

Physical Sciences Section

Pakistan J. Sci. Ind. Res., Vol. 30, No. 4, April 1987

CICHORIUM INTYBUS L (KASNI) – TOTAL LIPID FRACTIONS AND THEIR FATTY ACID COMPOSITION

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(Received February 20 1986; revised January 18, 1987)

Cichorium intybus L ('Kasni') seed oil (5.8%) was examined for its physico-chemical values and fatty acid composition by gas chromatography. The oil was fractionated by TLC into lipid classes; neutral lipids (56.74%) and polar lipids (43.26%). Fractionation of neutral lipids gave hydrocarbon wax-esters (6.46%), triglycerides (23.39%), free fatty acids (10.70%), 1,3-diglycerides (4.95%), 1,2-diglycerides (5.90%) 1-Monoglycerides (3.21%) and 2-Monoglycerides (2.13%). Polar lipids were separated into glycolipids (30.22%) and phospholipids (13.04%). All the lipid classes except phospholipids were studied for their fatty acid composition. Except for 2-Monoglycerides, all other lipid classes showed a similar fatty acids pattern, as the saturated fatty acids constituted 72-88% of the total. All the lipid classes have shown a fair amount of an odd numbered fatty acid (C₁₇: O).

Key Words: Lipids, *Cichorium intybus* L., Composition.

INTRODUCTION

Chicory, *Cichorium intybus* L (N.O. Compositae) is locally known as "Kasni". It is an annual herbaceous plant and is native to the north-western parts of the Indo-Pak sub-continent, Europe and Egypt [1]. Hakims use seeds, roots and leaves of the plant for the treatment of various ailments [2-4]. In the western medicine, no medicinal properties have been assigned to the plant. However, its leaves, after boiling with water, are taken as salad.

Balbaa et al [5]. Investigated eight varieties of *Cichorium intybus*. The phytochemical screening revealed the presence of flavonoids, catechol tannins, glycosides, carbohydrates, unsaturated sterols, triterpenoids, and the absence of alkaloids, oxidase enzymes and saponins.

In continuation of our general interest in the evaluation of local resources [6-13], the seed oil from *Cichorium intybus* has been examined for its physico-chemical values (Table 1) and fatty acid composition. The oil was also fractionated by TLC, into various lipid classes (Table 2) and they in turn, except for phospholipids, were also studied for their fatty acid composition (Table 1).

MATERIALS AND METHODS

The seeds of chicory were obtained from the local market, finely ground in a micromill and then extracted in a Soxhlet apparatus using chloroform/methanol (2:1

v/v) according to the procedures of Folch *et al* [14], to yield the oil. The oil was used to determine specific gravity, refractive index (Abbe's), acid value, saponification value and iodine value (Wijs) according to the standard procedures [15], and are reported in Table 3).

Aliquots of the oil (100 mg) were streaked on 20x20 cm. glass plates coated with 0.5 mm silica gel G.

Chromatograms were developed in hexane/diethyl ether/acetic acid (80:20:1 v/v/v, and the resulting bands were made visible under UV lamp by spraying with 2,7-dichlorofluorescein in methanol. Lipid classes were identified by comparison of their R_F's with those of standards. The bands made visible under UV light were marked and then scrapped from the plates. Polar lipids did not move in this solvent system and were collected separately. Neutral lipids were eluted three times with chloroform/methanol (2:1, v/v) and their weight percentages were determined (Table 2). Polar lipids were also eluted with the same solvent system. These were applied again on 10x20 cm TLC plates coated with 0.5 mm silica gel G. Chromatograms were developed in chloroform/methanol/ammonium hydroxide/water (60:35:5: 2.5 v/v). Glycolipids were identified by orcinol spray (3,5-dihydroxy toluene in H₂SO₄) which gave violet colour. For the identification of phospholipids, Molybdenum Blue reagent was used which gave blue spots. Weight percentages are given in Table 2.

Methyl esters of each class and the whole oil were prepared by the method of Kumar and Tsunoda [16]. The samples were analysed by GC using Pye Unicam 204 Series apparatus equipped with a flame ionisation detector

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Table 1. Physico-chemical characteristics of chicory oil.

Specific gravity at 25°/25°	0.9190
Refractive Index (Abbe's) at 40°	1.4578
Acid value	10.18
Saponification value	190.49
Iodine value (Wijs)	97.00

Table 2. Wt% of lipid fractions of chicory oil

Neutral lipids	= 56.74%
Polar lipids	= 43.26%
<i>Fractions of neutral lipids:</i>	
Hydrocarbon wax-esters	6.46%
Triglycerides	23.39%
Free fatty acids	10.70%
1,3 Diglycerides	4.95%
1,2 Diglycerides	5.90%
1-Monoglycerides	3.21%
2-Monoglycerides	2.13%
<i>Fractions of polar lipids:</i>	
Glycolipids	30.22%
Phospholipids	13.04%

and a 4 mm x 1.5 m glass column packed with 10% DEGS on diatomite C.A.W. Column was maintained at 200°. The nitrogen flow rate was 40 ml/min. and the chart speed 10 mm/min. Fatty acids were identified by comparison with the chromatograms of standard acids obtained under identical conditions, and percentages determined by calculating the area under the curves. The results are given in (Table 3).

RESULTS AND DISCUSSION

The total amount of lipids in *Cichorium intybus* L seeds was found to be 5.8%.

From the knowledge of physico-chemical characteristics of the oil (Table 1), it is seen that the oil is semi-drying in nature.

The purified lipid fractions, obtained after TLC were found to be composed of 56.74% neutral lipids and 43.26% polar lipids. Triglycerides were the predominant neutral fraction averaging 23.39% of the total lipids. Among the neutral lipids fractions, the minor component was 2-monoglycerides (2.13%) (Table 2). Glycolipids were the main polar fraction averaging 30.22% (Table 2). The fatty acid composition of the total lipids and lipid fractions

Table 3. Percent fatty acids composition of total lipids and lipid classes of chicory seed oil.

Lipid classes.	Percentage fatty acids							
	C _{8:0}	C _{12:0}	C _{14:0}	C _{16:0}	C _{17:0}	C _{18:0}	C _{18:1}	C _{18:2}
Hydrocarbon-wax-esters			5.88	51.76	5.88	11.76	24.70	
Triglycerides.				50.70	19.72	18.30	11.27	
Free fatty acids	0.95	0.95	1.14	45.63	10.45	17.11	22.81	0.95
1,3-Diglycerides			2.20	39.43	18.93	17.35	22.08	
1,2-Diglycerides		1.31	1.49	41.12	11.21	18.69	26.16	
1-Monoglycerides		3.16	2.10	46.31	6.31	18.94	23.16	
2-Monoglycerides				19.80	3.96	14.85	51.48	9.90
Glycolipids				42.70	11.36	17.95	19.83	8.16
Total lipids	1.25	3.16	6.25	38.35	6.27	14.60	24.34	5.78

except those of phospholipids is shown in Table 3. It is evident that all the lipid classes except 2-monoglycerides fractions were similar in their fatty acid pattern, as the saturated fatty acids constituted 72-88%. 2-Monoglyceride fraction contained 38.61% saturated acids. All the lipid classes contained a fair amount of an odd numbered fatty acid (C₁₇:0) Misra and Dutt [17] analysed the oil for fatty acids in 1937. They reported that the oil contained 20.01% saturated and 72.19% unsaturated fatty acids. However, our results show that the amount of saturated acids is greater than that of unsaturated fatty acids.

Akiyoshi *et al.* [18] studied the steam volatile components of air-dried and roasted chicory roots. They found that major components of the air-dried roots were palmitic acid (16.2%) and linoleic acid (31.5%). The same acids and the corresponding methyl esters were found in large quantities in the roasted roots as well.

The oil might be suitable for soap industry and the residual meal being rich in proteins and free from toxic principle could be used for animal feed.

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