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LIPID COMPOSITION OF *FERULA JAESCHKEANA* – PRESENCE OF AN ODD FATTY ACID

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Ferula jaeschkeana seed oil (8.15%) was examined for its fatty acid composition. The oil was fractionated by TLC into lipid classes; neutral lipids (83.23%) and polar lipids (16.77%). Further fractionation of the neutral lipids resulted into hydrocarbons (4.46%), waxesters (3.90%), triglycerides (36.30%), free fatty acids (11.17%), 1:3-diglycerides (10 10%), 1:2-diglycerides (7.80%), monoglycerides (5.10%) and unidentified fraction (4.40%). Fatty acid composition of the whole oil and its fractions were determined by GC and presence of an odd fatty acid, margaric acid, $C_{17:0}$ was identified.

Key words: Umbelliferae, *Ferula jaesachkeana*, lipid compositions, Margaricacid ($C_{17:0}$)

INTRODUCTION

Ferula jaeschkeana belongs to the genus Ferula of the family Umbelliferae. This genus is of about 140 species found mostly from Mediterranian region to central Asia. Only 15 species have been found to occur in Pakistan. These species are: *Ferula assafoetida, F. baluchistanica, F. communis, F. costata, F. hindukushensis, F. jaeschkeana, F. kokanica, F. lehmanii, F. microlobe, F. narthex, F. oopoda, F. ovina, F. reppiae, F. rubicaulis* and *F. stewartiana. Ferula jaeschkeana* plants are usually 2m tall parenial herbs. Fruits are broadly oblong, reddish in colour and fruit wings are less than half the width of the seed. These plants are naturally distributed in Afghanistan and Pakistan. They commonly grow on the hill-sides from 1300-3000 m in Chitral, Abbotabad, Swat and Kashmir. Their flowering period is from April to June [1]. A gum from the stems of *Ferula jaeschkeana* is used locally to treat wounds and bruises [2]. The seed contain essential oil [3] as well as fixed oil. Essential oils from the seed of certain species of the genus Ferula have been studied [4-11]. Kleiman and Spenser [12] have reported the fatty acid composition of the seed oils of some of the *Ferula* species. They found palmitic, oleic, petrosilinic and linoleic acids as the major component fatty acids.

In continuation of our general interest in the evaluation of the seed oils from the local resources [13-16], the oil of *Ferula jaeschkeana* has been fractionated into its lipid classed by thin layer chromatography and the fatty acid composition of these lipid classes except that of an unidentified fraction has been determined by gas chromatography.

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MATERIALS AND METHODS

Ferula jaeschkeana sees were collected from Abbottabad. The essential oil from the seeds was removed by the steam distillation of the crushed seeds. The residual seeds were taken out and dried in the shade for two days and the fatty oil was extracted with a solvent mixture of chloroform methanol (2:1 v/v) and filtered. The solvent was distilled out from the filterate and the oil was further dissolved in chloroform. The non-lipids were removed from the oil by the use of sodium chloride solution [17]. The lipids were obtained after the removal of chloroform in the rotatory evaporator at 40°

The oil was fractionated into lipids classes by the use of thin layer chromatography followed by gravimetric evaluation according to the procedure already reported elsewhere [14-16]. The methyl esters of the whole oil and each fraction except that of the hydrocarbons and an unidentified fraction were prepared by the use of boron-trifluoride solution in methanol [18]. The methyl esters were analyzed for the respective fatty acid composition by GC on a Pye Unicam 204 series apparatus equipped with a FID and a glass column (4 mm x 1500) packed with 10% diethyleneglycol succinate on diatomite CAW. The temperature of the column was 200° , and nitrogen was used as the carrier gas. The peaks were recorded on a Philips recorder PM 8251 and were identified by comparison of their retention times with those of the standard methyl esters analyzed under the same conditions. Percent peak areas are quoted as fatty acids composition percent weight.

RESULTS AND DISCUSSION

The fatty oil contents of *F. jaeschkeana* seed were found to be 8.15%. The oil was fractionated into lipid

Table 1. Percentage of lipid fractions of *Ferula jaeschkeana*

Lipid Fraction	Percent
Neutral	83.23
Polar	16.77
Hydrocarbons	4.46
Wax esters	3.90
Unidentified	4.40
Triglycerides	36.30
Free fatty acids	11.17
1:3-Diglycerides	10.10
1:2-Diglycerides	7.80
Monoglycerides	5.10
Polar lipids	16.77

The total lipids of *F. jaeschkeana* showed higher percentage of unsaturated fatty acids (90.5%); mainly C18:1 fatty acid (80.74%). Higher percentage of the unsaturated fatty acids had also been found in other fractions of the lipids except the wax-esters and the polar lipids. The predominent fatty acids found were plamitic among the saturated, and oleic and linoleic acids among the unsaturated fatty acids. The high percentage of oleic acid obtained might it be a mixture of petrosilinic acid and oleic acids. These two acids could not be separated by the GC column and is also known that these two acids are mostly present in the lipids of the genus Ferula of the family Umbelliferea seed oils [20]. Kleiman and Spenser [12] reported the analysis of the seed oils of *Ferula assa-foetida, Ferula communis, Ferula communis* subsp. *Glauca, Ferula galbaniflus, Ferula oppoda* and *Ferula ovina.* They reported the presence of petrosilinic acid (23-76%) and oleic acid (5-26%) in the seed oil of these species. These results also confirm our observation of the high percentage of C18:1 acids in the seed oil of *Ferula jaeschkeana.* The other fatty acids found were lauric, myristic, palmitoleic, margaric, stearic, arachidic, linolenic, behenic and two unidentified fatty (I, II) acids. The presence of these acids have been confirmed by GC analyses using authentic samples of these acids. It is the first time ever that the presence of an odd fatty acid (margaric acid) has been reported in the Ferula seed oil.

Table 2. Fatty acids composition of *Ferula jaeschkeana* seed oil and its fractions

	$C_{12:0}$	14:0	16:0	16:1	17:0	Unidentified I	18:0	18:1	18:2	20:0	18:3	Unidentified II	22:0	Percent Saturated Fatty Acids	Percent unsaturated Fatty Acids	Percent unidentified Fatty Acids
Whole oil	0.18	0.32	7.94	0.36	0.12	0.32	0.29	80.74	9.35	0.08	0.06	0.12	0.11	9.04	90.51	0.44
Wax esters	6.24	4.16	33.34	8.33	2.08	2.52	10.42	15.62	5.83	8.33	2.08	traces	1.04	65.61	31.86	2.52
Triglycerides	3.59	2.88	14.98	4.79	0.72	4.78	5.99	47.96	10.79	0.60	2.40	0.50	traces	28.76	65.94	5.29
Free fatty acids	6.58	7.89	15.79	2.63	3.94	–	13.15	32.91	14.47	traces	2.63	traces	traces	47.35	52.64	–
1:3-diglycerides	3.73	4.85	13.06	5.59	5.97	5.97	9.33	26.32	9.88	7.83	3.36	2.98	1.12	45.89	45.15	8.95
1:2-diglycerides	4.43	2.53	12.00	1.90	1.90	6.96	8.23	50.65	11.39	–	traces	traces	traces	29.09	63.94	6.96
Monoglycerides	2.93	1.90	11.71	2.34	2.93	1.46	11.71	35.14	11.71	11.71	4.98	1.46	traces	42.89	54.17	2.92
Polar lipids	1.44	2.30	18.25	3.46	6.72	4.22	13.83	22.71	13.39	4.03	3.84	5.70	traces	46.57	43.50	9.92

classes by thin layer chromatography which gave neutral lipid (83.23%) and polar lipids (16.77%). Neutral lipids were further fractionated into eight fractions, which were identified by comparison of their Rf values with those of the standards except one which has the Rf value between the wax-ester and triglycerides. These identified fractions were hydrocarbons, wax-esters, triglycerides, free fatty acids, 1:3-diglycerides, 1:2-diglycerides, monoglycerides and the unidentified fraction which could be a sterol ester because of the Rf value of this ester is similar to the values reported in the literature in this eluting solvent system [19].

Triglycerides were the predominent fraction amounting to 36.30% of the total lipids where the wax-esters were the minor component of the neutral lipids (Table 1). The total lipids and the fractions except the unidentified fraction and the hydrocarbons, were analysed for their fatty acid composition (Table 2).

The unidentified, fraction F.A.I. could be an highly unsaturated C_{16} fatty acid, while the unidentified F.A. II might be an unsaturated fatty acid of a chain length between C_{20} to C_{22}.

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