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Evaluation of Fatty Acid Composition of Oil Extracted from Nine Varieties of Sunflower Seed

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ABSTRACT: In this study nine new varieties of sunflower seeds were obtained and subjected to oil extraction using soxhlet apparatus. The extracted oil was analyzed for fatty acid composition and phosphorus content to measure the phospholipid concentration. The results indicated that Armavirski variety had the highest oil content. The fatty acid composition of the extracted oils indicated that Armavirski followed by Alstar varieties had the highest concentrations of oleic acid and lower concentrations of linoleic acid as compared to other varieties. Therefore the two varieties mentioned earlier might be considered as suitable substrates for frying and cooking practices.

Keywords: *Fatty Acids, Frying Oils, Sunflower Seed Oil.*

Introduction

Sunflower seed (Heliauthus annus) belongs to a group of plants that are of economical importance. This plant was originated in the United States of America near the Mexico border. The Indians in that region used to consume it as food. The oil content of sunflower seed has been reported between 26-50% with a light yellow color that is rich in fat soluble vitamins mainly tocopherols (Gerami, 1999). The oil extracted from sunflower seed has been recognized as a valuable oil and linoleic acid has been reported as the predominant fatty acid in most varieties of the oil while in some other varieties the presence of oleic acid up to 80% has been reported (Gerami, 1999).

Sunflower seed oil has an attractive color with mild taste and aroma that does not complicate the original flavor of the food that it has been applied as salad, cooking or frying oils (Davidson *et al*., 1996). Sunflower seed oil approximately constitutes 12% of the world oil production and due to its specification, it is considered a valuable oil for salad dressing, cooking and frying applications. Therefore the object of this study is to concentrate on the oil content and the fatty acid composition of nine new varieties of sunflower seed and to recommend the use of certain varieties for specific applications.

Materials and Methods

Nine different varieties were collected from Karaj, Seed Supply Institute, as shown in table 1.

The oil was extracted by the application of soxhlet apparatus according to Ghavami *et al*. (2008). Fatty acid compositions of the extracted oils were determined by formation of fatty acid methyl esters, using interesterfication method by dissolving 50mg of the oil in 1ml of dry toluene and adding 2ml of 0.5N sodium methoxide as

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Table 1. Some characteristics of new sunflower seed varieties

Varieties	Origin	Growth group
Zaria	Yugoslavia	Serotinal
Favourate	Russia	Medium growth
Azar Gol	Iran	Serotinal
Progress	Yugoslavia	Serotinal
Alstar	Russia	Medium growth
Armavirski	Russia	Serotinal
Lacumca	Russia	Medium growth
Master	Rumania	Medium growth
Youroflower	France	Serotinal

Table 2. Percent oil contents in the seeds, iodine value and phospholipid concentrations of the oils extracted from different varieties of sunflower seeds

varieties	Fat (%)	Iodine value	Phospholipid (%)
Armavirski	48.03	111.7	0.27
Youroflower	39.98	121.9	0.34
Lacumca	33.19	132.9	0.28
Master	53.25	126.2	0.25
Progress	44.25	127.8	0.27
Zaria	43.25	128.1	0.27
Favourate	41.63	123.0	0.26
Azar Gol	43.63	124.9	0.32
Alstar	38.63	114.5	0.30

alkali catalyst and keeping the mixture in a water bath at 50° C for 30 minutes followed by extraction of the derivatives according to Giassi Tarzi *et al*. (2006). A varian star 3400 GC equipped with BP×70 capillary column and Flame Ionisation Detector was employed for the analysis of the fatty acid methyl esters according to Kadivar et.al (2010). The Iodine value of the oil samples were calculated according to Mirhosseini *et al* (2004). The phosphorus content, representing the concentration of phospholipids was determined according to Joshaghani and Ansaripour (2005). All the chemicals used in the present work was purchased from Merck Chemical Company, Germany.

Results and Discussion

Table 2 presents the oil content of the seeds, the Iodine value of the extracted oils and the phospholipid concentration.

Phospholipids were present at the lowest concentrations and regarding their stabilizing property as synergists, have a positive effect on the quality of the oil but due to the unwanted characteristics of phospholipids this fraction is removed during refining operations mainly degumming and neutralization stages. The Master variety had the highest oil concentration while the Armavirski variety that had almost high oil content had the least Iodine value among the examined varieties, meaning the presence of lower concentrations of polyunsaturated fatty acid namely linoleic acid.

The fatty acid compositions of the oils are presented in table 3. The results are in good agreement with the work carried out by Gitiravan *et al*. (2001) except here in this research the Armavirski variety had oleic fatty acid as the predominant fatty acid while in other varieties, linolieic acid was

Table 3. Fatty acid composition of oils extracted from different varieties of sunflower seed

varieties	C14:0	C16:0	C16:1	C17:0	C17:1	C18:0	C18:1	C18:2	C18:3	C20:0	C20:1	other
Armavirski	0.06	5.00	0.01	0.06	0.04	7.29	47.00	40.00	0.05	0.30	0.19	-
Youroflower	0.07	7.39	0.14	0.11	0.04	9.41	21.98	58.84	0.14	0.34	0.13	1.41
Lacumca	0.06	6.96	0.09	0.03	0.02	7.33	14.53	68.98	0.47	0.50	0.10	0.93
Master	0.09	7.09	0.14	0.04	0.03	5.68	25.69	60.75	0.04	0.33	0.12	-
Progress	0.12	7.90	0.13	0.04	0.03	7.13	22.32	61.63	0.07	0.44	0.19	-
Zaria	0.09	7.33	0.08	0.07	0.03	7.22	18.55	64.44	0.09	0.52	0.19	1.39
Favourate	0.10	7.21	0.09	0.08	0.04	8.24	22.92	59.45	0.06	0.63	0.15	1.03
Azar Gol	0.08	7.86	0.11	0.07	0.03	7.12	21.82	60.97	0.08	0.56	0.19	1.11
Alstar	0.06	6.09	0.08	0.04	0.03	5.69	39.85	46.08	0.07	0.45	0.20	1.36

the major fatty acid present.

Therefore oils extracted from different varieties might be used in different applications. It is worth to mention that all the varieties examined had 1.00-1.65% non saponifiable matter that was mainly composed of sterols and tocopherols where β–sitosterol and α-tocopherol constituted the predominant sterol and tocopherol fractions respectively according to Jamali *et al*. (2013).

Conclusion

The nine different varieties of examined sunflower seed indicated that one variety contained a high proportion of oleic acid while others had linoleic acid as the predominant fatty acid. Therefore one might suggest that Armavirski variety with a high concentration of oleic acid (47% of the total fatty acids) might be recommended and suggested to be used as frying, cooking and salad dressing oils due to its lower oxidation rate at room and elevated temperatures. Other varieties having high concentrations of linoleic acid might be considered for applications that are carried out at lower temperatures.

References

Davidson, H. F., Campbell, E. J., Bell, R. J. & Pritchard, R. A. (1996). Bailey's Industrial Oil and Fat Products; vol. 2, pp 603-689.

Ghavami, M., Gharachorloo, M. & Giassi Tarzi, B. (2008). Laboratory Techniques in Oils and Fats.

Ghiassi Tarzi, B., Hosseini, S. E. & Ghavami, M. (2006). Fatty Acid Composition of Vegetable Oils Available in Iranian Markets. Journal of Food Technology and Nutrition; Vol. 3, No. 2.

Gitiravan, N. (2001). Evaluation of the Effect of Refining on the Quality of Sunflower Seed Oil; M. Sc Thesis; Islamic Azad University, Science and Research Branch.

Gerami, E. (1999). Four Agronomical Products (Sugar beet, Cotton Seed, Sunflower Seed, and Cane Sugar); Ministry of Agriculture Publication; Third volume.

Jamali Kermanshahi, M., Amini, N. & Ghavami, M., (2013). Evaluation of the Non Saponifiable Matter of Oils Extracted from Nine Varieties of Sunflower Seeds. Journal of Food Biosciences and Technology; Vol. 3.

Joshaghani, Gh. & Ansaripour, M. (2005). Journal of Food Technology and Nutrition; Vol. 2, No. 1.

Kadivar, Sh., Ghavami, M., Gharachorloo, M. & Delkhosh, B. (2010). Chemical Evaluation of Oil Extracted from Different Varieties of Colza. Journal of Food Technology and Nutrition; Vol. 7, No. 2.

Mirhosseini, H., Ghavami, M., Safafar, H. & Mazhari, S. Z. (2004). A survey of Mathematical Relation Between Dependent Variables (IP, PX) and Effecting Variables

on Them in Different Mixtures of Canola and Cotton Seed Oils. Journal of Food Technology and Nutrition; Vol. 1, No. 2.