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DETERMINATION OF SEED FATTY ACIDS IN *CONSOLIDA* SPECIES BY GC-MS

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Abstract

Seed oil content and fatty acid composition of seed lipids in 4 species of *Consolida* viz., *C. orientalis*, *C. armeniaca*, *C. glandulosa* and *C. hoheneckeri* of the family Ranunculaceae are reported. The oil ranges from 44.5 to 53.1% by dry weight. The 18:1 chain length pattern was dominant fatty acid in seed lipids in all the 4 species examined. Among the total 7 fatty acids, 18:2 was the next abundant lipid component whereas pattern 16:1 and 20:0 were minor constituents in all the four species.

Introduction

The genus *Consolida* (DC) SF., Gray of the family Ranunculaceae, represented with 23 species is widely distributed in Turkey. Most of the species are native to Turkey (Davis, 1965; Glasby, 1975). Some species of this genus have been known as *Delphinium* L., for a long time, but in recent years the genus has been revised. *Consolida* are toxic plants due to their diterpenoid alkaloids (Stern *et al.*, 1957). *Consolida* species are well known folk medicinal plants in Turkey (Stoyanow, 1982). The plants have been known to possess insecticidal, growth inhibitive, sedative, laxative and emetic effects (Ozden *et al.*, 1990a, 1992b; Baytop, 1984; Wallis, 1967).

Consolida species have been studied for their organic acids (Ozden *et al.*, 1990a; Attila *et al.*, 1990), benzoxazolinone (Ozden *et al.*, 1992b), Carboxylic acid (Ozden *et al.*, 1995C), and alkaloids (Pelletier, 1984). There does not appear to be any report on the fatty acid composition in the seeds of *Consolida* species. The present report discribes the presence of seed fatty acids in 4 *Consolida* species viz., *Consolida orientalis* (Gay) Schrod, *C. armeniaca* (Staph ex Huth) Schrod, *C. glandulosa* (Boiss & Hueth) Bornm., and *C. hohenackeri* (Boiss) Grossh found in North Anatolia.

Materials and Methods

Consolida orientalis, *C. armeniaca*, *C. glandulosa* and *C. hohenackeri* plants were collected in mid-August, 1993, from Gumushane-Bayburt valley. Mature seeds were removed from the flowers and dried in open air in the Herbarium of the University of Karadeniz Technical in Biology Department.

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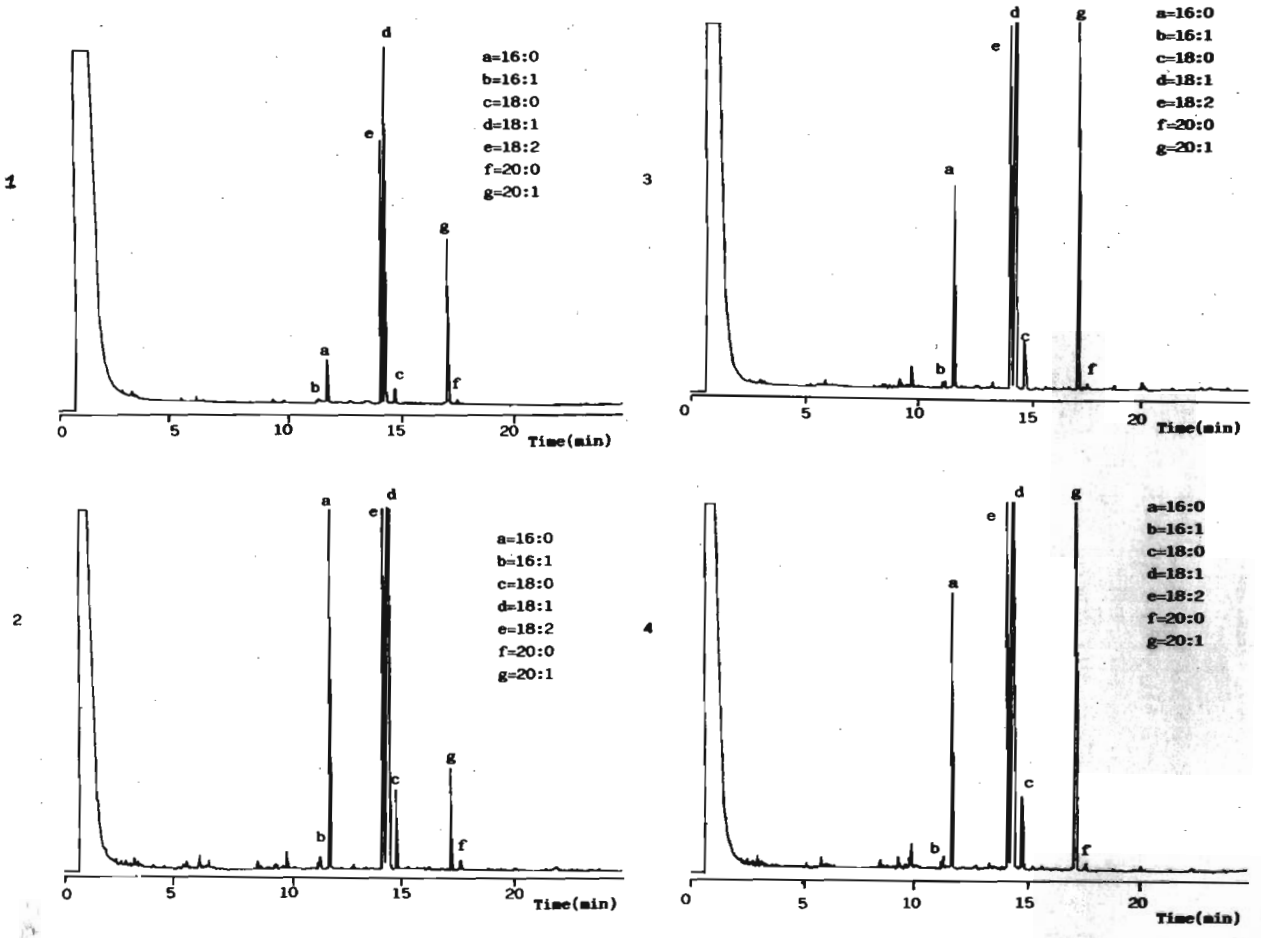

Fig.1.GC chromatograms of the seed fatty acids of *Consolida* species. (1: *C. orientalis*, 2: *C. armeniaca*, 3: *C. glandulosa*, 4: *C. hohenackeri*).

Table 1. Composition of a mixture of fatty acids (% w/w) and oil content (% dry weight) in seeds of *Consolida* species.

Fatty acids	CCL*	Species *C. orientalis*	*C. armeniaca*	*C. glandulosa*	*C. hohenackeri*
Palmitic acid	16:0	3.7	6.5	5.2	4.9
Palmitoleic acid	16:1	<0.1	0.2	0.2	0.2
Stearic acid	18:0	1.1	1.2	1.2	1.3
Oleic acid	18:1	56.0	75.2	63.7	69.9
Linoleic acid	18:2	24.7	17.9	19.4	12.4
Arachidic acid	20:0	<0.1	0.2	0.1	0.2
Eicosenoic acid	20:1	14.4	1.6	10.4	11.1
Oil content		49.6	45.2	44.5	53.1

Values, means of three indepndent determinations
*CCL = Carbon Chain Length,

Lipid extraction: One g seeds sample of each plant were homogenized in porcelin mortar in 20 ml of hot isopropanol according to Kates (1986). The homogenate was filtered on a Buchner funnel and the residue from filter was suspended in 20 ml of chloroform/methanol (2:1, v/v), stirred with a magnetic stirrer for 30 min at room temperature under nitrogen and filtered again. The process was repeated three times. The combined filtrates were first concentrated *in vacuo*, then the lipids extracted in 10 ml of chloroform/methanol (2:1, v/v), and finally the solution washed several times with 20 ml portions of 0.9% sodium chloride according to Folch *et al.*, (1957). The lipid extract was kept in a freezer at - 20°C. The lipids were saponified and the liberated fatty acids methylated according to Folch *et al.*, (1957).

GC and GC-MS Analysis: The methylated sample solutions were analysed with Varian 3300 gas chromatography (GC) equipped with flame ionisation detector (FID) and HP-1 silica capillary column (crosslinked methyl silicone gum, 0.17 μm film thickness, 25 mm, 0.32mm i.d.). Hydrogen was used as the carrier gas at a flow rate of ca. 40 cm/s, and the column oven temperature was programmed from 100°C to 290°C at 6°C/min. heating rate. The injector and detector were 260°C and 290°C, respectively. Peak areas were measured with Merck-Hitachi D-200 integrator. Similar column with helium as the carrier gas was used at the same conditions in gas chromatography-mass spectrometry (GC-MS) and analyses performed with an HP 5890-5970 GC-MS instrument. The mass spectra were recorded at 70 eV impact energy.

Results and Discussion

Seeds showed an oil content of 49.6% in *C. orientalis*, 45.2% in *C. armeniaca*, 44.5% in *C. glandulosa* and 53.1% in *C. hohenackeri* on dry weight basis (Table 1). A total of seven fatty acids were identified with gas chromatography (Fig.1) and mass spctrometry (Fig.2). Oleic acid (18:1), linoleic acid (18:2) and eicosenoic acid (20:1)

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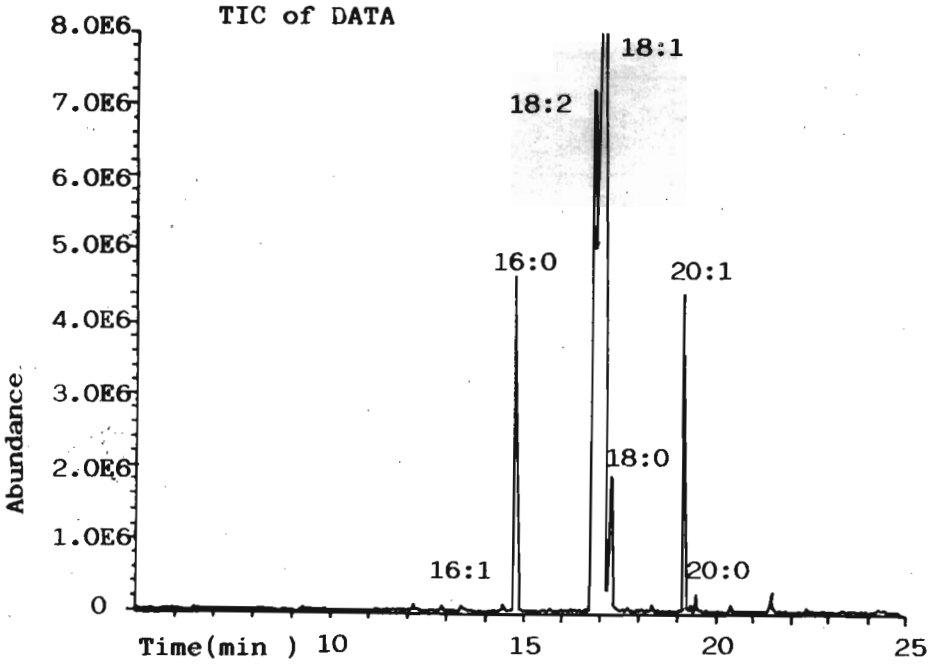

Fig.2. A representative GC-MS chromatogram of the seed fatty acids of *Consolida* species.

showed significantly higher amounts in all the 4 species constituting 92-95 % of the acids as compared to palmitoleic acid (16:1) and arachidic acids (20:0) in significantly low amounts. The different fatty acid composition confirms the morphological differences among the species (Beyazoglu, 1992). *C. orientalis* is chracterized by the trace or absence of 16:1 and 20:0 acids. From a chemotoxonomic point of view, the present results indicate that unsaturated fatty acids composition of oleic (18:1), linoleic (18:2) and icosenoic (20:0) acids show the main differences among the *Consolida* species.

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