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Lipid concentrations of wild edible greens in Crete

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Abstract

Wild greens play an important role in the traditional diet of Crete and are eaten daily, either fresh in salads, boiled or cooked in pies. Six cultivated and forty eight wildly grown greens were collected and analyzed for their total monounsaturated, polyunsaturated and saturated lipid content, their total fat content, the total ω-3 and ω-6 fatty acid composition and ω-6/ω-3 ratio. According to our, studies edible wild greens of Crete are valuable sources not only of vitamins and antioxidants, but also of monounsaturated and essential fatty acids, thus playing an important role in health promotion and disease prevention in those who adhere to the traditional diet of Crete.

Keywords: Fatty acid content; ω-6/ω-3 ratio; Wild greens; Cretan diet

1. Introduction

The traditional diet of Crete first became well-known worldwide with the seven countries study. In that epidemiological study, the dietary habits of sixteen populations from seven countries (from Greece, Finland, Japan, former Yugoslavia, Italy, Holland and the United States) were analyzed and the results showed that the population of Crete had the lowest rate of cardiovascular disease and cancer (Keys, 1970). Follow up studies, such as the Lyon Heart Study by Renaud et al. (1995) and De Lorgeril et al. (1994) study, supported those results, proving that adopting the traditional diet of Crete, high in α-linoleic acid, provided protection against coronary heart disease much more efficiently than the American Heart Association's recommended diet.

The traditional diet of Crete is based on: (a) a high fat intake (estimated at 40% of the total daily energy intake) comprised mainly of monounsaturated fatty acids, derived from its high consumption of virgin olive oil; (b) low consumption of red meat; (c) a moderate consumption of fish and diary products; supplemented daily with (d) substantial quantities of wild greens, fruits, whole wheat bread, legumes and nuts. Thus, the diet was high in antioxidants and polyphenols, low in cholesterol, low in saturated but high in monounsaturated fat as demonstrated by Ferro-Luzzi, James, and Kafatos (2002). Simopoulos (1998) stated that another important role in the traditional diet of Crete is played by its ideal ω-6/ω-3 fatty acid ratio of 2–1:1.

The traditional diet of Crete is still maintained in certain parts of Crete, mainly by the elderly in rural areas, where wild greens are collected and eaten daily-fresh in salads or cooked in pies. Those wild greens likely provide health benefits thus, the aim of the present research was to collect, chemically analyze and summarize the composition of 54 commonly eaten greens, 6 that are cultivated or 48 that grow wild in Crete for their total monounsaturated, polyunsaturated and saturated lipid content, their total fat content, the total ω-3 and ω-6 fatty acid composition and ω-6 and ω-3 ratio. Furthermore, the present study aimed to identify potential health benefits associated with the adherence to a diet rich in these wild greens due to their valuable nutritional composition in fatty acids.

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2. Methods

2.1. Field collection

The wild greens were collected between late winter and early spring of 2002 from three different prefecture's of Crete, Greece. In Heraklion from the village of Venerato and from the Valley of Messara. In Rethymo from the villages of Panormo, Monastiraki and Drimiskos. Finally collection were also made from the prefecture of Lassithi (from its plateau, at an altitude of 1200 m). Forty eight wild plants were collected. For reasons of comparison, samples of 6 commonly cultivated vegetables in Crete were also taken from plants bought from the supermarket. Table 1 shows the complete list of plant samples along with their common and scientific names were available.

2.2. Laboratory processing

The wild Cretan greens were sent to Institute of Nutritional Sciences in Vienna, Austria for the analysis. Immediately after receipt the samples were coded, homogenized, freeze dried and frozen at −80 °C until analysis. The fatty acid composition of the saturated stearic acid (18:0), palmitic acid (16:0), myristic acid (14:0), lauric acid (12:0), capric acid (10:0), monoenoic oleic acid (18:1n9), palmitoleic acid (16:1n7), polyenoic linoleic acid (18:2n6) and α-linolenic acid (18:3n3) was determined by gas chromatography.

2.3. Sample extraction and preparation

The lipid phase of Cretan greens was obtained according to the method of Folch, Less, and Stoane-Stanley (1957). After the extraction of a sample (1 g) with chloroform–methanol (2:1, v/v, sample/solvent: 1:30, 0.005% BHT) the lipid phase was separate from the water phase by addition of a 0.05 m calcium chloride solution and dried filtration through dehydrated sodium sulfate (Na_2SO_4).

Fatty acids methyl esters (FAMES) were obtained using boron trifluoride (BF_3) according to the AOAC method (1980). One millilitre of the lipid phase was saponified with 1 ml 0.5 mol/l methanolic sodium hydroxide (freshly made) at 100 °C for 6 min, than the sample was cooled and the fatty acids were methylated by adding 1 ml BF_3 in methanol and boiling for 6 min. FAMES were extracted into 2 ml hexane three times and evaporated to dryness with nitrogen and redissolved in hexane for gas chromatographic analysis.

3. Gas chromatography

Gas chromatography was performed by using an Auto-System-Gas chromatograph, Perkin–Elmer, equipped with a split capillary injector. FAMES were separated on a 30 m × 0.25 mm ID fused silica column and detected by using a flame ionisation detector (FID); the FID temperature was set to 250 °C. Samples of of FAME (1 μl) were injected at an initial injector temperature of 90 °C, which was then increased to 150 °C at a rate of 15 °C/min, from 150 to 200 °C at a rate of 3 °C/min and to 220 °C at a rate of 15 °C/min, with a final isothermal period of 6 min. Nitrogen was used as carrier gas with a pressure of 2 bar. The

Table 1
Common and scientific names of the Cretan plants

Common name	Latin name
Cultivated greens	
Lettuce, organic	*Lactuca sativa*
Lettuce, non-organic	*Lactuca sativa*
Spinach	*Spinacea oleracea* var. *glabra*
Broad beans	*Vicia faba*
Artichokes	*Cynara carduncelus* var. *scolymus*
Kokkinogoulia	*Beta vulgaris*
Wild greens	
Radikia	*Taraxacum* spp.
Stafilinakas	*Daucus carota*
Fasoulides	–
Lapatha	*Rumex obtusifoliuss*
Pikrorodika	*Taraxacum* spp.
Wild leeks	*Allium scoenoprasm*
Petrahatziki	*Daucus carota*
Papoules	*Lathyrus ochrus*
Agriopapoules	*Silene vulgaris* subsp. *macrocarpa*
Akournopodi	–
Glikorodika	*Taraxacum* spp.
Galatsides	*Reihardia picroides*
Miridouses (wild)	*Apium graveolens*
Maratha	*Foeniculum vulgare*
Lapsana	*Sinapis* spp. Gruciferae
Ahatziki	–
Parsley (wild)	*Petroselinum sativum*
Agrioselino	–
Kalogeros	–
Avizitis	–
Stravoksilo	*Scabiosa cretica*
Goules or Askolibri	*Scolymus hispanicus*
Agoglossi	*Cynoglossum creticum*
Hiromourides	*Hypochoeris cretensis*
Avronies	*Bryonia cretica*
Lagoudohorto	*Prasium majus*
Maroulides	–
Volvi or Askordoulaki	*Muscari commosum*
Tsohi	*Sonchus oleraceus*
Pigounites	*Tragopogon sinuatus*
Roka	*Eruca sativa*
Artichokes (wild) (stems only)	*Cynara cornigera*
Radish bitter (semi-cultivated)	*Cichorium intibus*
Radish (wild)	*Cichorium* spp.
Pikroussa	–
Petsetes	–
Stamnagathi	*Cichorium spinosum*
Strufoulia	*Solanum nigrum*
Pahies or Pikrorodiko	–
Glikossirides	*Crepis commutata*
Koutsounades	*Papaver rhoeas*
Skouloi	*Tragopogon sinuatus*
Spinach (wild)	–
Harakoulia	–
Katsoules	–
Pontikines	–
Pikrosirides	*Crepis vesicaria*
Kofta	–

FID signal was processed by TURBOCHROM 3, PE Nelson, Perkin–Elmer. FAMES were identified by comparing the retention time with standard fatty acid methyl esters obtained from Sigma Aldrich (Vienna, Austria). The detection limit was 0.05 wt% of total fatty acids for each fatty acid in a fatty acid mixture. The fat content was determined according to the method of Weibull–Stoldt stated by Walstra and Mulder (1963).

4. Results

4.1. Total fat content–monounsaturated fatty acid (MUFA)–saturated fatty acid (SFA)–polyunsaturated fatty acid (PUFA)

The collected wild greens were found to have rather low total fat concentrations. The lowest total fat concentration were found in *Cichorium intibus* with 10 mg of fat per 100 g of fresh matter followed by *Cynara cornigera* and the cultivated *Beta vulgaris* with 20 mg and 30 mg of fresh matter respectively.

All of the greens collected and analyzed in our study contained less than 380 mg of fat per 100 g (an equivalent total fat content lower than 0.38%/wt) as seen also in Table 2, Although highest amounts of total fat were found in Kofta containing 380 mg of fat and *Lathyrus ochrus* with 360 mg, most of the collected wild greens had lower total fat concentrations.

Lagoudohorto was found to have the highest amount of monounsaturated fatty acid (51.4 mg per 100 g), followed by *Crepis commutata* and Maroulides with 43.7 and 30.5 mg per 100 g of fresh matter, respectively. Although Lagoudohorto contained the highest quantity, *C. commutata* contained the highest percentage of monounsaturated fat (44.1%), followed by cultivated Spinach (20.2%) whilst Lagoudohorto's 51.4 mg amounted to only 15.6% of its total fat content.

The lowest monounsaturated fatty acid content was found in *C. intibus* 0.5 mg per 100 g and in the stems of *C. cornigera* with 1.3 mg per 100 g whilst the lowest percentage was found in *Silene vulgaris* (3.2%) followed by cultivated non-organic Lettuce (3.3%).

As for the saturated fat content, although the lowest amounts were found in the three greens stated in previous paragraph, the lowest saturated percentage was found in *C. commutata*, (18.2%) followed by cultivated organic Lettuce (20%) and wild Leeks (20.1%). The highest saturated fat content was found in Kofta (144.6 mg), followed by Harakoulia (125.6 mg) and Lagoudohorto with 122.2 mg of SFA per l00 g of fresh matter.

L. ochrus was found to have the highest PUFA content of 232.4 mg per l00 g of fresh leaves, followed by Pontikines with 221.5 mg/100 g, in contrast to semi cultivated bitter Radish and wild Artichokes with a mere 6.9 and 11 mg per l00 g correspondingly. The greens stated above, although they have the highest and lowest polyunsaturated content, respectively, they do not have the highest and lowest percentages. The highest percentage was found in wild Leeks with 74.1% of its total fat content polyunsaturated, compared to *Solanum nigrum*, which had the lowest percentage at 37.4%

4.2. ω-3 and ω-6 Fatty acids

As shown in Table 3 the highest concentration of n-3 fatty acids was found in *L. ochrus*, which contained 182.5 mg of ω-3 fatty acids per 100 mg of fresh plant matter. Pontikines and Kofta followed with 162.6 and 142.8 mg, respectively.

The lowest ω-3 fatty acid concentration was found in wild Artichokes (3 mg/100 g nw), followed by semi cultivated bitter Radish (5.6 mg/100 g nw) and cultivated Broad Beans (8.5 mg/100 gnw).

When looking into the nutritional value of the greens it is necessary to take into consideration the ω-6 fatty content as well as the ω-3, due mainly to the significance of the ω-6/ω-3 ratio. According to our results the lowest ω-6 content was found in semi cultivated bitter Radish with 1.3 mg/100 g of fresh matter, followed by *Cynoglossum creticum* (4.8 mg/100 g nw), cultivated *B. vulgaris* (7.4 mg/100 gr nw) and *C. commutata* (7.6 mg/100 g nw). The highest concentration of ω-6 fatty acids was found in *Muscari commosum* with 85.8 mg per 100 g matter, followed by Harakoulia with 67.6 mg/100 g. We must state though that the edible part of *M. commosum* is not actually its leaves but its bulb, so technically it cannot be classified as a wild green.

As shown by our data, a high ω-3 or a ω-6 content does not determine exactly the ω-6/ω-3 ratio. Although for all greens the ω-6/ω-3 ratio was calculated, in Table 4 we find it necessary to display separately the highest ($\omega\text{-}6/\omega\text{-}3 > 1$) and the 179 lowest ($\omega\text{-}6/\omega\text{-}3 < 0.25$) values. Very low ω-6/ω-3 ratios were found in *Sonchus oleraceus*, *Sinapis* spp. Gruciferae, semi cultivated bitter Radish, *Taraxacum* spp. F(Glikorodikia), *Taraxacum* spp. (Pikrorodikia) and *C. creticum* (as seen in Table 3). The highest ω-6/ω-3 ratio was found in *M. commosum* (due to its high ω-6/ω-3 fat content), followed by cultivated Broad Beans, wild and cultivated Artichokes, as also depicted in Table 4.

4.3. Individual fatty acid content

Presented in Tables 5–9 are the values for each fatty acid methyl-ester separately in mg per 100 g of fresh leaf matter. From the analysis of these values we are able to verify the individual quantity of the fatty acids contained in the selected greens. According to our results the most commonly found fatty acids were palmitic (with values ranging between 1.9 and 112.1 mg), linoleic (values between 1.3 and 85.8 mg) and α-linolenic (with values varying from 3 to 181.7 mg). All other fatty acids were found in smaller quantities.

The highest α-linolenic content (which is a ω-3 fatty acid) was found in *L. ochrus*, containing 181.7 mg of α-linolentic acid (ALA) per 100 g of the fresh mass, followed by

Table 2
SFA, MUFA, PUFA and total fat content (results pre 100 mg of fresh matter, percentages refer to percentage of total fat)

Name	SFA		MUFA		PUFA		Total fat
	mg	%	mg	%	%	mg	mg
Cultivated greens							
Lactuca sativa (Lettuce, organic)	20.0	20.0	3.8	76.1	3.8	76.1	100
Lactuca sativa (Lettuce, non-organic)	18.6	20.7	3.0	76.0	3.3	68.4	90
Spinacea oleracea var. *glabra* (Spinach)	30.2	24.2	25.3	55.7	20.2	69.6	125
Vicia faba (Broad beans)	16.5	27.5	3.7	66.3	6.2	39.8	60
Cynara carduncelus var. *scolymus* (Artichokes)	42.0	46.7	5.1	47.7	5.7	42.9	90
Beta vulgaris (Kokkinogoulia)	8.3	27.7	2.3	63.0	7.7	18.9	30
Wild greens							
Taraxacum spp. (Radikia)	42.6	28.4	9.0	65.6	6.0	98.4	150
Daucus carota (Stafilinakas)	29.7	31.9	13.0	53.5	14.0	49.8	93
Fasoulides	23.5	23.5	4.2	72.3	4.2	72.3	100
Rumex obtusifolius (Lapatha)	24.5	30.6	4.0	64.3	5.0	51.4	80
Taraxacum spp. (Pikrorodika)	36.9	33.5	5.7	60.9	5.2	67.0	110
Allium scoenoprasm (Wild leeks)	36.2	20.1	10.0	74.1	5.6	133.3	180
Daucus carota (Petrahatziki)	64.1	38.4	6.5	57.7	3.9	96.4	167
Lathyrus ochrus (Papoules)	111.2	30.9	16.4	64.6	4.6	232.4	360
Silene vulgaris subsp. *Macrocarpa* (Agriopapoules)	53.4	29.7	5.8	67.0	3.2	120.6	180
Akournopodi	21.9	24.6	7.2	66.7	8.1	59.4	89
Taraxacum spp. (Glikorodika)	24.9	27.7	5.3	66.4	5.9	59.8	90
Reihardia picroides (Galatsides)	31.2	34.7	2.9	61.9	3.4	55.7	90
Apium graveolens (Miridouses)	43.6	39.6	9.7	51.7	8.8	56.9	110
Foeniculum vulgare (Maratha)	32.8	33.1	4.9	61.8	4.9	61.2	99
Sinapis spp. Gruciferae (Lapsana)	46.6	26.3	8.0	44.1	4.5	78.1	177
Ahatziki	51.2	28.9	8.8	66.2	5.0	117.2	177
Petroselinum sativum (Agriomalndanos)	73.6	40.0	25.1	46.1	13.6	84.9	184
Agrioselino	30.0	36.6	4.9	57.7	6.0	47.3	82
Kalogeros	30.5	38.1	3.1	57.4	3.9	45.9	80
Avizitis	49.2	41.0	7.0	53.1	5.8	63.7	120
Scabiosa cretica (Stravoksilo)	62.9	49.1	6.1	45.9	4.8	58.7	128
Scolymus hispanicus (Goules or Askolibri)	40.4	33.7	13.7	54.8	11.4	65.8	120
Cynoglossum creticum (Agoglossi)	19.3	38.6	6.9	47.4	13.8	23.7	50
Hypochoeris cretensis (Hiromourides)	41.3	29.5	10.0	63.4	7.1	88.7	140
Bryonia cretica (Avronies)	65.5	32.8	15.9	59.3	8.0	118.6	200
Prasium majus (Lagoudohorto)	122.2	37.1	51.4	47.4	15.6	155.8	329
Maroulides	48.2	20.3	30.5	66.7	12.9	158.0	237
Muscari commosum (Volvi or Askordoulaki)	54.4	30.2	19.5	59.0	10.8	106.2	180
Sonchus oleraceus (Tsohi)	39.9	26.6	10.5	66.4	7.0	99.6	150
Tragopogon sinuatus (Pigounites)	59.6	28.4	13.3	65.1	6.3	136.7	210
Eruca sativa (Roka)	47.3	41.5	10.1	49.6	8.9	56.5	114
Cynara cornigera (Artichok sterms wildly grown)	7.6	38.0	1.3	55.0	6.5	11.0	20
Cichorium intibus (Radish bitter, semi-cultivated)	2.6	26.0	0.5	69.0	5.0	6.9	10
Radish wildly grown	53.6	35.7	17.7	52.5	11.8	78.7	150
Pikroussa	49.3	32.9	10.8	59.6	7.2	89.4	150
Petsetes	27.1	30.1	6.4	62.8	7.1	56.5	90
Cichorium spinosum (Stamnagathi)	25.9	32.4	5.4	60.9	6.8	48.7	80
Solanum nigrum (Strufoulia)	111.2	55.6	13.9	37.4	7.0	74.8	200
Pahies or Pikrorodiko	33.2	27.7	11.8	62.2	9.8	74.6	120
Crepis commutata (Glikossirides)	18.0	18.2	43.7	38.0	44.1	37.7	99
Papaver rhoeas (Koutsounades)	52.2	34.8	12.2	56.8	8.1	85.2	150
Tragopogon sinuatus (Skouloi)	54.4	28.6	11.3	65.2	6.0	123.9	190
Spinach wildly grown	29.0	24.6	7.3	68.9	6.2	81.3	118
Harakoulia	125.6	39.3	33.6	50.3	10.5	160.9	320
Katsoules	51.9	34.6	12.5	57.1	8.3	85.6	150
Pontikines	89.3	27.1	18.2	67.3	5.5	221.5	329
Crepis vesicaria (Pikrosirides)	69.3	30.3	14.1	63.8	6.2	146.0	229
Kofta	144.6	38.1	31.5	53.7	8.3	203.9	380

Pontikines with 160.2 mg. High quantities were also found in Kofta (139.4 mg) and Maroulides (113.5 mg). Comparing the mg of α-linolenic acid to the total fat content, one can evaluate its percentage of the whole fatty acid intake. The highest percentage was found in cultivated organic lettuce with almost 60% of all its fat content found as ALA. Similar percentages were found also in some of the wild greens, specifically *L. ochrus*, *Taraxacum* spp.

Table 3
ω-3 and ω-6 Content (results in mg per 100 mg of fresh matter)

Name	ω-3 Sum	ω-6 Sum	Ratio ω6/ω3
Cultivated greens			
Lactuca sativa (Lettuce, organic)	59.5	16.6	0.28
Lactuca sativa (Lettuce, non-organic)	54.1	14.3	0.26
Spinacea oleracea var. *glabra* (Spinach)	51.5	18.1	0.35
Vicia faba (Broad beans)	8.5	31.2	3.67
Cynara carduncelus var. *scolymus* (Artichokes)	12.7	30.2	2.38
Beta vulgaris (Kokkinogoulia)	11.5	7.4	0.64
Wild greens			
Taraxacum spp. (Radikia)	64.5	34.0	0.53
Daucus carota (Stafilinakas)	26.0	23.8	0.92
Fasoulides	50.8	21.4	0.42
Rumex obtusifolius (Lapatha)	33.9	17.5	0.52
Taraxacum spp. (Pikrorodika)	54.1	12.9	0.24
Allium scoenoprasm (Wild leeks)	101.7	31.6	0.31
Daucus carota (Petrahatziki)	61.1	35.3	0.58
Lathyrus ochrus (Papoules)	182.5	49.9	0.28
Silene vulgaris subsp. *Macrocarpa* (Agriopapoules)	72.4	48.2	0.67
Akournopodi	35.3	24.1	0.68
Taraxacum spp. (Glikorodika)	48.3	11.5	0.24
Reihardia picroides (Galatsides)	42.9	12.8	0.30
Apium graveolens (Miridouses)	29.8	27.1	0.91
Foeniculum vulgare (Maratha)	32.4	28.7	0.89
Sinapis spp. Gruciferae (Lapsana)	63.8	14.3	0.22
Ahatziki	65.7	51.5	0.78
Petroselinum sativum (Agriomaindanos)	44.6	40.3	0.90
Agrioselino	21.5	25.8	1.20
Kalogeros	29.3	16.6	0.57
Avizitis	46.7	17.0	0.36
Scabiosa cretica (Stravoksilo)	45.7	13.0	0.28
Scolymus hispanicus (Goules or Askolibri)	32.0	33.8	1.06
Cynoglossum creticum (Agoglossi)	19.0	4.8	0.25
Hypochoeris cretensis (Hiromourides)	65.7	23.0	0.35
Bryonia cretica (Avronies)	51.4	67.2	1.31
Prasium majus (Lagoudohorto)	109.6	46.3	0.42
Maroulides	113.9	44.1	0.39
Muscari commosum (Volvi or Askordoulaki)	20.3	85.8	4.23
Sonchus oleraceus (Tsohi)	82.1	17.5	0.21
Tragopogon sinuatus (Pigounites)	97.1	39.6	0.41
Eruca sativa (Roka)	44.7	11.7	0.26
Cynara cornigera (Artichoke stems wildly grownn)	3.0	8.0	2.67
Cichorium intibus (Radish bitter, semi-cultivated)	5.6	1.3	0.23
Radish wildly grown	56.1	22.6	0.40
Pikroussa	65.8	23.7	0.36
Petsetes	40.3	16.2	0.40
Cichorium spinosum (Stamnagathi)	33.8	14.9	0.44
Solanum nigrum (Strufoulia)	38.7	36.2	0.94
Pahies or Pikrorodika	56.5	18.1	0.32
Crepis commutata (Glikossirides)	30.1	7.6	0.25
Papaver rhoeas (Koutsounades)	63.5	21.7	0.34
Tragopogon sinuatus (Skouloi)	95.3	28.6	0.30
Spinach wildly grown	58.7	22.6	0.39
Harakoulia	93.2	67.6	0.73
Katsoules	61.9	23.7	0.38
Pontikines	162.6	58.9	0.36
Crepis vesicaria (Pikrosirides)	104.2	41.8	0.40
Kofta	142.8	61.1	0.43

(Glikorodika), wild Leeks, and *S. oleraceus*, which all had α-linolenic concentrations >50% of their total fatty acid content.

M. commosum had the highest linoleic acid (c 18:2) content followed by Harakoulia and *Bryonia cretica* with 85.8, 67.6 and 67.2 mg, respectively. *C. intibus* was found to have the lowest linoleic content of 1.3 mg followed by *C. creticum* with 4.8 mg per 100 g of fresh matter. As stated before though, a high linoleic content does not always coincide with a high linoleic percentage. Cultivated Broad Beans

Table 4
Highest and lowest n-6/n-3 ratio

Highest levels		Lowest levels	
Muscari commosum	4.23	*Sonchus oleraceus*	0.21
Broad beans (cultivated)	3.67	*Sinapis* spp. Gruciferae	0.22
Cynara cornigera	2.67	Bitter radish (semi-cultivated)	0.23
Artichokes (cultivated)	2.38	*Taraxacum* spp. (Glikorodikia)	0.24
Bryonia cretica	1.31	*Taraxacum* spp. (Pikrorodikia)	0.24
Agrioselino	1.2	*Cynoglossum creticum*	0.25
Scolymus hispanicus	1.06	*Crepis commutata*	0.25

had a consistency of 52% linoleic acid followed by *M. commosum* with 47%. The lowest linoleic percentage was found in *C. commutata* (7.6%) as also noted in Table 7.

Taking into account the quantities of each fatty acid in each plant one can calculate the amounts of essential fatty acids obtained in a fresh salad consisting of wild Cretan greens.

5. Discussion

In the traditional diet of Crete, edible wild plants were a common food source for the older generations of the population of Crete, and continue today in families who maintain the traditional lifestyle. The available variety of wildly grown edible greens differs every season and they are usually collected are either eaten fresh in salads with plenty of virgin olive oil or boiled or cooked with tomatoes and onions. In it self olive oil is high in monounsaturated fatty acids and, as proven in numerous studies (Aravanis et al., 1988; Ferro-Luzzi et al., 2002; Kafatos, Verhagen, Moschandreas, Apostolaki, & Van-Westerop, 2000; Psaltopoulou et al., 2004; Serra-Majem, Ngo de la Cruz, Ribas, & Salleras, 2003), plays an important role in the Mediterranean diets such as the traditional diet of Crete, accompanying the wild greens in salads, pies or cooked dishes.

This study has focused on evaluating the fatty acid concentration of 48 wildly grown greens, analytically per type as well as the quantity and ratio of essential ω-3 and ω-6 fatty acids. By including daily wild greens in their diet, the population of Crete was able to supplement their diet not only with vitamins and antioxidants but also with essential fatty acids in a ratio similar to that kept by the local Minoan population 4500 years ago. Similar studies have also shown the importance of wildly grown greens in the traditional diet of Crete. Simopoulos (2004) presented such a study using lettuce, spinach and purslane, with which our laboratory results agree. Zeghini, Kallithraka, Simopoulos, and Kypryotakis (2003) also evaluated 25 wild Cretan greens, but only for their antioxidant and mineral contents. Trichopoulou et al. (2000) also presented a similar study of the nutritional composition and flavonoid content of edible wild greens.

The optimal daily intakes of essential fatty acids contained in the wild greens eaten in the traditional diet of Crete play an important role in health promotion and disease prevention. The dietary ω-6 fatty acids are associated with a lower prevalence of hypertension and lower systolic blood pressure (Djousse et al., 2005) and studies reveal that they play a role in nerve conduction velocity due to incorporation of ω-6 of fatty acids in membrane phospholipids (Coste et al., 1999). Dietary ω-6 fatty acids also have been shown to posses effective tumoricidal properties, when taken according to their recommended daily intake, against prostate and breast cancers (Bidoli et al., 2005; Menendez, Ropero, Lupu, & Colomer, 2004) as well as malignant gliomas (Das, 2004) pancreas tumors (Agombar, Cooper, & Johnson, 2004) and lymphpocytic leukaemia (Mainou-Fowler, Proctor, & Dickinson, 2001). Gamma linoleic acid as an ω-6 fatty acid has also been shown to support the treatment of rheumatoid arthritis, atopic eczema, ARDS, asthma, cancer, diabetic neuropathy, osteoporosis and possibly CHD as shown in numerous research reports (Andreassi et al., 1997; Coste et al., 1999; Gadek et al., 1999; Horrobin, 1992; Kruger, Coetzer, deWinter, Gericke, & van Papendorp, 1998; Kumar, Rao, Gayani, Mohan, & Naidu, 2000; Laidlaw & Holub, 2003; Leventhal, Boyce, & Zurier, 1993; Mainou-Fowler et al., 2001; Pacht et al., 2003; Suresh & Das, 2003; Surette et al., 2003; Zurier et al., 1996).

The most well-known category of essential fatty acids, with an important role in human health, is the ω-3 acids. The most commonly found ω-3 fatty acid found in our wild greens was; C 18:3 alpha, found in substantial quantities in the greens. Their role in human health is multiple. Essential ω-3 fatty acids have been found in mice to slow the growth of various types of cancers, including lung, colon, mammary, and prostate as stated by Hardman (2004). Epidemiological studies have also suggested the protective effect of α-linolenic acid in the risk of breast, prostrate and colorectal cancer in humans as shown in the studies of Klein et al. (2000), Terry, Terry, and Rohan (2004) and Reddy (2004), respectively. Dietary ω-3 fatty acids also possibly play a vital role in hypertension (Dokholyan et al., 2004), coronary heart disease (Ascherio, 2002; Wijendran & Hayes, 2004; Wolfram, 2003), rheumatoid arthritis and other inflammatory diseases (Simopoulos, 2002), reducing their prevalence in the population of crete, mainly due to the daily intake of wild greens, vegetables and fruit.

The ratio of ω-6 to ω-3 fatty acids, have an important role in the human diet. The traditional diet of Crete has a ω-6/ω-3 ratio of 1–2/1 which is similar to the ratio kept during human evolution. As shown by Eaton, Eaton, Sinclair, Cordain, and Mann (1998) palaeolithic populations maintained a ratio of ω-6/ω-3 of 0.79/1 and a similar ratio of 1–2 /1 were maintained in Greece until the 1960s (Simopoulos, 1998). Today's western cultures have an ω-6/ω-3 approximately 15 for northern Europe and 16.74 for the current US (Sanders, 2000) differing from human evolutions low ratio. The optimal balance between dietary ALA and linoleic acid, such as the one in the traditional diet of Crete has recently shown to reduce the potential

Table 5
Analytical contents of C14:0, C14:1, C15:0, C15:1, C16:0, C16:1 lipids in percentage of total fatty acid content

Name	C14:0	C14:1	C15:0	C15:1	C16:0	C16:1
Cultivated greens						
Lactuca sativa (Lettuce, organic)	1.7	0.3	0.2	0.0	13.0	1.0
Lactuca sativa (Lettuce, non-organic)	1.7	0.3	0.2	0.0	11.7	1.0
Spinacea oleracea var. *glabra* (Spinach)	1.7	0.0	0.4	0.0	21.1	1.4
Vicia faba (Broad beans)	0.2	0.0	0.2	0.3	10.7	0.0
Cynara carduncelus var. *scolymus* (Artichokes)	0.0	0.0	0.0	0.6	31.3	0.0
Beta vulgaris (Kokkinogoulia)	0.3	0.0	0.0	0.7	7.0	0.1
Wild greens						
Taraxacum spp. (Radikia)	3.8	0.6	1.3	0.0	28.4	1.2
Daucus carota (Stafilinakas)	2.2	0.2	0.2	0.0	19.5	1.3
Fasoulides	1.5	0.2	0.3	0.0	17.7	1.2
Rumex obtusifolius (Lapatha)	1.8	0.2	0.1	0.0	16.0	0.6
Taraxacum spp. (Pikrorodika)	3.3	0.5	0.4	0.0	22.3	0.8
Allium scoenoprasm (Wild leeks)	0.5	0.0	0.0	0.0	24.9	2.4
Daucus carota (Petrahatziki)	5.8	0.0	0.5	0.0	45.3	2.7
Lathyrus ochrus (Papoules)	8.0	1.0	0.6	0.0	61.2	2.5
Silene vulgaris subsp. *Macrocarpa* (Agriopapoules)	3.2	0.0	0.5	0.0	39.1	1.8
Akournopodi	2.6	0.2	0.2	0.0	15.7	1.6
Taraxacum spp. (Glikorodika)	3.6	0.5	0.3	0.0	15.6	0.9
Reihardia picroides (Galatsides)	2.0	0.0	0.0	0.0	18.9	0.6
Apium graveolens (Miridouses)	1.5	0.0	0.5	0.0	24.3	1.3
Foeniculum vulgare (Maratha)	3.1	0.3	0.3	0.0	23.7	1.5
Sinapis spp. Gruciferae (Lapsana)	3.2	0.0	0.9	0.0	27.0	1.2
Ahatziki	2.2	0.0	0.6	0.0	35.0	3.2
Petroselinum sativum (Agriomaindanos)	5.3	0.4	0.8	0.0	40.1	2.3
Agrioselino	2.3	0.1	0.4	0.0	21.2	1.2
Kalogeros	1.6	0.0	0.3	0.0	19.1	0.5
Avizitis	4.0	0.2	0.6	0.0	27.7	1.1
Scabiosa cretica (Stravoksilo)	2.1	0.0	0.8	0.0	29.8	1.6
Scolymus hispanicus (Goules or Askolibri)	1.2	0.0	0.9	0.0	30.3	2.2
Cynoglossum creticum (Agoglossi)	0.6	0.0	0.0	0.5	8.1	0.3
Hypochoeris cretensis (Hiromourides)	3.3	0.0	0.6	3.9	28.9	1.0
Bryonia cretica (Avronies)	1.8	0.0	0.0	2.2	52.8	2.8
Prasium majus (Lagoudohorto)	6.9	0.0	0.5	11.2	73.9	3.1
Maroulides	8.1	0.0	0.6	10.9	9.3	2.1
Muscari commosum (Volvi or Askordoulaki)	0.0	0.0	0.0	0.0	32.8	0.0
Sonchus oleraceus (Tsohi)	4.0	0.3	0.0	4.3	26.3	1.1
Tragopogon sinuatus (Pigounites)	3.7	0.0	0.4	5.1	41.6	2.3
Eruca sativa (Roka)	3.4	0.0	0.3	5.4	29.5	1.3
Cynara cornigera (Artichoke stems wildly grown)	0.2	0.0	0.2	0.1	5.8	0.1
Cichorium intibus (Radish bitter, semi-cultivated)	0.2	0.0	0.0	0.3	1.9	0.1
Radish wildly grown	2.4	0.0	0.4	3.9	31.6	1.0
Pikroussa	4.4	0.0	0.6	2.0	29.0	1.1
Petsetes	2.0	0.0	0.4	1.3	19.1	0.3
Cichorium spinosum (stamnagathi)	2.6	0.0	0.3	1.8	16.6	0.4
Solanum nigrum (Strufoulia)	0.0	0.0	0.0	0.0	71.2	5.1
Pahies or Pikrorodiko	2.3	0.0	0.3	1.7	22.1	0.7
Crepis commutata (Glikossirides)	1.7	0.0	0.2	1.4	12.2	0.5
Papaver rhoeas (Koutsounades)	3.8	0.0	0.7	4.8	31.0	1.1
Tragapogon sinuatus (Skouloi)	3.8	0.2	0.4	5.1	34.2	1.5
Spinach wildly grown	1.3	0.0	0.0	2.6	23.7	0.7
Harakoulia	5.7	0.0	1.1	11.2	86.4	1.9
Katsoules	3.0	0.3	0.4	3.9	30.7	0.6
Pontikines	6.5	0.4	1.1	7.9	66.0	1.4
Crepis vesicaria (Pikrosirides)	4.1	0.0	0.6	5.1	47.8	0.7
Kofta	10.1	0.0	1.1	14.6	112.1	2.6

for lung cancer (Xia, Wang, & Kang, 2005), asthma (Oddy, De Klerk, Kendall, Mihrshahi, & Peat, 2004) and may prevent thrombosis and atherosclerosis (Hu, Manson, & Willett, 2001). In contrast a high serum: n-6:n-3 ratio is associated with major depression as studied by Maes et al. (1996) and may increase the risk of coronary heart disease (Sanders et al., 1997).

Analytically comparing the cultivated leafy greens (spinach, organic and inorganic lettuce) with the wild leafy greens of our study we deduce that most wild greens had

Table 6
Analytical contents of C17:0, C17:1, C18:0, an unknown, lipids in percentage of total fatty acids contents

Name	C17:0	C17:1	C18:0	Unknown
Cultivated greens				
Lactuca sativa (Lettuce, organic)	0.2	0.9	1.6	0.1
Lactuca sativa (Lettuce, non-organic)	0.2	0.2	1.3	0.0
Spinacea oleracea var. *glabra* (Spinach)	0.5	0.2	1.8	4.9
Vicia faba (Broad beans)	0.0	0.0	1.7	0.0
Cynara carduncelus var. *scolymus* (Artichokes)	0.5	0.0	4.1	0.0
Beta vulgaris (Kokkinogoulia)	0.1	0.0	0.3	0.5
Wild greens				
Taraxacum spp. (Radikia)	0.6	1.8	3.2	0.0
Daucus carota (Stafilinakas)	0.0	0.2	1.7	6.9
Fasoulides	0.3	0.2	1.3	10.0
Rumex obtusifolius (Lapatha)	0.3	0.2	2.5	0.1
Taraxacum spp. (Pikrorodika)	0.6	1.7	5.4	0.4
Allium scoenoprasm (Wild leeks)	0.7	0.0	4.1	0.5
Daucus carota (Petrahatziki)	0.5	0.2	2.8	21.9
Lathyrus ochrus (Papoules)	1.8	3.9	25.8	0.0
Silene vulgaris subsp. *Macrocarpa* (Agriopapoules)	0.5	1.8	2.5	0.3
Akournopodi	0.3	0.2	1.4	10.3
Taraxacum spp. (Glikorodika)	0.3	1.5	1.5	0.0
Reihardia picroides (Galatsides)	0.2	0.6	2.2	0.2
Apium graveolens (Miridouses)	0.5	0.0	5.0	8.8
Foeniculum vulgare (Maratha)	0.3	1.6	1.2	10.8
Sinapis spp. Gruciferae (Lapsana)	0.3	2.0	4.9	16.2
Ahatziki	1.3	0.0	4.7	20.6
Petroselinum sativum (Agriomaindanos)	0.6	2.5	16.4	16.8
Agrioselino	0.3	1.0	1.3	7.8
Kalogeros	0.5	0.8	1.7	0.6
Avizitis	1.0	0.4	4.3	0.2
Scabiosa cretica (Stravoksilo)	0.9	0.0	7.6	2.3
Scolymus hispanicus (Goules or Askolibri)	1.4	0.5	3.1	0.0
Cynoglossum creticum (Agoglossi)	0.0	0.0	2.8	0.0
Hypochoeris cretensis (Hiromourides)	0.5	1.4	1.9	0.0
Bryonia cretica (Avronies)	0.8	0.5	2.0	0.0
Prasium majus (Lagoudohorto)	1.0	2.6	11.3	0.6
Maroulides	1.6	3.8	8.7	33.3
Muscari commosum (Volvi or Askordoulaki)	0.0	0.0	6.4	0.0
Sonchus oleraceus (Tsohi)	0.3	1.9	3.3	0.0
Tragopogon sinuatus (Pigounites)	0.5	1.7	5.0	0.5
Eruca sativa (Roka)	0.4	0.1	3.3	16.2
Cynara cornigera (Artichoke stems wildly grown)	0.1	0.0	0.4	0.0
Cichorium intibus (Radish bitter, semi-cultivated)	0.0	0.0	0.2	0.0
Radish wildly grown	0.0	1.0	4.3	0.0
Pikroussa	0.6	2.3	6.3	0.5
Petsetes	0.4	0.8	2.0	0.0
Cichorium spinosum (Stamnagathi)	0.4	1.4	2.3	0.0
Solanum nigrum (strufoulia)	6.1	0.0	8.2	0.0
Pahies or pikrorodiko	0.6	0.2	3.3	0.4
Crepis commutata (Glikossirides)	0.2	40.2	1.3	0.6
Papaver rhoeas (Koutsounades)	3.3	1.8	3.6	0.3
Tragopogon sinuatus (Skouloi)	0.7	0.4	6.2	0.4
Spinach wildly grown	0.0	0.4	1.1	2.5
Harakoulia	0.0	3.6	10.7	0.0
Katsoules	0.0	2.2	7.1	0.0
Pontikines	1.0	2.5	5.5	1.0
Crepis vesicaria (Pikrosirides)	0.9	2.2	5.7	0.6
Kofta	0.0	3.4	14.0	0.0

larger saturated and monounsaturated, but lower polyunsaturated fatty acid concentrations. On the whole, the total fat content of the wild greens was found to be similar or higher than the cultivated greens. Also, certain wild greens were found to have lower ω-6/ω-3 ratios than those cultivated, although most had similar ratios.

We must state that certain greens have different common names depending on the part of Crete from which

Table 7
Analytical contents of C18:1, C18:2, C18:3 gamma, C18:3 α, C18:4 ω-3, C20.0 lipids in percentage of total fatty acid content

Name	C18:1	C18:2	C18:3n6 γ	C18:3 α	C18:4n3	C20:0
Cultivated greens						
Lactuca sativa (Lettuce, organic)	1.0	16.6	0.2	59.3	0.0	0.7
Lactuca sativa (Lettuce, non-organic)	1.1	14.3	0.2	53.9	0.0	0.5
Spinacea oleracea var. *glabra* (Spinach)	15.9	18.1	0.2	51.3	0.0	1.6
Vicia faba (Broad beans)	3.2	31.2	0.0	8.5	0.0	2.9
Cynara carduncelus var. *scolymus* (Artichokes)	2.3	30.2	0.0	12.7	0.0	2.5
Beta vulgaris (Kokkinogoulia)	1.4	7.4	0.0	11.5	0.0	0.1
Wild greens						
Taraxacum spp. (Radikia)	5.0	34.0	0.4	63.7	0.4	1.2
Daucus carota (Stafilinakas)	11.2	23.8	0.0	26.0	0.0	2.7
Fasoulides	2.3	21.4	0.3	50.1	0.4	0.2
Rumex obtusifolius (Lapatha)	2.6	17.5	0.2	33.8	0.0	2.2
Taraxacum spp. (Pikrorodika)	2.4	12.9	0.3	50.4	3.5	0.9
Allium scoenoprasm (Wild leeks)	6.7	31.6	1.0	98.4	2.3	1.4
Daucus carota (Petrahatziki)	3.4	35.3	0.2	60.9	0.0	2.5
Lathyrus ochrus (Papoules)	9.1	49.9	0.8	181.7	0.0	3.9
Silene vulgaris subsp. *Macrocarpa* (Agriopapoules)	2.2	48.2	0.4	71.3	0.7	2.8
Akournopodi	5.0	24.1	0.1	35.1	0.0	0.7
Taraxacum spp. (Glikorodika)	1.9	11.5	0.3	47.6	0.4	1.1
Reihardia picroides (Galatsides)	1.6	12.8	0.1	42.8	0.0	0.0
Apium graveolens (Miridouses)	6.2	27.1	0.0	29.8	0.0	3.3
Foeniculum vulgare (Maratha)	1.3	28.7	0.1	32.3	0.0	0.8
Sinapis spp. Gruciferae (Lapsana)	3.7	14.3	0.0	63.8	0.0	3.5
Ahatziki	4.2	51.5	0.0	65.1	0.6	2.8
Petroselinum sativum (Agriomaindanos)	19.9	40.3	0.0	44.6	0.0	2.2
Agrioselino	2.1	25.8	0.1	21.3	0.0	0.7
Kalogeros	1.6	16.6	0.1	29.2	0.0	2.6
Avizitis	3.6	17.0	0.7	45.7	0.3	5.3
Scabiosa cretica (Stravoksilo)	3.0	13.0	1.3	42.0	2.4	9.0
Scolymus hispanicus (Goules or Askolibri)	10.3	33.8	0.0	32.0	0.0	1.8
Cynoglossum creticum (Agoglossi)	3.5	4.8	0.4	17.7	0.9	3.9
Hypochoeris cretensis (Hiromourides)	3.2	23.0	0.6	65.1	0.0	1.1
Bryonia cretica (Avronies)	9.7	67.2	0.5	50.9	0.0	0.7
Prasium majus (Lagoudohorto)	13.9	46.3	0.0	109.6	0.0	4.8
Maroulides	10.9	44.1	0.4	113.5	0.0	9.7
Muscari commosum (Voivi or Askordoulaki)	19.0	85.8	0.0	20.3	0.0	7.5
Sonchus oleraceus (Tsohi)	1.6	17.5	0.3	81.8	0.0	2.4
Tragopogon sinuatus (Pigounites)	3.2	39.6	0.5	96.3	0.2	2.6
Eruca sativa (Roka)	2.9	11.7	0.4	44.3	0.0	2.7
Cynara cornigera (Artichoke stems wildly grown)	0.6	8.0	0.0	3.0	0.0	0.3
Cichorium intibus (Radish bitter, semi-cultivated)	0.1	1.3	0.0	5.5	0.0	0.1
Radish wildly grown	2.3	22.6	0.5	55.6	0.0	1.5
Pikroussa	3.3	23.7	0.5	61.5	3.8	3.1
Petsetes	2.9	16.2	0.4	39.1	0.8	0.7
Cichorium spinosum (Stamnagathi)	1.5	14.9	0.2	33.6	0.0	1.0
Solanum nigrum (Strufoulia)	4.8	36.2	2.3	36.4	0.0	8.6
Pahies or Pikrorodiko	8.5	18.1	0.3	53.4	2.8	1.1
Crepis commutata (Glikossirides)	1.3	7.6	0.2	29.4	0.5	0.6
Papaver rhoeas (Koutsounades)	3.6	21.7	0.3	63.2	0.0	3.4
Tragopogon sinuatus (Skouloi)	3.5	28.6	0.4	95.0	0.0	2.7
Spinach wildly grown	2.5	22.6	0.3	58.4	0.0	0.4
Harakoulia	13.5	67.6	0.0	93.2	0.0	11.3
Katsoules	2.8	23.7	0.0	61.9	0.0	5.8
Pontikines	6.1	58.9	1.3	160.2	1.1	3.0
Crepis vesicaria (Pikrosirides)	6.1	41.8	0.5	99.9	3.8	1.9
Kofta	9.6	61.1	1.2	139.4	2.2	3.5

they come. Specifically in our study, one plant with two different common names is *Tragopogon sinatus*, which is known in Heraklion as Skouloi and in Rethymnon as Pigounites. Therefore, this was an excellent opportunity to check the validity of the laboratory methods. The two different batches gave almost identical results for the total saturated, monounsaturated and polyunsaturated percentages, with a small difference between the

Table 8
Analytical contents of C20:1n9, C22:0, C22:1, C22:2 lipids in percentage of total fatty acid content

Name	C20:1n9	C22:0	C22:1	C22:2
Cultivated greens				
Lactuca sativa (Lettuce, organic)	0.0	0.8	0.1	0.0
Lactuca sativa (Lettuce, non-organic)	0.0	0.9	0.1	0.0
Spinacea oleracea var. *glabra* (Spinach)	0.5	1.0	2.1	0.0
Vicia faba (Broad beans)	0.2	0.6	0.0	0.0
Cynara carduncelus var. *scolymus* (Artichokes)	0.0	1.6	0.0	0.0
Beta vulgaris (Kokkinogoulia)	0.1	0.2	0.1	0.0
Wild greens				
Taraxacum spp. (Radikia)	0.0	1.9	0.0	0.0
Daucus carota (Stafilinakas)	0.0	1.4	0.0	0.0
Fasoulides	0.3	0.9	0.0	0.0
Rumex obtusifolius (Lapatha)	0.1	0.6	0.0	0.0
Taraxacum spp. (Pikrorodika)	0.0	1.5	0.0	0.0
Allium scoenoprasm (Wild leeks)	0.0	1.5	0.6	0.0
Daucus carota (Petrahatziki)	0.2	1.1	0.0	0.0
Lathyrus ochrus (Papoules)	0.0	2.3	0.0	0.0
Silene vulgaris subsp. *Macrocarpa* (Agriopapoules)	0.0	0.0	0.0	0.0
Akournopodi	0.2	0.7	0.0	0.0
Taraxacum spp. (Glikorodika)	0.0	0.4	0.0	0.0
Reihardia picroides (Galatsides)	0.0	5.0	0.0	0.0
Apium graveolens (Miridouses)	0.7	6.6	0.0	0.0
Foeniculum vulgare (Maratha)	0.0	1.1	0.0	0.0
Sinapis spp. Gruciferae (Lapsana)	0.5	3.5	0.0	0.0
Ahatziki	0.3	3.0	0.5	0.0
Petroselinum sativum (Agriomaindanos)	0.0	5.6	0.0	0.0
Agrioselino	0.0	1.1	0.2	0.0
Kalogeros	0.0	3.5	0.2	0.0
Avizitis	0.4	2.7	0.6	0.0
Scabiosa cretica (Stravoksilo)	0.0	8.5	1.5	0.0
Scolymus hispanicus (Goules or Askolibri)	0.3	0.9	0.0	0.0
Cynoglossum creticum (Agoglossi)	0.0	2.3	1.1	0.0
Hypochoeris cretensis (Hiromourides)	0.2	1.5	0.0	0.0
Bryonia cretica (Avronies)	0.3	1.2	0.0	0.0
Prasium majus (Lagoudohorto)	0.0	20.6	0.0	0.0
Maroulides	0.5	4.2	0.0	0.0
Muscari commosum (Volvi or Askorddoulaki)	0.0	1.9	0.0	0.0
Sonchus oleraceus (Tsohi)	0.0	2.0	0.0	0.0
Tragopogon sinuatus (Pigounites)	0.0	2.4	0.0	0.0
Eruca sativa (Roka)	0.0	2.4	0.0	0.0
Cynara cornigera (Artichoke stems wildly grown)	0.0	0.3	0.0	0.0
Cichorium intibus (Radish bitter, semi-cultivated)	0.0	0.1	0.0	0.0
Radish wildly grown	0.0	1.7	0.0	0.0
Pikroussa	0.0	2.1	0.0	0.0
Petsetes	0.0	1.0	0.0	0.0
Cichorium spinosum (Stamnagathi)	0.0	1.1	0.0	0.0
Solanum nigrum (Strufoulia)	0.0	4.6	1.9	0.0
Pahies or Pikrorodiko	0.0	1.2	0.0	0.0
Crepis commutata (Glikossirides)	0.0	0.7	0.0	0.0
Papaver rhoeas (Koutsounades)	0.0	3.5	0.0	0.0
Tragopogon sinuatus (Skouloi)	0.0	2.8	0.0	0.0
Spinach wildly grown	0.3	1.0	0.2	0.0
Harakoulia	0.0	4.0	0.0	0.0
Katsoules	0.0	3.0	0.0	0.0
Pontikines	0.0	2.3	0.0	0.0
Crepis vesicaria (Pikrosirides)	0.0	3.0	0.0	0.0
Kofta	0.0	2.1	0.0	0.0

total measured fat content. They also give very similar results for the total ω-3 and ω-6 content as well as the ω-6/ω-3 ratio. The minute differences noted between those two batches are possibly due to environmental factors that differ between the two places of collection on the island of Crete.

A weakness in our study is that there is insufficient information to ascertain the exact variety and the quan-

Table 9
Analytical contents of C23:0, C24:0, C24:1 lipids in percentage of total fatty acid content

Name	C23:0	C24:0	C24:1
Cultivated greens			
Lactuca sativa (Lettuce, organic)	0.6	1.1	0.5
Lactuca sativa (Lettuce, non-organic)	0.3	1.8	0.4
Spinacea oleracea var. *glabra* (Spinach)	0.2	2.0	5.3
Vicia faba (Broad beans)	0.2	0.0	0.0
Cynara carduncelus var. *scolymus* (Artichokes)	0.6	1.6	2.2
Beta vulgaris (Kokkinogoulia)	0.1	0.2	0.0
Wild greens			
Taraxacum spp. (Radikia)	0.5	1.8	0.4
Daucus carota (Stafilinakas)	0.3	1.8	0.0
Fasoulides	0.4	0.9	0.0
Rumex obtusifolius (Lapatha)	0.6	0.3	0.4
Taraxacum spp. (Pikrorodika)	0.5	2.2	0.2
Allium scoenoprasm (Wild leeks)	0.4	2.5	0.3
Daucus carota (Petrahatziki)	0.4	5.3	0.0
Lathyrus ochrus (Papoules)	6.1	1.6	0.0
Silene vulgaris subsp. *Macrocarpa* (Agriopapoules)	0.6	4.3	0.0
Akournopodi	0.2	0.2	0.0
Taraxacum spp. (Glikorodika)	0.4	1.7	0.5
Reihardia picroides (Galatsides)	1.6	1.2	0.0
Apium graveolens (Miridouses)	0.0	1.8	1.5
Foeniculum vulgare (Maratha)	0.8	1.5	0.3
Sinapis spp. Gruciferae (Lapsana)	1.4	1.7	0.5
Ahatziki	0.8	0.7	0.5
Petroselinum sativum (Agriomaindanos)	0.6	2.0	0.0
Agrioselino	0.4	2.4	0.3
Kalogeros	0.0	1.2	0.0
Avizitis	1.4	2.1	0.7
Scabiosa cretica (Stravoksilo)	0.6	3.6	0.0
Scolymus hispanicus (Goules Askolibri)	0.5	0.5	0.4
Cynoglossum creticum (Agoglossi)	0.2	1.5	1.6
Hypochoeris cretensis (Hiromourides)	0.4	3.1	0.3
Bryonia cretica (Avronies)	1.2	5.0	0.5
Prasium majus (Lagoudohort)	0.7	2.3	20.6
Maroulides	1.1	5.1	2.2
Muscari commosum (Volvi or Askordoulaki)	1.2	4.5	0.5
Sonchus oleraceus (Tsohi)	0.4	1.3	1.4
Tragopogon sinuatus (Pigounites)	0.5	2.7	0.9
Eruca sativa (Roka)	0.2	5.2	0.4
Cynara cornigera (Antichoke stems wildly grown)	0.1	0.4	0.4
Cichorium intibus, (Radish bitter, semi-cultivated)	0.0	0.1	0.0
Radish wildly grown	0.4	11.4	9.5
Pikroussa	0.5	2.6	2.1
Petsetes	0.3	1.3	1.0
Cichorium spinosum (Stamnagathi)	0.3	1.3	0.4
Solanum nigrum (Strufoulia)	5.0	7.5	2.1
Pahies or Pikrorodiko	0.3	2.1	0.6
Crepis commutata (Glikossirides)	0.2	0.9	0.3
Papaver rhoeas (Koutsounades)	0.4	2.4	1.0
Tragopogon sinuatus (Skouloi)	0.3	3.1	0.6
Spinach wildly grown	0.2	1.3	0.7
Harakoulia	1.1	5.2	3.3
Katsoules	0.0	1.9	2.7
Pontikines	1.0	2.9	0.0
Crepis vesicaria (Pikrosirides)	0.7	4.7	0.0
Kofta	0.0	1.6	1.2

tities of the wild greens consumed by the children, the adults and the elderly. Further studies are required to evaluate the feasibility of commercially growing some of the wild greens.

6. Conclusion

Taking into consideration the amount and percentage of saturated, monounsaturated polyunsaturated fat, as well as

the ω-6/ω-3 ratio in the 48 greens of our study that grow wild in Crete, it becomes obvious that they are valuable sources not only of vitamins and antioxidants but also of monounsaturated and essential fatty acids. The wild greens whether eaten fresh, cooked or in pies, fortify the population of Crete by delaying and preventing disease, and contribute to a high life expectancy of the elder generations who adhere to such a diet.

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