COMPARISON OF FOUR LOW-COST SUNFLOWER OIL ASSORTMENTS FROM ROMANIAN MARKET

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Abstract

Sunflower oil is a food consumed by the great majority of Romanian peoples, because have a varied range of utilisations, and consumed in moderate quantities is beneficial to human organism. Due to the socio-economic situation in Romania, a large part of consumers oriented themselves to achieve products from the so called "low cost" category. The current paper aimed to establish the main quality characteristics of sunflower food oils from low-cost category sold on Iaşi City market and their comparison in according with the values of actual standards. Sunflower oil samples gathered from four different producers (A, B, C, D) were achieved from Iaşi City market. The determined physical-chemical properties for the analysed assortments of sunflower oil were: acidity value, saponification value, bulk density, humidity, iodine colour, peroxide value and impurities content in organic solvents.

Key words: sunflower oil, assortments, quality characteristics, low-cost

INTRODUCTION

Nutritive value of vegetal oils consists in their content in polyunsaturated fatty acids and especially in linoleic (ω6) and linolenic (ω3) acids which have an important role in metabolism (Dorobanţu, 2008, Dorobanţu and Beceanu, 2008). Vegetal oils and fats have an important role in nutrition (Latif, and Anwar, 2009a), but are also used as raw materials in different industries (Tasan, et.al., 2011). Vegetal oils processing represent a substantial domain of foodstuff extractive industry, the obtained products being intended for human consumption, as fluid oils, margarines and cookery fats, and also are utilised in obtaining a large range of industrial products and by-products. Traditional polyunsaturated linoleic acid sunflower oil has been a popular vegetable oil for many years (Chabiri et al., 2009), and currently ranks fourth in the world production among all vegetable oils (Rehman et.al., 2006, Xu, et al., 1999).

MATERIAL AND METHODS

To complete the current study were achieved 24 bottles with sunflower oils from different batches, 6 for each studied assortment, and were bought from different stores localised in Iaşi City. Samples provided from four different producers were gathered in original package and transferred to the analysis laboratory.

Sensory evaluation was conducted by a team of six members, persons who are familiar with sunflower oil. Respecting a modern working method (Banu et al., 2002, 2007) each of the board members received four coded samples, corresponding for each type of oil. After the manner of presentation of the samples, they are classified as fractionated products, of rectangular shape, with the weight of about 20g/per sample. 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 (Banu et al., 2002, 2007). 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 four types of samples. The obtained results are interpreted based on the scoring scale for quality evaluation (Banu et al., 2002, 2007).

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. Method is based on neutralization of free acidity of a certain fat quantity with an alcoholic solution of potassium hydroxide with a well-know titre and factor, in the presence of phenolphthalein. 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 (Gunstone, 2004, Hamm, and R.J. Hamilton, 2000).

Determination of peroxide value was realised in according with standard *STAS 145/22-74.* Product is titre in an acetic acid and chloroform environment, with solution of potassium iodide. Iodine is titre with a solution of sodium thiosulphate with a known titre. 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 ^{0}C 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 DISCUSSION

At the end of sensorial analysis of those four studied oils assortments and after processing the data regarding the tracked sensorial attributes and calculation of the weighed mean score for all the tracked sensorial characteristics, were obtained a total mean score (fig. 1), which show the fact that rank one is occupied by oil D which remarked by: clear aspect, yellow colour, characteristic flavour of roasted sunflower seeds, pleasant taste, characteristic to raw material. In according with the total mean score of 17.02 oil D receive the mark ***Good***. Rank second in tasters' preferences was oil C with a total mean score of 15.22, assortment characterised by: clear aspect, light-yellow colour; pleasant smell characteristic to roasted seeds; pleasant taste, without strange taste. In according with the score board oil C receive mark ***Good***. Oil A obtained a total mean score of 14.44 due to its sensorial attributes less accentuated such as colour which presents a too light yellow shade, and also due to the smell which was less accentuated. Aspect was clear and the taste was specific to raw material. In according with the total mean score oil a receive mark ***Satisfactory.*** Ranked last was oil D with a total mean score of 13.63 points because some sensorial attributes didn't fulfil the tasters' desired conditions. Those were: pale yellow colour, less accentuated smell but without strange smell, pleasant taste, a clear aspect without impurities. In according with the score this assortment receive mark ***Satisfactory***.

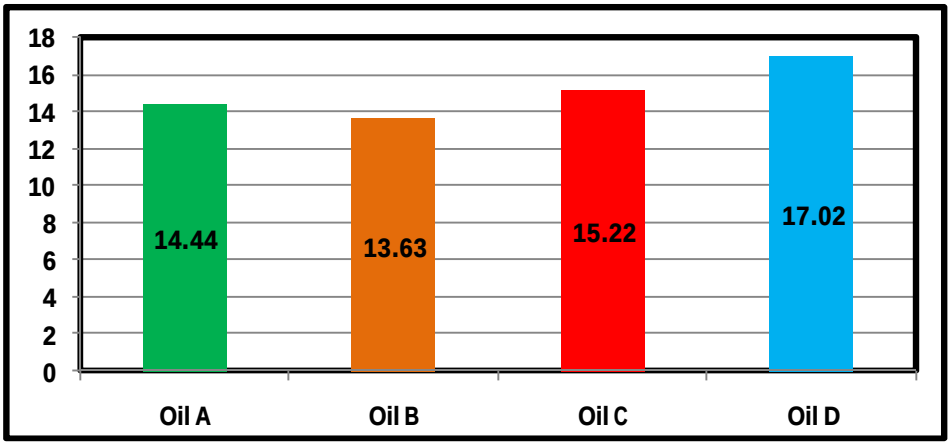

Fig. 1. Score obtained at sensorial examination

The analysed physical-chemical properties were represented by acidity

value, saponification value, bulk density, humidity, iodine value, peroxide value and impurities content in organic solvents.
Humidity is a physical-chemical parameter which shows the water content in oil. The obtained results show the fact that at the analysed oil samples humidity recorded a minimum value of 0.17% and a maximum one of 1.368%, values which exceeded a lot over the maximal admissible limits of the actual standard (fig. 2).

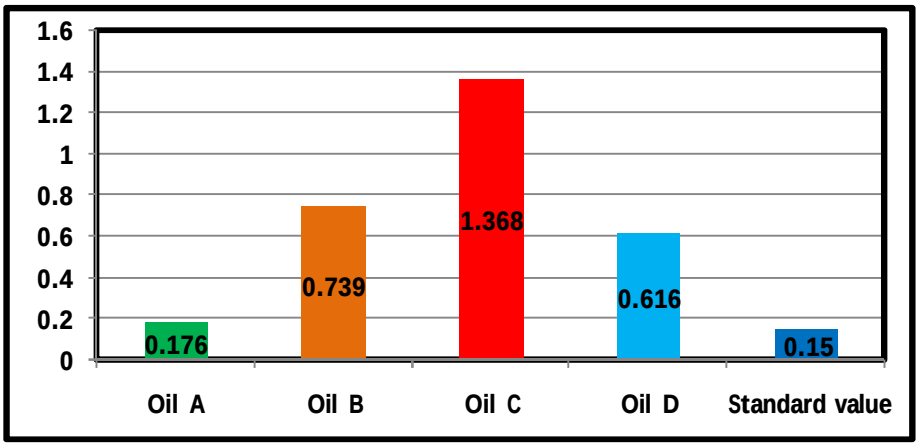

Fig. 2. Humidity at sunflower oil (%)

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.

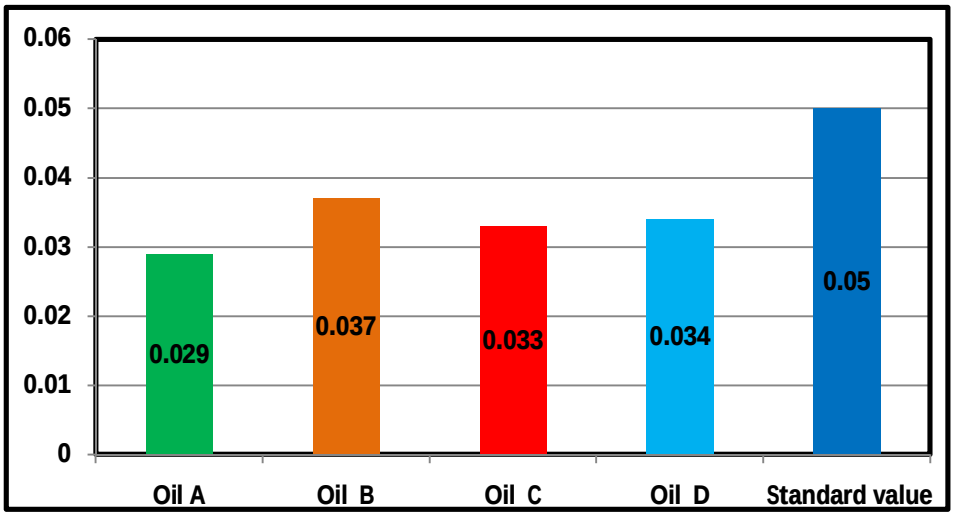

Fig. 3. Insoluble impurities in organic solvents

Based on the obtained results for all four studied oil assortments regarding determination of insoluble impurities in organic solvents, those ones were in the limits of the actual standard. The obtained values were 0.029 for oil A and 0.037 for oil B.
Acidity value is a physical-chemical parameter which allows us to appreciate the preservation degree of the oils. 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 C.

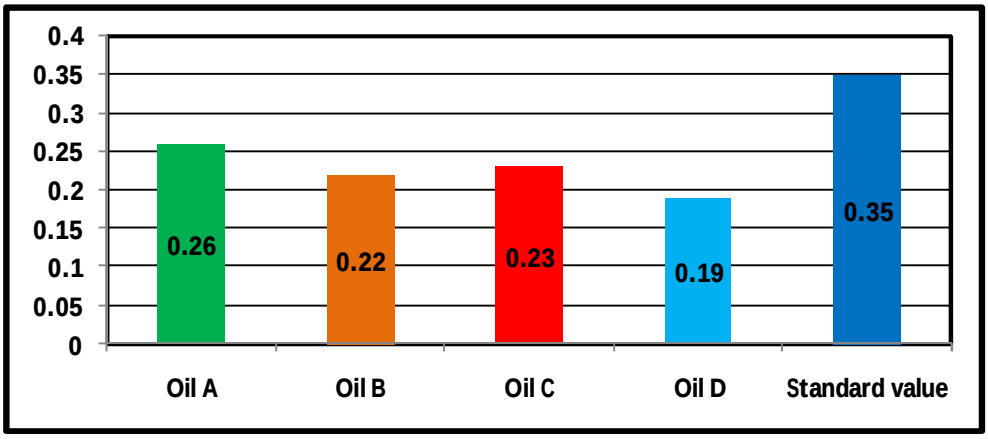

Fig. 4. Acidity value, mg KOH/g, oil

Acidity of the analysed oils didn't present significant differences, which means that studied oil samples were fresh and without any risk for consumers.
Determination of saponification value offers information regarding mean molecular mass of fatty acids from a certain fat (fig. 5).

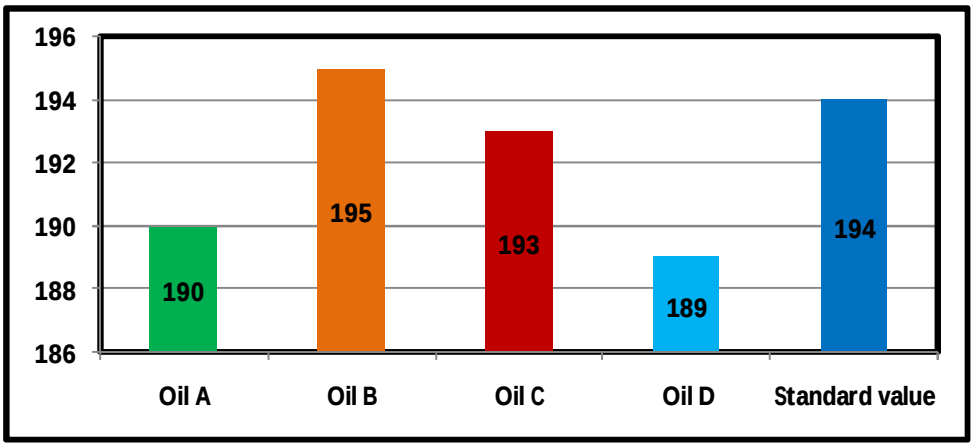

Fig. 5. Saponification value, mg KOH/g oil

In according with the obtained data was observed that the saponification value was 190 for oil A, 195 for oil B, 193 for oil C and 189 for oil D.
Data presented in fig. 5. enlightened the fact that saponification value of oil B exceeded the maximum admissible value of 194, 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.
Bulk 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 fig. 6

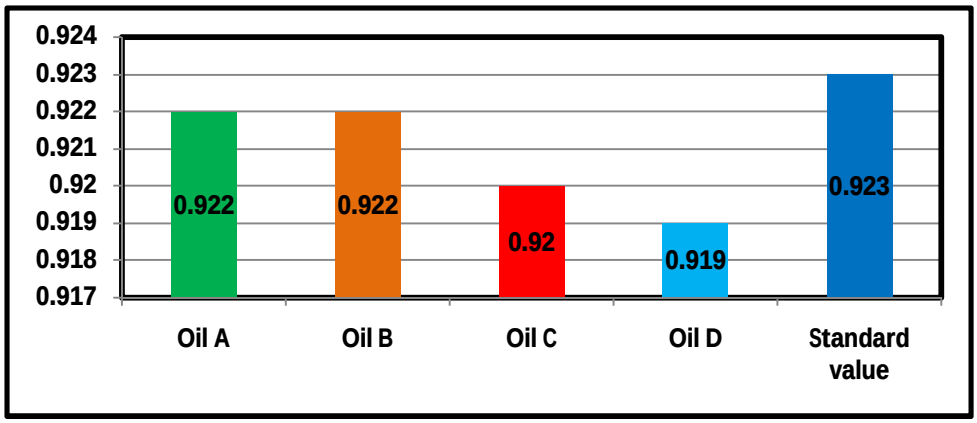

Fig. 6. Bulk density g/ml

Based on the recorded results bulk density is in according with the actual standards, being between 0.919 and 0,923.
In according with them we could observe that oil assortments A and B had obtained an identical value of 0.922, at assortment C was obtained a value of 0.92 and assortment D recorded a value of 0.919.
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 3.89 and 5 (fig. 7), values which are in the limits of actual standard.

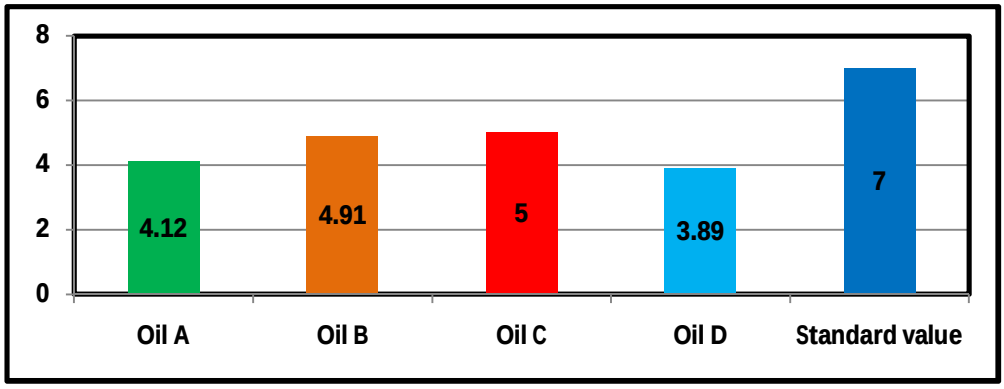

Fig. 7. Iodine colour, mg I/100 cm^3

From the analysed oils, oil D is the most favourable for iodine colour with a value of 3.89, value assuring suitable sensorial characteristics.
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.
Obtained results show that peroxide value is in according with the standard value and presented values between 0.42 for oil D, and 0.58 for oil A.

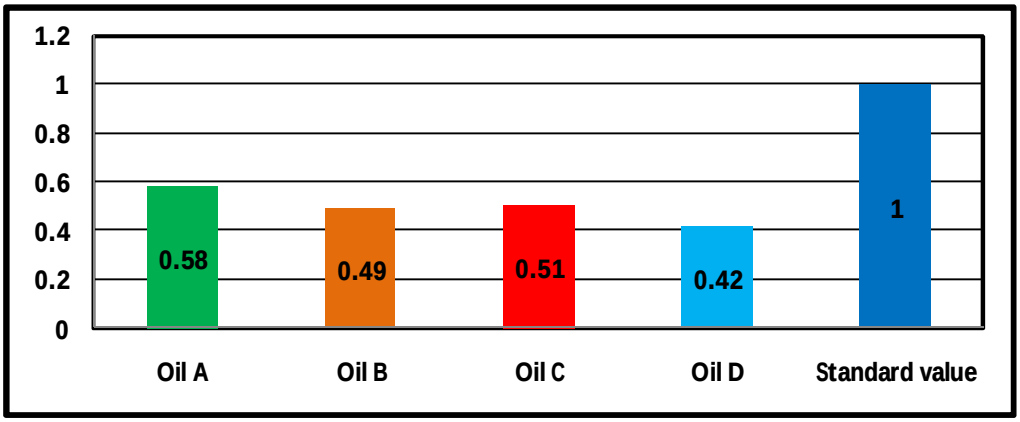

Fig. 8. Peroxide value (meq/kg)

CONCLUSIONS

At the end of our own investigations we observed that the studied oil assortments fulfil the qualities imposed by nowadays legislation with the exception of humidity, parameter which exceeded the admissible limits imposed by the actual standards.
Results regarding sensorial analysis of parameters aspect and colour, smell and taste at each oil assortment, didn't present significant differences, being

recorded scores of over 11.1 points, which the main condition for the product to be delivered.

Oils from low-cost category on Romanian market fulfil the imposed qualities conditions by the actual legislation, fact checked on each batch of products, subjected to analysis.

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