



IRAQI
Academic Scientific Journals



العراقية
المجلات الأكاديمية العلمية

TJAS

Tikrit Journal for
Agricultural
Sciences

ISSN:1813-1646 (Print); 2664-0597 (Online)

Tikrit Journal for Agricultural Sciences

Journal Homepage: <http://tujas.tu.edu.iq>

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KEY WORDS:

oils, Fat / oil mixtures,
physical properties, flash
point, smoke point

ARTICLE HISTORY:

Received: 08/08/2021

Accepted: 14/10/2021

Available online:
31/12/2021

Tikrit Journal for Agricultural Sciences (TJAS)

Effect of Mixing Sunflower Oil with Butter Ghee in Physical Properties and Characteristics of the Product

ABSTRACT

Sunflower oil, butter ghee and their mixtures at two levels 10 and 20% were studied. The density of samples was estimated at 0.92, 0.91, 0.914 and 0.916 g/cm³ for treatments 1, 2, 3 and 4, respectively. While the value of the smoking point was 240, 269, 271 and 278 ° C for treatments 1, 2, 3 and 4, respectively, and the value of the flashpoint for oils were estimated to be 292, 295, 297 and 310 ° C for all treatments, respectively, which directly affected the point of ignition value for all samples were 310, 316, 318 and 325 °C for all treatments, respectively. Sensory evaluation was conducted for French fries, and the Score values were 100%, for models 68, 80, 84 and 94 percent for treatments 1, 2, 3 and 4, respectively.

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INTRODUCTION

The process of preparing oils and fats and their industrial production is one of the important processes for its main role in preparing various food products, as vegetable oils with nutritional use are important in producing products with high nutritional value. Plants are an important source of extractable vegetable oils (Yusuf, 2018). Oils and fats are the most concentrated form of energy, as they provide about 9 kilocalories of energy compared to 4 kilocalories per gram of proteins and carbohydrates (Ali *et al.*, 2005), in addition to various industrial and food applications (Yusuf, 2018).

The physical characteristics of oils and fats are among the critical and important characteristics in the study, and the most important physical characteristics of oils are smoking, flash and ignition points, in addition to some other characteristics such as viscosity, density and refractive index. Viscosity is on its way to identify the efficiency and quality of the oil and its suitability for use, in addition to the effect of all the treatments in which it passes all the manufacturing details (Valantina *et al.*, 2010; Askar and Naji, 2016)

Smoking, glowing, and ignition points are important characteristics for observing the efficiency of the oil for frying and other manufacturing processes (Al-Janabi and Naji, 2020). The smoking point is the temperature that is sufficient to see smoke rising from the oil under the appropriate conditions, and this smoke results from the breaking of a number of compounds such as

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free fatty acids and short chain fatty acids and reactions resulting from oxidation and other reactions (Kaur *et al.*, 2014). This research aimed to study differences between samples in their physical properties and acceptance value of products fried with samples.

MATERIALS AND METHODS

Raw materials

Zeer sunflower oil of Turkish origin and butter ghee brand (100 Cows) of (Ukrainian origin) and purchased from the local market of Salah al-Din Governorate were used. Density characteristics, smoking points, flashand ignition were examined with two levels of addition, which are 10 and 20%.

Preparation of the mixtures

The mixtures of sunflower oil with butter ghee were proposed in order to take advantage of the physical properties that can be obtained after mixing the oil with the fat in different proportions. The mixing was done according to the method mentioned by (Al-Janabi and Naji, 2020) by placing the specified proportions of the oil in a beaker with a capacity of 250 ml then heated to 35-40 °C, with stirring by a magnetic stirrer (Alfa HS-860 – China) , and the percentage of butter ghee is added to it slowly with continuous stirring for a period ranging between 5-10 minutes until the mixing process is completed and ensuring a homogeneous distribution of oil and fat, , as in the following table:

Table (1) combinations of oil and butter ghee

Treatment	butter ghee %	Sun flower Oil %
1	0	100
2	100	0
3	10	90
4	20	80

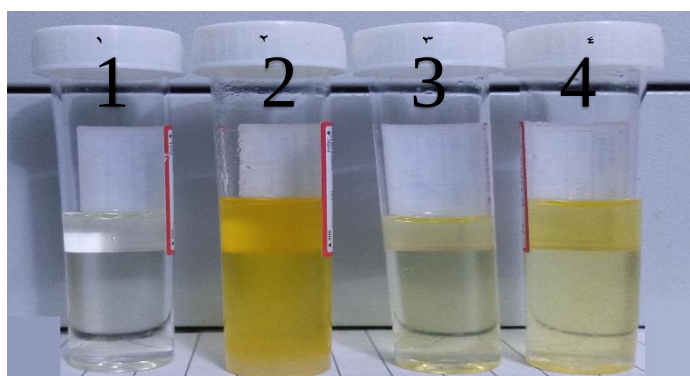


Figure (1) mixtures of oil and butter ghee preparation

Density determination

The density of the crude oil and mixtures was estimated using a density pycnometer vial of 25 ml at a temperature of 25 °C and the density was measured using the following law (Felhauer and wolf, 2006):

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

Smoking Point Estimation

The smoking point of the treatments was estimated according to the method mentioned by (Jarad and Sahi, 2013) using 50 ml of oil in a volumetric flask with a capacity of 150 ml and placed on a hot surface, then gradually raised the temperature and monitored it with the use of a thermometer until smoke appeared.

Estimated flare and ignition points

The flash and ignition points of the oil and its mixtures were also estimated according to what was mentioned by (Janes and Chaieaux, 2013) by taking 10 ml of oil and placing it in a jar and exposing it to heat on a Bunsen lamp while continuing to move the flame source over the oil,

following the appearance of the oil flash and recording the temperature when it appears for flash and ignition.

Prepare food product

Potato cubes were prepared from Iraqi potatoes, the dimensions of the cubes were approximately 1 x 1 cm. The product was divided into four groups that were fried in four groups of fats and mixtures, each group of potatoes was fried in a kind of oil and its mixtures. Potato add to oil when oil temperature become over 160 °C for all treatments.

Sensory evaluation:

The sensory evaluation of French fries was tested based on a (10) of normal consumers aged between 20-40 years. The product and its recipes were evaluated according to a specific scale, in which the total evaluation score is (100 degrees) (Al-Janabi, 2017) and as shown in Table (2).

Table (2) Sensory evaluation form for fried products

Fried product	Apparent characteristics of the product				
	Oder (30%)	Taste (30%)	Appearance and color (20%)	Acceptable (20%)	Score (100%)
Samples					

Statistical analysis

Statistical analysis of the samples was carried out using the Dancun test according to the SPSS Statistical Package for Social Science (2009).

RESULTS AND DISCUSSION

Density

Figure (2) shows the density values of sunflower oil, butter ghee and their mixtures. It is noted that there are differences between the values of the density coefficients at all levels, as the mixing process led to a noticeable decrease in the density of sunflower oil and the increase was directly in the density of ghee, less ghee add Cause increase in density of the oil. The density of the oil increased, and treatment (1) was superior to the rest of the treatments, and it amounted to 0.92 g/cm³, while the lowest values were for treatment No. (2), which amounted to 0.91 g/cm³, the value of the density of sunflower oil agreed with what was found by Mengistie *et al.* (2018), who indicated that the value of the density of sunflower oil is 0.925 g / cm³, while it was proved that the density of sunflower oil in the Asian Guide for Nutritional Analyzes (2011) is between 0.918 and 0.923 g / cm³.

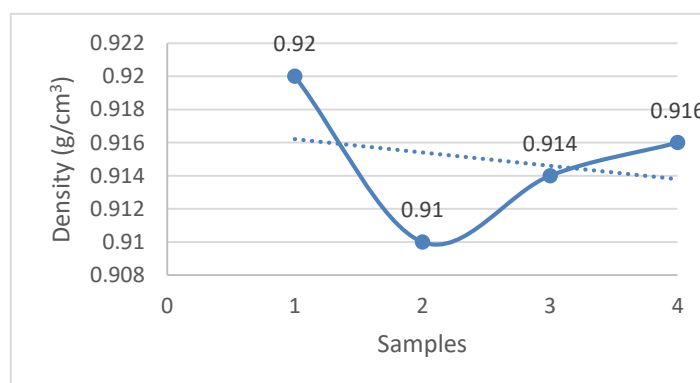


Figure (2) Density of sunflower oil, butter ghee, and their mixtures at a ratio of 10 and 20%

1- Smoke Point

Figure (3) shows the smoking point values for sunflower oil and butter ghee used and their mixtures, as the values showed that butter ghee had a smoking point of 269 °C, while sunflower oil had a smoking point of 240 °C and the lowest values were close to what was found by Al-Janabi and Naji (2020) while Chu (2004) mentioned that the smoking point of refined sunflower oil is 227 °C, while the highest values in treatments were 4 with a smoking point of 278 °C. This rise in the smoking point values has directly led to a rise in the values of the flaring point and smoking as well as an outcome. This rise may be attributed to the formation of correlations, and the difference in smoking points for the studied Fat/oils mixtures may be attributed to the

different content of oils and fats of saturated and unsaturated fatty acids. In addition to the differences in the degree of saturation of these fatty acids (Sharif, 2009).

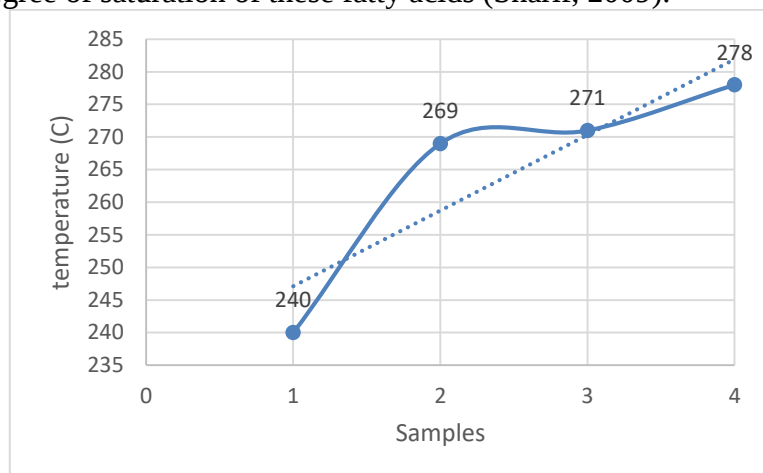


Figure (3) Smoke point of sunflower oil, butter ghee, and their mixtures at a ratio of 10 and 20%

3- Flash Point

Figure (4) shows the values of the flashpoint of sunflower oil and butter ghee and their mixtures. The flashpoint represents the lowest temperature at which the oil can form a flammable mixture near its surface. The measurement of the flashpoint does not require the production of a stable flame, but only requires the ignition of oil vapors (Durkee, 2006). The figure shows that the lowest value of the flashpoint was in sample No. 1 and it amounted to 292 ° C. This result is close to what was reached by Al-Janabi and Naji (2020), who mentioned that the flashpoint of sunflower oil has reached 286 ° C. While the highest values were in treatment 4, which amounted to 310 °C. This difference may be due to a change in the composition of the triglycerides that make up the mixture, the presence of an abundance of saturated fatty acids leads to an increase in the energy needed to break covalent bonds that require higher energy to break and compared to those needed to break double bonds (Sharif, 2009).

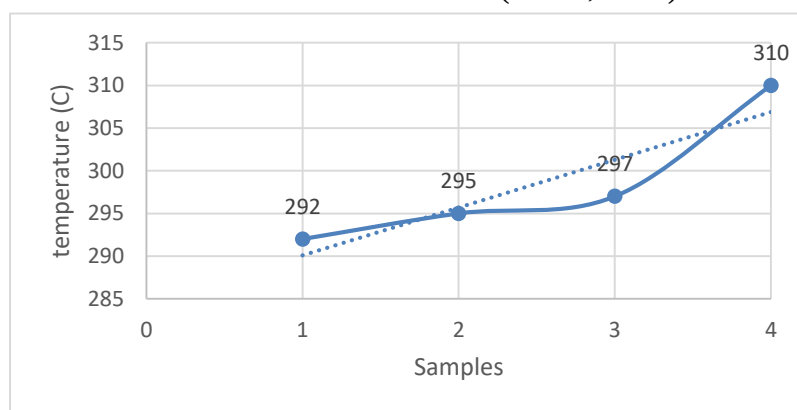


Figure (4) Flash point of sunflower oil, butter ghee, and their mixtures at a ratio of 10 and 20%

4- Fire point

Figure (5) shows the values of the ignition point for sunflower oil, butter ghee and their mixtures. The ignition point refers to the point at which the oil burns while exposed to a flame (Hollebone, 2017). The figure shows that the lowest value of the ignition point was in sample No. 1 and it was 310 ° C, this result did not agree with what was reached by Shahidi (2005), who mentioned that the ignition point of sunflower oil reached 313 ° C. The fatty acids were free from the composition of the oil (Sharif, 2009), while the highest values were in treatment 4, which amounted to 325 °C. This difference may be attributed to a change in the composition of the triglycerides that make up the mixture, especially since the presence of an abundance of saturated fatty acids leads to an increase in the energy needed to break

covalent bonds that require higher energy to break and compared to those needed to break double bonds (Sharif, 2009).

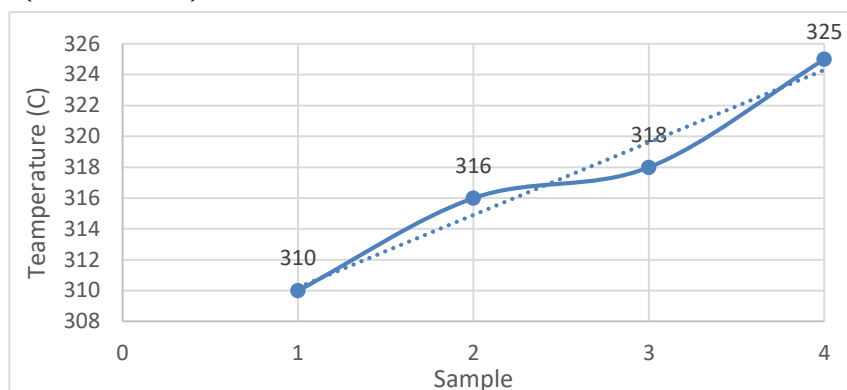


Figure (5) Fire point of sunflower oil, butter ghee, and their mixtures at a ratio of 10 and 20%

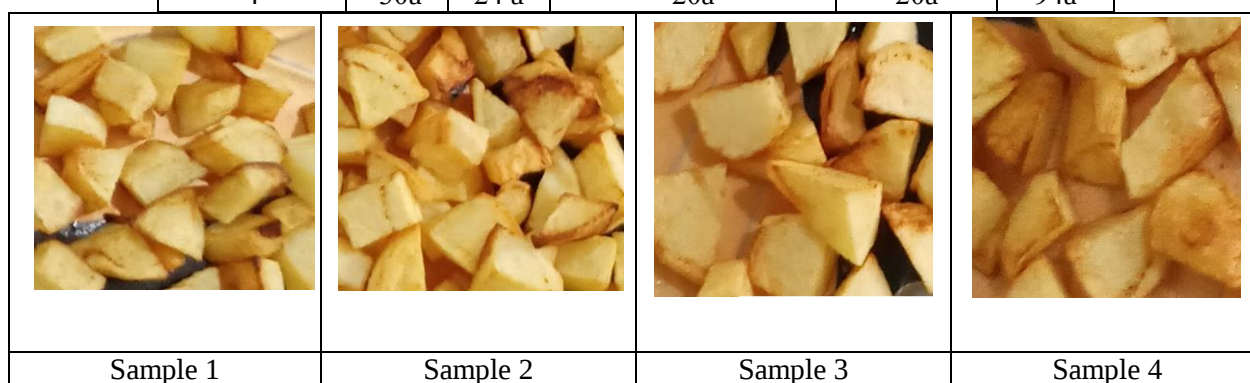
5- Taste panel

Table (3) shows the characteristics of the product fried by sunflower oil, butter ghee and their mixtures, which include the characteristics of smell, taste, appearance, color and general acceptance, as it is noted that there are significant differences in the characteristic of odor, and it is noted that treatment No. 4 is superior to the rest of the treatments and its value reached 30%, While the lowest values were for treatment 1 and amounted to 18%, as for the taste trait, significant differences were found between treatment 1 and the rest of the treatments, while there were no significant differences between treatments 2, 3 and 4, and their value was 24%, respectively.

The characteristics of appearance and color recorded significant differences between samples 1 and 2, the value of each was 16%, and samples 3 and 4, value of each was 20%. The general acceptance trait recorded that there were no significant differences between treatments 1, 2 and 3, which amounted to 16 for each of them, but treatment 4 significantly differ and gave a value of 20%. From the observation of Table (3), we note that the value of the score varied significantly, and treatment 4 outperformed the rest of the values, and the total evaluations value reached 94%, while the lowest values were for transaction No. 1 and the total evaluations value was 68 only. This evaluation may be due to the presence of new flavors that were formed during the interaction of the components of oil and butter ghee with a percentage of 20% in the oil, creating desirable flavors and flavors for the consumer.

Table (3) the characteristics of the product fried by sunflower oil, butter ghee and their mixtures

Fried product	Apparent characteristics of the product				
	Oder (30%)	Taste (30%)	Appearance and color (20%)	Acceptable (20%)	Score (100%)
1	c 18	b 18	16b	b 16	68d
2	24 b	24a	16b	b 16	80c
3	24 b	a 24	20 a	b 16	84b
4	30a	24 a	20a	20a	94a



Shape (1) fried potatoes by oils and their mixtures

CONCLUSION

Results showed that mixing processes of sunflower oil and butter ghee have led to emergence of better sensory qualities in food product. There for we conclude that it is possible to use mixing with this ratio to give sensory qualities that consumers prefer in terms of smell, taste, appearance and general acceptance. Mixing process has also led to this mixing ratio has a higher heat tolerance than sunflower oil and butter ghee, which increases the periods of deep frying to more times, and this is an important economic characteristic for consumers, especially in cafeterias and restaurants.

REFERENCES

- Ali, F.M., Ali, B.E. and Speight, J.G. (2005). Handbook of Industrial Chemistry: Organic Chemicals. McGrawHill Education, USA.
- Al-Janabi, A. M. A. (2017). Effect of addition three levels of guar gum on rheological properties of altunsa flour and sensory qualities of homemade cake. Tikrit Journal for Agricultural Sciences, 13(3), 235-240.
- Al-Janabi, A. M. A. and Naji, E. Z. (2020) Effect of mixing ratios & Heating treatment on some physical properties for vegetable oil and their mixing. Tikrit Journal for Agricultural Sciences, conference edition 301-310.
- Asian Manual of food Analysis (2011). Regional Center of Asian network of food data system, Institute of nutrition, Mahidol University Thailand 2011-1-3.
- Askar, A. W. N. and Naji, E. Z. (2016) Estimate Percentage of Oil Extracted from Local Rice Milling Byproducts (Rice Bran) and Study Some of the Chemical Characteristics. Tikrit journal for Agricultural Sciences, 16(4), 197-207.
- Chu, M. (2004). Smoke Points of Various Fats - Kitchen Notes. Cooking For Engineers. Retrieved 2013-02-07.
- Durkee (2006) Health and safety hazards associated with cleaning agents. www.sceincedirect.com/flash-point.
- Fehlauer, H. and Wolf, H. (2006) Density reference liquids certified by the Physikalisch-Technische Bundesanstalt. Meas.Sci.Technol., 17, 2588–2592
- Hollebone, B. (2017) Oil spill Science and technology 2nd Edn.
- Janès. A. and Chaineaux. J. (2013). Experimental Determination of Flash Points of Flammable Liquid Aqueous Solutions. Cemical Engeneering Transactions, Vol 31. ISSN 1974-9791
- Jarad, B. B. and Sahi, A. A. (2013) Effect of storage period and temperature on the physicochemical properties of purified wheat germ oil. Journal of Basra Sciences, 39 (4), 200:210
- Kaur, A., Vishaldeep, J. and Bhise, R. (2014). Replacement of bakery shortening with rice bran oil in the preparation of muffins. African journal of biochemistry research, 8(7), 141-146.
- Mengistie, T., Alemu, A. and Mekonnen, A. (2018) Comparison of physicochemical properties of edible vegetable oils commercially available in Bahir Dar, Ethiopia. Chemistry International, 4(2): 130-135.
- Shahidi, F. (2005). Quality assurance of fats and oils. Bailey's Industrial Oil and Fat Products, 6thEdn, Six Volume Set, 565-575.
- Sharif, M. K (2009). Rice Industrial By-products, Management for Oil Extraction and Value Added Products National institute of Food science and Technology University of agriculture Faisalabad, Pakistan.
- SPSS, (2009). Statistical Pakage for Social Science
- Valantina, S., Rubalya, P., Sahayaraj, A. and Angelin, P. A. (2010). Antioxidant Stability in palm and rice bran oil using simple parameters. J.of chem., 3(1), 2340-2345.
- Yusuf, A.K. (2018). A review of methods used for seed oil extraction. International journal of science and research (IJSR), 17(12), 233-238.

تأثير خلط زيت زهرة الشمس بالسمن البقري (Better ghee) على الصفات الفيزيائية وصفات المنتج المقلّي

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الخلاصة

تم دراسة تأثير عملية خلط زيت زهرة الشمس مع السمن البقري Butter Chee وبمستويين هما 10 و 20 % وقد تم تقدير كثافة العينات وقد بلغت 0.92 و 0.91 و 0.914 و 0.916 غم / سم³ للمعاملات 1 و 2 و 3 و 4 على التوالي. في حين كانت قيمة نقطة التدخين 240 و 269 و 271 و 278 °م للمعاملات 1 و 2 و 3 و 4 على التوالي، كما قدرت قيمة نقطة التوهج للزيوت وكانت 292 و 295 و 297 و 310 °م للمعاملات كافة على التوالي والتي اثرت بشكل مباشر على قيمة نقطة الاشتعال للعينات كافة وبلغت قيمتها 310 و 316 و 318 و 325 °م لكافة المعاملات على التوالي. واجري التقييم الحسي للبطاطا المقلية وكانت قيم Score 100% للنماذج 68 و 80 و 84 و 94 % للمعاملات 1 و 2 و 3 و 4 على التوالي .

الكلمات المفتاحية:

الزيوت ، الخصائص الفيزيائية للزيوت , مخاليط الزيوت والدهون , نقطة التوهج ، نقطة الاشتعال ، نقطة التدخين .