EFFECT OF BLENDING AND FRYING TRENDS ON THE PROPERTIES OF CANOLA, SUNFLOWER AND SOYBEAN OILS

EL-AGAIMY, MAGDI. A.[1], MARWA A. ABD-EL-FATAH.[1], SALAH H. ABO-RIA[2] AND MOHAMAD M. EL-NIKEETI.[2]

[1] *Oils & Fats Res. Dept., Food Technology Res. Inst., Agric. Res. Center, Giza, Egypt.*
[2] *Food Sci. Dept., Fac. Agric., Cairo Univ., Giza, Egypt.*

(Manuscript received 13 September 2004)

Abstract

Canola seed cultivar (*Pactol)* was studied for its oil content, protein, ash, crude fiber and carbohydrate and was found as 45.50%, 32.00%, 3.64%, 2.10% and 11.76%, respectively.

Canola oil (CAO) was individually blended with both sunflower oil (SUO) and soybean oil (SBO) with the ratios of 1:1, 7:3and 9:1 v/v, respectively. Refractive index (R.I), color, acidity, peroxide value (P.V), iodine value (I.V) and conjugated diene and triene of oil blends were ranged between (1.4682-1.4708), (3.7- 5 red), (0.14-0.19%), (2.96-7.64), (110.6-121.5), (0.169-0.972), (0.04-0.394), respectively.

The effect of frying on canola oil and the oil blends (CAO + SUO) (1:1v/v) and (CAO + SBO) (1:1) was studied and the blends were heated at 180 °C for continuous frying for 8 hours. Results obtained indicated that (CAO + SUO 1:1) and (CAO + SBO 1:1) were the highest stable blends.

Fatty acid profile of canola, sunflower, soybean oils and their blends showed that oleic acid (18:1) was the major fatty acid in canola oil (63.3%) while the erucic acid was 0.6%, meanwhile linoleic acid (18:2)was the major fatty acid in sunflower oil and soybean oil (60.8%and53.3%respectively)

The physiochemical properties of oils and their blends after frying indicated that (R.I), color, acidity, (P.V), (I.V), conjugated diene and triene, polar and polymer were (1.4701-1.4759), (4.3-7.9 red), (0.32-0.37%) (4.68-13.26), (97-114.5), (1.05-1.23), (0.03-0.28), (17.13-23.89), (1.94-2.93), respectively. The obtained results indicated that CAO+SUO blend (1:1v/v) was the best heat stability.

INTRODUCTION

Edible oils and fats are consider the main important sources of energy, essential fatty acid and fat–soluble vitamins. The production of vegetable oils in Egypt is not sufficient to provide consumers with their needs of edible oils. The cultivated areas of canola, sunflower and soybean in Egypt reached 1548, 2816 and 18910 feddans with an average yield of 0.957, 0.853 and 1.256 MT/ feddans, respectively. But the cultivated areas in the world reached to 21.92, 20.37 and 81.22 Million Hectares of

canola, sunflower and soybean crops, respectively. The world production of the oils from the three crops reached to 31.72, 24.02 and 195.81 Million Ton, respectively, (EAS, 2003). Attempts are given to improve the cropping pattern, intensify the cropping system, reclamation and cultivation of desert lands, improvement & development of irrigation water and increasing the availability of high seed quality together with agricultural imputes at fair prices.

The National Oils Research Program developed some new local varieties and hybrids characterized by short duration, high yield productivity, high oil content and resistance to adverse environmental condition as well as insect and diseases. (Ahmed, 2004).

Canola is an important oil seed crop since it contains 40-45% oil and 22-24% protein (Delisle *et al.,* 1984), while the defatted meal contains 34 to 40 % protein, (Sarwar *et al., 1984).* In Canada canola oil seeds are the second to wheat in area planted (Shahidi, 1990). While high–erucic acid rape seed oil is widely used in lubricant manufacture and in other industrial processes, low erucic acid rape seed oil (LEAR) is utilized for cooking and as a salad oil, and in the manufacture of margarines and shortening (Carr, 1990).

Most consumers in Egypt used oils for frying but the industrial frying operation require fats that are stable against oxidation and polymerization during heating. Therefore liquid oils (Soybean, Canola and Sunflower oils) are partially hydrogenated to reduce the oxidation process (Noraini *et al.,* 1995).

Therefore, this study was carried to suggest some oil blends of canola with sunflower and soybean oils to improve its stability during frying process beside studying the effect of blending and frying processes on physical, chemical and fatty acid profile of the different oils blends.

MATERIALS AND METHODS

Materials

Canola seeds (*Brassica napus*) (*Pacto* 1) were obtained from East-Auinat Experimental Station of Ministry of Agriculture.

Oil extraction Canola seed oil was extracted by mechanical pressing procedure (Haumann, 1997) and the extracted canola oil was laboratory refinied. The refined sunflower and soybean oils containing 150 ppm TBHQ were obtained from Arma Company, Egypt.

Blends canola oil was blended with sunflower oil with the ratios of 1:1, 7:3 and 9:1 (v/v), and with soybean oil with the ratios of 1:1, 7:3 and 9:1(v/v). All the blends were prepared according to Danthine and Deroanne (2003).

Potatoes One Kilogram of potatoes was brought from the local market.

Frying processes potatoes sample were peeled and sliced and submerged in oil blends used until frying. Canola oil and the highest oxidative stability blends (after testing) were used for the frying of potatoes chips.

One Kilogram of each oil blend was placed in a 2-L capacity stainless-steel open pan and heated to 180 °C and used for potatoes frying for 8 hours for different batches.

Methods of Analysis Chemical composition (protein, oil, crude fiber, ash, carbohydrates (by difference), and moisture), physical properties: Refractive indexes (R.I.) and color beside chemical properties total acidity (A.V.), peroxide value (P.V.), iodine value (I.V.), ultra violet absorbance 232 and 270 nm (U.V.), polar and polymer content were determined according to A. O. A. C. (2000).

Fatty acid profile The fatty acid methyl esters were prepared using benzene: methanol: concentrated sulfuric acid (10:86:4 V/V) and methylation processes was carried out for one hour at 80 – 90 °C according to Stahl (1967).

The Fatty acid composition was determined by GC instrument using GC-Capillary column, Hewlett-Packard 6890 N (G1530N) with flame ionization detector and DB-225 capillary column 15 m. (50% Cyanopropylphenyl)-dimethylpolysiloxane). The testing conditions were as follows: Nitrogen was used as carrier Gas at flow rate 5m/min.The injection temperature was 250 °C and the temperature program was, 150 - 170 °C at 10 °C/min, 170 - 192 °C at 5 °C /min, holding at 192 °C for 4min, 192 – 220 °C at 10 °C /min, and holding at 220 °C for 10min.The percentages of fatty acids were obtained from a computerized data process.

The stability of investigated oils and their blends were determined by Rancimate apparatus according to Barrera-Arellano and Esteves (1992).

RESULTES AND DISCUSSION

The chemical composition of whole canola seeds and meal as tabulated in Table 1 Showed that the oil content was 45.50% and 19.23% for seeds and meal, respectively. The meal had a high percentage of protein content (40%). Moisture, ash, carbohydrate, and crude fiber content are illustrated in the same table. These data are in agreement with that mentioned by Delisle *et al. (1984),* Sarwar *et al.* (1984), Shahidi (1990) and Thakor *et al.* (1995).

Physicochemical properties in terms of R.I., Color, Acidity, P.V., I.V., U.V. 232 and U.V. 268 of all the tested fresh oils and blends (Table 2) showed that the fresh oil was of good quality, as indicated by low P. V. (1.50 - 6.48 m eq/kg oil) and U.V. absorbance at 232 nm (0.086 - 0.708) and at 270 nm (0.04 - 0.301), color values and the low percent of free fatty acids (0.1 - 0.2 %) as compared with the Codex Alimentarius (1992). I.V. of canola, sunflower and soybean oils were 107.07, 126.72, and 130.00 respectively. Meanwhile, R.I., Color, acidity, P.V., U.V. absorbance at 232 nm, 270nm and I.V. of blended oils from blend I to blend VI were 1.4682 - 1.4700, 3.7 - 5.00, (0.14 - 0.19), 2.96 - 7.64, 0.169 - 0.972, 0.04 - 0.394 and 110.6 - 121.50, respectively. From the same Table it could be also noticed that blend II has higher P.V., U.V. absorbance at 232 and 270 nm than blend I. These data are in agreement with that mentioned by Hawrysh, (1992) and Tyagi and Vasishtha, (1996).

Fatty acid composition of canola, sunflower and soybean oils and their blends (Table 3) showed that oleic acid (18:1) was the major fatty acid in canola oil (63.33 %) and the erucic acid was as 0.6 %, meanwhile linoleic acid (18:2) was the major fatty acid in sunflower oil and soy bean oil (60.87 % and 53.30 %, respectively). As a result of blending oleic acid was the major fatty acid (43.79 - 63.26%) in all blends followed by linoleic acid (21.02 - 37.13 %). For fresh oils the highest content of linolenic acid was found in canola seed oil (7.92 %) meanwhile it was 6.28 and 0.05 % in soybean and sunflower oils, respectively. These data are in agreement with that mentioned by Barrera-Arellano and Esteves (1992) Hamama *et al.* (2003).

The oxidative stability of canola, sunflower, soybean oils and their blends are shown in Table 4. The oxidative stability of fresh oils were 9.71, 8.00, 9.38 h/100 °C (rancimate) for canola, sunflower and soybean oils, respectively. The high stability of sunflower and soybean oil is due to their content of TBHQ 150 ppm as an antioxidant, meanwhile the high stability of canola seed oil 9.71 is also due to its high content of monounsaturated fatty acid (oleic acid 63.33 %), and its low content of linoleic acid 17.05 %. The highest stability was found in blend II (12.56 h) followed by blend I (11.30 h), and this is may be due to their content of (TBHQ 150 ppm) and oleic acid as the major fatty acid in these blends in addition to the active role of the natural antioxidant the oxidative stability of the investigated oil blends were ranged between 8.95 to 10.18 h which in another meaning it some what like that of fresh oils. These results are in parallel with that previously reported by Hawrysh (1992), Warner and

Mounts (1993), Thomsen *et al.* (2000) and Hamama *et al.* (2003).

Concerning the effect of frying on the properties of the tested oils and their blends results (Table 5) illustrated that R.I., acidity, color, peroxide value, U.V. 232, Polar content %, and Polymer content % Showed a real incresment in canola oil, blends I and II after 8 hours of frying meanwhile I.V. and U.V. 270 were decreased under similar condition. The R.I. of canola oil, blend I and blend II, was 1.4685, 1.4700 and 1.4699, respectively, and reached to 1.4701, 1.4723 and 1.4759, respectively, after 8 hours of frying. This increment could be attributed to the formation of high molecular weight materials during frying as given by (Johnson and Kummerow, 1957).These results are also in agreement with those reported by Khalil *et al.* (1993) and Allam (1994). Total acidity of canola, blend I and blend II that was 0.2, 0.18, and 0.15 %, respectively, increased to 0.35, 0.32 and 0.37 %, respectively, after 8 hours of frying. Such trend might be attributed to the hydrolysis of oil as well as from further oxidation of the secondary products (ketones and aldehydes) formed during frying (Kun, 1988). The increase of acidity in case of blend I was somewhat lower than that of blend II. The increase in acidity of frying oil during frying was also observed by Zhang and Addis (1995) and Sudatip *et al.* (2003). The P.V. of fresh canola oil, blend I and blend II was 6.48, 2.96 and 5.69 meq/kg oil, respectively, and increased to 13.26, 4.68 and 8.68 meq/kg oil, respectively, after 8 hours of frying. The highest increase was found in canola oil while the lowest trend was found in blend I.

Cuesta *et al.* (1991) reported that measurement of unsaturation is somewhat reliable in assessment the deterioration of frying oils than other analytical methods. During Frying, progressive reduction in unsaturation that observed in all oils (by determination of I.V.), can be attributed to the destruction of double bonds by oxidation and polymerization.

The results in the same table indicated that the I.V. of fresh canola oil, blend I and blend II were 107.07, 117.89 and 119.50 meq/kg oil respectivly and decrease to 97, 114.5 and 112.31 meq/kg oil, respectively, after 8 hours of frying. The lowest decrease in iodine value was found in blend I (from 117.89 to 114.51 meq/kg oil) followed by blend II. These results are in agreement with that reported by Allam. (1994) and Tyagi and Vasishtha, (1996).

Concerning heat stability it is well known that oils are oxidatively under Frying condition and so peroxides and other radicals are formed. These changes cause the molecule to become somewhat polar (positively charged on one end and negative on

the other). As the number of a polar molecules increase, the dielectric constant of oil increases as mentioned by Graziano (1979). Results Table 5 revealed also that the polar materials increased from 4.02 to 23.89%, 1.73 to 17.13 % and from 7.32 to 19.58 % for canola oil, blend I and blend II, respectively after, 8 hours of frying. These results indicate that polar materials increased as a result of frying as previously reported by Croon *et al.* (1986) and Sudatip *et al.* (2003).The results in the same table indicated that the polymer content of fresh canola oil, blend I and blend II were 0.7, 1.07 and 1.82 % respectively, and increased to 1.94, 2.48 and 2.93 %, respectively, after 8 hours of frying. These results are in agreement with that reported by Tyagi and Vasishtha (1996). It could be also noticed that the increase in polymer content in blend one and two was lower than that of Canola oil.

Conjugated fatty acids (dienes) were initially present in small quantities in canola oil, blend I and blend II (Table 5). Frying for 8 hours at 180 °C produced an increase in the conjugated fatty acid from the initial values. The higher quantity of conjugated dienes was observed in Canola oil (1.23) as given in Table 5.

The conjugated trienes which were initially very small in Canola oil (0.07) and blend I (0.04) and somewhat high in the case of blend II (0.39), and decreased to 0.03, 0.03 and 0.28, respectively, after frying. These results are in agreement with that reported by Tyagi and Vasishtha. (1996).

It could be concluded that blend I and blend II were more stable for frying While the blend I was the best for frying at 180 °C for 8 hours.

Table I. Chemical Composition of the investigated Canola Seed And their Meal

Chemical constituents %	Tested Samples	
	Canola Seed	Meal of Canola seed
Moisture	5.00	5.58
Oil	45.50	19.23
Ash	3.64	7.30
Protein (N*6.25)	32.00	40.00
Crude fiber	2.10	10.00
Carbohydrate	11.76	17.89

Table 2. Physiochemical Properties of Canola, Sunflower and Soybean Oils and their Blends.

Tested samples	R.I.	Color (Red unit)	Acidity %	P.V. meq/ kg oil	I.V meq/kg oil	U.V. 232 nm	U.V. 270 nm
Canola seed oil	1.4685	4.00	0.20	6.48	107.07	0.086	0.079
Soybean oil	1.4708	2.20	0.10	1.60	130	0.701	0.20
Sunflower oil	1.4708	2.00	0.10	1.50	126.72	0.672	0.11
Blend I	1.4700	4.00	0.18	2.96	117.89	0.169	0.04
Blend II	1.4699	4.10	0.15	5.69	119.50	0.972	0.394
Blend III	1.4686	4.50	0.19	5.81	115.3	0.301	0.190
Blend IV	1.4689	5.00	0.18	7.64	121.5	0.380	0.212
Blend V	1.4682	3.70	0.14	6.27	110.6	0.463	0.183
Blend VI	1.4692	3.90	0.16	6.74	113.4	0.708	0.301

Table 3. Fatty acid Composition of Canola, Sunflower, Soybean oils and their Blends.

Tested Oils	C 16:0	C 18:0	C 18:1	C 18:2	C 18:3	C 20:0	C 22:1
Canola oil	4.20	2.10	63.33	17.05	7.92	0.72	0.6
Soybean oil	10.76	3.86	24.61	53.30	6.28	0.33	-
Sunflower oil	6.28	3.81	27.31	60.87	0.05	0.30	-
Blend I	4.99	2.63	58.62	24.85	5.82	0.64	Traces
Blend II	7.46	3.15	43.79	37.13	6.83	0.53	Traces
Blend III	4.61	2.50	61.46	21.33	6.95	0.63	Traces
Blend IV	4.87	1.21	63.26	21.02	7.58	0.67	Traces
Blend V	4.45	3.03	48.69	28.42	4.97	0.53	Traces
Blend VI	6.24	1.82	54.69	28.70	7.65	0.64	Traces

Table 4. Stability of canola, sunflower, soybean oils and their Blends.

Tested Samples	Thermal Stability in hours
Canola oil	9.71
Sunflower oil	8.00
Soybean oil	9.38
Blend I	11.30
Blend II	12.56
Blend III	9.50
Blend IV	9.85
Blend V	8.95
Blend VI	10.18

Table 5. Physiochemical Properties of Canola oil and its Blend I and Blend II before and after frying.

Parameters	Canola oil		Blend I		Blend II	
	zero time	after frying	zero time	after frying	zero time	after frying
R.I.	1.4685	1.4701	1.4700	1.4723	1.4699	1.4759
Color (red unit)	4.00	5.40	4.00	4.30	4.10	7.90
Acidity %	0.20	0.35	0.18	0.32	0.15	0.37
P.V. (meq/kg oil)	6.48	13.26	2.96	4.68	5.69	8.68
I.V. (meq/kg oil)	107.07	97.00	117.89	114.51	119.50	112.31
U.V. 232nm	0.086	1.233	0.169	1.103	0.972	1.05
U.V. 270nm	0.07	0.03	0.04	0.03	0.39	0.28
Polar %	4.02	23.89	1.73	17.13	7.32	19.58
Polymer %	0.70	1.94	1.07	2.48	1.82	2.93

REFERENCES

1. Ahmed, Fadia H. A 2004. Biochemical Studies on Some Vegetable Oils. Ph.D. Thesis, Fac. Agric., Cairo Univ.
2. Allam, S. M. 1994. Preparation of High Stable Frying Oil. M. Sc. Thesis, Fac. Agric. Cairo University.
3. A. O. A. C. (Association of official Analytical Chemists) 2000. Official Methods of Analysis (17 th ed.) Published by the Association official Analytical Chemists. Virginia DC
4. Barrera-Arellano, D. and W. Esteves. 1992. Oxidative stability of potato chips determined by Rancimate. J. Am. Oil Chem. Soc. 69:335-337.
5. Carr, R. A. 1990. Edible fat and oil processing: Basic principles and modern practices (edited by D. R. Erickson). American oil Chemists Society, Champaign.
6. Codex Alinenterius 1992. Codex Standard for Edible Low Erucic Acid Rapessed Oil. Codex Stan. 123, Vol.8.
7. Croon, L. B., A. Rogstad, T. Leth. and T. K. Kiutama. 1986. A Comparative Study of Analytical Methods for Quality Evaluation of Frying Fat. Fette Seifen Anstrichmitel 88, (3), 87-91.
8. -Cuesta, C., F. J. Sanchez-Muntizand and I. Hernandez. 1991. Evaluation of Nonpolar Methyl Esters by Colum and Gas Chromatography for the Assessment of Used Frying Olive Oils. J. Am. oil chem. Soc. 68, 443.
9. Danthine, S. and C. Deroanne. 2003. Physical and Textural characteristics of hydrogenated low erucic acid rapeseed oil and low erucic acid rapeseed oil blends. J. Am. Oil Chem. Soc. 80:109-114.
10. Delisle, J., J. Amiot, G. Goulet, C. Simard, G. J. Brisson, and J. D. Jones. 1984. Nutritive value of protein fractions extracted from soybean, rapeseed and wheat flours in the rat. Qual plant–plant foods. Hum. Nutr. 4: 243.
11. EAS (Economic Affairs Sector) Ministry Agric. & Land Rec. September. 2003.
12. Graziano, V. J. 1979. Protable Instrument Rapidly Measures Quality of Frying Fat. Food Service Operations, Food Technology, 33, (9), 50, 52, 67 - 76.

13. Hamama, A. A., H. L. Bhardwaj, and D. E. Starner. 2003. Genotype and Growing location effects on phytosterols in canola oil. J. Am. Oil Chem. Soc., 80(11): 1121-1126.

14. Haumann, B. F. 1997. Mechanical extraction capitalizing on solvent free processing. Inform. 8: 165-174

15. Hawrysh, Z. J. 1992. Quality evaluation of snack foods fried in canola oil products. Tenth project report, Research on canola seed oil and meal. The canola Council of Canada. pp. 214 - 234.

16. Johnson, O. C. and F. A. Kummerow. 1957. Chemical changes which take place in an edible oil during thermal oxidation. J. Am. Oil Chem. Soc. 34 (8): 407 - 409.

17. Khalil, M. F., M. A. El-Agaimy and H. A. A. Badawy. 1993. Effect of Blending on Stability of Commercial oil During Frying. Egypt J. Appl. Sci., 8 (1): 106 - 113.

18. Kun, T. Y. 1988. Improvements in Frying Qualities of Liquid Vegetable Oils by Blending. Palm oil developments, 8 (1): 1 - 4

19. Noraini, I., H. Hanirah, N. Sudin, C. H. Flingoh and T. S. Tang. 1995. Clarity of blends of double-Fractionated palm olein with low erucic acid rape seed. oil. J. Am. Oil Chem. Soc., 72 (4): 443 - 448.

20. Sarwar, G. R. Blair, M. Friedman, M. R. Gumbmann, L. R. Hackler, P.L. Pellett and T. K. Smith. 1984. Inter-and intra- laboratory variability in rat growth assays for estimating protein quality of foods J. Assoc. off. Anal. Chem. 67:976.

21. Shahidi, F. 1990. Canola and Rapeseed: Production, Chemistry, Nutrition and Processing Technology. (edited by F. Shahidi) Van Nostrand Reinhold Inc., New York, P.3.

22. Stahl, E. 1967. "Thin layer chromatograpyy." A laboratory Hand Book, Ed. Springer Verloag, Berlin, p.359. Heidelberg. New York.

23. Sudatip, K. M., M. B. Swsan, R. C. Keith and E. A. William. 2003. Pan-Frying Stability of NuSun Oil, a Mid-Oleic Sunflower Oil. J. Am. Oil Chem. Soc., 80 (5): 479 - 483.

24. Thakor, N. J., S. Sokhansanj, I. McGregor and S. McCurdy. 1995. Dehulling of canola by hydrothermal treatments. J. Am. Oil Chem. Soc., 72:597-602.

25. Thomsen, M. K., , D. Kristensen and L. H. Shibsted. 2000. Electrons spin resonance spectroscopy for determination of the oxidative stability of food lipids. J. Am. Oil Chem. Soc., 77 (7): 725 - 730

26. -Tyagi, V. K. and A. K. Vasishtha. 1996. Changes in the Characteristics and Composition of Oils during Deep- Fat Frying. J. Am. Oil Chem. Soc., 73(4): 499.

27. Warner, K. and T. L. Mounts. 1993. Frying stability of soybean and canola oils with modified fatty acid compositions. Am. Oil Chem. Soc., 70: 983 - 988.

28. Zhang. W. B. and P. B. Addis. 1995. Prediction of Levels of Cholesterol Oxides in Heated Tallow by Dielectric Meassurement. J. Food Science, 55 (6): 1673 - 1675.

دراسة تأثير الخلط و التحمير على صفات زيت الكانولا وعباد الشمس و الصويا

مجدي احمد العجيمى[1]، مروه عبد الهادي عبد الفتاح[1]،
صلاح حسين أبو ريه [2]، محمد محمد النقيطى[2]

[1] قسم الزيوت والدهون – معهد بحوث تكنولوجيا الأغذية – مركز البحوث الزراعية
[2] كلية الزراعة – قسم الصناعات الغذائية – جامعة القاهرة

تمت هذه الدراسة على بذور الكانولا (المزروعة بشرق العوينات) و زيت عباد الشمس و زيت فول الصويا. تم تقدير نسبة الزيت و البروتين و الرماد و الألياف و الكربوهيدرات فى بذور الكانولا و كانت(٤٥,٥%و٣٢%و٣,٦٤%و٢,١%و١١,٧٦%) على التوالى .تم استخلاص زيت الكانولا ثم عمل خلطات بين زيت الكانولا مع كل من زيت عباد الشمس و زيت الصويا بنسب(١:١ ،١:٩,٣:٧حجم/حجم) و تم تقدير الصفات الطبيعية و الكيميائية لهذه الزيوت و مخالطها من حيث (معامل الانكسار و اللون و الحموضة و رقم البيروكسيد و رقم اليودى و الامتصاص فى منطقة فوق البنفسجية ٢٣٢ و ٢٧٠ نانوميتر ٠ و كانت النتائج كالتالى(١,٤٦٨٢–١,٤٧٠٨) و(٣,٧–٥ أحمر) و (٠,١٤–٠,١٩%) و(٢,٩٦–٧,٦٤) و(١١٠,٦–١٢١,٥) و(٠,١٦٩–٠,٩٧٢) و(٠,٠٤–٠,٣٩٤) على التوالى٠ كذلك تم دراسة زيت الكانولا وزيت عباد الشمس وزيت الصويا والخلطات من حيث محتواها من الاحماض الدهنية فلوحظ ان زيت الكانولا مرتفع فى حمض الاوليك وزيت عباد الشمس والصويا مرتفع فى حمض اللينوليك وكانت نسبة حمض الايورسيك فى زيت الكانولا ٠،٦% بينما كانت نسبتها ضئيلة فى حالة زيوت المخاليط تم أيضا دراسة تأثير التحميرعلى درجة حرارة ١٨٠م° لمدة ٨ ساعات على زيت الكانولا و افضل مخاليط الزيت المحضرة من حيث ثباتها الحرارى. فأظهرت النتائج ان مخلوط(زيت الكانولا مع زيت عباد الشمس بنسبة ١:١ حجم/حجم) و كذلك (زيت الكانولا مع زيت الصويا بنسبة ١:١ حجم/حجم)هى افضل الخلطات من حيث ثباتها الحرارى. كذلك تم دراسة تاثير التحمير على الصفات الطبيعية و الكيميائية لزيت الكانولا وافضل المخاليط من حيث معامل الانكسار واللون والحموضة ورقم البيروكسيد ورقم اليودى والامتصاص فى منطقة الفوق بنفسجية ٢٣٢و٢٧٠ نانوميتر والبولر والبوليمر فكانت (١,٤٧٠١–١,٤٧٥٩) و(٤,٣–٧,٩ أحمر) و(٠,٣٢–٠,٣٧%) و(٤,٦٨–١٣,٢٦) و(٩٧–١١٤٠٥) و(١,٠٥–١٠٢٣) و(٠,٠٣–٠,٢٨٩) و(١٧,١٣–٢٣,٨٩) و(١,٩٤–٢,٩٣) على التوالى هذا يؤكد أن افضل هذه المخاليط فى عملية التحمير هو الكانولامع عباد الشمس (نسبة ١:١حجم /حجم).