ISSN 2181-8622

**Manufacturing technology problems**

# Scientific and Technical Journal Namangan Institute of Engineering and Technology

Volume 8
Issue 2
2023

Google Scholar

Crossref doi

SLIB.UZ
Scientific library of Uzbekistan

22. Marrufo T, Nazzaro F, Mancini E, Fratianni F, Coppola R, De Martino L, Agostinho AB, De Feo V, “Chemical composition and biological activity of the essential oil from leaves of Moringa oleifera Lam. cultivated in Mozambique”. Molecules; 2013, 18(9): pp.10989-11000.

23. Chuang PH, Lee CW, Chou JY, Murugan M, Shieh BJ, Chen HM, “Anti-fungal activity of crude extracts and essential oil of Moringa oleifera Lam”. Bioresource technology; 2007, 98(1): pp.232-236.

24. Abalaka ME, Daniyan SY, Oyeleke SB, Adeyemo SO, “The antibacterial evaluation of Moringa oleifera leaf extracts on selected bacterial pathogens”. Journal of Microbiology research; 2012, 2(2): pp.1-4.

UDK 664.34:637.144

# INDICATORS OF BLENDING OF REFINED VEGETABLE OILS

**ADASHEV BEXZOD**

Doctoral student of Namangan Institute of Engineering and Technology
E-mail: adashev.bexzod@mail.ru

**SALIKHANOVA DILNOZA**

Professor of Institute of General Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan
E-mail: salihanova79@mail.ru

**RUZMETOVA DİLDORA**

Associate Professor of Urgench State University
E-mail: ruzmetovadildora2018@gmail.com

**ABDURAHIMOV AKHROR**

Professor of Tashkent Chemical Technological Institute
E-mail: ahror86_249@mail.ru

**SAGDULLAEVA DILAFRUZ**

Leading Researcher of Institute of Bioorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan
E-mail: Dilya15@ mail.ru

**Abstract:**

**Objective**. This article discusses the issues of blending refined vegetable oils and the impact on fatty acid composition. The effect on its physicochemical properties has been studied.

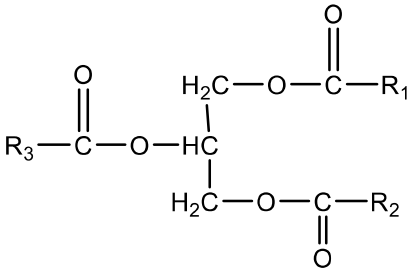
**Methods.** The fatty acid composition was determined on an Agilent 8860 GC gas chromatograph with a flame ionization detector using a Supelco 100m x 0.25mm capillary column with SRtm-2560 phase, helium carrier gas, column programming temperature from 1400 C to 2500 C. The acid number and peroxide number were determined according to GOST standards.

**Results.** It has been established that biologically valuable components are higher in unrefined oil than in refined oil. The physicochemical composition of the resulting mixtures was studied, and it was found that they correspond to the normative technical documentation.

**Conclusion**. Thus, based on the study of blending refined vegetable oils at different ratios (as well as unrefined), the ratio of ω-6:ω-3 is different.

**Keywords**: Vegetable oil, fatty acid composition, physico-chemical composition, peroxide number, acid number, biological value.

**Introduction.** Fats and oils, in terms of organic chemistry [1-8], are described as esters of glycerol and fatty acids, called glycerides or triglycerides. These compounds consist of glycerol linked to three molecules of fatty acids, where the hydrocarbon residues of higher carboxylic acids are $R_1$, $R_2$ and $R_3$.



Vegetable oils and products play an essential role in human nutrition, providing the necessary calorie content and the content of biologically active substances of a lipid nature, including essential ones. Nutritionists recommend adding products with a balanced fatty acid composition to the human diet, including polyunsaturated fatty acids of the omega-3 and omega-6 families in an optimal ratio of 1: (5-10), as well as biologically active substances such as vitamins, provitamins and phytosterols. Products containing oil oxidation products and trans-fatty acids should be avoided [1,2].

In the world, with an increase in the production of vegetable oils and the creation of new types of oil and fat products for various sectors of the economy, as well as taking into account recommendations for their composition, it is becoming increasingly important to ensure the high quality and safety of the original vegetable oils, as well as the constant improvement of technologies for their modification. Therefore, it is necessary to develop new methods and technologies to improve the quality and safety of vegetable oils.

**Research methodology**. The fatty acid composition was determined on an Agilent 8860 GC gas chromatograph with a flame ionization detector using a Supelco 100m x 0.25mm capillary column with SRtm-2560 phase, helium carrier gas, column programming temperature from 1400 C to 2500 C. The acid number and peroxide number were determined according to GOST standards [9-12].

**Results and discussion.** In works [13-17] blending of unrefined vegetable oils was carried out, where a balanced mixture of vegetable oils was obtained for daily, medicinal and prophylactic purposes. Vegetable oils were blended at the same ratios to study the effect of the refining process on these compositions.

№1. Cottonseed oil + linseed oil + rapeseed oil - 70:10:20;

№2. Soybean oil + sunflower oil - 60:40;

№3. Rapeseed oil + sunflower oil - 20:80;

№4. Rapeseed oil + sunflower oil - 10:90;

№5. Cottonseed oil + linseed oil - 80: 20;

№6. Cottonseed oil + soybean oil - 60:40;

№7. Cottonseed oil + soybean oil + rapeseed oil - 60:30:10;

Further, the fatty acid composition of the above-mixed vegetable oils was studied on a modern Agilent Technologies 6890 N gas-liquid chromatograph with a flame ionization detector. The results are shown in the table. 1.

Table 1

**Composition of fatty acids of blended mixtures of refined vegetable oils**

| Fatty acids | №1 (cot.+ lin. + rape.) | №2 (soy. + sun.) | №3 (rape.+ sun.) |
|---|---|---|---|
| Lauric, 12:0 | Сл. | - | - |
| Myristic, 14:0 | 0,54 | 0,06 | 0,15 |
| Palmitic, 16:0 | 15,7 | 7,98 | 7,36 |
| Palmitoleic, 16:1 | 0,36 | 0,06 | 0,10 |
| Margaric, 17:0 | 0,08 | 0,07 | - |
| Stearic, 18:0 | 2,35 | 3,54 | 2,88 |
| Oleic, 18:1 | 19,21 | 22,93 | 16,89 |
| Linoleic, 18:2 **ω-6** | 42,8 | 59,83 | 61,84 |
| Linolenic, 18:3 **ω-3** | 10,8 | 4,33 | 3,78 |
| Arachidonic, 20:0 | 0,33 | 0,35 | 0,37 |
| Eicosenoic, 20:1 | 2,91 | 0,18 | 1,58 |
| Behenic, 22:0 | 0,31 | 0,50 | 0,72 |
| Erucic, 22:1 | 4,23 | - | 3,88 |
| Lignoceric, 24:0 | 0,16 | 0,17 | 0,25 |
| Nervonic, 24:1 | 0,21 | - | 0,20 |
| $\Sigma_{saturated\ FA}$ | 19,5 | 12,67 | 11,73 |
| $\Sigma_{unsaturated\ FA}$ | 80,5 | 87,33 | 88,27 |

Table 2

**Composition of fatty acids of blended mixtures of refined vegetable oils**

| Fatty acids | №4 (rape.+ sun.) | №5 (cot.+ lin. ) | №6 (cot.+ soy.) | №7 (cot.+ soy.+ rape.) |
|---|---|---|---|---|
| Myristic, 14:0 | 0,06 | 0,60 | 0,46 | 0,47 |
| Palmitic, 16:0 | 4,69 | 17,4 | 17,37 | 16,6 |
| Palmitoleic, 16:1 | 0,08 | 0,40 | 0,35 | 0,31 |
| Margaric, 17:0 | 0,05 | tr. | tr. | - |
| Stearic, 18:0 | 3,13 | 2,65 | 3,37 | 3,06 |
| Oleic, 18:1 | 15,47 | 18,86 | 22,27 | 21,83 |
| Linoleic, 18:2 **ω-6** | 69,1 | 46,3 | 52,25 | 49,26 |
| Linolenic, 18:3 **ω-3** | 2,08 | 13,3 | 3,2 | 3,66 |
| Arachidonic, 20:0 | 0,32 | 0,23 | 0,30 | 0,35 |
| Eicosenoic, 20:1 | 1,65 | 0,05 | 0,12 | 1,64 |
| Behenic, 22:0 | 0,73 | 0,12 | 0,21 | 0,29 |
| Erucic, 22:1 | 2,30 | - | - | 2,27 |
| Lignoceric, 24:0 | 0,22 | 0,07 | 0,10 | 0,15 |
| Nervonic, 24:1 | 0,12 | - | - | 0,11 |
| $\Sigma_{saturated\ FA}$ | 9,2 | 21,1 | 21,81 | 20,92 |
| $\Sigma_{unsaturated\ FA}$ | 90,8 | 78,9 | 78,19 | 79,08 |

From the data obtained in Table 1 and 2, it can be seen that, with the blending of refined vegetable oils, the ratio ω-6:ω-3 is:

№1. Cottonseed oil + linseed oil + rapeseed oil - ω-6:ω-3 - 4:1;

№2. Soybean oil + sunflower oil - ω-6:ω-3 - 14:1;

№3. Rapeseed oil + sunflower oil - ω-6:ω-3 - 16:1;

№4. Rapeseed oil + sunflower oil - ω-6:ω-3 - 33:1;

№5. Cottonseed oil + linseed oil - ω-6:ω-3 - 3.4:1;

№6. Cottonseed oil + soybean oil - ω-6:ω-3 - 16:1;

№7. Cottonseed oil + soybean oil + rapeseed oil - ω-6:ω-3 - 13.1:1;

The ratio ω-6:ω-3 in more than one sample does not meet the requirements set by nutritionists and nutritionists [13]. According to him, for a healthy person, it should be ω-6: ω-3-10: 1; for therapeutic

and preventive nutrition, ω-6:ω-3-5:1 or 3:1.

In works [13-17], unrefined vegetable oils were studied at the same ratios. We compare them with the results of refined oils (Tables 1 and 2). The refined oils ratio no longer corresponds to the required ones. Further, the change in the acid and peroxide values of the original and blended vegetable oils was studied (Tables 3-4).

Table 3

**Fundamental data on refined vegetable oils**

| Indicator name | Vegetable oils | | | | |
|---|---|---|---|---|---|
| | rapeseed | sunflower | cottonseed | soybean | linseed |
| Acid number (mg KOH/g) | 0,3 | 0,2 | 0,3 | 0,2 | 0,4 |
| Peroxide value (mmol $O_2$ /kg) | 2,1 | 1,8 | 3,2 | 1,9 | 2,5 |

Table 4

**Changes in acid and peroxide values of blended vegetable oils**

| Name of product | Acid number (mg KOH/g) | Peroxide value (mmol $O_2$ /kg) |
|---|---|---|
| №1 (cot.+ lin. + rape.) | 0,3 | 2,8 |
| №2 (soy. + sun.) | 0,2 | 1,9 |
| №3 (rape.+ sun.) | 0,2 | 1,8 |
| №4 (rape.+ sun.) | 0,2 | 1,8 |
| №5 (cot.+ lin. ) | 0,3 | 3,1 |
| №6 (cot.+ soy.) | 0,2 | 2,6 |
| №7 (cot.+ soy.+ rape.) | 0,2 | 2,7 |

As can be seen from the data obtained in Table. 3-4 you can see that all the physicochemical parameters of the original and blended refined vegetable oils correspond to the normative technical documentation.

**Conclusion.** Thus, based on the study of blending refined vegetable oils at different ratios (and unrefined), the ω-6:ω-3 ratio is different. This can be explained by the fact that valuable fatty acids are partially lost during refining, and therefore the ratios made from unrefined oils need to be changed. For example: in samples No. 1 and No. 5, they need to increase the amount of linseed oil, or in samples No. 2,3,6, they need to reduce the amount of ω-6.

It has been established that biologically valuable components of unrefined oil are higher than those of refined oil. Further research will look to obtain a balanced cooking PUFA for daily consumption.

## References

1. Rudakov O.B. Fats, chemical composition and quality examination-M .: De Li print, 2005.-312 p.
2. Tyutyunnikov B.N. Chemistry of fats. -M.: Kolos, 1992.-448 p.
3. Bezzubov L.P. Chemistry of fats. -M.: Food industry, 1975.-350 p.
4. Nechaev A.P., Eremenko T.V. Organic chemistry. -M.: Higher School, 1985. -463 p.
5. Агугу А. Разработка технологии получения растительных масел повышенной физиологической ценности пищевого назначения: автореф. дисс. ... канд. техн. наук. / Агугу А. - Краснодар., 1990,- 24 с

6. Биохимические указания по определению общих биохимических показателей качества масла и семян масличных культур ВНИИМК / под общ. ред. А.А. Бородулиной // Краснодар, 1986. - с. 37-41.

7. Григорьева В.Н. Факторы, определяющие биологическую полноценность жировых продуктов / В.Н. Григорьева, А.Н. Лисицын // Масложировая промышленность. - 2002. -№4. - С. 14-17.

8. Климантова Е.В. Витаминизация масложировой продукции / Е.В. Климантова, Т.Э. Некрасова // Масложировая промышленность. - 2000. - №1. - С. 34-34.

9. ГОСТ 5472-50 Масла растительные, определение запаха, цвета и прозрачности.

10. ГОСТ 18848-73 Масла растительные. Показатели качества. Термины и определения.

11. ГОСТ Р 50457-92 Жиры и масла животные и растительные. Определение кислотного числа и кислотности.

12. ГОСТ Р 51487-99 Масла растительные и животные жиры. Метод определения перекисного числа.

13. Adashev B.Sh., Salikhanova D.S., Ismoilova M.A. Improving the biological properties of vegetable oils by blending // Universum: chemistry and biology: electron. scientific magazine 2023.4(106). URL: https://7universum.com/en/nature/archive/item/15218 (date of access: 04/14/2023).

14. Adashev B.Sh., Abdurahimov S.A., Khodzhaev S.F. Composition and properties analysis of clarified light vegetable oils using local clays. Universum: Engineering sciences. –Moscow, 2021 No. 6 (87).

15. Yazeva L.I. On the biological properties of vegetable oils containing linolenic acid (18:3co3) / L.I. Yazeva, G.I. Filippova, N.I. Fedina // Food Issues. - 1989. -№3. - P.45-50

16. Skoryukin A.N. Fatty products with a balanced fatty acid composition / A.N. Skoryukin, S.Yu. Utesheva, A.P. Nechaev // Materials of the scientific-practical conference. - Moscow, 2003. - P.69-72.

17. Recommended levels of consumption of food and biologically active substances. Guidelines MP 2.3.1.1915-04-M.:RIK GOUOGU,2004.-36 p.

18. В.М.Копейковский, С.И.Данильчук, Г.И.Гарбузова и др.Технология производства растительных масел.-Легкая и пищевая промишленность,1982.

19. Н.С.Арутюнян, Е.А.Аришева, Л.И.Янова, И.И.Захарова, Н.Л.Меламуд. Технология перероботки жиров.-М:, Агропромиздат,1985.

Б.Н.Чубинидзе, В.Х.Паронян, А.В.Луговой и др. Оборудование предприятий масло-жировой промышленности. - М:, Агропромиздат,1985.

# CONTENTS

## PRIMARY PROCESSING OF COTTON, TEXTILE AND LIGHT INDUSTRY



## GROWING, STORAGE, PROCESSING AND AGRICULTURAL PRODUCTS AND FOOD TECHNOLOGIES