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THE RELATIONSHIP BETWEEN MORPHOLOGICAL FEATURES AND NUTRITIVE VALUE OF SWEET PEPPER FRUITS

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Abstract. Sweet pepper cultivars of Polish breeding have a high biological potential predisposing them to cultivation in field conditions of moderate climatic zone. The aim of investigations was the description of the dependence between morphological features of pepper fruits and its nutritional value. The experiment was performed in 2008, 2009 and 2011 at the University of Agriculture in Krakow, Poland, on eleven *Capsicum annuum* L. cultivars of Polish origin ('Barbórka', 'Calipso', 'Caryca' F_1, 'Etiuda', 'Gloria', 'Iga', 'Lena', 'Mercedes', 'Mira', 'Oliwia', 'Ożarowska'). Fruits shape was diversified, from spherical ('Iga') to the slim conical ('Mercedes', 'Mira'). The fruits of greatest weight was typical for 'Barbórka', 'Caryca' F_1, 'Etiuda', 'Gloria' and 'Ożarowska'. Thick pericarp and high share of pericarp in weight of fruit were characteristic for all investigated genotypes, and differences with regard to this parameters were slight. 'Barbórka', 'Gloria', and 'Ożarowska' contained higher than average dry weight, soluble sugars and carotenoids contents for all tested cultivars. The relationships between fruit morphology parameters and chosen chemical parameters was shown on a base of regression analyses. Present results made possible to select the most valuable sweet pepper cultivars with respect to nutritional value and fruit morphology. This study also enables to select genotypes, destined for field cultivation in Polish climatic conditions, for different ways of utilization. The results can also be used in future breeding programs.

Key words: *Capsicum annuum* L., chemical composition, fruit morphology, correlations

INTRODUCTION

Sweet peppers are among the most popular vegetables because unique taste, attractive colour and high nutritional value. Studies on this crop are mainly focused on opti-

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mization of fruits chemical composition [Sun et al. 2007, Rembiałkowska and Hallmann 2008, Jayaprakasha et al. 2012] as well as the control of the yielding [Stoffella and Bryan 1988]. Such target of investigations is defined by the profitability of production and also the vegetable market demands with regard to fruit quality. Pepper can be used raw and processed into various kinds of products, so it is valuable material for frozen and processing industry. The Polish National List of Vegetable Plant Varieties [COBORU 2013] listed 57 pepper cultivars, most of them are dedicated for cultivation under covers, while open field production is also supported by economic regards. In Polish climatic conditions, the introduction of new pepper cultivars, well adapted for the field cultivation, is essential for the sustainable development of fresh vegetables' market and processing industry [Gajc-Wolska and Skąpski 2002]. Despite of stress conditions during open field cultivation, pepper fruits must customize the high frozen and processing industry demands, i.e. uniform morphological characteristics, proper technological features and chemical composition.

Sweet pepper cultivars are characterized by great diversity of fruit morphological characteristics and nutrient composition. Fruit colour changes during ripening, and can become white, yellow, orange, red, violet, and even chocolate-brown in a stage of harvest maturity [Simonne et al. 1997, Valšíková et al. 2006]. The most popular and valuable are cultivars of block type fruit (cube), but fruits can also take the form of cone, prism, ball, heart and many others [COBORU 2013]. The weight of the fruit in a stage of harvest maturity varies from a few dozen to a few hundred grams, this parameter is also an important feature of cultivar identity [Jakubas et al. 2013]. Recent studies highlight the important role of the pepper as a valuable source of biologically active substances of major importance for human health, through the prevention of civilization diseases [Howard et al. 2000, Sun et al. 2007] and pharmacological usefulness [Jayaprakasha et al. 2012]. The berries are a rich source of provitamin A, phenolics and flavonoids [Lee et al. 2005, Materska and Perucka 2005]. Haworth and Szent-Gyorgyi [1933] isolated first time ascorbic acid from a plant material: pepper cultivar commonly used in Hungary. Up to now, pepper is treated as a very important source of vitamin C and prevents many diseases through its antioxidant properties. Mature fruits contain E, P, H, and B vitamins and many minerals [Kmiecik and Lisiewska 1994, Seddon et al. 1994, Márkus et al. 1999, Wierzbicka and Kuskowska 2002, Jadczak et al. 2010, Shotorbani et al. 2013]. Red ripe fruits are high in total carbohydrates, inter alia fructose, glucose, and sucrose (29.14, 25.57, and 2.94 g 100 g^{-1} DW, respectively) [Bernardo et al. 2008]. Carbohydrates are responsible for the flavor of the fruit, and capsaicinoids (capsaicin and dihydrocapsaicin) – for their sharpness [Canto-Flick et al. 2008]. Calorific value of pepper is low, 100 g fresh product provides 25 kcal. The content of bioactive components depends on the ripeness stage of the fruit, cultivar, cultivation methods and the weather conditions during the growing season [Serrano et al. 2010].

The establishment of inter-dependencies between morphological and biological fruits features is a novel idea performed to analyze the basic phenomenon describing the peppers fruit quality. The novel and important utilitarian aspect is the recommendation of the most valuable genetic creations for proper way of exploitation. The aim of present investigations was the evaluation of Polish sweet pepper cultivars with respect to

morphological features and biological value for future breeding programs. The analyses of correlation and multiply regression were used for description of relationships among analyzed parameters to predict the fruit quality on a base of its morphology.

MATERIAL AND METHODS

Experiment design. The experiment was conducted in 2008, 2009 and 2011 at the Vegetable Experimental Station of University of Agriculture in Krakow, Poland. The material of the study was eleven cultivars of sweet pepper (*Capsicum annuum* L.) from three Polish breeding companies 'Gloria', 'Iga', 'Lena', 'Mira', 'Oliwia' (KHNO POLAN Ltd), 'Etiuda', 'Ożarowska' (PNOS, Ożarów Mazowiecki) and 'Barbórka', 'Calipso', 'Caryca' F_1, 'Mercedes' (PlantiCo, HNO). These cultivars were selected on the basis of the recommendations of the breeding companies, taking into account the differentiation in colour, size, and shape of the fruits, type of growth and yield earliness. In all years of the experiment the production of pepper seedlings started in the second 10-days of March, seeds were sown in the greenhouse. 21–29 days after seed sowing (depending on the cultivar) seedlings with developed first leaf were transplanted up to multipot trays with 40 cells, filled with standard peat substrate. After four weeks of growing in standard greenhouse conditions, seedlings were hardened for one week, through the lowering of temperature and reduction of watering and then planted out to the field at the end of May. The experiment was established with the method of random blocks in four replications. A single plot was of 4.8 m^2 area and included 24 plants in spacing 50 × 40 cm. Standard cultivation practices, recommended for pepper, were performed during growing season [Jakubas et al. 2013]. Mature fruits were harvested on 10 and 24 September (two harvests) in 2008; between 8 September and 2 October (three harvests) in 2009; and between 12 September and 10 October (three harvests) in 2011. The measurements and analyses were performed on twelve physiologically mature fruits from each replication. Fruits of typical shape, size and colour were collected from investigated cultivars during first harvest.

Morphology of fruits. Morphological characteristics of the fruit included: length, and width at the widest part of the fruit, shape coefficient (length : width ratio), the thickness of the pericarp, the weight of the whole fruit and the mass of pericarp.

Chemical composition of fruits. Pericarp of washed pepper fruits was grounded in a blender. The dry matter content was determined by drying at 105°C until constant weight was obtained, measured with Sartorius A120S, Germany. The total soluble sugars were determined by anthrone method [Yemm and Willis 1954], plant material was mixed with 80% ethanol, with anthrone reagent, the absorbance was measured at 625 nm with Helios Beta spectrophotometer (Thermo Fisher Scientific Inc., USA). Carotenoids contents were determined by the modified Lichtenthaler and Wellburn [1983] method, after acetone extraction from 0.1 g samples, at wavelength of 470 nm, with Helios Beta spectrophotometer. The content of L-ascorbic acid was assessed by the Tillmans method. Plant material (50 g) was mixed with 200 cm^3 CH_3COOH, and after 30 min extract was titrated with the reagent 2.6-dichlorophenolindophenol (Tillman's reagent). Phosphorus was determined by visible spectrophotometry at 460 nm using

colored phosphor-vanado-molybdenum complex, while potassium, calcium, magnesium, sodium, iron, zinc, manganese by atomic absorption spectrophotometer Varian SpectrAA 20 (V*arian Techtron* Pty, *Australia*) and air/acetylene flame under standard operating conditions.

The results were presented as the mean values of the three years for synthetic description. Data were elaborated with the use of one-way ANOVA, STATISTICA software (StatSoft Inc., USA), with the usage of HSD Tukey's test with $p < 0.05$. In order to determine the relationships between morphological characteristics and chemical components the linear Pearson correlation together with multiple linear regression analysis were elaborated on a base of 3-year means. The equations allowing to predict the main nutritional parameters as the function of independent morphological variables were proposed with a use of a multiply regression method. Coefficients of determination (R^2) were calculated to assess the accuracy of the obtained equations.

RESULTS AND DISCUSSION

The breeding program for sweet pepper lead to introduce an attractive cultivars with a high nutritional value, which will meet the exact demands of the vegetable market. The proper size, colour, shape, and a small share of the seeds in the mass of the fruit are basic quality characteristics for the sweet peppers, which are taken into account in the process of breeding [Wahyuni et al. 2013].

Present studies showed a significant difference in morphological characteristics of Polish cultivars of sweet pepper (tab. 1). The fruits were characterized by the length of 74.6–122.5 mm and width 59.8–85.7 mm. The shortest fruits were typical for 'Iga' and 'Calipso', while the longest – for 'Mira'. 'Mercedes' and 'Oliwia' had fruits of the smallest width, while 'Gloria' and 'Caryca' F_1 of the largest. Fruits of tested cultivars (with exception of 'Iga') were characterized by greater length than width, with a shape ratio value above 1.02. Long, conical fruits were typical for 'Mercedes' and 'Mira', and the spherical – for 'Iga' and 'Gloria'. Valšíková et al. [2006] also demonstrated high diversity in shape of 15 Slovak cultivars of pepper cultivated in an open field. Such diversity enlarge the attractiveness of fruits on fresh vegetable market and enable selection of proper fruit shape for different ways of processing.

The weight of the fruit was an important feature with a large variation between cultivars, ranged from 113.7 to 220.1 g. The smallest weight of a single fruit was obtained for 'Oliwia', 'Calipso' and 'Mercedes', an intermediate for 'Mira', 'Iga' and 'Lena', and the largest for 'Caryca' F_1, 'Barbórka', 'Ożarowska', 'Etiuda' and 'Gloria'. The statistical analysis showed only two homogeneous groups for the thickness of the pericarp, which indicated the slight differences between the cultivars with regard to this parameter, ranged from 6.77 to 8.98 mm. The thickest pericarp characterized fruits of 'Caryca' F_1, 'Barbórka' and 'Iga'. For industrial processing, the usable part of a fruit – pericarp, should compose above 75% of total fruit weight [Korzeniewska and Niemirowicz-Szczytt 2007, Jadczak et al. 2010]. In the present investigations the share of pericarp in a fruit weight (technological yield) was high and ranged from 82.1% 'Ożarowska' to 88.7% for 'Calipso'. The weight of pericarp was the lowest for 'Oliwia'

(90.0 g) and the highest for ‘‘Gloria’, ‘Etiuda’, Barbórka’, ‘Ożarowska’, and ‘Caryca’ F_1 (190.2–168.4 g).

Table 1. Morphological characteristics of sweet pepper fruits (means for 3 years)

Cultivar	Fruit length (mm)	Fruit width (mm)	Shape coefficient	Fruit weight (g)	Pericarp thickness (mm)	The pericarp weight (g)	The share of pericarp mass in fruit weight (%)
Barbórka	105.3 d*	77.0 cd	1.37 d	205.6 d	8.02 ab	175.4 c	85.3 abcd
Calipso	75.6 a	64.5 ab	1.17 b	123.9 ab	7.52 a	109.9 ab	88.7 d
Caryca F_1	86.5 b	82.3 ef	1.06 ab	196.1 d	8.98 b	168.4 c	85.9 abcd
Etiuda	95.7 c	79.6 de	1.20 bc	212.6 d	6.82 a	183.0 c	86.1 bcd
Gloria	86.6 b	85.7 f	1.02 a	220.1 d	7.43 a	190.2 c	86.4 bcd
Iga	74.6 a	75.2 cd	0.99 a	153.6 c	8.85 b	134.4 b	87.5 cd
Lena	99.0 cd	73.0 c	1.36 cd	159.4 c	6.77 a	132.0 b	82.8 ab
Mercedes	114.3 e	59.8 a	1.92 e	134.4 abc	7.50 a	115.4 ab	85.9 abcd
Mira	122.5 f	65.9 b	1.86 e	147.8 bc	7.07 a	125.2 b	84.7 abc
Oliwia	79.8 ab	59.8 a	1.34 cd	113.7 a	7.37 a	96.0 a	84.4 abc
Ożarowska	102.6 cd	76.4 cd	1.34 cd	208.0 d	6.88 a	170.8 c	82.1 a
Mean	94.77	72.65	1.330	170.47	7.565	145.52	85.44

* – values marked with the same letter do not differ significantly at $p < 0.05$

Valšíková et al. [2006] tested fifteen sweet pepper cultivars in relation to morphological features of a fruit. The mean fruit weight was lower and pericarp thickness was more differentiated than in the present elaboration. Jadczak et al. [2010] compared hybrid sweet pepper cultivars in field cultivation. Authors showed significant differences in fruit length, width and weight. Szafirowska and Elkner [2008] demonstrated lower fruit weight and thinner pericarp for ‘Caryca’ F_1 in comparison to ‘Mercedes’, nevertheless pepper morphological features were highly depended on the course of meteorological conditions during the vegetation period. In the climatic conditions of North-East Poland, Michalik [2010] obtained ‘Iga’, ‘Lena’ and ‘Mira’ fruits of twice lower weight than in the present investigations. In conditions of East Poland (Lublin) the mean weight of mature ‘Caryca’ F_1 fruits was 134.2 g and pericarp thickness – 8.8 mm [Rożek et al. 2012]. Buczkowska et al. [2014] also described ‘Caryca’ F_1 as a cultivar characterized by heavy fruits with thick pericarp. The cited and present results confirm, that climatic conditions strongly affect the fruit morphological parameters in open field cultivation. In Poland, the localization of sweet pepper plantations in the regions of favourable microclimate should be considered in future prospects.

Table 2. The content of nutritive constituents and pigments in sweet pepper fruits (means for 3 years)

Cultivar	Dry weight	Soluble sugars	L-ascorbic acid	Carotenoids
	(g·100 g^{-1} FW)		(mg·100 g^{-1} FW)	
Barbórka	9.00 h*	4.92 h	155.5 c	11.70 de
Calipso	8.50 e	4.28 e	171.0 d	4.53 a
Caryca F_1	8.73 g	4.51 f	136.5 b	6.97 b
Etiuda	8.69 g	4.64 fg	188.9 e	8.71 bc
Gloria	8.53 ef	4.64 fg	116.3 a	10.49 cd
Iga	7.76 d	4.12 de	190.5 e	12.91 e
Lena	7.18 b	3.70 b	169.6 d	9.57 cd
Mercedes	7.72 d	3.91 c	122.0 a	13.29 e
Mira	7.00 a	3.20 a	173.4 d	2.84 a
Oliwia	7.56 c	4.00 cd	186.8 e	4.52 a
Ożarowska	8.68 fg	4.75 g	135.8 b	11.28 de
Mean	8.123	4.243	158.75	8.800

* – abbreviation: see Table 1

The sweet pepper fruit taste is determined by soluble sugars, organic acids, and flavonoids composition and content [Eggink et al. 2012]. In the conditions of present experiment the dry weight of fruits was between 7.0 and 9.0 g·100g^{-1} FW and soluble sugars content of 3.20–4.92 g·100g^{-1} FW, with highest values of these constituents for 'Barbórka' and lowest – for 'Mira' (tab. 2). Rembiałkowska and Hallmann [2008] showed much lower dry weight content for 'Ożarowska'. The physiologically mature pepper fruits are valuable source of vitamin C and provitamin A in a human diet. Many investigations showed, that L-ascorbic acid and pigments content is depended not only on the cultivar but also on the stage of fruit maturity, growth conditions and method of cultivation [Deepa et al. 2006, Szafirowska and Elkner 2008, Michalik 2010]. The present experiment showed that all investigated cultivars were characterized by high content of L-ascorbic acid and carotenoids with a mean value of 158.75 and 8.000 mg·100g^{-1} FW, respectively. Marín et al. [2004] and Deepa et al. [2007] demonstrated that compounds of high antioxidant activity, like L-ascorbic acid and carotenoids, are found especially in physiologically mature fruits. In conditions of a present experiment the fruits were harvested in a stage of physiological maturity, when most of cultivars had red fruits with exception of 'Calipso', 'Mira', 'Oliwia' (yellow), and 'Etiuda' (orange). There was no evident connection between fruit colour and dry weight, and soluble sugars content in pericarp, however, yellow and orange fruits had high content of L-ascorbic acid but low – of carotenoids. According to Simonne et al. [1997], cultivars forming black, violet or white fruits contained lower amount of L-ascorbic acid in comparison to these with green, yellow, orange, red or bronze fruits. Zhang and Hamauzu [2003] showed that red

pepper fruits had higher content of ascorbic acid and carotenoids than yellow ones. It was confirmed by the present results only in regard to carotenoids while for ascorbic acid such relationship was not observed. These differences may be due to different cultivars and stages of fruit maturity analyzed by cited authors.

The mature pepper fruits are a rich source of mineral elements. Rubio et al. [2002] showed that contents of K, Mg, P, Fe, Cu, Zn, Mn and B were correlated with the phase of fruit development and increased with the fruit maturation from green to red colour. Lee et al. [2012] demonstrated the dependence between mineral composition and fruit location in plant profile. Fruits of lower nodes had higher content of N, P, K, and Mg as compared to higher ones, for Ca these differences were not significant. In the present experiment, mature fruits of cultivars 'Calipso' and 'Caryca' F_1 were the most valuable sources of potassium; 'Gloria', 'Mercedes' and 'Calipso' – phosphorus; 'Caryca' F_1 and 'Iga' – calcium; 'Barbórka' – magnesium, and sodium – especially 'Mercedes' and 'Ożarowska' (tab. 3). The highest level of iron was found for 'Barbórka' fruits, zinc for 'Mercedes' and manganese for 'Ożarowska'. Jadczak et al. [2010] determined significant differences in the content of macro- and microelements for seven sweet pepper genotypes cultivated in the open field in North-West Poland.

Table 3. The mineral content of sweet pepper fruits (means for 3 years)

Cultivar	K	P	Ca	Mg	Na	Fe	Zn	Mn
	(mg·100 g^{-1} FW)							
Barbórka	226 de	15.7 e	13.6 bc	12.4 e	0.533 c–e	0.727 d	0.313 c–e	0.152 ab
Calipso	238 f	17.2 f	13.5 a–c	11.5 d	0.506 b–d	0.691 cd	0.320 ef	0.170 a–c
Caryca F_1	231 ef	14.8 d	15.6 c	11.5 d	0.542 c–e	0.653 a–d	0.298 cd	0.120 a
Etiuda	212 ab	14.2 cd	14.1 bc	11.1 cd	0.460 a	0.706 cd	0.318 d–f	0.191 bc
Gloria	216 a–c	17.3 f	13.6 a–c	10.3 b	0.545 c–e	0.673 a–d	0.334 fg	0.190 bc
Iga	209 a	12.9 ab	15.2 c	8.6 a	0.543 c–e	0.558 ab	0.261 a	0.172 a–c
Lena	209 a	12.4 a	11.3 a	10.3 b	0.467 ab	0.592 a–c	0.272 ab	0.119 a
Mercedes	210 a	17.0 f	14.7 bc	11.2 d	0.565 e	0.605 a–d	0.354 g	0.140 ab
Mira	222 cd	12.5 a	12.5 ab	8.8 a	0.466 ab	0.543 a	0.299 c–e	0.167 a–c
Oliwia	222 cd	13.4 bc	12.7 ab	9.9 b	0.502 a–c	0.677 b–d	0.294 c	0.169 a–c
Ożarowska	219 bc	15.7 e	14.1 bc	10.4 bc	0.550 de	0.706 cd	0.292 bc	0.206 c
Mean	219.3	14.82	13.71	10.55	0.516	0.6482	0.3050	0.1632

* – abbreviation: see Table 1

Breeding for high level of bioactive compounds in fresh pepper pericarp have important health-related implications. This should be analyzed together with morphologi-

cal parameters to meet demands of processing industry. Among investigated cultivars, as the most valuable were those characterized by high dry weight, soluble sugars, L-ascorbic acid, and carotenoids content. Fruits of 'Babórka' and 'Gloria', and 'Ożarowska' contained higher than average amount of dry weight, soluble sugars and carotenoids. 'Barbórka' and 'Gloria' had also large fruits with thick pericarp and pericarp share in fruit mass comparable or higher than mean for all investigated cultivars.
The simple coefficients of correlation were counted to describe the relationships among morphological parameters of pepper fruit and its biochemical composition. The correlation matrix was analysed and significant relations were shown in Table 4 and Figure 1.

Table 4. Coefficients of correlation (r) between chosen biochemical parameters of sweet pepper fruits and morphological features

Specification	Fruit width	Fruit weight	Pericarp thickness
Dry weight	0.5904	0.8236	0.2552
	p = 0.056	p = 0.003	p = 0.449
Soluble sugars	0.7674	0.8818	0.2184
	p = 0.016	p = 0.002	p = 0.519
Calcium	0.3082	0.2721	0.8840
	p = 0.356	p = 0.418	p = 0.002

The positive relationship was found between fruit weight together with its width and dry weight and soluble sugars content. The positive correlation was also shown for pericarp thickness and calcium content. Tadesse et al. [2002] described a positive dependence between fresh matter of fruit and its physical parameters, like length, width and shape. Nielsen et al. [1991] divided pepper fruit development into three phases; during the last phase of ripening, fresh weight of fruit was stable, and the accumulation of hexoses, and degradation of starch and sucrose were observed. The increased level of soluble hexoses in ripening fruits may be the reason of positive correlations between soluble sugars content and weight and width of fruits.

The positive correlation between pericarp thickness and Ca content showed the proper nutrition in this element for all investigated cultivars. Ca is hardly mobile element so fruits are especially sensitive against its deficit. Marcelis and Ho [1999] found, that pepper cultivars more susceptible to blossom-end rot had a larger final size in the spring production than the resistant ones. Proper Ca management positively correlated with pericarp thickness is valuable characteristic genotypes included the present experiment.

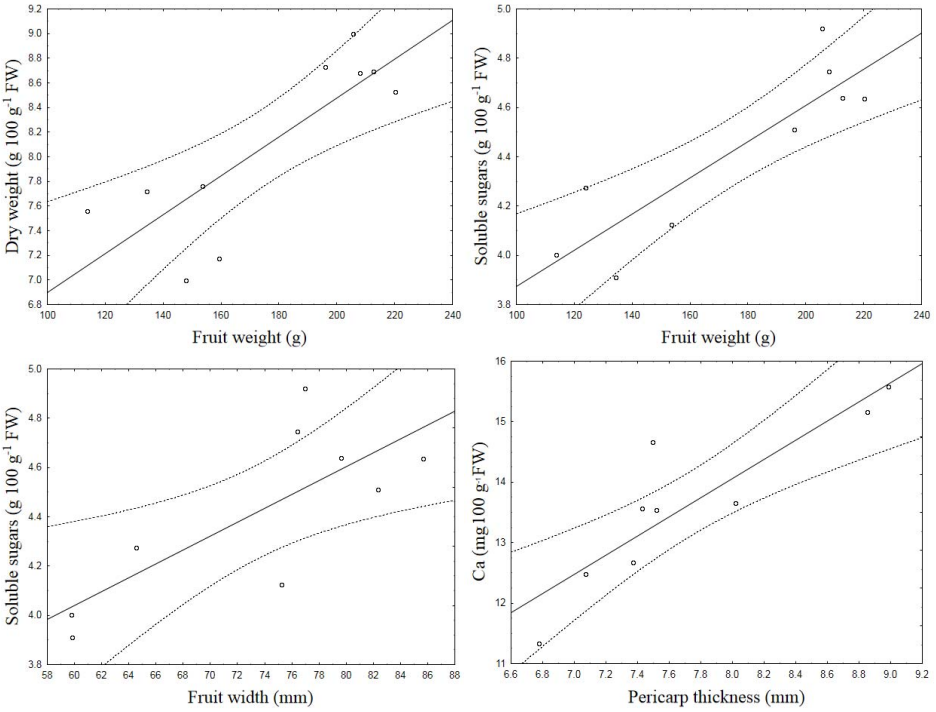

Fig. 1. Diagrams of dispersion between morphological parameters and chosen chemical constituents of sweet pepper fruit

The prediction of the main constituents determining fruit quality can be made on a basis of the regression equations:

„Dry weight" = 12.2281270 - 0.08173168 × „Fruit width" - 1.5903247 × „Shape coefficient" + 0.023156435 × „Fruit weight", $R^2 = 0.62$

„Soluble sugars" = 6.39954620 - 0.02161520 × „Fruit length" - 0.04696438 × „Fruit width" + 0.019372404 × „Fruit weight", $R^2 = 0.72$

"Calcium" = -9.3334630 - 0.22908172 × „Fruit length" + 0.292464358 × „Fruit width" + 14.8145491 × „Shape coefficient" + 0.501513242 × „Pericarp thickness", $R^2 = 0.33$

Coefficients of determination (R^2) for regression equations developed on the basis of 3-year values and ranged from 0.33 to 0.72. The highest values of R^2 proved that there was a high accuracy of the developed models for data on soluble sugars and dry weight. These constituents of pepper fruits could be well predicted as the function of morphological variables.

CONCLUSIONS

In the assortment the higher than medium fruit weight was identified for 'Gloria', 'Etiuda', 'Ożarowska', 'Barbórka' and 'Caryca' F_1. Fruits shape was diverse from spherical ('Iga') to the slim conical ('Mercedes', 'Mira'). All investigated cultivars formed fruits of thick pericarp and high share of pericarp in mass of fruit, the genotype differences with regard to this parameters were slight. Fruits of all genotypes were characterized by high content of L-ascorbic acid (116.3–190.5 mg·100 g^{-1} FW) and carotenoids (4.5–13.3 mg·100 g^{-1} FW). 'Barbórka', 'Gloria', and 'Ożarowska' contained higher than average content of dry weight, soluble sugars and carotenoids. Present results are also a guideline for selection of cultivars as valuable sources of micro- and macroelements. We showed the relationship between some fruit morphological parameters and chosen chemical constituents. Additionally the regression equations were proposed for precise prediction of chosen nutritional parameters of fruits on a basis of morphological features. Our study of sweet pepper assortment in field cultivation in Polish climatic conditions enables to select the most valuable genotypes for different ways of utilization.

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ZALEŻNOŚĆ POMIĘDZY CECHAMI MORFOLOGICZNYMI A WARTOŚCIĄ ODŻYWCZĄ OWOCÓW PAPRYKI SŁODKIEJ

Streszczenie. Odmiany papryki słodkiej polskiej hodowli mają wysoki biologiczny potencjał pozwalający na ich uprawę polową w warunkach klimatu umiarkowanego. Celem pracy było poszukiwanie zależności pomiędzy cechami morfologicznymi owoców a ich wartością odżywczą. W latach 2008, 2009 i 2011 w Uniwersytecie Rolniczym w Krakowie przeprowadzono badania jedenastu polskich odmian papryki słodkiej: 'Barbórka', 'Calipso', 'Caryca' F_1, 'Etiuda', 'Gloria', 'Iga', 'Lena', 'Mercedes', 'Mira', 'Oliwia', 'Ożarowska'. Kształt owoców był zróżnicowany, od kulistego ('Iga') do wydłużonego stożka ('Mercedes', 'Mira'). Owoce o dużej masie były charakterystyczne dla odmian

‘Barbórka’, ‘Caryca’ F_1, ‘Etiuda’, ‘Gloria’ i ‘Ożarowska’. Wszystkie porównywane genotypy cechowały się grubym miąższem i wysokim udziałem perykarpu w całej masie owoców. ‘Barbórka’, ‘Gloria’ i ‘Ożarowska’ zawierały więcej niż inne odmiany suchej masy, cukrów rozpuszczalnych i karotenoidów. Na podstawie analizy regresji wykazano powiązania korelacyjne pomiędzy niektórymi cechami owoców a zawartością składników odżywczych. Uzyskane wyniki mogą pomóc w wyborze najbardziej wartościowych odmian papryki słodkiej pod względem wartości odżywczej oraz morfologicznych cech owoców. Mogą być również wykorzystane przy doborze odmian o różnym zastosowaniu do uprawy polowej w warunkach polskiego klimatu oraz być użyteczne w przyszłych programach hodowlanych.

Słowa kluczowe: *Capsicum annuum*, skład chemiczny, morfologia owoców, korelacje

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