Effect of heat treatment on commercial grape seed oil*

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Introduction

The historical aspects of utilization of grape seed oil was reviewed a decade ago (1). The oil is used as a good anticholesteric edible or dietetic oil. *Razuvaev* et al. (2) reported that the oil content of grape seed is 17.1% and the composition of fatty acids in the oil -is 8.3 palmitic, 4.0% stearic, 18.1% oleic and 69.6% línoleic acids. *Mattil* et al. (3), mentioned that the characteristics and composition of such oil are as follows: iodine number 124 – 143, saponification number 178 – 196, unsaponifiable matter 0.3 – 1.6%, saturated acids 8.0 – 16.0% and unsaturated acids 85.0 – 90.0%.

The present work was designed to investigate the effect of heat treatment on some characteristics of grape seed oil.

Materials and methods

Grape seed oil was obtained from the local market (produced by Ganaklis factory). The oil was divided into two samples:

a) untreated
b) heated at 180 °C for 45 minutes for frying potato chips several times (three).

Analysis:

1. The conventional physical and chemical properties were determined in accordance with the (4), (5).

2. Fractionation of lipid classes:

   Fractionation of grape seed oil was carried out on plates of silica gel *G*, using a system composed of petroleum ether, diethyl ether and acetic acid (90:10:1 v/v). After development and drying, the plates were subjected to iodine vapor for visualization.

3. Determination of fatty acid (FA) composition:
   Methyl esters of FA were prepared following the procedure adopted by (8).

* Hazánkban a szőlőmag olaj termelés jelenleg nem jelentős, de szerző hazájában Egyiptomban nem hagyható figyelmen kívül (szerk.).
** Szerző tanulmányait a Budapesti Műszaki Egyetemen végezte.

The esters were injected in gas chromatograph under the following conditions:

Volume of sample: 0.5 μ
Apparatus: Perkin – Elmer 15 HD
Detector: Flame ionization
Stationary phase: Polyethylene glycol
Temperature regimes: isothermal at 150 °C
Mobile phase: nitrogen, rate at 15 G3/min.

Identification of FA was performed with the aid of an authentic sample injected under the same conditions. Each fatty acid was calculated as the percentage of the total area under curves.

Results and discussion

Some physical and chemical properties of untreated and heated grape seed oil are given in table (1). It can be observed that the properties of the untreated oil are within the limits known for other edible oils. On comparing the present data with those compiled elsewhere (9, 10) – no appreciable differences could be noted.

It is worthy to mention that the iodine value of grape seed oil was 133.5, however, it is classified as a semidrying oil (11).

From the same table one can notice that the heated oil, i. e. (at 180 °C for 45 minutes) was somewhat stable concerning specific gravity, refractive index, unsaponifiable matter and saponification value. On the other hand, the iodine value decreased from the value 133.5 in the commercial oil (untreated) to 131.0 after the heating process and this may be due to the saturation of double bonds by oxidation caused by heating of to the breakdown of the molecules at the unsaturated centers (12).

The results given in table (1) show that the free fatty acid content (as oleic acid) of the untreated sample was 0.18%. The percentage of FFA increased to 0.35% after heat treatment. It seems that heating at 180 °C for 45 min. during frying potato chips is too mild to cause considerable changes in free fatty acids (13).

The peroxide content increased after using the oil for frying potato chips. The initial value was 4.0 and increased to 12.66 as shown in table (1). This may be due to the accelerating effect of heat on the peroxide formation.

Table 1.

Some physical and chemical properties of commercial grape seed oil

Property	Untreated	Heated at 180 °C for 45 min.
Specific gravity (at 25 °C)	0.9200	0.9190
Refractive index (at 25 °C)	1.4760	1.4760
Saponification value	187.000	190.000
Iodine value	133.50	131.00
Acid value (FFA %)	0.18	0.35
Unsaponifiable matter (%)	0.55	0.53
Peroxide value	4.00	12.66

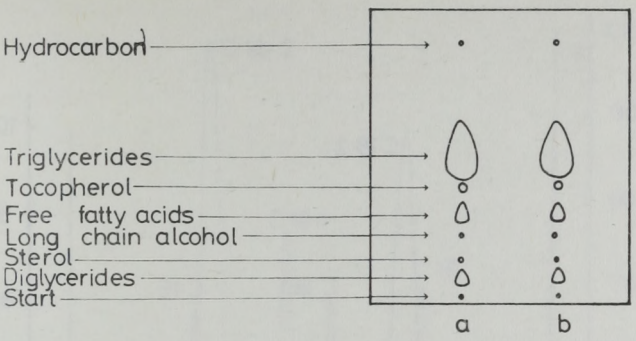

Fig. 1.

Thin layer chromatogram of grape seed oil (a) Untreated. (b) Grape seed oil used for frying potato chips (heated at 180 °C for 45 mint.)

Identification of lipid classes by thin layer chromatography:

Fig. (1) shows the TLC of lipid classes of untreated and heated grape seed oil at 180 °C for 45 min. It is clear from this figure that the main components of the oil were present in the two samples. No sharp differences could be noticed due to the thermal treatment.

It is obvious from table (2) and figures (2 and 3) that the composition of grape seed oil was not affected by heat treatment and no important changes occurred in fatty acids in the untreated sample. These results were in agreement with the finding of (14) who reported that the oil was suitable for frying purposes without appreciable effect on its physical and chemical properties.

Table 2.

Fatty acid constituents (%) of grape seed oil

Fatty acid	Untreated	Thermally heated
C_{14}	0.75	0.70
C_{15}	0.20	0.25
C_{16} aldehyde	0.05	0.05
C_{16}	9.35	11.10
$C_{16:1}$	1.85	1.60
C_{18} aldehyde	0.30	0.20
C_{18}	8.70	9.05
$C_{18:1}$	24.55	23.95
$C_{18:2}$	43.20	43.30
$C_{18:2}$ isomer	3.70	4.60
C_{20}	4.40	3.15
$C_{18:3}$	1.95	1.00
Saturated acids	24.70	25.45
Unsaturated acids	75.25	74.45

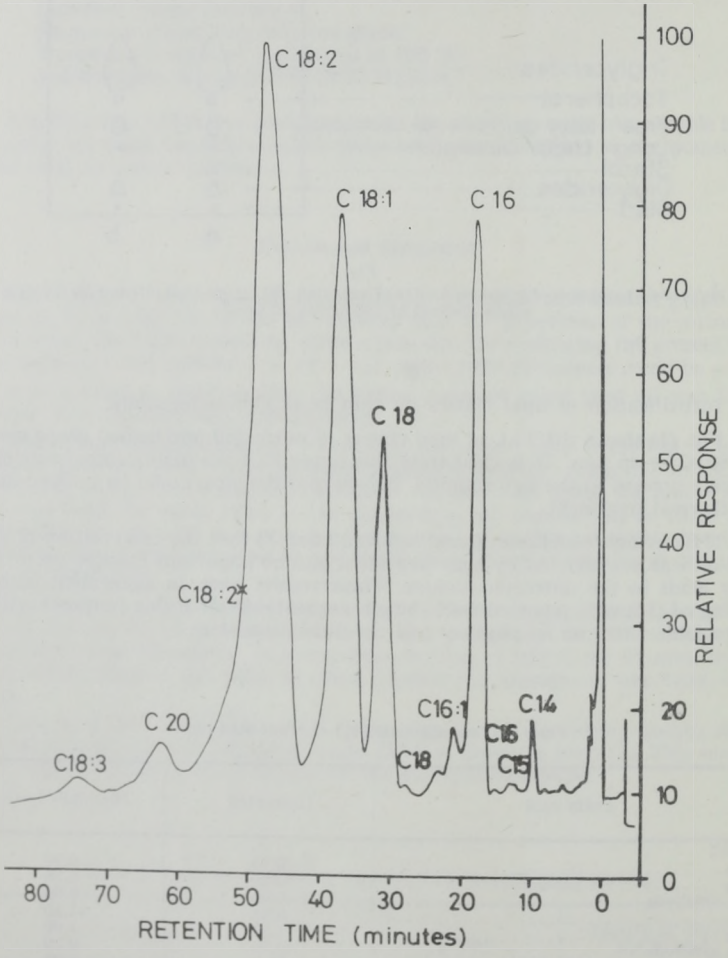

Fig. 2.
G. L. C. of fatty acid methyl esters of grape seed oil.

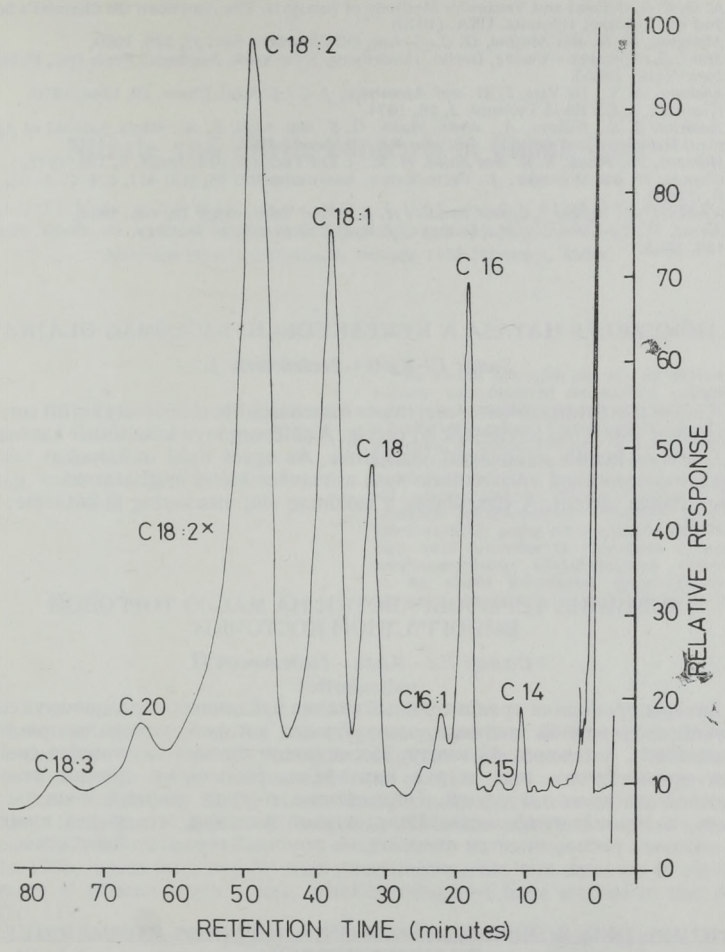

Fig. 3.
G. L. C. of fatty acid methyl esters of grape seed oil (nealed)

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HŐKEZELÉS HATÁSA A KERESKEDELMI SZŐLŐMAG OLAJRA

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Két kereskedelmi szőlőmag olaj minta összehasonlító elemzésére került sor, amelyek egyikét 180 °C-on hevítették 45 percig. A sültburgonya készítésnél használatos olaj fizkai és kémiai sajátságait vizsgálták. Az egyes lipid osztályokat vékonyrétegkromatográfiával választották el. A zsírsavösszetétel meghatározása gázkromatográfiásan történt. A vizsgálatok a szőlőmag olaj viszonylag jó hőtűrését bizonyították.

ВЛИЯНИЕ ТЕРМООБРАБОТКИ НА МАСЛО ТОРГОВОЙ ВИНОГРАДНОЙ КОСТОЧКИ

Самир Ел – Кади – Неделкович Й.

Авторы проводили сравнительный анализ маслянных образцов двух сортов торговой виноградной косточки, один образец которой нагревали при температуре 180 °С в течении 45 минут. Исследовали физико-химические свойства масла применяемого при жарке картофеля. Некоторые липиды отделяли тонкослойной хроматографией. Определение состава жирной кислоты проводили газохроматографически. Иследования доказали, что масло виноградных косточек распоряжается относительно хорошей термоустойчивостью.

WIRKUNG DER WΩRMEBEHANDLUNG AUF DEM KOMMERZIELLEN TRAUBENKERNÖL

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Eine vergleichende Analyse wurde mit zwei Mustern vom kommerziellen Traubenkernöl durchgeführt. Eines dieser Muster war unbehandeltes kommerzielles Öl, das andere war dagegen vorangehend 45 Minuten lang einer Wärmebehandlung bei 180 °C unterworfen. Die physikalischen und chemischen Eigenschaften des bei der Herstellung von Bratkartoffelstücken verwendeten Öls untersucht Die einzelnen Lipidgruppen wurden durch Dünnschichtchromatographie abgetrennt. Die Fettsäurezusammensetzung wurde gaschromatisch ermittelt. Die Untersuchungen haben die verhältnismässig gute Wärmetoleranz des Traubenkernöls bewiesen.