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CHEMICAL COMPOSITION OF THE PEPPER FRUIT EXTRACTS OF HOT CULTIVARS *Capsicum annuum* L.

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Abstract. Hot pepper fruits contain the chemical group of alkaloid compounds called capsaicinoids, which are responsible for the pungency of the *Capsicum* species. The aim of our study was to determine the chemical composition as well as the content of capsaicinoids in pepper fruits (*Capsicum annuum* L.) cultivars 'Adorno' and 'Etna', which were grown in the north-western Poland in 2009. Capsaicinoids were extracted from dry pepper fruits by solvents (acetone and hexane) and analyzed by GC/MS. The analysis revealed that the major components of the extracts are capsaicin, dihydrocapsaicin and nonivamide (pelargonic acid vanillylamide).

Key words: *Capsicum*, capsaicin, capsaicinoids, oleoresins, GC, MS

INTRODUCTION

Hot peppers, which belong to the plant genus *Capsicum*, are widely grown for their fruits, which may be eaten fresh (salads, baked dishes, salsa, pizzas, etc.) or cooked, used as a dried powder, or processed into oleoresins.

Paprika oleoresin, a viscous, dark red liquid, is prepared industrially by solvent extraction (most commonly employed is hexane) of the dried fruit and the subsequent removal of the solvent [Jaren-Galan et al. 1999, Parthasarathy et al. 2008].

Mini et al. [1998] used six different solvents for oleoresin extraction: acetone, ethyl alcohol, dichloroethane, hexane, benzene and ethyl acetate. They found that ethyl acetate produced maximum efficiency for capsaicin extraction, however, extraction with acetone gave the similar results.

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Capsicum oleoresins contain a complex mixture of essential oils, waxes, coloured materials (mainly capsanthin, capsorubin, zeaxanthin, cryptoxanthin, and lutein), several capsaicinoids and are commonly used as a pungent flavour in food, natural plant colour, and pharmaceutical ingredient [Hui and Barta 2006, Sanatombi and Sharma 2008]. The reddish colouring matter of oleoresin is due to carotenoids (0.3% to 0.8% in fruit) [Raghavan 2007].

Capsaicinoids, nonvolatile alkaloids, are acid amides of C_9-C_{11} branched-chain fatty acids and vanillylamine, and are responsible for the pungency of the *Capsicum* species [Diaz et al. 2004].

The major difference between the capsaicinoids are: the length of the aliphatic side chain, the presence or absence of a double bond, the branching point and their relative pungency. Generally, capsaicin and dihydrocapsaicin are responsible for 90% of the pepper fruits pungency [Madhumathy et al. 2007].

Capsaicin is currently used for the treatment of diabetic neuropathy, osteoarthritis, post-herpetic neuralgia, and psoriasis [Jin et al. 2009], as well as there are many patents on insecticides, insect or animal repellents, and pesticides containing capsaicinoids [Eich 2008].

Historically, capsaicinoids in foods have been analyzed by spectrophotometric methods such as ultraviolet and colorimetry. The organoleptic method used for determination of the pepper pungency was invented by a pharmacist, Wilbur L. Scoville in 1912. The hot pepper alcoholic extract was mixed with water and sugar and was given to the human subjects to taste [Scoville 1912]. This method of measuring the pungent property of chili (Scoville test) is now used widely across the world, but is done by High Performance Liquid Chromatography (HPLC) [Singh et al. 2009].

Nowadays, a variety of methods have been used for the identification and quantitation of capsaicinoids in hot peppers, oleoresins, and hot sauces. These include gas chromatography [Thomas et al. 1998], liquid chromatography (LC) with ultraviolet (UV) and fluorescence detection (FLD) [Maillard et al. 1997], LC with mass spectral (MS) detectors [Reilly et al. 2001], and thin layer chromatography (TLC) [Risch and Ho 1997].

Gas chromatography is used for rapid analysis of capsaicin and its analogs, however, the information obtained from the retention time is by no means conclusive as that from mass spectra and NMR spectra. Mass spectrometry (MS) is a powerful method for identification of unknown compounds, but requires a pure sample.

Gas chromatography-mass spectrometry (GC/MS) technique is efficient analysis of the content and type of capsaicinoids, even when the capsaicinoid peaks are contaminated with impurities [Brossi 1984, Hin et al. 2008].

The degree of pungency of hot peppers varies based on the cultivars, origins, growing conditions, and drying conditions.

The aim of the study was to determine the composition of solvent extracts obtained from two cultivars of hot peppers: ‘Adorno’ and ‘Etna’ using gas chromatography-mass spectrometry (GC/MS).

MATERIAL AND METHODS

All hot pepper fruits utilized in this study were produced at the Horticultural Experiment Station, which belongs to the Department of Vegetable Crops of the West Pomeranian University of Technology in north-western Poland.

The fruits of two *Capsicum annuum* L. cultivars: 'Adorno' and 'Etna', were harvested at 21 September 2009, dried at 35°C (electric drier), and stored in dry, dark place. The whole fruits, including the fruit wall, seeds and placenta, were used for extraction.

For extraction by acetone, 2.56 g of each dry pepper (crushed) were weighted and placed in a Soxhlet apparatus with 150 ml of acetone. The solution was gently refluxed for 9 h and allowed to cool, then filtered and evaporated to dryness in a rotary evaporator system. Oleoresin yields were 0.03 g; 1.17% (Adorno) and 0.05 g; 1.95% (Etna), respectively.

For isolation of capsaicinoids by maceration, 3.3 grams of each dry sample had been crushed in small pieces and extracted with hexane (25 ml) through maceration (15 days). The resultant extract was dried under reduced pressure to give 0.04 g; 1.2% (Adorno) and 0.05 g; 1.5% (Etna), dark red oily residue, respectively.

Gas chromatography-mass spectrometry (GC/MS) was used to determine the composition of the solvent extracts of two hot cultivars of *Capsicum annuum* L.

The composition of samples were assayed using a Gas Chromatograph (HP 6890 GC) with a Mass Spectrometer (HP 5973 MSD). The separation was achieved using an Agilent 19091S-433 HP-5MS fused silica capillary column 30 meters length, 0.25 mm in diameter and with 0.25 μm thick stationary phase film. The GC oven was programmed from 35°C (kept constant for 10 minutes) at a rate of 3°C per minute to 95°C, next to 270°C at a rate of 10°C per minute (kept constant for 10 minutes) and finally at a rate of 3°C per minute to 300°C (kept constant for 10 minutes). The total run time was 77.50 minutes. Flow rate of helium was 2.0 ml·min^{-1} at 2.2 psi. The injector temperature was 250°C, the mass detector temperature was 280°C. The injection volume was 5 μl and the solvent delay was 2.5 minutes.

The relative percentage of each component was determined based on peak area measurements.

Components of the extracts were identified using an automated library search that compares unknowns with a library of standard spectra such as Wiley NBS75K.L and NIST/EPA/NIH Mass Spectral Library (2002 version).

Spectra were analyzed for characteristic fragment ion patterns, which were compared with those published in the literature [Gannett et al. 1988, Schweiggert et al. 2006, Hin et al. 2008].

RESULTS AND DISCUSSION

Using GC/MS, we determined the composition of fruit extracts of two *Capsicum annuum* L. cultivars: 'Adorno' and 'Etna'.

Table 1. Composition of acetone extracts of chosen cultivars of *Capsicum annuum* L.
Tabela 1. Skład ekstraktów acetonowych z wybranych odmian *Capsicum annuum* L.

No.	Compound Związek	ADORNO		ETNA	
		R_t [min] czas retencji	%	R_t [min] czas retencji	%
1.	4-hydroxy-4-methyl-2-pentanone	10.95	0.98	11.05	2.84
2.	1-hexadecene	38.71	0.06	38.82	0.05
3.	2-methylpentadecane	39.17	0.04	–	–
4.	hexadecane	39.93	0.04	–	–
5.	heptadecane	40.35	0.15	40.35	0.10
6.	pentadecanoic acid	41.87	0.25	–	–
7.	1-heptadecanol acetate	42.23	0.10	42.23	0.07
8.	octadecane	42.35	0.21	42.35	0.08
9.	alloaromadendrene	43.00	0.52	–	–
10.	oleic acid	43.07	0.14	–	–
11.	2-methyl-3,13-octadecadienal	43.41	0.10	43.40	0.03
12.	5-eicosene	44.33	0.16	44.33	0.07
13.	cycloeicosane	44.62	0.04	–	–
14.	1-octadecanamine	45.09	5.28	45.06	1.54
15.	7,11-hexadecadienal	45.28	0.16	46.18	0.09
16.	9-octadecenamide	46.86	0.12	46.84	0.11
17.	3,6-dimethyl-2,3,3a,4,5,7a-hexa-hydrobenzofuran	47.04	0.07	–	–
18.	eicosane	47.51	0.04	47.50	0.09
19.	2-hydroxycyclopentadecanone	47.69	0.16	47.70	0.14
20.	heneicosane	47.81	0.36	47.81	0.48
21.	nonivamide	47.98	7.66	47.99	13.20
22.	nordihydrocapsaicin	48.28	0.62	48.28	0.87
23.	**capsaicin**	**48.90**	**37.22**	**48.89**	**40.85**
24.	**dihydrocapsaicin**	**49.16**	**28.68**	**49.09**	**19.87**
25.	homovanillyl alcohol	–	–	49.26	0.38
26.	N-vanillyldecanamide	49.39	1.39	49.39	4.28
27.	5-isopropyl-3,3-dimethyl-2-methylene-2,3-dihydrofuran	–	–	49.57	0.77
28.	docosane	49.75	0.52	49.73	0.52
29.	homocapsaicin	49.84	0.74	49.81	0.24
30.	homocapsaicin II	49.91	0.42	49.91	1.35
31.	homodihydrocapsaicin	50.09	1.85	50.09	4.03
32.	homodihydrocapsaicin II	50.20	0.43	50.18	0.20
33.	2-methyltricosane	50.96	0.08	–	–
34.	squalene	51.46	0.14	–	–
35.	tetracosane	51.86	0.23	51.85	0.20
36.	pentacosane	52.46	0.58	52.42	0.46
37.	hexacosane	55.65	0.14	56.54	0.22
38.	heptacosane	56.59	0.76	–	–
39.	vitamin E	57.92	2.10	57.87	1.98
40.	ergost-5-en-3-ol	60.33	0.30	60.28	0.20
41.	11-decyldocosane	61.83	0.25	–	–
42.	β-sitosterol	62.52	0.59	62.48	0.40
43.	α-amyrin	63.25	0.41	63.22	0.40
44.	β-amyrin	64.30	0.46	64.27	0.47
45.	methyl 3-hydroxycholest-5-en-26-oate	67.23	0.21	–	–

The hot pepper fruits were extracted with acetone in Soxhlet apparatus, macerated in hexane and analyzed for capsaicinoids as well as other components.

The composition of acetone extracts is shown in table 1.

The GC/MS analysis revealed the presence of 43 compounds in acetone extract of 'Adorno' cultivar and 33 compounds in acetone extract of 'Etna' cultivar.

The GC chromatograms of the main components of the extracts are presented in figures 1–2.

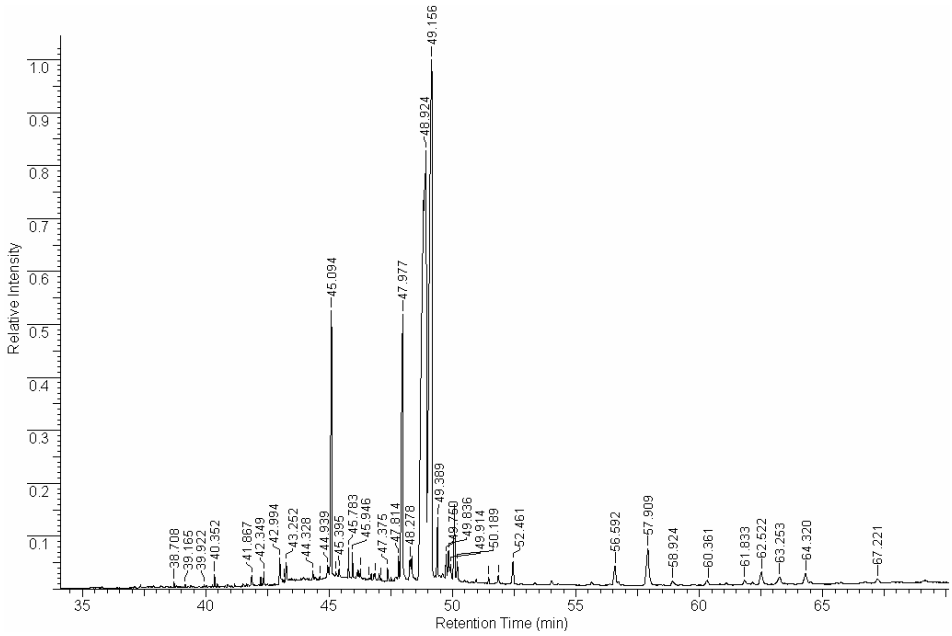

Fig. 1. GC chromatogram obtained from the oleoresin isolated by acetone from *Capsicum annuum* L. cultivar 'Adorno'

Rys. 1. Chromatogram GC otrzymany z oleożywicy wyizolowanej acetonem z odmiany *Capsicum annuum* L. 'Adorno'

The results obtained, indicate that the capsaicin contributes the highest amount (37.22% and 40.85%) to the total capsaicinoids level of the 'Adorno' and 'Etna' cultivars and that dihydrocapsaicin contributes the second highest amount (28.68% and 19.87%) in acetone extracts. Capsaicin concentrations were typically higher than dihydrocapsaicin.

Generally, the higher percentage amounts of the other capsaicinoids (nonivamide, N-vanillyldecanamide, homodihydrocapsaicin) were observed in hot pepper 'Etna'.

The content of vitamin E were similar in the both cultivars (2.10% – Adorno and 1.98% –Etna).

Figure 3 displays the structures of the nine capsaicinoids identified in *Capsicum annuum* L. extracts.

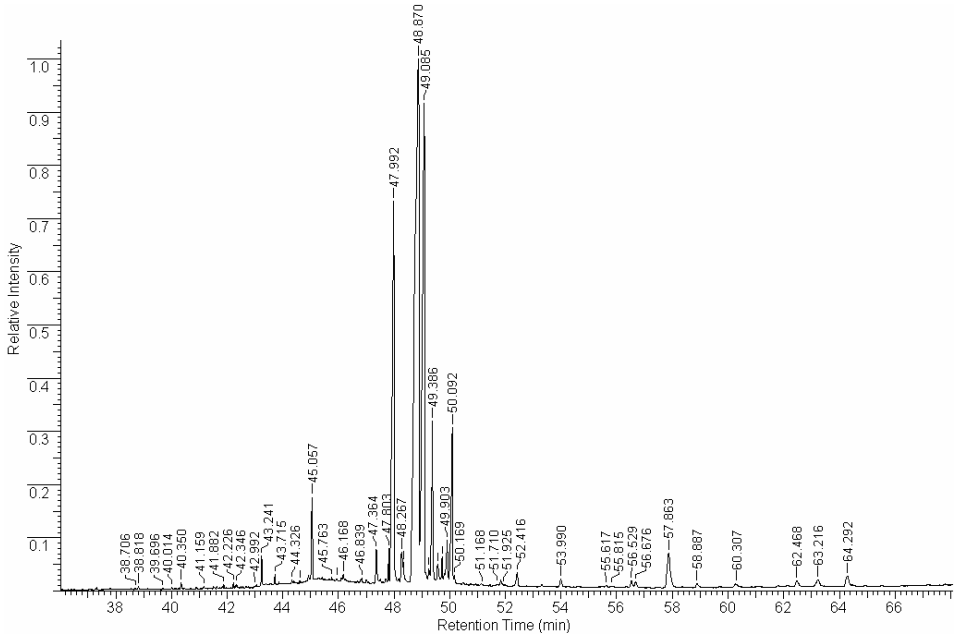

Fig. 2. GC chromatogram obtained from the oleoresin isolated by acetone from *Capsicum annuum* L. cultivar 'Etna'

Rys. 2. Chromatogram GC otrzymany z oleożywicy wyizolowanej acetonem z odmiany *Capsicum annuum* L. 'Etna'

Table 2 shows the mass spectra data of capsaicinoids identified in acetone extracts.

Mass spectrometry of the *Capsicum annuum* L. extracts indicate that the molecular ions at m/z 293, 305, 307, 319 and 321, which correspond to nonivamide, nordihydrocapsaicin, capsaicin, dihydrocapsaicin, homocapsaicin and homodihydrocapsaicin, respectively, have a common benzyl cation fragment ($C_6H_3(OH)(OCH_3)CH_2^+$) at m/z 137. According to Antonious and Jarret [2006] this characteristic fragment ion, can be used for monitoring capsaicinoids content in pepper fruit extracts.

The compositions of hexane extracts of *Capsicum annuum* L. hot cultivars 'Adorno' and 'Etna' are presented in table 3 and table 4.

The GC chromatograms obtained from the oleoresins isolated by hexane from the both cultivars are presented in figures 4–5.

As shown in table 3, capsaicin (28.34%) and dihydrocapsaicin (22.46%) were the major components found in 'Adorno' hexane extract, similarly to 'Etna' hexane extract (36.82% and 16.33%), presented in table 4.

The content of the other capsaicinoids was higher in 'Etna' (16.28%) than in 'Adorno' (8.01%). Homodihydrocapsaicin II was not detected in the 'Adorno' hexane extract.

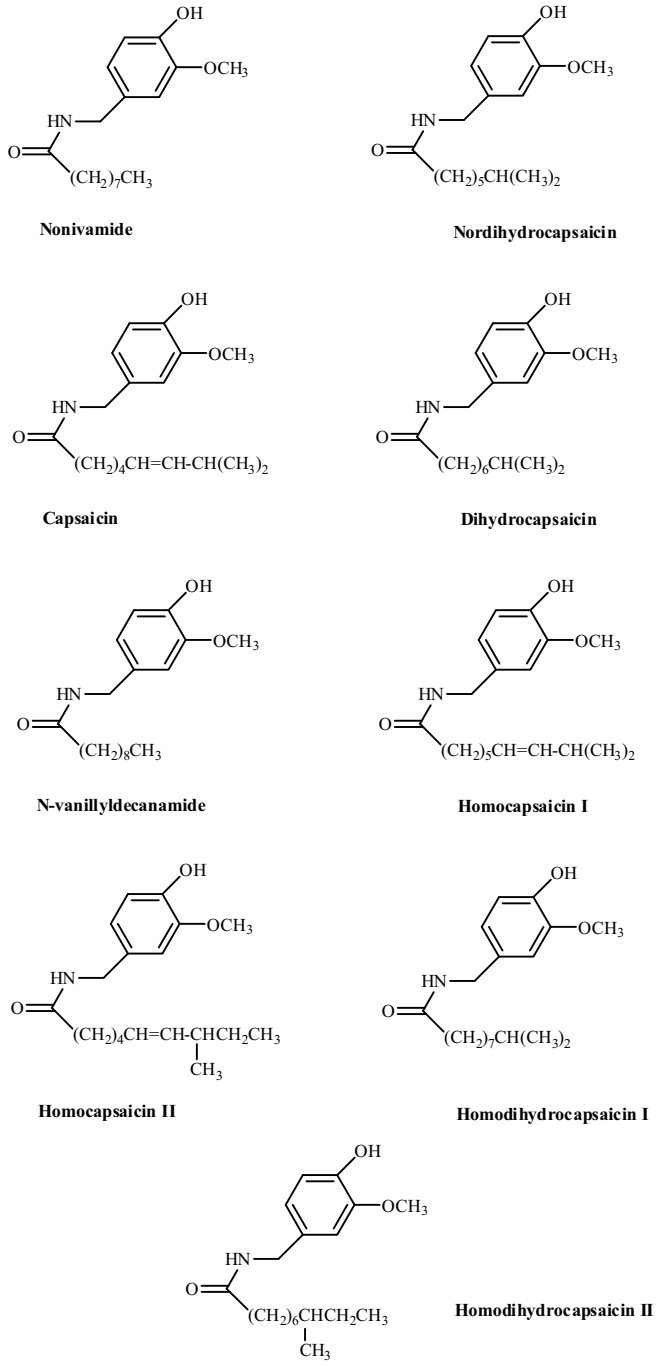

Fig. 3. Chemical structures of identified capsaicinoids
Rys. 3. Wzory chemiczne zidentyfikowanych kapsaicynoidów

Table 2. Mass spectra data of capsaicinoids identified in acetone extracts of chosen cultivars of *Capsicum annuum* L.

Tabela 2. Dane uzyskane z widm masowych kapsaicynoidów zidentyfikowanych w ekstraktach acetonowych z wybranych odmian *Capsicum annuum* L.

Cultivar Odmiana	Compound Związek	m/z (relative intensity), % Stosunek masy do ładunku (względna intensywność)
Adorno	Nonivamide	293 [M^+] (29), 195 (13), 178 (3), 152 (15), **137 (100)**, 122 (11), 110 (4), 94 (7), 43 (23)
	Nordihydrocapsaicin	293 [M^+] (21), 195 (11), 151 (16), **137 (100)**, 122 (11), 110 (5), 94 (8), 55 (19), 41 (34), 29 (19)
	Capsaicin	305 [M^+] (18), 262 (2), 195 (6), 168 (5), 152 (20), **137 (100)**, 122 (12), 94 (8), 69 (10), 41 (24)
	Dihydrocapsaicin	307 [M^+] (42), 195 (22), 178 (4), 151 (26), **137 (100)**, 122 (16), 94 (8), 43 (30)
	N-vanillyldecanamide	307 [M^+] (21), 195 (11), 152 (13), **137 (100)**, 122 (10), 94 (6), 57 (6), 55 (12), 41 (24)
	Homocapsaicin	319 [M^+] (8), 195 (4), 152 (11), **137 (100)**, 122 (9), 94 (8), 79 (6), 55 (26), 41 (24), 29 (9)
	Homocapsaicin II	319 [M^+] (8), 195 (3), 178 (1), 157 (5), 152 (12), **137 (100)**, 122 (9), 110 (3), 94 (8), 67 (9), 43 (31)
	Homodihydrocapsaicin	321 [M^+] (21), 195 (11), 151 (13), **137 (100)**, 122 (9), 94 (5), 43 (31)
	Homodihydrocapsaicin II	321 [M^+] (18), 195 (11), 152 (12), **137 (100)**, 122 (10), 94 (7), 41 (32)
Etna	Nonivamide	293 [M^+] (32), 195 (15), 178 (3), 151 (21), **137 (100)**, 122 (12), 110 (5), 94 (7), 77 (3), 43 (23)
	Nordihydrocapsaicin	293 [M^+] (22), 195 (10), 151 (21), **137 (100)**, 122 (12), 110 (4), 94 (7), 55 (16), 41 (31), 29 (16)
	Capsaicin	305 [M^+] (21), 262 (3), 195 (6), 168 (5), 152 (22), **137 (100)**, 122 (13), 94 (9), 69 (11), 41 (26)
	Dihydrocapsaicin	307 [M^+] (35), 195 (18), 178 (3), 151 (21), **137 (100)**, 122 (14), 94 (7), 43 (27)
	N-vanillyldecanamide	307 [M^+] (22), 195 (12), 152 (13), **137 (100)**, 122 (10), 94 (6), 55 (9), 41 (20)
	Homocapsaicin	319 [M^+] (7), 195 (4), 152 (12), **137 (100)**, 122 (10), 94 (8), 55 (37), 41 (39), 29 (15)
	Homocapsaicin II	319 [M^+] (9), 276 (1), 195 (3), 178 (1), 152 (12), **137 (100)**, 122 (8), 110 (3), 94 (6), 67 (6), 43 (23)
	Homodihydrocapsaicin	321 [M^+] (23), 195 (12), 151 (14), **137 (100)**, 122 (10), 94 (5), 57 (5), 43 (28)
	Homodihydrocapsaicin II	321 [M^+] (17), 195 (11), 152 (12), **137 (100)**, 122 (11), 94 (7), 57 (18), 41 (39)

We were able to identified 39 compounds in the fruits of 'Adorno' cultivar and 46 compounds in the fruits of 'Etna' cultivar.

Besides capsaicinoids, which dominated in the both extracts, we identified vitamin E, sterols, squalene, aliphatic and aromatic hydrocarbons, α-amyrin (precursor of ursolic acid), and small amounts of fatty acids, also.

According to Barceloux [2008], the composition of oleoresin capsicum depends mainly on the environmental conditions, maturity of the fruit and the extraction process. Depending on the variety of chili pepper, oleoresin contains about 0.01–1% capsaicinoids on a dry mass basis. The approximate distribution of these compounds is as fol-

Table 3. Composition of hexane extract of *Capsicum annuum* L. cultivar 'Adorno'
Tabela 3. Skład ekstraktu heksanowego z odmiany *Capsicum annuum* L. 'Adorno'

No.	Compounds Związki	R_t [min] czas retencji	%
1.	1,3-dimethylbenzene	12.91	1.36
2.	cyclotetradecane	37.39	0.10
3.	1-hexadecene	38.72	0.12
4.	hexadecane	40.05	0.30
5.	heptadecane	40.36	0.21
6.	octadecane	42.35	0.14
7.	methyl 11-(3-pentyl-2-oxiranyl)undecanoate	43.95	0.09
8.	5-eicosene	44.33	0.24
9.	glicerol oleate	44.41	0.09
10.	1-octadecanamine	45.05	6.62
11.	7,11-hexadecadienal	45.27	0.07
12.	9,12-octadecadien-1-ol	46.11	0.17
13.	dodine	46.25	0.19
14.	tricosanoic acid	46.35	0.14
15.	9-octadecenamide	46.85	0.40
16.	heneicosane	47.80	0.49
17.	nonivamide	47.90	4.71
18.	nordihydrocapsaicin	48.24	0.68
19.	**capsaicin**	**48.71**	**28.34**
20.	**dihydrocapsaicin**	**48.94**	**22.46**
21.	N-vanillyldecanamide	49.25	0.75
22.	docosane	49.72	1.45
23.	homocapsaicin	49.81	0.29
24.	1,1,6-trimethyl-1,2-dihydronaphthalene	49.89	0.16
25.	homocapsaicin II	49.96	1.25
26.	homodihydrocapsaicin	50.09	0.33
27.	13-docosenamide	50.88	0.95
28.	squalene	51.43	0.62
29.	tetracosane	51.83	0.23
30.	pentacosane	52.41	1.19
31.	N-methoxy-2-carbomethoxy-2-carboethoxyaziridine	52.75	0.29
32.	heptacosane	56.54	1.15
33.	hexatriacontane	56.64	0.68
34.	vitamin E	57.89	5.52
35.	ergost-5-en-3-ol	60.26	0.63
36.	β-sitosterol	62.44	1.46
37.	α-amyrin	63.20	1.21
38.	β-amyrin	64.27	1.94
39.	methyl 3-hydroxycholest-5-en-26-oate	67.18	0.39

Table 4. Composition of hexane extract of *Capsicum annuum* L. cultivar 'Etna'
Tabela 4. Skład ekstraktu heksanowego z odmiany *Capsicum annuum* L. ' Etna'

No.	Compounds Związki	R_t [min] czas retencji	%
1.	dihydroactinidiolide	38.56	0.05
2.	1-hexadecene	38.71	0.05
3.	rans-nerolidol	38.82	0.07
4.	8-heptadecene	40.12	0.04
5.	heptadecane	40.35	0.17
6.	1-octadecene	40.88	0.06
7.	octadecane	42.35	0.12
8.	1-bromotetradecane	42.48	0.03
9.	stearic acid (octadecanoic)	43.15	0.02
10.	palmitic acid (hexadecanoic)	43.31	0.22
11.	2-methyl-3,13-octadecadienal	43.40	0.14
12.	methyl 11-(3-pentyl-2-oxiranyl) undecanoate	43.96	0.13
13.	1-octadecanamine	45.10	3.92
14.	7,11-hexadecadienal	45.22	0.20
15.	oxacyclohexadecan-2-one	45.32	0.48
16.	1-acetoxynonadecane	45.42	0.88
17.	9,12-octadecadien-1-ol	46.12	0.20
18.	tetradecylcyclohexane	46.18	0.32
19.	tricosanoic acid	46.36	0.12
20.	oleic acid	46.69	0.10
21.	13-tetradecen-1-ol acetate	47.11	0.05
22.	heneicosane	47.81	0.70
23.	nonivamide	47.98	7.98
24.	nordihydrocapsaicin	48.28	0.65
25.	**capsaicin**	**48.95**	**36.82**
26.	**dihydrocapsaicin**	**49.14**	**16.33**
27.	N-vanillyldecanamide	49.41	2.72
28.	homocapsaicin	49.84	0.18
29.	docosane	49.75	0.90
30.	homocapsaicin II	49.94	1.12
31.	homodihydrocapsaicin	50.13	3.49
32.	homodihydrocapsaicin II	50.21	0.14
33.	2-methyltricosane	50.96	0.15
34.	squalene	51.46	0.09
35.	tetracosane	51.85	0.20
36.	pentacosane	52.46	1.40
37.	nonacosane	54.27	0.11
38.	β-tocopherol	55.50	0.10
39.	γ-tocopherol	55.86	0.20
40.	hexatriacontane	56.58	0.84
41.	vitamin E	58.01	5.71
42.	ergost-5-en-3-ol	60.32	0.39
43.	β-sitosterol	62.52	0.60
44.	α-amyrin	63.28	1.02
45.	β-amyrin	64.35	1.50
46.	lupeol	64.95	0.12

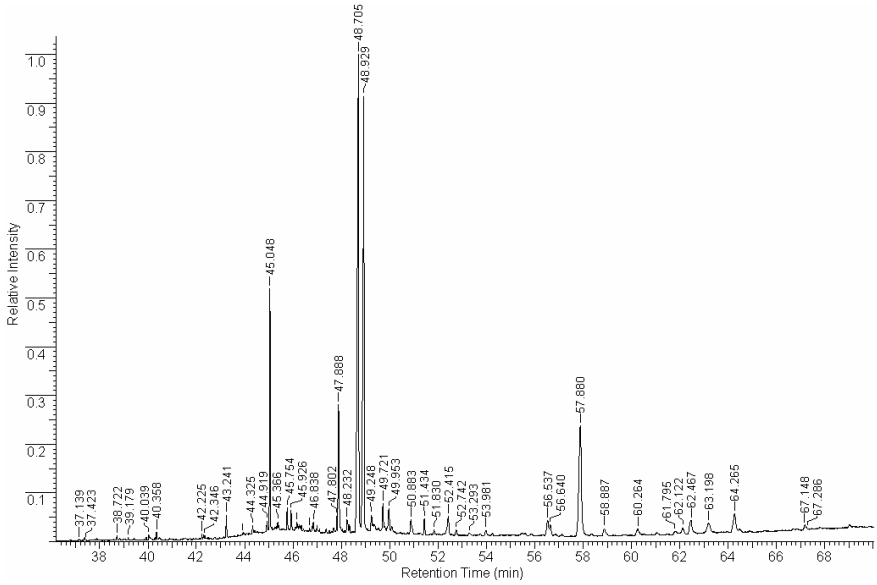

Fig. 4. GC chromatogram obtained from the oleoresin isolated by hexane from *Capsicum annuum* L. cultivar 'Adorno'

Rys. 4. Chromatogram GC otrzymany z oleożywicy wyizolowanej heksanem z odmiany *Capsicum annuum* L. 'Adorno'

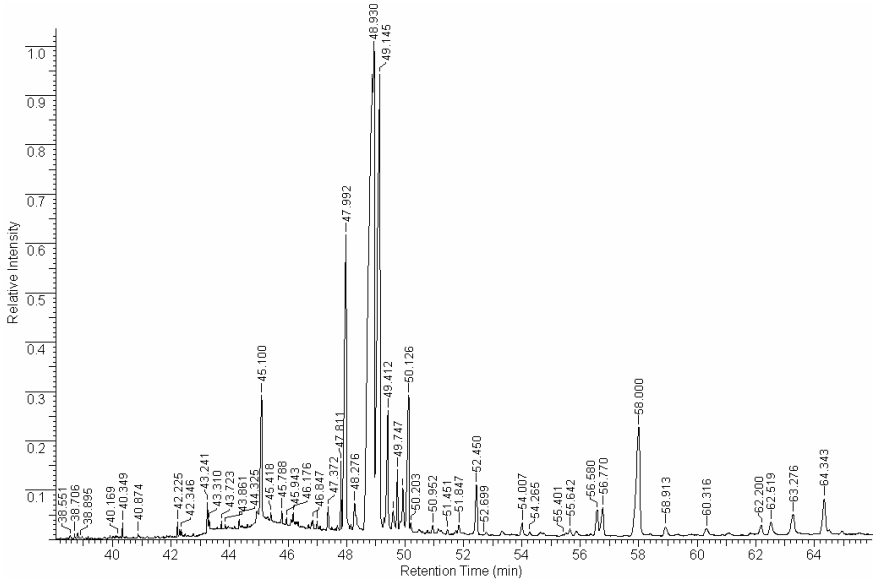

Fig. 5. GC chromatogram obtained from the oleoresin isolated by hexane from *Capsicum annuum* L. cultivar 'Etna'

Rys. 5. Chromatogram GC otrzymany z oleożywicy wyizolowanej heksanem z odmiany *Capsicum annuum* L. 'Etna'

lows: capsaicin (70%), dihydrocapsaicin (20%), nordihydrocapsaicin (7%), homocapsaicin (1%) and homodihydrocapsaicin (1%). Capsaicin and dihydrocapsaicin, the two most pungent capsaicinoids, comprise 80–90% of the total capsaicinoids found in peppers in concentrations of 0.1–1% and in ratio of 1:1–2:1, respectively [Hayman and Kam 2008, Dewick 2009].

Regarding the composition in capsaicinoids, capsaicin, dihydrocapsaicin, and nonivamide were the predominant ones, accounting for >73% in acetone extracts (Adorno – 73.56%, Etna – 73.92%) and about 60% in hexane extracts (Adorno – 55.51%, Etna – 61.13%) of total capsaicinoids detected. The total content of capsaicinoids were lower compared to cited literature. Capsaicin and dihydrocapsaicin comprised 50.8–65.9% of the total capsaicinoid concentration. The content of dihydrocapsaicin (16.33–22.46%), in the hexane extracts was similar to the literature data (20–22%) [Hui and Barta 2006, Barceloux 2008].

CONCLUSIONS

1. In *Capsicum* fruits we were able to identify 9 components among major and minor capsaicinoids using GC/MS. Capsaicin and dihydrocapsaicin were the dominant capsaicinoids detected.

2. The number of components identified in acetone and hexane extract of 'Adorno' cultivar were similar.

3. The number of components identified in hexane extract of 'Etna' cultivar were higher than in acetone.

4. The total content of capsaicinoids was higher in 'Etna' cultivar (84.89% – in acetone extract; 69.43% – in hexane extract) than in 'Adorno' cultivar (79.01% – in acetone extract; 58.81% – in hexane extract).

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SKŁAD CHEMICZNY EKSTRAKTÓW Z OWOCÓW OSTRYCH ODMIAN *Capsicum annuum* L.

Streszczenie: Owoce papryki ostrej zawierają grupę związków chemicznych (alkaloidów) nazywanych kapsaicynoidami, które odpowiadają za ostry i piekący smak gatunku *Capsicum.* Celem badań było określenie składu chemicznego ekstraktów i zawartości kapsaicynoidów w owocach dwóch odmian papryki ostrej ‘Adorno’ i ‘Etna’, uprawianych w północno-zachodniej Polsce w 2009 r. Kapsaicynoidy ekstrahowano z wysuszonych owoców

papryki ostrej rozpuszczalnikami (aceton i heksan). W analizie ekstraktów wykorzystano GC/MS. Analiza wykazała, że głównymi składnikami ekstraktów są kapsaicyna, dihydrokapsaicyna i wanililoamid kwasu pelargonowego.

Słowa kluczowe: *Capsicum*, kapsaicyna, kapsaicynoidy, oleożywice, GC, MS

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