ACTA SCIENTIARUM POLONORUM *Acta Sci. Pol., Hortorum Cultus 9(4) 2010, 75-84*

THE YIELD AND NUTRITIVE VALUE OF SELECTED CARROT CULTIVARS WITH ORANGE – AND PURPLE – COLORED STORAGE ROOTS

Joanna Majkowska-Gadomska, Brygida Wierzbicka
University of Warmia and Mazury in Olsztyn

Abstract. The aim of an experiment conducted in 2006–2008 was to determine the effect of soil fertilization with Crop Care on the yield and chemical composition of carrot cultivars with orange- and purple-colored storage roots. The yield and chemical composition of three carrot cultivars: 'Florida F_1' with orange-colored roots, 'Deep Purple F_1' with purple-colored roots and 'Purple Haze F_1' with roots that have a purple cortex and an orange core were compared in this study. Plants were grown in control soil with sufficient quantities of nutrients to support the development of carrot roots as well as in soil additionally fertilized with Crop Care. The results of the study showed that carrots of cv. 'Florida F_1' produced a much higher total yield and marketable yield than carrots of cv. 'Deep Purple F_1' and 'Purple Haze F_1'. Additional fertilization significantly increased the marketable yield of the carrots. The edible parts of purple root cultivars were characterized by a higher content of dry matter, L-ascorbic acid and total carbohydrates. The application of the Crop Care fertilizer significantly increased the dry matter content of carrots. Roots of cv. 'Deep Purple F_1' contained the highest levels of N, K and Mg, while cv. Florida F_1 was most abundant in Ca and Na.

Key words: carrot, Crop Care, yield, L-ascorbic acid, sugars total, macroelements

INTRODUCTION

The biological value of plant material is determined by the hereditary characters of species, cultivars, environmental factors and the applied cultivation practices [Bąkowska-Barczak 2005, Cebula et al. 2006]. In the botanical classification system, carrot cultivars are divided into two groups: cultivars with orange-colored roots (*Daucus carota* ssp. *sativus* var. *sativus*) and purple-colored roots (*Daucus carota* ssp. *sativus* var. *atrorubens* Alef.) [Kammerer et al. 2004, Kidoń et al. 2008]. The yield, organic and nutrient content of carrot roots are determined mostly by the cultivar and growing con-

Corresponding author – Adres do korespondencji: Joanna Majkowska-Gadomska, Department of Horticulture, University of Warmia and Mazury in Olsztyn, ul. Prawocheńskiego 21, 10-957 Olsztyn, e-mail: majkowska-gadomska@uwm.edu.pl

ditions [Sady et al. 2000, Kołota and Biesiada 2000, Walczak and Sławiński 2000, Marchew. Wymagania… 2003, Wierzbicka et al. 2004]. According to the cited authors, the total and marketable yield of carrots with orange-colored storage roots ranged from 63 to 77 t·ha^{-1} and 57 to 74 t·ha^{-1}, respectively. The marketable yield of those cultivars had also a high share of the total yield (88–100%). The yield of carrots with purple-colored roots was lower, in the range of 50–60 t·ha^{-1}.

The objective of this study was to determine the effect of soil fertilization with Crop Care on the yield and the chemical composition of carrot cultivars with orange and purple-colored storage roots.

MATERIALS AND METHODS

The field experiment was carried out in 2006–2008 at the Experimental Station of the University of Warmia and Mazury in Olsztyn, in a randomized block design, in three replications. The first experimental factor were three carrot cultivars intended for industrial processing, grown on cultivation ridges: 'Florida F_1' with orange-colored roots, 'Deep Purple F_1' with purple-colored roots and 'Purple Haze F_1' with purple cortex and orange core of the roots.

The second experimental factor was fertilization. Carrots were grown in the next year after manure application, in brown soil of good rye complex with humus content of 2.8%, pH in H_2O of 7.1, salt content of 0.36 g·dm^{-3}, and the following nutrient content: P – 90 mg·dm^{-3}, K – 154 mg·dm^{-3}, Ca – 2880 mg·dm^{-3}, Mg – 146 mg·dm^{-3} and Cl – 16 mg·dm^{-3}. Mineral deficiencies were supplemented to the required levels. The soil was enriched with the Crop Care mineral fertilizer at a rate of 30 kg·ha^{-1}. The fertilizer contained N-P-K in the 10-10-20 ratio as well as the following micronutrients: MgO – 4.1%, CaO – 1.4%, S – 11.0%, B – 0.15%, Cu – 0.1%, Fe – 0.1%, Mn – 0.7%, Mo – 0.01%, Zn – 0.1%, Se – 0.01%. The fertilizer was applied to soil surface 14 days before sowing, and it was mixed thoroughly with soil.

The experiment was carried out in a randomized block design, in three replications. The experimental plot had an area of 7.5 m^2. The forecrop of carrots were cruciferous vegetables. Seeds were sown in the middle of May in each year of the study. The recommended cultivation practices for carrots were applied. Plants were harvested once, in mid October, and roots were sorted into fractions in accordance with the applicable standards and commercial requirements for carrots [Marchew. Wymagania… 2003]. Total yield and marketable yield are given in terms of t·ha^{-1}.

Immediately after harvest, 15 roots were sampled from the marketable yield in each treatment, and were subjected to chemical analyses to determine the content of:

– dry matter – by the gravimetric method where plant material was dried to constant mass at 105ºC (PN-90/A-75101/03),

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

– total sugars – by the method proposed by Luff-Schoorl (PN-90/A-75101/07).

To determine the mineral content of carrot edible parts, sliced roots were dried to constant mass at 65ºC and ground in an electric mill. The prepared material was forwarded to the Chemical and Agricultural Station in Olsztyn where it was mineralized and analyzed to determine the content of the following macronutrients: nitrogen (total) by potentiometry, phosphorus – by the vanadium-molybdate method, potassium – by flame photometry, magnesium – by atomic absorption spectrometry (AAS), calcium and sodium – by flame photometry. The study was carried out under Accreditation Certificate no. AB 277 issued by the Polish Center for Accreditation.

The results were validated statistically by analysis of variance. The significance of differences between means was evaluated with the use of Tukey's test at $\alpha = 0.05$.

RESULTS AND DISCUSSION

Carrots are popularly grown and consumed in Poland. They are the number one root vegetable and the third most common soil-grown vegetable as regards harvest yield and farming area. At present, farmers show a preference for cultivars with orange-colored roots, but the interest in cultivars with purple-colored edible parts is steadily on the rise. Those cultivars differ significantly as regards the morphological properties of roots and their applications in the food processing industry [Kidoń et al. 2008]. The seeds of two carrot cultivars with purple-colored roots, 'Deep Purple F_1' and 'Purple Haze F_1', are available on the Polish market.

The average carrot yield in Poland ranges from 30 to 90 $t \cdot ha^{-1}$ [Litka 2000]. It is affected by numerous factors, including the cultivar, cultivation method, fertilization levels and climatic conditions during the growing season. This was confirmed by a statistical analysis of carrot yield in successive years of the study (tab. 1). The results of this study also demonstrated that the analyzed cultivars had a significant effect on the yield of carrot storage roots. Cv. 'Florida F_1' with orange-colored roots produced the highest total and marketable yield, at 83.15 $t \cdot ha^{-1}$ and 57.33 $t \cdot ha^{-1}$, respectively, while

Table 1. Yield of carrot cultivars (mean values for 2006–2008)
Tabela 1. Plonowanie marchwi (mean values of 2006–2008)

Cultivar Odmiana	Fertilization Nawożenie	Total yield Plon ogółem	Marketable yield Plon handlowy
		$t \cdot ha^{-1}$	
Florida F_1	control – kontrola	77.30	41.37
	Crop Care	89.00	73.30
	mean – średnio	83.15	57.33
Deep Purple F_1	control – kontrola	54.60	25.30
	Crop Care	62.00	54.00
	mean – średnio	58.30	39.65
Purple Haze F_1	control – kontrola	56.00	25.30
	Crop Care	49.30	25.00
	mean – średnio	52.65	25.15
Mean – Średnio	control –kontrola	62.63	30.65
	Crop Care	66.76	50.76
LSD $NIR_{\alpha = 0.05}$			
Cultivar – Odmiana(a)		3.99	16.73
Crop Care (b)		n.s.	15.94
Interaction – Interakcja (a×b)		1.45	1.26

the yields of 'Purple Haze F_1' were low, at 52.65 t·ha^{-1}and 25.15 t·ha^{-1}, respectively. The obtained results are consistent with previous findings of Majkowska-Gadomska et al. [2007]. The yields of cv. 'Deep Purple F_1' and 'Purple Haze F_1' were lower and comparable with the values noted by other authors [Litka 2000]. The marketable yield of 'Purple Haze F_1' carrots had the lowest share of its total yield (fig. 1). The highest share of marketable yield in total yield was reported in respect of cv. 'Deep Purple F_1'. The application of the Crop Care fertilizer had a significant effect on marketable yield (tab. 1).

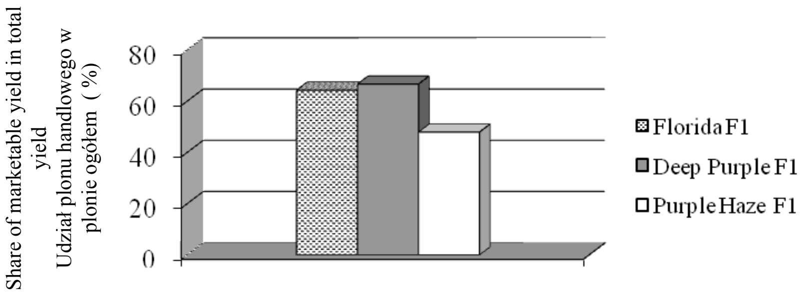

Fig. 1. Share of marketable yield in total yield, subject to cultivar
Rys. 1. Udział plonu handlowego w plonie ogółem w zależności od uprawianej odmiany

The share of marketable yield in total yield is an important characteristic feature of every carrot cultivar [Litka 2000, Majkowska-Gadomska et al. 2007]. In treatments fertilized with Crop Care, marketable yield increased by 27.44% in comparison with control (fig. 2).

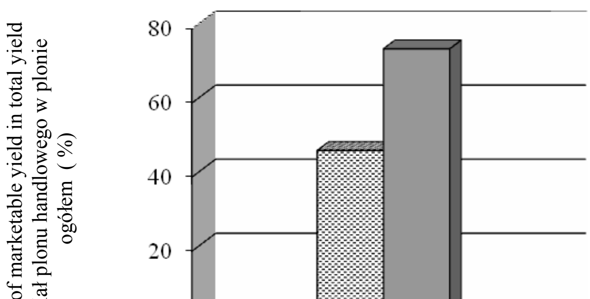

Fig. 2. Share of marketable yield in total yield, subject to fertilization
Rys. 2. Udział plonu handlowego w plonie ogółem w zależności od zastosowanego nawożenia

The interactions between the analyzed factors significantly influenced yield values, both in individual years and throughout the experimental period (tab. 1). Cv. 'Florida F_1' and 'Deep Purple F_1' produced higher yields in treatments enriched with the Crop Care fertilizer, while the opposite trend was noted for 'Purple Haze F_1'. The share of the investigated cultivars' marketable yield in total yield was higher in treatments fertilized with Crop Care than in control (fig. 3).

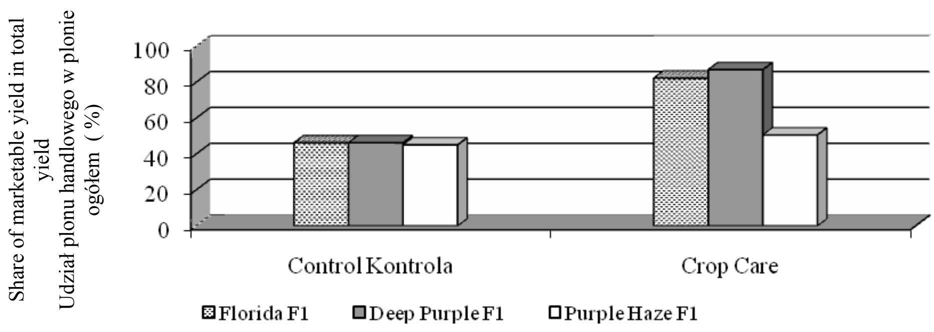

Fig. 3. Share of marketable yield in total yield, subject to cultivar and fertilization
Rys. 3. Udział plonu handlowego w plonie ogółem w zależności od odmiany i nawożenia

The chemical composition of carrot roots is a varietal features, and it may vary widely depending on habitat conditions [Wierzbicka et al. 2004, Gajewski et al. 2007]. Significant differences in dry matter content were affected by the investigated factors (tab. 2). Differences in L-ascorbic acid concentrations, subject to cultivar and fertilization rates, were statistically non-significant. Significant differences were found between the studied cultivars with respect to total sugars content, which was not influenced by fertilization. The interactions between the experimental factors had a significant effect on the content of organic elements, including L-ascorbic acid and sugars, in carrot roots.

The dry matter content of edible parts was similar to that observed by Łoś-Kuczera [1990] and Wierzbicka et al. [2004], and it ranged from 11.90 to 13.40%. In the analyzed group of cultivars, the highest dry matter content was found in 'Purple Haze F_1', and the lowest – in 'Florida F_1' carrots. Similar results were noted by Gajewski et al. [2007] in a study of the same cultivars. The application of a mixed fertilizer significantly increased the dry matter content of edible carrot parts.

Carrot roots contain small quantities of L-ascorbic acid. Neither cultivar nor fertilization had a significant effect on the content of L-ascorbic acid which differed only as a result of the interaction between the investigated factors. The highest quantities of L-ascorbic acid were accumulated by purple root carrots grown in the control treatment (9.78 mg·100 g^{-1}), while the lowest – by 'Florida F_1' grown in the control treatment and by 'Purple Haze F_1' carrots grown in soil fertilized with Crop Care (6.52 mg·100 g^{-1}). The above results are consistent with published data [Sady et al. 2000].

Table 2. Dry matter, L-ascorbic acid and total sugars content in carrot roots (mean values for 2006–2008)
Tabela 2. Zawartość suchej masy, kwasu L-askorbinowego oraz cukrów ogółem w korzeniach spichrzowych marchwi (mean values of 2006–2008)

Cultivar Odmiana	Fertilization Nawożenie	Dry matter Sucha masa	L-ascorbic acid Kwas L-askorbinowy	Sugars total Cukry ogółem
		%	mg·100 g^{-1} fw, św.m.	g·100 g^{-1} fw, św.m.
Florida F_1	control – kontrola	11.90	6.52	5.05
	Crop Care	12.05	8.48	4.90
	mean – średnio	11.97	7.50	4.97
Deep Purple F_1	control – kontrola	12.00	9.78	6.16
	Crop Care	12.86	7.83	7.85
	mean – średnio	12.43	8.80	7.00
Purple Haze F_1	control – kontrola	12.35	9.78	5.50
	Crop Care	13.40	6.52	4.90
	mean – średnio	12.87	8.15	5.20
Mean – Średnio	control – kontrola	12.08	8.69	5.57
	Crop Care	12.77	7.61	5.88
LSD – $NIR_{\alpha = 0.05}$				
Cultivar – Odmiana(a)		0.69	n.s.	0.70
Crop Care (b)		0.56	n.s.	n.s.
Interaction – Interakcja (a×b)		0.73	0.72	0.12

Carrot roots are a relatively rich source of carbohydrates. The edible parts of cv. 'Deep Purple F_1' and 'Purple Haze F_1' were also characterized by a significantly higher total carbohydrate content than Florida F_1 carrots. The highest carbohydrate levels were found in 'Deep Purple F_1' carrots grown in fertilized soil (7.85 g·100 g^{-1}), while fertilization produced an opposite effect in cv. 'Purple Haze F_1' and 'Deep Purple F_1' (4.90 g·100 g^{-1}). Their total carbohydrate content noted in this study was insignificantly higher than that reported by Wierzbicka et al. [2004], and it was similar to the findings of Jagosz et al. [2000] and Biological Tables data [1994].

Table 3. Mineral content of carrot roots (mean values for 2006–2008)
Tabela 3. Składniki mineralne w korzeniach spichrzowych marchwi (mean values of 2006–2008)

Cultivar Odmiana	Fertilization Nawożenie	N-total N-ogółem	P	K	Ca	Mg	Na
		g·100g^{-1}d. m. s.m.					
Florida F_1	control – kontrola	0.87	0.32	2.22	0.50	0.07	0.142
	Crop Care	1.02	0.35	2.31	0.47	0.08	0.064
	mean – średnio	0.94	0.33	2.26	0.48	0.07	0.103
Deep Purple F_1	control – kontrola	1.36	0.39	2.14	0.24	0.13	0.012
	Crop Care	1.15	0.38	2.77	0.42	0.08	0.070
	mean – średnio	1.25	0.39	2.45	0.33	0.10	0.041
Purple Haze F_1	control – kontrola	0.96	0.38	2.08	0.39	0.10	0.030
	Crop Care	0.96	0.30	2.06	0.32	0.11	0.037
	mean – średnio	0.96	0.34	2.07	0.35	0.10	0.033
Mean – Średnio	control – kontrola	1.06	0.36	2.14	0.37	0.10	0.061
	Crop Care	1.04	0.34	2.38	0.40	0.09	0.057
LSD – $NIR_{\alpha = 0.05}$							
Cultivar – Odmiana(a)		0.10	n.s.	0.24	0.09	0.02	0.03
Crop Care (b)		n.s.	n.s.	0.22	n.s.	n.s.	n.s.
Interaction – Interakcja (a×b)		0.01	0.02	0.01	0.10	0.01	0.01

Minerals also determine the nutritive value of edible carrot parts. Carrots are an abundant source of mineral salts, in particular potassium, phosphorus and calcium. The content of the following minerals in the edible parts of carrots was analyzed: N, P, K, Ca, Mg and N. The data in table 3 are similar to the values reported by Kunachowicz et al. [2006], Dyśko and Kaniszewski [2007].

The content of all investigated nutrients, except for phosphorus, in carrot roots was largely dependent on the cultivar (tab. 3). 'Deep Purple F_1' carrots with purple-colored roots contained more nitrogen, potassium and magnesium and showed a tendency to increased phosphorus levels than the orange-colored cultivar. Different results were noted as regards the calcium and sodium content which was significantly higher in 'Florida F_1 roots'.

The application of the Crop Care fertilizer had a statistically significant impact only on the potassium content of edible carrot parts. Potassium levels in fertilized treatments were higher than in the control treatment.

The interaction between the investigated factors produced significant differences in the chemical composition of carrot roots. Higher salt, nitrogen, phosphorus and magnesium levels were reported in 'Deep Purple F_1'carrots grown in the control treatment. 'Deep Purple F_1' carrots harvested in treatments with supplemental Crop Care fertilization had a higher potassium content. The highest calcium and sodium content was noted in carrots with orange-colored roots, grown in the control treatment. Lower nitrogen and magnesium levels were found in 'Florida F_1' carrots grown in the control treatment, while cv. 'Purple Haze F_1' from the treatment fertilized with Crop Care contained less phosphorus and potassium. 'Deep Purple F_1' roots from the control treatment contained significantly lower levels of calcium and sodium.

According to Kotowska and Wybieralski [1999], the nutritive value of edible vegetable parts is largely determined by the following ratios: K to Mg, Ca to Mg and K: (Mg + Ca). Nutrient ratios varied subject to the investigated cultivar and the interaction between cultivar and fertilization (tab. 4).

According to Radkowski et al. [2005], Majkowska-Gadomska and Wierzbicka [2008], the optimal Ca:Mg ratio should approximate 3, and the Ca:P ratio should be within the 1.2 – 2.2 range. A higher ratio is indicative of magnesium or phosphorus deficiency. As demonstrated by the results of this study, the highest magnesium deficiency in relation to calcium supply was observed in the edible parts of 'Florida F_1' carrots, while the roots of carrot cv. 'Purple Haze F_1' were marked by the most desirable Ca:Mg ratio. In the storage roots of cv. 'Florida F_1' and 'Purple Haze F_1', higher ratios of the studied nutrients were noted in the control treatment than in treatments with supplemental fertilization. The application of Crop Care increased the Ca:Mg ratio only in the edible parts of 'Deep Purple F_1', in comparison with control. The proportion between calcium and phosphorus noted in this study was similar to that reported by Radkowski et al. [2005]. All analyzed cultivars showed a wider potassium to magnesium ratio and a wider potassium to total magnesium and calcium ions ratio. According to Radkowski et al. [2005], the optimal ratios are K:Mg – 6:1 and K:(Mg + Ca) – 1.6–2.2. The highest K:Mg ratio was noted in 'Florida F_1' carrots grown in the control treatment, and the lowest – in 'Purple Haze F_1' carrots grown in the treatment fertilized with Crop Care. The potassium to total magnesium and calcium ions ratio was highest (5.78) in

'Deep Purple F_1' carrots, and lowest (3.89) – in 'Florida F_1' carrots grown in the control treatment.

Table 4. Selected nutrient ratios (mean values for 2006–2008)
Tabela 4. Wzajemne stosunki wybranych pierwiastków (mean values of 2006–2008)

Cultivar Odmiana	Fertilization Nawożenie	Ca : Mg	Ca : P	K : Mg	K : (Mg+Ca)
Florida F_1	control – kontrola	7.14	1.56	31.71	3.89
	Crop Care	5.87	1.34	28.87	4.20
	mean – średnio	6.50	1.45	30.29	4.04
Deep Purple F_1	control – kontrola	1.84	0.61	16.46	5.78
	Crop Care	5.25	1.07	34.62	5.54
	mean – średnio	3.54	0.84	25.54	5.66
Purple Haze F_1	control – kontrola	3.90	1.02	20.80	4.24
	Crop Care	2.90	1.06	18.72	4.79
	mean – średnio	3.40	1.04	19.76	4.51
Mean – Średnio	control – kontrola	4.29	1.06	22.99	4.63
	Crop Care	4.67	1.15	27.40	4.84
LSD – $NIR_{\alpha = 0.05}$					
Cultivar – Odmiana(a)		1.47	0.19	7.20	0.26
Crop Care (b)		n.s.	n.s.	n.s.	n.s.
Interaction – Interakcja (a×b)		0.10	0.01	0.07	0.07

Supplemental fertilization had no significant effect on nutrient proportions. A tendency to increased nutrient ratios in fertilized treatments was noted in comparison with the proportions observed in the roots of carrots grown in control soil.

CONCLUSIONS

1. The results of the present study show that cv. 'Florida F_1' with orange roots produced a significantly higher total yield and marketable yield than 'Deep Purple F_1' carrots with purple-colored roots and 'Purple Haze F_1' carrots with a purple cortex and an orange core.

2. The Crop Care fertilizer applied pre-sowing contributed to a significant increase in the average marketable yield of carrot storage roots of cv. 'Florida F_1' and 'Deep Purple F_1'.

3. The storage roots of cv. 'Deep Purple F_1' and 'Purple Haze F_1' were characterized by a higher content of dry matter, L-ascorbic acid and total carbohydrates, in comparison with the orange-colored roots of cv. 'Florida F_1'.

4. The storage roots of cv. 'Deep Purple F_1' contained the highest levels of nitrogen, potassium and magnesium, while the storage roots of cv. 'Florida F_1' were most abundant in calcium and sodium.

REFERENCES

Bąkowska-Barczak A., 2005. Acylated anthocyanins as stable, natural food colorants – a review. Pol. J. Food Nutr. Sci. 14/55(2),107–116.

Biological Tables. 1994. Adanandtan, Warszawa.

Cebula S., Kunicki E., Kalisz A., 2006. Quality changes in curds of white, green, and romanesco cauliflower during storage. Pol. J. Food Nutr. Sci. 15/56(2), 155–160.

Dyśko J., Kaniszewski S., 2007. Effect of drip irrigation, N-fertilization and cultivation method on the yield and quality of carrot. Veg. Crops Res. Bull. 67, 25–33.

Gajewski M., Szymczak P., Elkner K., Dąbrowska A., Kret A., Danilcenko H., 2007. Some aspects of nutritive and biological value of carrot cultivars with orange, yellow and purple-coloured roots. Veg. Crops Res. Bull. 67, 149–161.

Jagosz B., Żukowska E., Zabagło A., Czeladzka B., Michalik B., 2000. Porównanie składu chemicznego korzeni mieszańców F_1 i linii rodzicielskich marchwi (*Daucus carota).* Zesz. Nauk. AR w Krakowie 364(71), 109–112.

Kammerer D., Carle R., Sschieber A., 2004. Qualification of anthocyanins in black carrot extracts (*Daucus carota* ssp. *sativus* var. *atrorubens* Alef) and evaluation of their color properties. Eur. Food Res. Tech. 219, 479–489.

Kidoń M., Czapski J., Witrowa-Rajchert D., 2008. Możliwość zastosowania korzeni purpurowych odmian marchwi, jako surowca w przemyśle owocowo-warzywnym. Nowości Warzywnicze. 46, 5–27.

Kołota E., Biesiada A., 2000. Wpływ nawożenia dolistnego na plon i jakość korzeni marchwi. Rocz. AR Poznań 323, Ogrodnictwo 31(1), 331–335.

Kotowska J., Wybieralski J., 1999. Quantitative ratios between K, Ca and Mg in the soil and plants. Biul. Magnezol. 4(1), 104–110.

Kunachowicz H., Iwanow K., Nadolna I., Przygoda B., 2006. Tabele wartości odżywczej produktów spożywczych Wyd. Lekarskie, PZWL, Warszawa, 64–65.

Litka M., 2000. Warzywa korzeniowe marchew jadalna, burak ćwikłowy, seler korzeniowy. Synteza wyników doświadczeń odmianowych. Słupia Wielka. 1182, 10–38.

Łoś-Kuczera M., 1990. Food products, composition and nutritive value. Prace IŻŻ. Warszawa, 54, 153.

Majkowska-Gadomska J., Wierzbicka B., Nowak M., 2007. Yield of nine carrot cultivars grown for processing purposes in the Warmia region. Rocz. AR Poznań. ser. Ogrodnictwo 383, 559–563.

Majkowska-Gadomska J., Wierzbicka B., 2008. Content of basic nutrients and minerals in heads of selected varieties of red cabbage (*Brasicca oleracea* var. *capitata* f. *rubra*). Polish J. Environ. Stud. 17(2a), 295–298.

Marchew. Wymagania Jakości Handlowej. Commission Regulation (EC) No. 46/2003. www.ijhar-s.gov.pl/download/Marchew: p. 29.

Radkowski A., Grygierzec B., Sołek-Podwika K., 2005. Zawartość składników mineralnych w wybranych gatunkach i odmianach traw. J. Elementol. 10(1), 121–128.

Sady W., Robak J., Wiech K., 2000. Carrot growing. Plantpress sp. z o.o., Kraków.

Walczak R.T., Sławiński C., 2000. Fizyczne czynniki decydujące o wzroście i plonowaniu roślin warzywnych. Annales UMCS, Sect. EEE, supl. 8, 1–12.

Wierzbicka B., Pierzynowska-Korniak G., Majkowska-Gadomska J., 2004. Plonowanie dziewięciu odmian marchwi przeznaczonych dla przetwórstwa uprawianych w rejonie Warmii. Folia Univ. Agric. Stetin., Agricultura 239(95), 415–418.

PLONOWANIE I WARTOŚĆ ODŻYWCZA WYBRANYCH ODMIAN MARCHWI O POMARAŃCZOWYM I PURPUROWYM ZABARWIENIU KORZENI SPICHRZOWYCH

Streszczenie. Przedstawione wyniki dotyczą porównania plonowania i składu chemicznego trzech odmian marchwi o korzeniu pomarańczowym – 'Florida F_1', purpurowym – 'Deep Purple F_1' oraz o korze purpurowej i rdzeniu pomarańczowym – 'Purple Haze F_1'. Rośliny uprawiano na glebie kontrolnej zawierającej niezbędną ilość składników potrzebną do prawidłowego rozwoju korzeni spichrzowych marchwi oraz na glebie dodatkowo nawożonej nawozem Crop Care. Wykazano, że marchew odmiany 'Florida F_1' osiągnęła istotnie większy plon ogółem i handlowy w porównaniu z plonem roślin odmian 'Deep Purple F_1' oraz 'Purple Haze F_1'. Dodatkowe nawożenie wpłynęło istotnie na zwiększanie plonu handlowego korzeni. Odmiany marchwi o korzeniach purpurowych charakteryzowały się większą zasobnością części jadalnej w suchą masę, kwas L-askorbinowy oraz cukry ogółem. Dodatkowe nawożenie nawozem Crop Care spowodowały istotne zwiększenie zawartości suchej masy. Analizując zawartość składników mineralnych, wykazano, że odmiana 'Deep Purple F_1' zawierała w korzeniach spichrzowych najwięcej N, K, Mg, natomiast 'Florida F_1' Ca oraz Na.

Słowa kluczowe: marchew, Crop Care, plon, kwas L-askorbinowy, cukry ogółem, makroelementy

Accepted for print – Zaakceptowano do druku: 22.07.2010