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THE CHEMICAL COMPOSITION OF FRUIT IN SELECTED MELON CULTIVARS GROWN UNDER FLAT COVERS WITH SOIL MULCHING

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Abstract. A number of research studies investigating melon production technologies in various macroregions of Poland characterized by different climate conditions have been initiated to investigate the effect of perforated PE film and non-woven PP fabric covers as well as soil mulching with organic and mineral material on the melon growing process. A two-factorial field experiment was conducted in the years 2004–2008, in the Garden of the Research and Experimental Station of the University of Warmia and Mazury in Olsztyn. The first experimental factor were four Polish melon cultivars, Malaga F_1, Melba, Oliwin and Seledyn F_1, recommended for open ground and forced cultivation. The second factor were types of soil cover and plant cover. Apart from the control treatment (without protective cover), the effect of the following types of cover on the growth rate and yield of melon plants was determined in a five-year cycle: perforated PE film with 100 holes per m^2, non-woven PP fabric with surface density of 17 $g \cdot m^{-2}$, black PE film for soil mulching; black PE film for soil mulching + perforated PE film with 100 holes per m^2, black PE film for soil mulching + non-woven PP fabric. An analysis of the chemical composition of melon fruit showed that the concentrations of dry matter, L-ascorbic acid and total carbohydrates were higher in the edible parts of heterotic cultivars. The type of plant cover and soil cover had a significant effect on the dry matter content of the edible parts of melon, but it caused no considerable changes in the levels of the remaining organic compounds. In the majority of cases, the nitrate content of melon fruit was below the allowable standards. The lowest quantities of nitrates were accumulated by melon fruit of cv. Oliwin in the control treatment.

Key words: cultivar, PE film, non-woven PP fabric, dry matter, organic compounds, nitrates

INTRODUCTION

Melons are highly demanding, thermophilous plants which makes them relatively unpopular in Poland. Melons should be grown on a larger scale due to their exceptional

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taste and a high nutritional value. A number of research studies investigating melon production technologies in various macroregions of Poland characterized by different climate conditions have been initiated to investigate the effect of perforated PE film and non-woven PP fabric covers as well as soil mulching with organic and mineral material on the melon growing process. The applied cultivation measures inhibit weed infestation and improve the microclimatic environment around plants [Grudzień 1998, Grudzień 2000, Grudzień and Górecki 2001].

Seven Polish melon cultivars are presently grown on the domestic market, including cantaloupes, netted and smooth-skinned cultivars. They are well adapted to the local climate. The growth rate, vigor, fruit shape, fruit size, rind color and flesh thickness, color and flavor of those cultivars vary [Lista odmian… 2009].

The aim of this study was to determine the chemical composition of melon fruit grown in the field using soil mulching and plant covers.

MATERIALS AND METHODS

A two-factorial field experiment was conducted in the years 2004–2008, in the Garden of the Research and Experimental Station of the University of Warmia and Mazury in Olsztyn. The first experimental factor were four Polish melon cultivars, Malaga F_1, Melba, Oliwin and Seledyn F_1, recommended for open ground and forced cultivation. The second factor were soil mulching and plant cover. Apart from the control treatment (without protective cover), the effect of the following types of cover on the growth rate and yield of melon plants was determined in a five-year cycle:

– perforated PE film with 100 holes per m^2,
– non-woven PP fabric with surface density 17 $g \cdot m^{-2}$,
– black PE film for soil mulching,
– black PE film for soil mulching + perforated PE film with 100 holes per m^2,
– black PE film for soil mulching + non-woven PP fabric.

Seedlings were grown in pots in a greenhouse, in line with the generally observed standards for melon cultivation (BN-88/9125-08, Vegetable seedlings). Each year, between 28 April and 4 May, two melon seeds were sown per pot with a diameter of 10 cm, filled with peat with the following chemical composition: $N\text{-}NO_3$ – 100, P – 80, K – 215, Ca – 1240, Mg – 121 $mg \cdot dm^{-3}$, pH in H_2O – 5.9 and salt concentration of 1.5 $g \cdot dm^{-3}$. Seedlings emerged after four to five days. The weaker seedling was removed from each pot, leaving the stronger one. Seedlings were watered and soil was sprayed with the fungicide Rowral FLO 255 SC. After the development of five to six leaves, the main stem was cut above the third leaf.

Field treatments were set up on layered proper brown soil of quality class IVb, good rye complex, developed from slightly loamy sand on medium-heavy silty loam underlain by loose sand. Melons were grown after a tomato forecrop. The mineral content of soil was analyzed prior to establishing the experiment and the following results were obtained: $N\text{-}NO_3$ – 38, P – 90, K – 157, Ca – 1840, Mg – 194 ($mg \cdot dm^{-3}$). Chemical analyses of soil samples were performed at the Chemical Station in Olsztyn. The study was carried out under Accreditation Certificate no. AB 277 issued by the Polish Center for Accreditation. The soil was found to be abundant in phosphorus and potassium, and no supplemental fertilization with these elements was needed throughout the experiment. Due to a low nitrate nitrogen content of soil, nitrogen was applied at a single dose of 240 $kg \cdot ha^{-1}$ in the form of ammonium saltpeter, 14 days before the planting out of seedlings [Starck 1997].

The experiment was carried out in a split-plot design, in three replications. Each plot had a surface area of 8.0 m^2. Ten melon seedlings were planted per plot. The spacing between rows was 100 cm, and plant spacing in the row was 80 cm. There was a 50 cm-wide belt of soil between rows. New covers were applied each year. After planting out in the field, each row of seedlings was covered with PE film and non-woven PP fabric, 1.6 m wide, whose edges were buried in the soil. The covers were removed after 14–18 days. Soil was mulched with black PE films, 1.2 m wide, applied one day prior to the planting out of seedlings. Film edges were buried in the soil and openings were made by crosswise incisions. Seedlings were planted in the openings in early June.

The required cultivation measures were carried out over the growing period. PE film and non-woven PP fabric covers were removed after the first flowers had appeared on plants (16–18 June, except in 2006 when the covers were removed on 1 July). As the covers were removed, plants were sprayed twice with a 0.2% solution of Ekosol U. Weeds were removed manually three times. Plants were sprinkler-irrigated according to the current values of soil water potential (40–50 KPa) measured with a tensiometer. As the first symptoms of downy mildew were observed, plants were sprayed with fungicides, in line with the Vegetable Protection Program.

Melon fruit was harvested on ripening [Rozporządzenie Komisji (WE) 2001]. The chemical composition of melon fruit was determined immediately after harvest. Fruits were sampled from the marketable yield of each treatment, and the bulk sample was prepared in accordance with the Polish Standard PN-72/A-75050. At the laboratory of the Department of Horticulture, University of Warmia and Mazury in Olsztyn, melon fruit was assayed for:

– dry matter content – by drying to constant mass at 105°C (Polish Standard PN-90/A-75101/03),

– L-ascorbic acid content – by the Tillmans method modified by Pijanowski (Polish Standard PN-90A-75101/11),

– concentrations of total carbohydrates, monosaccharides and disaccharides – by the Luff-Schoorl method (Polish Standard PN-90/A-75101/07),

– organic acid content (on malic acid basis) – by the titration method as described by Pietersburgski,

– the ratio between carbohydrates and organic acids,

The nitrate content of dried plant material was determined by the colorimetric method, using salicylic acid [Krauze and Domska 1991].

The results were validated statistically by an analysis of variance. The significance of differences between means was evaluated by constructing Tukey's confidence intervals at $\alpha = 0.05$. Coefficients of correlation and determination were calculated for selected parameters.

RESULTS AND DISCUSSION

The concentrations of chemical compounds in vegetables and fruit may vary widely, depending on the cultivar, ripeness stage at harvest, soil and climate conditions, and cultivation methods [Gajc and Skąpski 1991, Zadernowski and Oszmiański 1994]. The main components of the edible parts of plants are water and dry matter. The latter is crucial for the processing suitability of plant raw materials.

In the present study the dry matter content of the edible parts of melon fruit varied significantly throughout the growing season. Melon fruit harvested in 2008 accumulated the largest quantities of dry matter, while melon fruit harvested in 2004 had the lowest dry matter content (fig. 1). Melon fruit of cv. Seledyn F_1 contained the largest amount of dry matter (7.46%), while the lowest concentration of dry matter (5.96%) was noted in cv. Oliwin (mean of 2004–2008, fig. 2). Differences in dry matter content subject to cultivar were also observed in earlier studies of the family Cucurbitaceae [Sztangret et al. 2001, Sztangret et al. 2002, Danilčenko et al. 2004, Wojdyła et al. 2007, Majkowska-

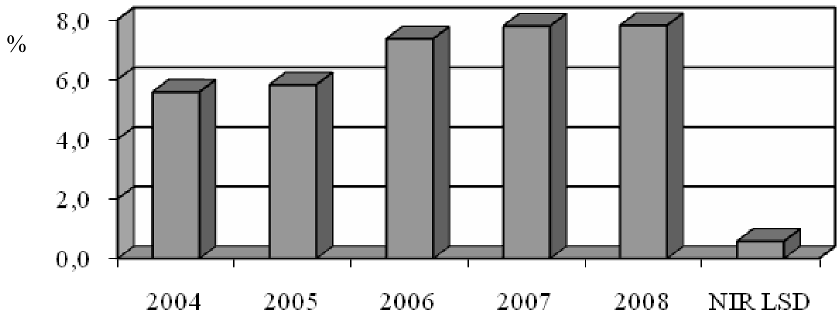


Fig. 1. Average dry matter content of melon fruit in successive years of the study
Rys. 1. Średnia zawartość suchej masy w owocach melona w poszczególnych latach badań

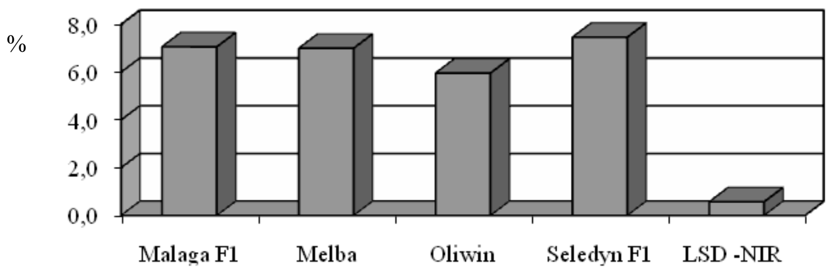
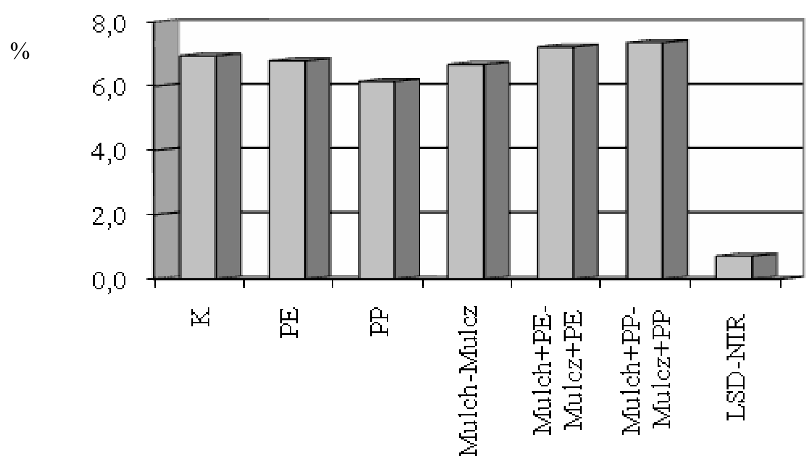


Fig. 2. Average dry matter content of melon fruit depending on the cultivar (mean of 2004–2008)
Rys. 2. Zawartość suchej masy w owocach melona w zależności od badanej odmiany (średnio za lata 2004–2008)

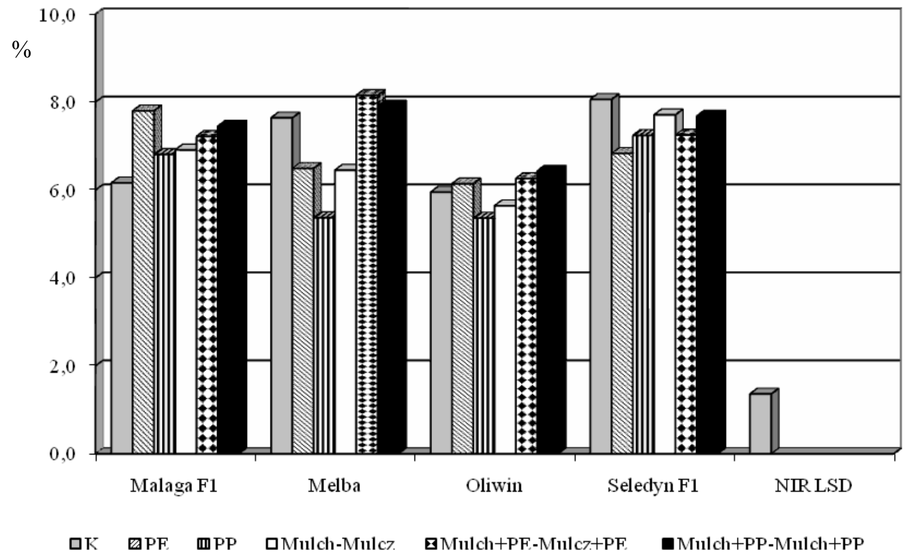
-Gadomska 2010]. The results of this experiment are comparable with those reported by other authors. According to Sztangret et al. [2001], the dry matter content of pumpkin flesh ranged from 5.6 to 16%, whereas in a study by Danilčenko et al. [2004] it reached 19%. In the present study the dry matter content of melon fruit was also significantly affected by the type of plant cover and soil cover. The highest dry matter accumulation was noted in the fruit of melon plants grown in mulched soil under non-woven PP cover (7.36%), and the lowest (6.15%) – in plants grown under non-woven PP cover – (fig. 3). Mean values obtained for the entire five-year experimental period show that the fruit of Melba plants grown in soil mulched with black PE film and covered with PE film were most abundant in dry matter (8.15%). The lowest dry matter content (5.36%) was determined in the fruit of Oliwin plants grown in soil mulched with black PE film (fig. 4). Similar differences in dry matter concentrations resulting from the use of various types of plant cover and soil cover were also observed by other authors. As regards the dry matter content of the edible parts of celery, it decreased in plants grown in soil mulched with black PE film and non-woven PP fabric, and reached the highest level in plants covered with non-woven PP fabric [Dyduch and Najda 2005]. According to Kołota and Słociak [2003], covers had no significant effect on the dry matter content of the edible parts of zucchini fruit.



K – Control – no cover – Kontrola
PE – PE sheet – Folia PE
PP – Non-woven PP cover – Włóknina PP
Mulcz – Mulch – (Black PE sheet mulch – Mulcz z czarnej folii PE)
Mulch + PE – Mulcz + PE (black PE sheet mulch + PE sheet – Mulcz z czarnej folii PE + folia PE)
Mulch + PP – Mulcz + PP (Mulch + non-woven PP cover – Mulcz z czarnej folii PE + włóknina PP)

Fig. 3. Average dry matter content of melon fruit depending on the type of plant cover and soil cover (mean of 2004–2008)

Rys. 3. Zawartość suchej masy w owocach melona w zależności od rodzaju osłony dla roślin i ściółkowania gleby (średnio za lata 2004–2008)



* Explanation as in figure 3 – Objaśnienia jak na rysunku 3

Fig. 4. Average dry matter content of melon fruit depending on the cultivar and the type of plant cover and soil cover (mean of 2004–2008)

Rys. 4. Zawartość suchej masy w owocach melona w zależności od badanej odmiany oraz rodzaju osłony dla roślin i ściółkowania g gleby (średnio za lata 2004–2008)

In all treatments, the mean L-ascorbic acid content of the edible parts of melon was as follows: in 2004 – 25.87 mg·100 g^{-1} fresh weight, in 2005 – 24.39 mg·100 g^{-1} fresh weight, in 2006 – 24.99 mg·100 g^{-1} fresh weight, in 2007 – 26.88 mg·100 g^{-1} fresh weight, in 2008 – 23.37 mg·100 g^{-1} fresh weight (fig. 5). The cultivar-related differences in L-ascorbic acid concentrations were statistically significant. The mean L-ascorbic acid content of melon plants in 2004–2008 was highest in cv. Malaga F_1 – 26.50 mg·100 g^{-1} fresh weight, and lowest in cv. Melba – 23.99 mg·100 g^{-1} fresh weight (tab. 1). Plant covers and soil mulching exerted a similar effect on the L-ascorbic acid content of the edible parts of melon fruit. A tendency towards higher L-ascorbic acid concentrations in melon plants grown in mulched soil was noted. The interaction between the above factors was not validated by a statistical analysis. An increase in L-ascorbic acid levels was observed in the fruit of Malaga F_1 plants grown in soil mulched with black PE film. The presents results are consistent with the findings of Ouzounidou et al. [2006] in whose study the L-ascorbic acid content of melon fruit ranged from 13 to 28 mg·100 g^{-1} fresh weight. Substantially lower concentrations of this acid, in the range of 8–13 mg·100 g^{-1} fresh weight, were reported by Lin et al. [2004], while Kunachowicz et al. [2006] noted a value of 20 mg·100 g^{-1} fresh weight.

Table 1. L-ascorbic acid of melon fruit and the saccharide to organic acid ratio (mean of 2004–2008)
Tabela 1. Zawartość kwasu L-askorbinowego w owocach melona (średnio za lata 2004–2008)

Cultivar Odmiana	Type of plant cover and soil cover Rodzaj osłony roślin i okrycia gleby	L-ascorbic acid Kwas L-askorbinowy $mg \cdot 100\ g^{-1}$ f.m. – św.m.
Malaga F_1	K	26.37
	PE	25.75
	PP	25.06
	Mulch – Mulcz	27.70
	Mulch + PE – Mulcz + PE	27.67
	Mulch + PP – Mulcz + PP	26.45
Mean – Średnia		26.50
Melba	K	22.84
	PE	24.11
	PP	26.56
	Mulch – Mulcz	23.87
	Mulch + PE – Mulcz + PE	23.29
	Mulch + PP – Mulcz + PP	23.26
Mean – Średnia		23.99
Oliwin	K	23.15
	PE	24.25
	PP	24.38
	Mulch – Mulcz	25.24
	Mulch + PE – Mulcz + PE	27.66
	Mulch + PP – Mulcz + PP	24.13
Mean – Średnia		24.80
Seledyn F_1	K	23.83
	PE	24.23
	PP	26.66
	Mulch – Mulcz	26.93
	Mulch + PE – Mulcz + PE	24.51
	Mulch + PP – Mulcz + PP	24.50
Mean – Średnia		25.11
Mean – Średnia	K	24.05
	PE	24.32
	PP	25.87
	Mulch – Mulcz	25.88
	Mulch + PE – Mulcz + PE	25.71
	Mulch + PP – Mulcz + PP	24.54
$LSD_{\alpha = 0.05}$ – $NIR_{\alpha = 0.05}$		
Cultivar – Odmiana (a)		1.22
Type of plant cover and soil cover (b) Rodzaj osłony roślin i okrycia gleby (b)		n.s. – n.i.
Interaction – Współdziałanie – (a × b)		n.s. – n.i.
Years – Lata – (1)		1.34

**Explanations – Objaśnienia:
K – Control – no cover – Kontrola;
PE – PE sheet – Folia PE;
PP – Non-woven PP cover – Włóknina PP;
Mulch – Mulcz – (Mulcz z czarnej folii PE – black PE sheet mulch);
Mulch + PE sheet – Mulcz + PE (Mulcz z czarnej folii PE + folia PE – black PE sheet mulch + PE sheet);
Mulcz + PP – Mulcz PP (Mulcz z czarnej folii PE + włóknina PP – Mulch + non-woven PP cover)

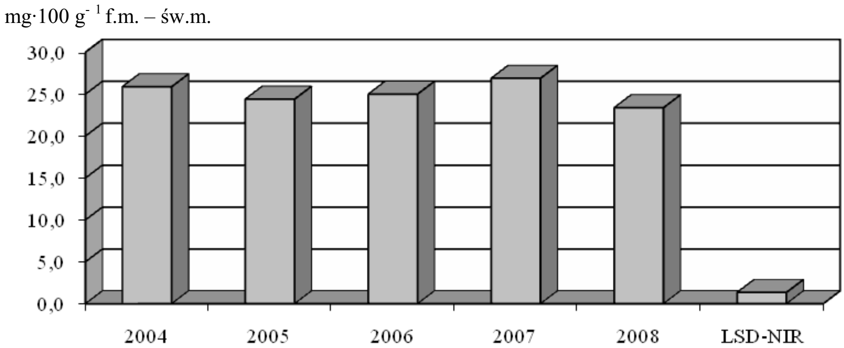


Fig. 5. Average L-ascorbic acid content of melon fruit in successive years of the study
Rys. 5. Średnia zawartość kwasu L-askorbinowego w owocach melona w poszczególnych latach badań

The taste and flavor of fruit is affected by sugar content. The edible parts of vegetables contain primarily monosaccharides and lower amounts of disaccharides (saccharose) [Zadernowski and Oszmiański 1994]. According to Kunachowicz et al. [2006], the content of carbohydrates and saccharose in the edible parts of melon is 8 g·100 g^{-1} and 3 g·100 g^{-1} fresh weight, respectively. In a study by Ouzounidou et al. [2006], melon fruit contained up to 5.1 g·100 g^{-1} fresh weight of monosaccharides and from 0.8 to 4.0 g·100 g^{-1} fresh weight of saccharose. In the present experiment the levels of total carbohydrates and monosaccharides in the edible parts of melon were significantly affected by the year of harvest and cultivar. The highest quantities of carbohydrates and monosaccharides were accumulated by melon fruit in 2007, and of disaccharides – in 2008 (fig. 6). Over the five-year study, higher concentrations of carbohydrates and disaccharides were determined in the fruit of cv. Seledyn F_1 – 5.68 and 1.79 g·100 g^{-1}

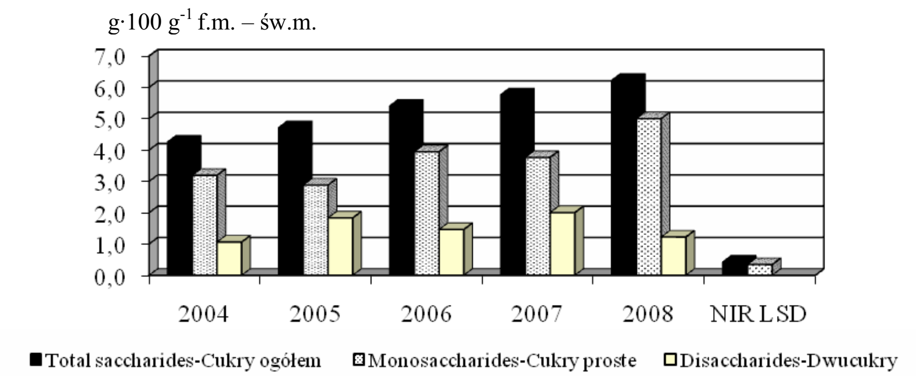


Fig. 6. Average saccharide content of melon fruit in successive years of the study
Rys. 6. Średnia zawartość cukrów w owocach melona w poszczególnych latach badań

fresh weight respectively, while cv. Melba was characterized by a higher monosaccharide content at 4.07 g·100 g^{-1} fresh weight (tab. 2). The fruit of cv. Oliwin had a significantly lower carbohydrate content. The above results are consistent with the findings of

Table 2. Saccharide and organic acid content (on malic acid basis) of melon fruit and the saccharide to organic acid ratio (mean of 2004–2008)
Tabela 2. Zawartość cukrów oraz kwasów organicznych w przeliczeniu na kwas jabłkowy oraz współczynnik cukrów do kwasów organicznych w owocach melona (średnio za lata 2004–2008)

Cultivar Odmiana	Type of plant cover and soil cover Rodzaj osłony roślin i okrycia gleby	Total saccharides Cukry ogółem	Monosaccharides Cukry proste	Disaccharides Dwucukry	Organic acids Kwasy organiczne	Saccharide to organic acid ratio Współczynnik cukrów/kwasów organicznych
		g·100 g^{-1} f.m. – św.m.				
Malaga F_1	K	5.04	3.69	1.35	0.52	9.69
	PE	5.47	3.88	1.55	0.55	9.95
	PP	5.17	4.06	1.11	0.54	9.57
	Mulch – Mulcz	5.43	3.37	2.06	0.54	10.06
	Mulch + PE – Mulcz + PE	5.81	3.88	1.94	0.59	9.85
	Mulch + PP – Mulcz + PP	5.49	3.01	2.49	0.58	9.47
Mean – Średnia		5,40	3.65	1.75	0.55	9.76
Melba	K	5.56	3.07	2.48	0.52	10.69
	PE	5.19	3.39	0.80	0.47	11.04
	PP	4.94	4.12	1.02	0.56	8.82
	Mulch – Mulcz	5.56	4.12	1.44	0.53	10.49
	Mulch + PE – Mulcz + PE	5.94	4.24	1.56	0.59	10.07
	Mulch + PP – Mulcz + PP	5.55	4.33	1.21	0.47	11.81
Mean – Średnia		5,46	4.07	1.42	0.52	10.49
Oliwin	K	4.33	3.65	0.68	0.64	6.77
	PE	4.79	3.62	1.17	0.56	8.55
	PP	4.38	3.31	0.94	0.50	8.76
	Mulch – Mulcz	4.62	3.22	1.38	0.62	7.45
	Mulch + PE – Mulcz + PE	4.99	3.26	1.53	0.57	8.75
	Mulch + PP – Mulcz + PP	4.22	3.42	1.00	0.41	10.29
Mean – Średnia		4,55	3.41	1.12	0.55	8.43
Seledyn F_1	K	5.89	3.93	1.96	0.59	9.98
	PE	5.58	3.81	1.77	0.52	10.73
	PP	5.77	4.11	1.71	0.62	9.31
	Mulch – Mulcz	5.84	3.85	1.99	0.57	10.25
	Mulch + PE – Mulcz + PE	5.45	3.80	1.65	0.52	10.48
	Mulch + PP – Mulcz + PP	5.54	3.90	1.64	0.56	9.89
Mean – Średnia		5,68	3.90	1.79	0.56	10.11
Mean Średnia	K	5.26	3.59	1.62	0.57	9.23
	PE	5.26	3.93	1.32	0.52	10.12
	PP	5.07	3.90	1.19	0.55	9.22
	Mulch – Mulcz	5.31	3.64	1.72	0.56	9.48
	Mulch + PE – Mulcz + PE	5.55	3.84	1.67	0.57	9.74
	Mulch + PP – Mulcz + PP	5.20	3.67	1.58	0.50	10.40
$LSD_{\alpha = 0.05}$ – $NIR_{\alpha = 0,05}$						
Cultivar – Odmiana (a)		0.41	0.37	n.s. – n.i.	n.s. – n.i.	–
Type of plant cover and soil cover (b) Rodzaj osłony roślin i okrycia gleby (b)		n.s. – n.i.	n.s. – n.i.	n.s. – n.i.	n.s. – n.i.	
Interaction – Współdziałanie – (a×b)		1.01	n.s. – n.i.	11.88	n.s. – n.i.	
Years – Lata – (1)		0.42	0.34	n.s. – n.i.	0.04	

** Explanationsin as in table 1 – Objaśnienia jak w tabeli 1

Table 3. Nitrate content of melon fruit (mg $N–NO_3·kg^{-1}$ fresh weight) (mean of 2004–2008)
Tabela 3. Zawartość azotanów w mg $N–NO_3·kg^{-1}$ św.m. w owocach melona (średnio za lata 2004–2008)

Cultivar Odmiana	Type of plant cover and soil cover Rodzaj osłony roślin i okrycia gleby	Nitrate Azotany
Malaga F_1	K	237
	PE	345
	PP	396
	Mulch – Mulcz	363
	Mulch + PE – Mulcz + PE	519
	Mulch + PP – Mulcz + PP	566
Mean – Średnia		404
Melba	K	271
	PE	350
	PP	449
	Mulch – Mulcz	394
	Mulch + PE – Mulcz + PE	483
	Mulch + PP – Mulcz + PP	621
Mean – Średnia		428
Oliwin	K	242
	PE	357
	PP	371
	Mulch – Mulcz	298
	Mulch + PE – Mulcz + PE	392
	Mulch + PP – Mulcz + PP	523
Mean – Średnia		364
Seledyn F_1	K	247
	PE	373
	PP	459
	Mulch – Mulcz	375
	Mulch + PE – Mulcz + PE	479
	Mulch + PP – Mulcz + PP	576
Mean – Średnia		418
Mean – Średnia	K	249
	PE	356
	PP	419
	Mulch – Mulcz	357
	Mulch + PE – Mulcz + PE	468
	Mulch + PP – Mulcz + PP	571
$LSD_{\alpha = 0.05}$ – $NIR_{\alpha = 0,05}$		
Cultivar – Odmiana (a)		40
Type of plant cover and soil cover (b)		
Rodzaj osłony roślin i okrycia gleby (b)		34
Interaction – Współdziałanie – (a×b)		65
Years – Lata – (1)		43

** Explanationsin as in table 1 – Objaśnienia jak w tabeli 1

Ekinci and Durson [2009] who demonstrated that heterotic varieties of melon contained more total carbohydrates than fixed varieties. An analysis of the interactions between the experimental factors revealed that the fruit of Melba plants grown in mulched soil and covered with PE film accumulated the largest amounts of total carbohydrates (mean for the experimental period). The edible parts of Malaga F_1 plants grown in mulched soil and covered with non-woven PP fabric had the highest disaccharide content. There was a positive correlation (r = 0.63) between the concentrations of dry matter and total carbohydrates in the edible parts of melon, and total carbohydrate content was determined by dry matter content in 39.91%.

The taste and flavor of fruit is also influenced by organic acid content, which in this study ranged from 0.41 to 0.64 $g \cdot 100\ g^{-1}$ fresh weight (non-significant differences). The ratios between carbohydrates and organic acids can be calculated based on their content. The highest value of the carbohydrate to organic acid ratio was noted in the fruit of Melba plants grown in mulched soil and covered with non-woven PP fabric, and the lowest value of this ratio was determined in the fruit of cv. Oliwin in the control treatment.

Apart from ingredients that exert a beneficial influence on human health, the edible parts of vegetables contain also undesirable compounds such as nitrates, nitrites and heavy metals. Nitrates and nitrites may be produced, in dangerous quantities, if vegetables are grown, transported and stored under inadequate conditions. Depending on the diet, vegetables account for 50 to 80% of total dietary nitrate intake [Wojciechowska et al. 2000]. Nitrate accumulation in the edible parts of vegetables is determined by genetic factors (species, cultivar), agricultural conditions (sowing and planting date, harvest time, soil type, fertilization), and climatic conditions [Rożek 2000, Francke and Majkowska-Gadomska 2008, Majkowska-Gadomska et al. 2008]. The Regulation of the Minister of Health of 22 December 2004 [2005] sets the maximum levels for nitrates in particular groups of vegetables in Poland. Melon fruit is not included in the above regulation, therefore the nitrate levels determined in this study were compared with the values established for the cucumber. Among the tested cultivars, Oliwin plants accumulated the lowest quantities of nitrates. In the remaining cultivars nitrate content insignificantly exceeded the allowable standards (tab. 3). In experiments conducted by Lisiewska and Kmiecik [1991], and Niewczas et al. [2006], the nitrate content of the edible parts of winter squash, summer squash and cucumber depended on fruit size. Smaller fruit of winter squash contained less nitrates. A similar relationship was observed in the present study. Nitrate concentrations were positively correlated with the weight of a single fruit (r = 0.22) and with the number of fruits per plant (r = 0.24). Nitrate content was determined by the above traits in 4.86% and 5.75% respectively.

The combination of soil mulching and plant covering with non-woven PP fabric had a particularly disadvantageous effect on the nitrate content of melon fruit. This could result from limited access to light of plants covered with non-woven PP fabric, which is in agreement with the findings of Wierzbicka et al. [2002a, 2002b], Biesiada [2008], and Gajc-Wolska et al. [2008]. Wierzbicka [2001] demonstrated than soil mulching had an adverse effect on nitrate accumulation in lettuce plants. A different response of melon fruit was noted in the control treatment, which confirms the previous findings of Wierzbicka et al. [2002 a, 2002b].

CONCLUSIONS

1. The concentrations of dry matter, L-ascorbic acid and total carbohydrates were higher in the edible parts of heterotic melon cultivars.

2. The type of plant cover and soil cover had a significant effect on the dry matter content of the edible parts of melon, but it caused no considerable changes in the levels of the remaining organic compounds.

3. In the majority of cases, the nitrate content of melon fruit was below the allowable standards. The lowest quantities of nitrates were accumulated by melon fruit of cv. Oliwin in the control treatment.

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OCENA SKŁADU CHEMICZNEGO OWOCÓW WYBRANYCH ODMIAN MELONA W UPRAWIE PRZY ZASTOSOWANIU PŁASKICH OSŁON I MULCZOWANIA GLEBY

Streszczenie. Obecnie prowadzone są badania dotyczące doskonalenia technologii uprawy melona w makroregionach Polski charakteryzujących się zróżnicowanymi warunkami klimatycznymi. Polegają one na stosowaniu w uprawie melona osłon z folii PE perforowanej i włókniny PP oraz ściółkowaniu gleby materiałami organicznymi bądź mineralnymi. Obecnie prowadzone są badania dotyczące doskonalenia technologii uprawy melona w makroregionach Polski charakteryzujących się zróżnicowanymi warunkami klimatycznymi. Polegają one na stosowaniu w uprawie melona osłon z folii PE perforowanej i włókniny PP oraz ściółkowaniu gleby materiałami organicznymi bądź mineralnymi. Dwuczynnikowe doświadczenie polowe z melonem przeprowadzono w latach 2004–2008 w Ogrodzie Zakładu Dydaktyczno-Doświadczalnego Uniwersytetu Warmińsko-Mazurskiego w Olsztynie. Pierwszy czynnik stanowiły rośliny 4 odmian melona polskiej hodowli: Malaga F_1, Melba, Oliwin oraz Seledyn F_1 polecane do uprawy polowej i przyspieszonej. Czynnikiem drugim były sposoby osłony roślin i okrycia gleby. W cyklu pięcioletnim poza nieosłanianą kontrolą przebadano wpływ na wzrost i plonowanie melona następujących osłon: z folii PE o 100 otworach na 1 m^2, z włókniny PP o masie 17 $g{\cdot}m^{-2}$, z czarnej folii PE do ściółkowania gleby, z czarnej folii PE do ściółkowania gleby + osłanianie roślin folią PE o 100 otworach na 1 m^2, z czarnej folii PE do ściółkowania gleby + osłanianie roślin włókniną PP. Analizując skład chemiczny owoców, wykazano, że zawartość suchej masy, kwasu L-askorbinowego i cukrów ogółem była większa w częściach jadalnych odmian heterozyjnych. Rodzaj osłony roślin i okrycia gleby istotnie różnicował poziom zawartości suchej masy w częściach jadalnych melona, natomiast nie powodował istotnych zmian w zawartości pozostałych składników organicznych. Poziom azotanów w owocach melona kształtował się w większości przypadków poniżej dopuszczalnej normy. Najmniejszą ich ilość nagromadziły owoce odmiany Oliwin z obiektu kontrolnego.

Słowa kluczowe: odmiana, folia PE, włóknina PP, sucha masa, związki organiczne, azotany

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