

**NOTE**

**LIPID CONTENT AND FATTY ACID COMPOSITION IN SOME SPECIES OF COMPOSITAE FAMILY**

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**ABSTRACT**

The percentage of oil in the seeds of four species, belonging to Compositae family, was determined. The range of fat content in the seeds studied was 16.3-43.5%. The results obtained by gas chromatographic separation showed that concentration of linoleic acid in *Carthamus oxyacantha* Bieb. and *Gundelia taurnefartii* L. was 76.06 and 60.15%, respectively. The results also indicated that oleic acid (C 18:1) was the predominant fatty acid in *Cynara syriaca* Boiss. and *Cirsium cangestum* Fich. & Mey. with a concentration of 47.70 and 37.50, respectively. Most of the isolated fats showed a high iodine value which is comparable with those of cultivated oilseed crops. In the case of *Cirsium cangestum* species, palmitoleic and arachidic acids were detected. These acids were not observed in other species.

**Key words:** Compositae family, fatty acids, Iodine value.

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**تعیین میزان چربی و ترکیب اسیدهای چرب در چند گونه از تیره کاسنی**

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### چکیده

درصد چربی در دانه های چهار گونه از تیره کاسنی تعیین گردید. میانگین درصد چربی در دانه های مورد مطالعه بین ۱۶/۳ و ۴۲/۵ درصد متغیر بود. نتایج بدست آمده از تفکیک اسید های چرب بوسیله کروما توگرافی گازی نشان داد که گلرنگ وحشی و کنگر معمولی به ترتیب با ۷۶/۰۶ و ۶۰/۱۵ درصد بالاترین میزان اسید لینولئیک (C18:1) را داشتند. این نتایج همچنین نشان داد که اسید اولئیک (C18:1) در گونه های کنگر فرنگی وحشی و کنگر صحرائی به ترتیب با ۴۷/۷۰ و ۲۷/۵۰ درصد، اسید چرب غالب بود. در اغلب دانه های مورد مطالعه اندیس ید بالا بود و دانه های روغنی از این نظر با دانه های زراعی قابل مقایسه هستند. اسید پالمیتو لئیک (C16:1) و اسید آراکیدیک (C20:0) در کنگر صحرائی اندازه گیری شد ولی در سایر گونه ها قابل اندازه گیری نبود.

### INTRODUCTION

The plant family Compositae is reported to have 950 genera and over 20000 species (14). Many plants of this family grow abundantly in the wild and cater for diverse uses such as in food, medicine, rubber, oil, detergents, protective coatings, insecticides and dyes (7, 10, 15). However, only *Helianthus annuus* (sunflower) and *Carthamus tinctorious* (safflower) of this family are cultivated as oilseed crops (3, 6, 8, 11).

Due to rapid population growth and man's great need for new oil resources to meet part of his dietary requirement, a wide range of investigations has been carried out to find new vegetable resources, and determine their lipid content and fatty acid composition (2, 4, 5, 9, 13, 16).

The major objectives of this study were to: 1) measure saponification number and iodine value and 2) identify and quantify fatty acids in seeds of four species of compositae family, namely *Cynara syriaca* (wild artichoke), *Gundelia taurnefortii*, *Cirsium congestum* (thistle) and *Carthamus oxyacantha* (wild safflower). These plants grow wild in west Azarbaijan area and were collected at the end of the summer.

## MATERIALS AND METHODS

The seeds were collected from different areas of west Azarbaijan (around Sardasht, Pyranshahr and Mahabad) in July and August. Their botanical classification was done by experts of the Department of Biology, Urumia University. After cleaning, the seeds were sun-dried and separately crushed with a mortar and pestle.

### Extraction of Total Lipids

The oil contents of the seeds were extracted by solvent extraction in a standard soxhlet apparatus with  $\text{CHCl}_3/\text{MeOH}$  (2:1) for 3h (1). The extracts were evaporated to dryness in a rotary vacuum evaporator at 45° C. The oils were kept under nitrogen atmosphere for further evaporating.

### Determination of Chemical Characteristic

Saponification number and iodine value were determined according to AOAC (1).

### Fatty Acid Composition

The fatty acids in oilseeds were determined by gas chromatography after trans-esterification to their methyl esters by the boron trifluoride according to the technique described by Metcalfe *et al.* (12). The esters were separated using a gas chromatograph (model 2800, Varian Aerograph), equipped with a flame ionization detector (FID) and a column with a stationary phase of 10% diethylene glycol succinate (DEGS) on Chromosorb G (80/100 mesh), coated in a stainless steel column (180 cm×3mm i.d.).

The operation conditions were as follows: oven temperature 190° C, injector temperature 240° C, flow rate of  $\text{H}_2$  10ml min<sup>-1</sup>, carrier gas flow

rate=40 ml min<sup>-1</sup>, and air feeds were set to 45 ml min<sup>-1</sup>. The identification of fatty acid methyl esters (FAME) was carried out by comparing their relative retention times (RRT) with those of standard FAME obtained from Sigma Chemical Company.

Percentages of FAME were calculated from peak areas given by the electronic integrator (model CDS 101). The values for fatty acids are given as percent by weight to total fatty acids.

### Statistical Analysis

Data were subjected to analysis of variance according to a completely randomized design with four replications. Means were separated with Duncan's multiple range test (11).

## RESULTS

The results obtained for chemical composition of the four species are given in Table 1.

Table 1. Percent fat, saponification No. and iodine value of four Compositae seed oils (mean±SE).

Sample	Percent fat	Saponification number	Iodine value
<i>Cynara syriaca</i>	43.52±0.70	199.27±2.09	117.0±2.16
<i>Gundelia tournefortii</i>	41.35±0.85	196.95±3.88	124.4±1.91
<i>Cirsium congestum</i>	42.60±0.64	203.23±3.21	96.7±3.51
<i>Carthamus oxyacantha</i>	16.30±0.45	194.46±6.05	146.2±1.24

The results of gas chromatographic analysis of seed oils are shown in Fig.1.

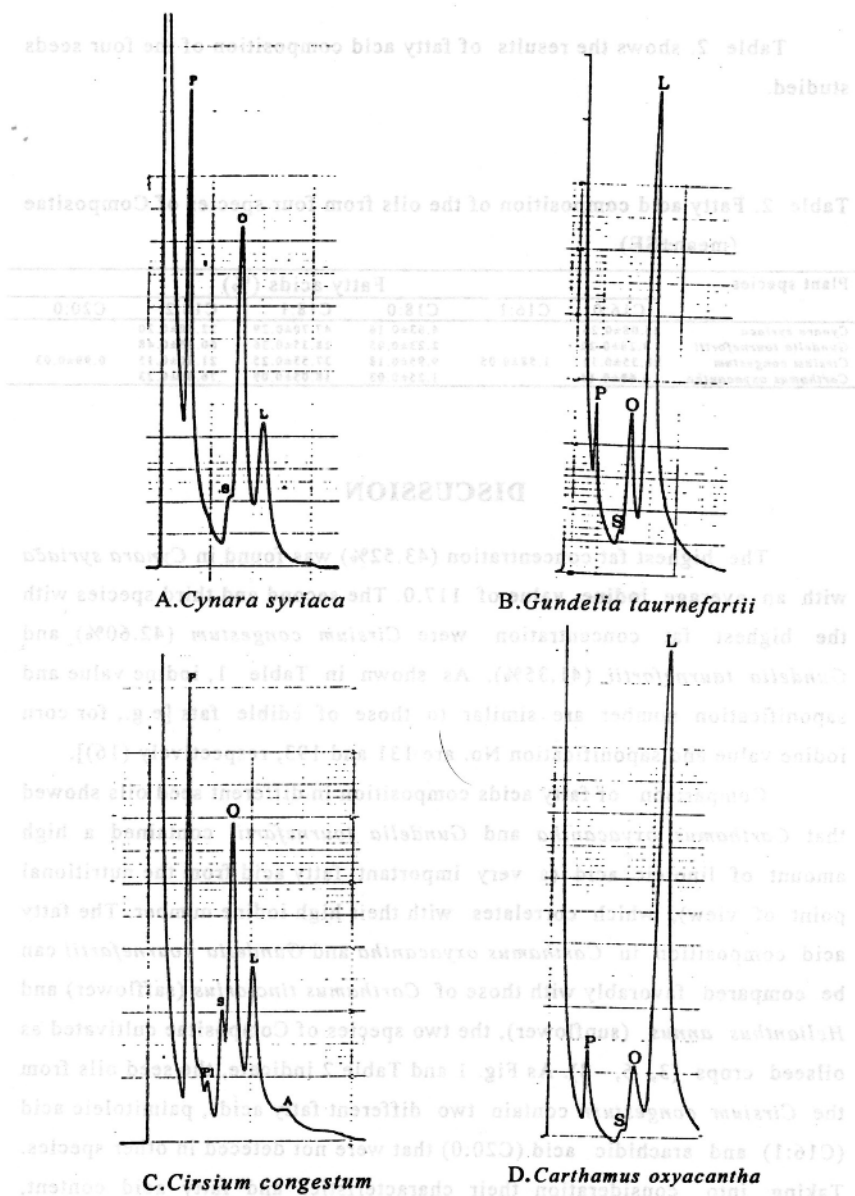


Fig. 1. Gas chromatogram of the methyl esters of fatty acids in the seeds of four species of Compositae family. P (palmitic), P1 (palmitoleic), S (stearic), O (oleic), L (linoleic), A (arachidic).

Table 2. shows the results of fatty acid composition of the four seeds studied.

Table 2. Fatty acid composition of the oils from four species of Compositae (mean±SE).

Plant species	Fatty acids (%)					
	C16:0	C16:1	C18:0	C18:1	C18:2	C20:0
<i>Cynara syriaca</i>	25.08±0.26		4.63±0.16	47.70±0.29	22.60±0.20	
<i>Gundelia tournefortii</i>	9.28±0.22		2.23±0.05	28.35±0.36	60.15±0.48	
<i>Cirsium congestum</i>	28.35±0.12	1.58±0.05	9.95±0.18	37.55±0.25	21.60±0.15	0.99±0.03
<i>Carthamus oxyacantha</i>	4.68±0.15		1.25±0.03	18.05±0.09	76.06±0.23	

## DISCUSSION

The highest fat concentration (43.52%) was found in *Cynara syriaca* with an average iodine value of 117.0. The second and third species with the highest fat concentration were *Cirsium congestum* (42.60%) and *Gundelia tournefortii* (41.35%). As shown in Table 1, iodine value and saponification number are similar to those of edible fats [e.g., for corn iodine value and saponification No. are 131 and 193, respectively (16)].

Comparison of fatty acids composition in different seed oils showed that *Carthamus oxyacantha* and *Gundelia tournefortii* contained a high amount of linoleic acid (a very important fatty acid from the nutritional point of view), which correlates with their high iodine number. The fatty acid composition in *Carthamus oxyacantha* and *Gundelia tournefortii* can be compared favorably with those of *Carthamus tinctorius* (safflower) and *Helianthus annuus* (sunflower), the two species of Compositae cultivated as oilseed crops (3, 6, 8). As Fig. 1 and Table 2 indicate, the seed oils from the *Cirsium congestum* contain two different fatty acids, palmitoleic acid (C16:1) and arachidic acid (C20:0) that were not detected in other species. Taking into consideration their characteristics and fatty acid content, especially linoleic acid with high nutritional value, the fat of some of the wild seeds studied could be considered as edible fats for animal and human

consumption. However, since these wild seeds have not been used as food before, toxicological studies have to be done to ensure their safety.

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