Research Article
Open Access
CrossMark

Evaluation of basic quality parameters with in sunflower and saff flower varieties from Holeta, Ethiopia

Abstract

Proximate analyses of the sunflower and safflower variety were carried out using AOAC Method and fatty acid profile was analyzed using Gas chromatograph-mass spectrometer. The result showed that Rassian Black was highest percentage of fat (23.9%) and Protein (16.5%). The fatty acid composition Turkana was the highest Linoleic (C18:2) (73.2%) Compared to Oissa (54.3%) and Rassian Black (32.2%). Rassian Black was the highest percentage of long chain mono unsaturated fatty acid oleic acid (C18:1) content (56.9%) compared to oissa (31.9%) and Turkana (18.05%). The sunflower and safflower variety with high linoleic and oleic fatty acid and low saturated fatty acids palmitic(C16:0), margaric (C17:0) and stearic(C18:0) appeared to be suitable for edible oil processer for edible purpose.

Keywords: sunflower, safflower, proximate, fatty acid composition

Volume 1 Issue 2 - 2017

Biadge Kefale, Alemnesh Sisay
Ethiopian Institute of Agricultural Research, Ethiopia

Correspondence: Biadge Kefale, Ethiopian Institute of Agricultural Research, Holeta Agricultural Research Center, Addis Ababa, Ethiopia, Email biadgekefale@yahoo.com

Received: May 18, 2017 | **Published:** June 14, 2017

Introduction

Lipids and triacylglycerol naturally occur in oils and fats. Their chemical composition contains saturated and unsaturated fatty acids and glycerides. Unsaturated Fatty acids (FAs) are classified as monounsaturated (MUFA) and poly unsaturated (PUFA) fatty acids. Edible oil is an essential nutrient and an important source of energy providing 9 kcal/g. Edible oils are vital constituents of our daily diet, which provide energy, essential fatty Acids and serve as a carrier of fat soluble vitamins. Oils in the diet are available to the body as fatty acids, which are excellent sources of dietary calorie intake. High fat diets enhance the incidence of coronary heart disease.[1,2]

Nutritionists have recommended vegetable oils as an important part of a healthy diet due to their high contents of fatty acids (FAs).[3] However, distribution and content of fatty acids differ in dependence on various plant sources of oils and technology process used for their production. Sun flower and safflower oil is considered premium oil due to its light color, mild flavor and low level of saturated fats.[4] The aim of this study was to find out a suitable variety of sun flower and safflower which were released and registered as well as to identify the edible oil seed rich in essential fatty acids to combat malnutrition and to aware edible oil processors factory for the better Variety.

Materials and methods

Sample preparation

Two sunflower and one safflower varieties (Rassian Black, Oissa & Turkana) respectively were collected from Holeta Agricultural research center. Sample was grinded with ultra centrifugal mill and the Grinded sample was stored in a plastic vial for chemical analysis.

Crude fat measurement

3g of dry sample was weighed to within milligrams in an extraction thimble; it was placed in the extraction unit. The flask was connected to hexane containing at 2/3 of total volume to the extractor until 6 hours. When finished, the hexane was evaporated by distillation or in a rota evaporator. The flasks were cooled in a dryer and weigh them to within milligrams. % oil = weight of sample - weight of residue after extraction x100/ Weight of sample

Moisture content measurement

2g of the grind sunflowers and safflowers sample were weighed out into the crucible, after the crucible has been heated and weighed. Moisture content was determined by oven drying at 105°C. This was removed and cooled in desiccators and then weighed. The moisture content was calculated by the formula: % Moisture content = Weight of sample – Weight of sample after dryingx100/Weight of sample

Crude protein measurement

0.25g of sample was digested by adding 10ml of sulfuric acid with selenium mixture as catalyst for 2 hours. After light green color was observed the digest solution was cooled and transferred into 100mls volumetric flask which was made up to mark with distilled water. Micro Kjeldahl distillation apparatus was used to distill 25mls of the prepared digest by the addition of 70ml 40% sodium hydroxide. The blue color changed to dark brown as distillation proceeded. The released ammonia was condensed and collected into a receiver containing 30mls of boric acid with indicator solution. The condensed ammonia is then back titrated with 0.01M HCl to pink color end point.

% Nitrogen by weight N=(R-B) N*14*100/1000*SW

% crude protein=NX6.25

Ash content measurement

3g of grind sunflowers and safflowers sample were weighed out into the crucible, after the crucible has been heated and weighed and was placed in a temperature controlled furnace at 500°C for about 5hours for proper ashing. The crucible was then cooled in desiccators and immediately weighed.

% Ash=weight of sample–weight of ashed samplex100/weight of sample.

Chromatography

Analysis of FAME was carried out on Gas Chromatograph-Mass spectrophotometer (GC-MS) Agilent Technology model 7820A. The GC was equipped with Mass Spectrometer Detector and stainless steel column, dimension 30X0.250m. The column was conditioned at 180°C about 2 hours for attaining thermal stability before use. The operating condition was programmed at oven temperature 150°C (hold time 5min) with increasing rate 8OC/min to190OC (hold time 0min), injection temperature at 350°C.

Result and discussion

Proximate and fatty acid (saturated and unsaturated) composition of sun flower and safflower

The proximate composition of sun flower seed were moisture (4.4%), protein (16.5%), fat (23.9%), and ash (3.6%) which were the maximum value and for safflower variety the result were protein (9.6%), fat (32.3) and ash (2.2%). The result showed that sunflower seed protein, total mineral and fat were better than safflower variety. The result of determination of fatty acid detected in sunflower and safflower samples compared with the range of standard composition the predominant fatty acid were oleic acid (C18:1) for the varieties Russian black (56.9%). From nutritional point of view the presence of oleic acid in diet is very useful it is effective in lowering cholesterol content (Table 1& 2).[5]

The pre dominant fatty acid is linoleic acid (C18:2) for the sunflower variety oissa (54.37%) and the saff flower variety Turkana (73.29%). The important impact of polyunsaturated fatty acids (PUFAs) on human health in the prevention of, particularly, cardiovascular disease, coronary heart disease and cancer; further, inflammatory, hypertension; diabetes type two, renal diseases; and rheumatoid arthritis. Their non-substitutable roles in many biological pathways are crucial.[6,7]

The sun flower Variety Russian black were higher oleic (C18:1) (56.99%) content than Oissa (31.96%) where as in linoleic (C18:2) the result is vice versa. The saff flower Variety Turkana was high in linoleic (C18:2) (73.3%) were as Palmitic (6.83%) and Margaric were low value (1.86%) content. Among the variety tasted oleic (C18:1) and linoleic were higher value compared to palmitic, stearic and margaric acid content. Relative concentration and distribution of fatty acids in dietary fats have been reported to be an important factor in considering nutritional values of lipids as well as the key factor, with proved effects, of lowering the risk of cardiovascular diseases.[8,9]

According to FAO Codex standard (210-1999) for sun flower seed oil for edible purpose palmitic(5-7.6%), stearic (2.7-6.5%), oileic (14-39.4%), linoleic (48.3-74%) and safflower seed oil for edible purpose palmitic(5.3-8%),stearic(1.9-2.9%) oleic (8.4-21.3%) and linoleic (67.8-83.2%).According to the specification palmitic, stearic, linoleic acid were in the accepted range for edible oil purpose for the sun flower variety (Figure 1–3). The safflower variety Turkana palmitic, stearic, oileic, linoleic were in the accepted range according to the specification (Table 3–5).

Table 1 Proximate analysis sunflower and safflower

Varity	%Protein	%Moisture	%Fat	%Ash
Oissa	14.9±0.01^{b}	4.4±0.01^{b}	20.5±0.07^{b}	3.6±0.007^{c}
Rassian black	16.5±0.014^{c}	3.9±0.01^{a}	23.9±0.00^{c}	2.4±0.007^{b}
Turkana	9.6±0.04^{a}	4.7±0.00^{c}	23.8±0.007^{a}	2.2±0.01^{a}

Table 2 Fatty acid compositions of two sun flower and one saff flower variety

Fatty acid%	Oissa	Rassian black	Turkana
Palmitic (C16:0)	6.8±0.01^{b}	6.6±0.07a	6.8±0.00^{b}
Stearic (C18:0)	-	4±0.007	-
Oleic (C18:1)	31.9±0.007^{b}	56.9±0.00^{c}	18.05±0.04^{a}
Linoleic (C18:2)	54.3±0.01^{b}	32.2±0.00^{a}	73.2±0.00^{c}
Margaric (C17:0)	6.7±0.07	-	1.8±0.01

Table 3 Integration peak list and peak id of individual fatty acid type of the variety rassian black

Fatty acid	Start	Retention time	End	Area %
1. Palmitic	14.894	14.946	15.121	6.7
2. Linoleic	17.436	17.516	17.557	32.25
3. Oleic	17.557	17.597	17.772	56.99
4. Stearic	17.96	18.014	18.175	4.07

Table 4 Integration peak list and peak id of individual fatty acid type of the variety turkana

Fatty acid	Start	Retention time	End	Area %
1. Palmitic	14.896	14.946	15.094	6.7
2. linoleic	17.437	17.516	17.57	32.25
3. oleic	17.57	17.597	17.772	56.99
4. stearic	17.934	18.014	18.203	4.07

Table 5 Integration peak list and peak id of individual fatty acid type of the variety oissa

Fatty acid	Start	Retention time	End	Area %
1. Palmitic	5.513	5.634	5.957	6.87
2. linoleic	14.895	14.946	15.108	54.37
3. Margaric	17.439	17.503	17.557	31.96
4. stearic	17.557	17.597	17.772	6.8

Citation: Kefale B, Sisay A. Evaluation of basic quality parameters with in sunflower and saff flower varieties from Holeta, Ethiopia. *MOJ Biorg Org Chem.* 2017;1(2):50–52. DOI: 10.15406/mojboc.2017.01.00010

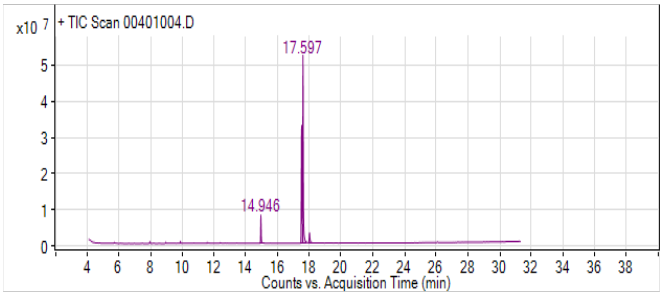

Figure 1 Fatty acid profile of the variety rassian black chromatogram.

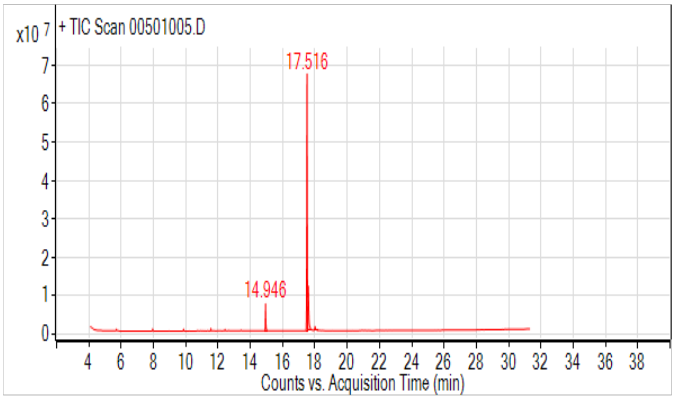

Figure 2 Fatty acid profile of the variety turkana chromatogram.

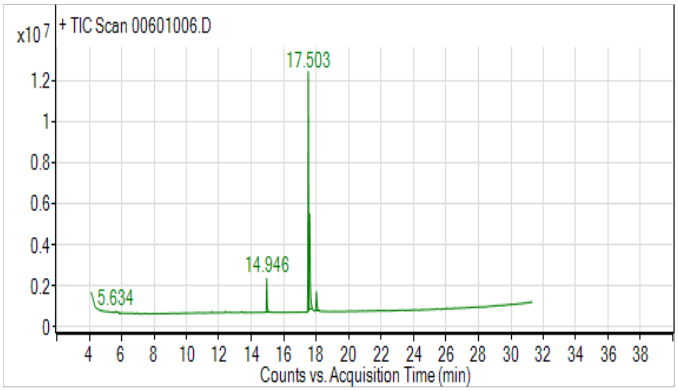

Figure 3 Fatty acid profile of the variety oissa chromatogram.

Conclusion

In consideration of proximate Rassian Black were superior on the total percentage of protein, Oissa were superior on the total percentage of total mineral. On the other hand in respect to the essential fatty acid content among the two sunflower variety and one safflower variety oleic acid were dominant for Rassian Black. Linoleic acid was dominant for the safflower variety Turkana. The saturated fatty acid palmitic acid was the dominant for all the sunflower and safflower variety. Over all this sunflower and safflower variety which is high in mono and poly unsaturated fatty acid is suitable for edible oil manufacturers as well as mass consumption to combat malnutrition. Proper attention should be given to identify good variety of sun flower and safflower seed to promote enhanced production and to combat malnutrition.

Acknowledgements

None.

Conflict of interest

The author declares no conflict of interest.

References

1. Romon M, Nuttens MC, Thaeret N. Comparison between fat intake assessed by a 3–day food record and phospholipids fatty acid composition of red blood cells: results from monitoring of cardiovascular disease –Lille study. *Metabolism*. 1995;44(9):1139–1145.
2. Simon JA, FongJ, Bernert JT, et al. Serum fatty acids and the risk of stroke. *Stroke*. 1995;26(5):778–782.
3. Maehre HK, Malde MK, Eilertsen KE, et al. Characterization of protein, lipid and mineral contents in common Norwegian seaweeds and evaluation of their potential as food and feed. *J Sci Food Agric*. 2014;94(15):3281–3290.
4. Putnam DH, Oplinger ES, Hicks DR, et al. *Sun flower alternative field crop manual*. USA: Coop extension service wiscons; 1990.
5. Thomson ABR, Clandinin MT. Effect of dietary cholesterol and ω3 fatty acids on lipid composition. *J Nutr*. 1988;118(6):661–668.
6. Abedi E, Sahari MA. Long–chain polyunsaturated fatty acid sources and evaluation of their nutritional and functional properties. *Food Sci Nutr*. 2014;2(5):443–463.
7. De Caterina R, Liao JK, Libby P. Fatty acid modulation of endothelial activation. *Am J Clin Nutr*. 2000;71(1 Suppl):213S–223S.
8. Misurcova L, Ambrozova J, Samek D. Seaweed lipids as nutraceuticals. *Adv Food Nutr Res*. 2011;64:339–355.
9. Kris–Etherton PM, Harris WS, Appel LJ. Fish consumption, fish oil, omega–3 fatty acids, and cardiovascular disease. *Circulation*. 2002;106(21):2747–2757.