ANALYSIS OF SUNFLOWER OIL SOLD IN THE NORTHEAST OF ROMANIA

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Abstract

One of the most widely consumed oil from Europe is sunflower oil. All european countries are cultivating sunflowers, but due to increased sunflower oil consumption, we rely on imports, the biggest coming from the Black Sea region, especially Russia and Ukraine. The main problems of quality on sunflower oil are contamination and oxidation (rancidity). Sunflower oil has a relatively high oxidative stability (resulting a long shelf life), but the stability depends on the quality of seeds, the seed treatment before extraction, extraction methods and processing conditions. The purpose of this paper is to determine the quality of sunflower oils marketed in northeastern of Romania. Samples were collected from different manufacturers, from various points of sale. In addition to the sensory analysis, were determined the following physico-chemical parameters: density, moisture content, acidity, saponification value, the color of iodine, peroxide, impurities contained in the organic solvent. We can conclude that all the samples analyzed are within current standards imposed by EU legislation.

Key words: oil, sunflower, quality, Romania

INTRODUCTION

Sunflower seeds are one of the main sources of vegetable fats used in human nutrition respectively the most important source of oil for Romania. The oil obtained by mechanical pressing or by solvent extraction is called "crude oil" because it contains a large number of impurities. Some impurities, such as fragments of seeds can be easily removed by filtration. Others, such as free fatty acids, hydrocarbons, ketones, tocopherols, glycolipids, phytosterol, phospholipids, proteins, pigments and the resins are soluble or form stable colloidal suspensions in oil. Most of them have adverse effects on flavor, appearance and shelf life of the oil and therefore must be removed from vegetable oils by refining chemical or physical processes [8]. Vegetal oils and fats have an important role in nutrition ([5], but are also used as raw materials in different industries [7]. Around 90% of the fatty acids from sunflower oil are unsaturated oil, namely oleic (C18: 1,16% - 19%) and linoleic (C18: 2,68% - 72%). Acids: palmitic (C16: 0,6%), stearic (C8: 0,5%), myristic (C14: 0), myristoleic (C14: 1), palmitoleic (C16: 1), arachidonic (C20: 0), behenic (C22: 0) and other fatty acids account for the remaining 10% [6]. The purpose of this paper is to determine the quality of sunflower oils marketed in northeastern of Romania.

MATERIAL AND METHOD

To achieve the papers work was purchased 40 bottles with sunflower oils from different batches, 4 for each studied assortment, and were bought from different stores localised in Iași City. Samples provided from five different producers, were gathered in original package and transferred to the analysis laboratory. From the five producers, 2 product oil from low-cost category and 3 from the premium category. Samples were coded with A, B, C, D and E for each type of oil.

Sensory evaluation was conducted by a team of 10 members, persons who are familiar with sunflower oil. Respecting a modern working method [1], [2]. each of the board members received five coded samples, corresponding for each type of oil. Sensory appreciation of the samples was performed

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using the analytical method of assessing the quality by scoring, using a 5-point system scale for oil [1], [2].

The criteria used for sensory evaluation were overall appearance and colour, taste, and smell. Based on the results of sensory evaluation, total average score was calculated (Pmt) for each of the five types of samples.

Determination of humidity, iodine value and bulk density by pycnometer method was realised in according with standard *STAS 145-67,* which establish the determination methods for humidity, iodine value and bulk density of vegetal oils and fats.

Acidity value represents the quantity, in mg, of potassium hydroxide necessary for neutralization of free fatty acids from one gram of fat material. Results are expressed in mg of potassium hydroxide for one gram of fat material.

For determination of saponification value, a known quantity of fat (oil) is subjected to saponification, by boiling with an in excess quantity of potassium hydroxide 0.5 n (alcoholic solution). At the end of saponification it is determined, by titration with an acid, the quantity of potassium hydroxide which didn't react (in excess); through difference is established the quantity of potassium hydroxide which was utilised at fat neutralization and saponification. It is reported to one gram of fat [3], [4].

Determination of peroxide value was realised in according with standard *STAS 145/22-74.* Peroxide value is expressed in milliequivalents of peroxide at 1 kg of product, micrograms of active oxygen at 1 g of product and millimoles of peroxide at 1 kg of product.

Determination of impurities content in organic solvents was realised in according with standard *STAS 145/11-71.* Product was treated with an excess of organic solvent, filtration of solution, filtration system washing with the same solvent, drying at 103 ± 2^0C till a constant mass and weighting of filtration system and drily residuum.

The software used for statistical analysis was SPSS. We calculated the average, standard deviation, coefficient of variation and statistical significance of differences between samples, using Anova Single Factor.

RESULTS AND DISCUSSIONS

Sensory analysis was performed by a team of 10 people, each receiving five coded samples, corresponding for each type of oil. Sensory appreciation of the samples was performed using the analytical method of assessing the quality by scoring, using a 5-point system scale for oil. The results are shown in Figure 1.

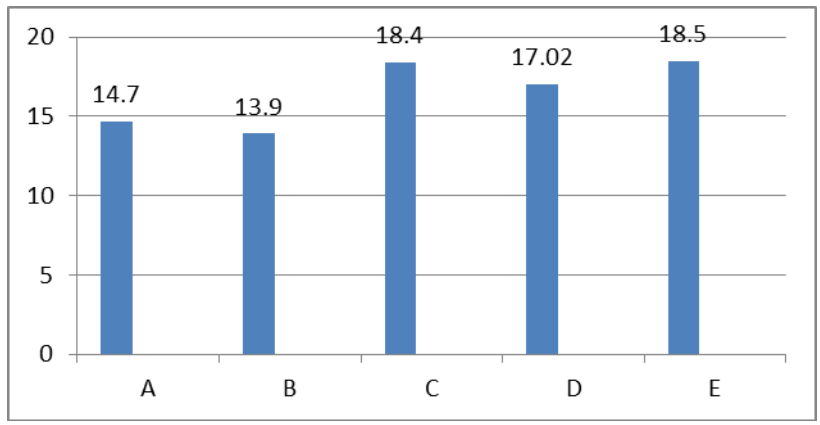

Fig. 1 Value obtained at sensory analysis

From the data presented in Figure 1 we see that there are major differences between the 5 types of oil analyzed. The score achieved at the 5 criteria analyzed (appearance and colour,

taste, and smell) having values between 13.9 points, ranging from low oil and 18.5 points in the premium category.

Moisture is a physical-chemical parameter which shows the water content in oil. The result are presented in the figure 2.

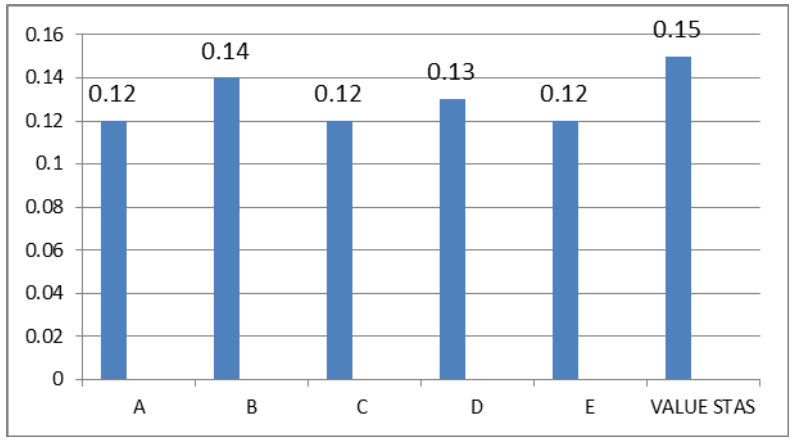

Fig. 2 Moisture content of sunflower oil (%)

The obtained results show the fact that at the analysed oil samples moisture recorded a minimum value of 0.12% and a maximum one of 0.14%, values that fall within the maximum limits set by the standards (0.15%).

Relative density represents the rate between the mass of a volume of analysed substance and the mass of the same volume of water, at the same temperature. Data obtained are presented in figure 3.

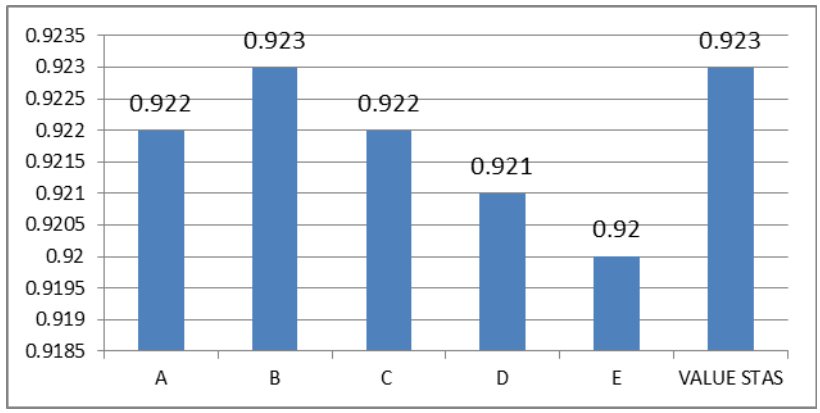

Fig. 3 Relative density (g/ml)

The results obtained at parameter Relative density indicating very similar values (0.921 to 0.923 g / ml) in all 5 types analyzed. Results from all varieties are equal to or less than the maximum permitted.

Acidity value is a physical-chemical parameter which allows us to appreciate the preservation degree of the oils (figure 4).

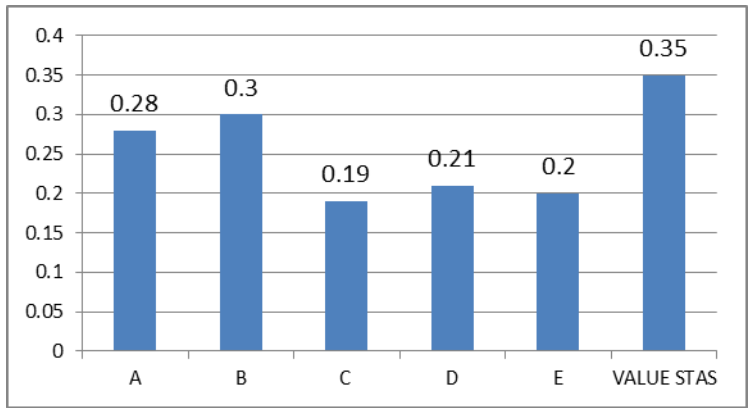

Fig. 4 Acidity value (mg KOH / g, oil)

The recorded results show the fact that at analysed oil samples were obtained values between: 0.19% for oil D and 0.23% for oil B. Higher values were obtained ranging from low oils and oils lowest premium category. All 5 analyzed oils have lower values than the maximum permissible value (0.35 mg KOH / g, oil).

Saponification value offers information regarding mean molecular mass of fatty acids from a certain fat (fig. 5).

In according with the obtained data, was observed that the saponification value had higher values at oils from category low and value lower at the premium category. The value was 190 for oil A, 195 for oil B, 187 for oil C, 188 for oil D and 186 for oil E.

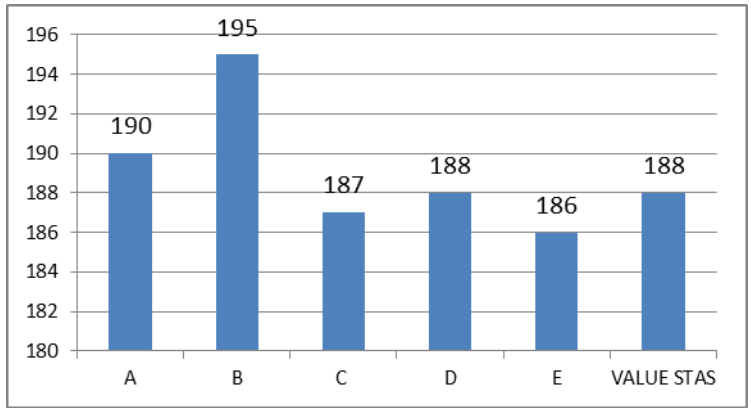

Fig. 5 Saponification value (mg KOH/g oil)

Value of oil A and B exceeded the maximum admissible value (194 mg KOH / g, oil), fact which show that molecular mass content of fatty acids from oil have an increased value which could affect the cellular metabolism in the case of an unbalanced consumption. The other three studied oil assortments were in the limits of standard values.

Iodine value is a qualitative parameter which indicates the iodine quantity in oil, this one influencing the colour of the final product. The recorded values were between 3.71 and 4.92 (fig. 6), values which are in the limits of actual standard.

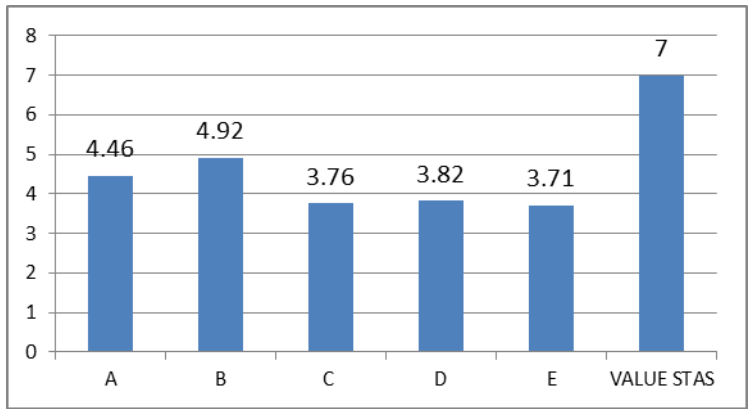

Fig. 6 Iodine colour (mg I/100 cm^3)

From the analysed oils, oil E is the most favourable for iodine colour with a value of 3.71, value assuring suitable sensorial characteristics. All 5 analyzed oils have lower values than the maximum permissible value (7 mg / 100 cm^3).

Peroxide value represents the content in peroxide and other oxidant substances from a certain quantity of product which in the conditions of determination method oxidizes potassium iodine freeing iodine (figure 7).

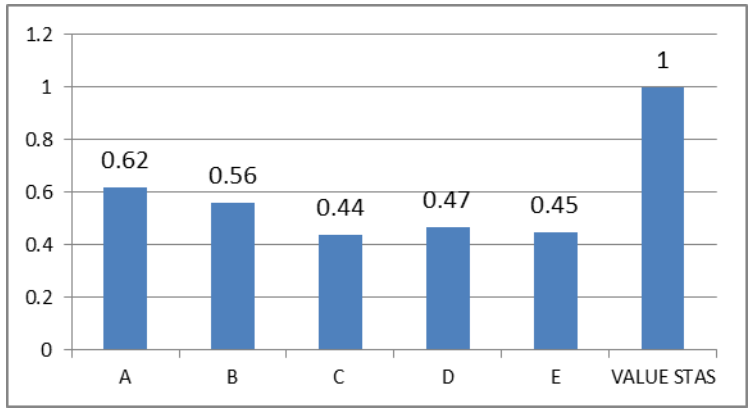

Fig. 7 Peroxide value (meq/kg)

The results obtained show that peroxide value is in according with the standard value, and values are between 0.44 for oil, and 0.62 for oil A.

Rate of insoluble impurities from sunflower oil indicates the way in which filtration operation was realised. Impurities percent is influenced by filtration process and the storage mode of oil till this one is bottled.

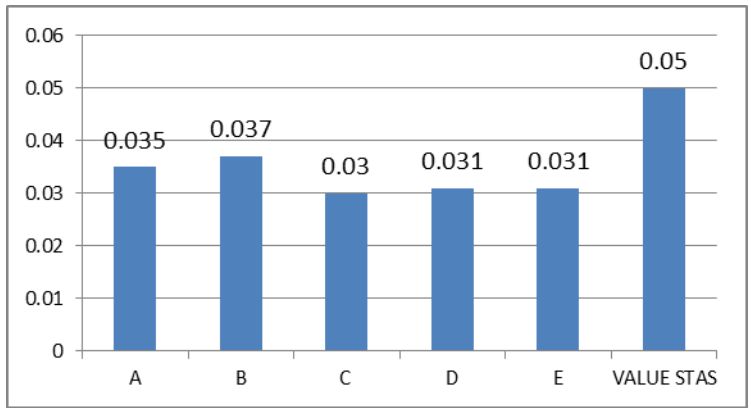

Fig. 8 Insoluble impurities in organic solvents

The results obtained in the indicator Insoluble impurities in organic solvents had values between 0.03 and 0.037. All 5 analyzed oils have lower values than the maximum permissible value (0.05).

CONCLUSIONS

Sensory differences exist between all five types of oil, but in particular, between two categories: the low and premium oil.

Regarding the physical-chemical differences are found significant and insignificant differences between the 5 oil varieties analyzed. Significant differences were recorded at parameters: acidity, saponification, iodine color and peroxide. Insignificant differences were recorded parameters: moisture content, relative density and insoluble impurities in organic solvents.

Exceeding the maximum permitted levels have been recorded parameter saponification to two types of oil. Given the results we conclude that all 5 types of oil analysis falls within the maximum allowed by law. Every parameter values obtained are analyzed according to category which includes oil assortment analyzed: premium or low cost.

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