2020). Physicochemical Properties, Rheology, and Storage Stability of Salad Creams made from Different Cassava Starch Varieties. *Journal of Food Processing and Preservation*, *44*(1), 1–11. https://doi.org/10.1111/jfpp.14662

Agidew, M. G., Dubale, A. A., Atlabachew, M., & Abebe, W. (2021). Fatty Acid Composition, Total Phenolic contents and Antioxidant Activity of White and Black Sesame Seed Varieties from Different Localities of Ethiopia. *Chemical and Biological Technologies in Agriculture*, *8*(14), 1–10. https://doi.org/10.1186/s40538-021-00215-w

Akusu, O. M., Kiin-kabari, D. B., & Isah, E. M. (2020). Anti-nutrients, Bioaccessibility and Mineral Balance of Cookies Produced from Processed Sesame Seed Flour Blends. *International Journal of Food Science and Nutrition Engineering*, *10*(1), 1–11. https://doi.org/10.5923/j.food.20201001.01

AOAC. (2016). *Association of Official Analytical Chemists, Official methods of analysis of AOAC International. International Suite 300, 2275 Research BLVD, Rockville, Maryland 20850-3250, USA.*

Ashaye, O. A., Sanni, O. L., & Arowosafe, B. E. (2010). Physicochemical, Rheological and Consumer acceptability of Cassava Starch Salad Cream. *Journal of American Science*, *6*(1), 65–72.

Chasapis, C. T., Ntoupa, P. S. A., Spiliopoulou, C. A., & Stefanidou, M. E. (2020). Recent Aspects of the Effects of Zinc on Human Health. *Archives of Toxicology*, *94*(1), 1443–1460.

Civille, G. V. & Oftedal, K. N. (2012). Sensory evaluation techniques - make "good for you" taste "good". *Physiology and Behavior*, 107(4), 598-605.

Cooney, R. V., Custer, L. J., Okinaka, L. & Franke, A. A. (2001). Effects of dietary sesame seeds on plasma tocopherol levels. *Nutrition and Cancer*, 39(1), 66-71.

Dongmo, H., Tambo, S. T., Teboukeu, G. B., Mboukap, A. N., Fotso, B. S., Djuidje, M. C. T., & Klang, J. M. (2020). Effect of process and variety on physico-chemical and rheological properties of two corn flour varieties (Atp and Kassaï). *Journal of Agriculture and Food Research*, *2*(1), 1–13. https://doi.org/10.1016/j.jafr.2020.100075

Duan, Y., Zeng, L., Zheng, C., Song, B., Li, F., Kong, X., & Xu, K. (2018). Inflammatory Links Between High Fat Diets and Diseases. *Frontiers in Immunology; Inflammation*, *9*(1), 1–10. https://doi.org/10.3389/fimmu.2018.02649

Eke-Ejiofor, J., & Owuno, F. (2014). The Functional Properties of Starches, Physico-Chemical and Sensory Properties of Salad Cream from Cassava and Potatoes. *International Journal of Nutrition and Food Sciences*, *3*(6), 567–571. https://doi.org/10.11648/j.ijnfs.20140306.22

Froning, G. W., Peters, D., Muriana, P., Eskridge, K., Travnicek, D., & Sumner, S. S. (2019). *International Egg Pasterization Manual*. 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863.

Garcia-Gomez, B., Fernandez-Canto, N., Vazquez-Oderiz, M. L., Quiroga-García, M., Munoz-Ferreiro, N., & Romero-Rodriguez, M. A. (2022). Sensory Descriptive Analysis and Hedonic Consumer Test for Galician Type Breads. *Food Control*, *134*(1), 1–9. https://doi.org/10.1016/j.foodcont.2021.108765

Grzeszczak, K., Kwiatkowski, S., & Kosik-Bogacka, D. (2020). The Role of Fe, Zn, and Cu in Pregnancy. *Biomolecules*, *10*(8), 1–33. https://doi.org/10.3390/biom10081176

Hadipour, E., Emami, S. A., Tayarani-Najaran, N. & Tayarani-Najaran, Z. (2023). Effects of sesame (*Sesamum indicum* Linn) and bioactive compounds (sesamin and sesamolin) on inflammation and atherosclerosis: A review. *Food Science and Nutrition*, 11(7), 3729-3757.

Jellin, J. M., Gregory, P., Batz, F. & Hitchens, K. (2000). Pharmacist's letter/prescriber's letter natural medicines comprehensive database. 3rd ed. Therapeutic research faculty. Stockton, CA. 1-1527.

Jomova, K., Makova, M., Alomar, S. Y., Alwasel, S. H., Nepovimova, E., Kuca, K., Rhodes, C. J., & Valko, M. (2022). Essential Metals in Health and Disease. *Chemico-Biological Interactions*, *367*(1), 1–28. https://doi.org/10.1016/j.cbi.2022.110173

Kaur, N., Chugh, V., & Gupta, A. K. (2014). Essential Fatty Acids as Functional Components of Foods – a review. *Journal of Food Science and Technology*, *51*(10), 2289–2303.

Liyanaarachchi, G. V. V, Mahanama, K. R. R., Somasiri, H. P. P. S., Punyasiri, P. A. N., & Kottawa-arachchi, J. D. (2020). Analysis of Total Amino Acids in Rice Using a Validated Reversed-Phase High Performance Liquid Chromatographic Method with Diode Array Detection (RP-HPLC-DAD). *International Journal of Analytical and Bioanalytical Methods*, *2*(8), 1–5. https://doi.org/10.35840/ijabm/2407

Maqbool, M. A., Aslam, M., Akbar, W., & Iqbal, Z. (2017). Biological Importance of Vitamins for Human Health: A review Breeding for Drought Tolerance in Maize (Zea mays L.) View Project Breeding of White Maize View Project. *Journal of Agriculture and Basic Science*, *2*(3), 50–58. https://www.researchgate.net/publication/32535 9151

McClements, D. J. (2004). *Food Emulsions: Principles, Practices and Techinques* (Second Edi). Boca Raton, New York: CRC Press.

Mihafu, F.D. Issa, J.Y. & Kamiyango, M. . (2020). Implication of sensory evaluation and quality assessment in food product development: A review. *Current Research in Nutrition and Food Science Journal (Enviro Research Publishers)*, *8*(3), 690–702.

Nwosu, A. M., & Eke-Ejiofor, J. (2021). Quality Parameters of Salad Cream from Four Local Varieties of Millet Starches in Nigeria. *American Journal of Food Sciences and Nutrition*, *3*(1), 10–20.

Oli, C. C., Ezeudu, E. C., & Okoye, O. N. N. (2017). Study on the Physicochemical Properties and Sensory Evaluation of Salad Creams made from Locally Available Raw Materials. *International Digital Organization for Scientific Research Journal of Scientific Research*, *2*(3), 26–35.

Sá, A. G. A., Pacheco, M. T. B., Moreno, Y. M. F., & Carciofi, B. A. M. (2022). Cold-Pressed Sesame Seed Meal as a Protein Source: Effect of Processing on the Protein Digestibility, Amino Acid Profile, and Functional Properties. *Journal of Food Composition and Analysis*, *111*(1), 1–10. https://doi.org/10.1016/j.jfca.2022.104634

Sinaga, S. M., Lubis, Y. I., & Silalahi, J. (2016). Analysis of Total Protein and Non Protein Nitrogen in Pakkat (Calamus caesius Blume.) as a Traditional Food of Mandailing Natal by using Kjeldahl Method. *International Journal of PharmTech Research*, *9*(12), 543–549.

Taslikh, M., Mollakhalili-Meybodi, N., Alizadeh, A. M., Mousavi, M., Nayebzadeh, K. & Mortazavian, A. M. (2021). Mayonnaise main ingredients influence on its structure as an emulsion. *Journal of Food Science and Technology*, 59(6), 2108-2116.

Vatanasuchart, N. & Stonsaovapak, S. (2000). Oatrim-5 as fat substitute in low calorie salad cream: nutritional and microbiological qualities. *Kasetsart Journal* (*Natural Science*), 34(4), 500-509.
Wang, P., Yuan, Y., Xu, K., Zhong, H., Yang, Y., Jin, S., Yang, K., & Qi, X. (2021). Biological Applications of Copper-Containing Materials. *Bioactive Materials*, *6*(4), 916–927. https://doi.org/10.1016/j.bioactmat.2020.09.017