Evaluation of vegetable pepper assortment

M. VALŠÍKOVÁ, J. KRÁLOVÁ, I. BELKO

Research Institute of Vegetables, Nové Zámky, Slovak Republic

ABSTRACT: In the period between 2001 and 2003 selected biological, morphological and technological characteristics were experimentally investigated in the pepper assortment. 12 traits that are important characteristics of individual varieties were studied for different growing methods and for utilisation in breeding work.

Keywords: vegetable pepper; assortment; biological, morphological and technological characteristics; evaluation

In the production of vegetables attention should be focused on those sorts that can supplement deficient factors in our food such as ascorbic acid. Vegetable pepper is one of the most important sorts of vegetables for the production of deficient ascorbic acid.

In experiments we studied selected biological, morphological and technological characteristics of vegetable pepper assortments.

The aim of modern production of vegetables is to achieve not only high but also good-quality crop. The quality is taken to mean total external traits, internal composition and biological and nutritive value of vegetables.

MATERIAL AND METHODS

Experimental material consisted of 19 varieties of vegetable peppers. The investigated experimental material of vegetable peppers was grown on experimental plots of Research Institute of Vegetables in Nové Zámky. According to the suitability of sorts they were cultivated under plastic tunnels or in field trials. The methods

Table 1. Origin, year of registration, breeder and type of peppers

Variety	Origin	Breeding place	Year of registration in SR	Suitability for growing
Almapaprika	HU	Szentesi Mag Szentes	1998	FL
Amy	CZ	Semo Smržice	1996	PT
Andrea	SK	ŠS Kvetoslavov	1987	PT, GR, FL
Citrina	SK	ŠS Kvetoslavov	1977	FL
Fok	MD	VÚ Tiraspol	unregistered	FL
Golde	SK	ŠS Kvetoslavov	1995	FL
Granova	SK	ŠS Kvetoslavov	1987	FL
Imelská	SK	VÚZ Nové Zámky	2001	PT, GR
Lumina	MD	VÚ Tiraspol	unregistered	PT, FL
Lýdia	CZ	Semo Smržice	1996	PT, FL
Maryša	CZ	ŠS Čejč	1993	FL
Merišor	MD	VÚ Tiraspol	unregistered	PT, FL
Nesvadská	SK	VÚZ Nové Zámky	2003	PT
PCR	SK	ŠS Kvetoslavov	1967	PT, GR
Plameň	MD	VÚ Tiraspol	unregistered	FL
Rubinova	SK	ŠS Kvetoslavov	1988	FL
Slovakia	SK	ŠS Králová pri Senci	1995	FL
Zlata	SK	ŠS Kvetoslavov	1990	FL
Zorka	CZ	ŠS Čejč	1994	FL

SK – Slovak Republic, CZ – Czech Republic, HU – Hungary, MD – Moldavia, PT – plastic tunnel, GR – greenhouse, FL – field

Table 2. Evaluation of maturity, fruit shape, number of cells and flesh thickness

Variety	Maturity	Fruit shape	Number of cells	Flesh thickness (mm)
Almapaprika	medium	almost round	2–3	9.0
Amy	medium	conical	3–4	6.0
Andrea	medium late	tapered	3	8.0
Citrina	early	conical or blocky	3	8.0
Fok	medium	conical	2–3	7.0
Golde	medium	blocky	3–4	6.0
Granova	medium late	blocky	3	7.0
Imelská	medium	tapered	3	6.0
Lumina	medium	conical	3	8.0
Lýdia	medium	conical	2–3	4.0
Maryša	medium	conical	3–4	8.0
Merišor	medium	triangular	2–3	9.0
Nesvadská	medium	tapered	3	5.0
PCR	early	conical	2–3	5.0
Plameň	medium	conical	3	6.5
Rubinova	early	conical	2–3	8.0
Slovakia	very early	conical	3	6.0
Zlata	medium	conical	2–3	6.0
Zorka	medium	conical	3–4	6.0

Table 3. Evaluation of fruit size

Variety	Fruit size (mm)							
	2001		2002		2003		average	
	length	width	length	width	length	width	length	width
Almapaprika	37.50	52.10	38.10	50.80	39.20	51.40	38.26	51.43
Amy	135.00	70.00	138.80	71.10	137.20	72.90	137.00	71.00
Andrea	104.50	67.20	103.90	67.10	106.00	65.80	104.80	66.70
Citrina	92.80	63.10	93.80	62.80	94.90	61.80	93.83	62.56
Fok	121.40	21.00	120.00	20.00	123.00	21.70	121.40	20.90
Golde	69.50	54.10	67.20	53.10	69.70	55.00	68.80	54.06
Granova	88.90	38.10	89.80	39.20	91.30	40.00	90.00	39.10
Imelská	148.50	82.30	146.40	82.10	148.10	82.30	147.66	82.23
Lumina	116.50	58.40	115.80	58.30	116.30	59.00	116.20	58.56
Lýdia	152.00	50.00	153.80	51.00	154.10	51.60	153.30	50.86
Maryša	69.50	57.10	67.80	56.20	69.70	58.00	69.00	57.10
Merišor	54.20	82.70	55.50	84.00	57.10	83.70	55.60	83.46
Nesvadská	164.20	70.10	162.60	70.00	165.10	72.00	163.96	70.70
PCR	104.10	50.00	106.20	53.00	105.70	52.40	105.33	51.80
Plameň	116.80	51.00	118.00	52.00	119.20	53.00	118.00	52.00
Rubinova	95.80	60.20	97.10	60.80	96.90	61.10	96.60	60.70
Slovakia	121.50	62.00	120.00	62.10	124.00	62.60	121.83	62.23
Zlata	106.50	65.30	105.40	62.80	108.10	65.10	106.66	64.40
Zorka	84.00	42.00	86.00	40.00	89.00	43.00	86.33	41.66
Average	104.38	57.72	104.54	57.70	106.03	58.54	104.97	57.97

Table 4. Ascorbic acid content in green and red fruits

Variety	Ascorbic acid content (mg/1,000 g)							
	in green fruits				in red fruits			
	2001	2002	2003	average	2001	2002	2003	average
Almapaprika	20.53	19.22	17.83	19.19	22.64	31.51	29.82	27.99
Amy	17.06	18.82	20.11	18.66	27.05	31.41	31.73	30.06
Andrea	19.02	15.86	18.31	17.73	23.03	26.91	23.23	24.39
Citrina	15.81	14.64	17.13	15.86	22.08	24.23	27.16	24.49
Fok	18.60	19.30	21.80	19.90	26.00	28.90	29.30	28.06
Golde	10.92	14.36	21.58	15.62	16.95	21.71	22.88	20.51
Granova	17.44	19.85	17.22	18.17	28.04	30.53	31.11	29.89
Imelská	14.33	21.11	21.93	19.12	29.88	22.43	22.18	24.83
Lumina	19.24	21.12	19.50	19.95	20.00	21.41	22.93	21.45
Lýdia	15.82	17.93	20.05	17.93	28.83	31.16	31.21	30.40
Maryša	21.50	21.38	21.91	21.59	27.04	29.85	31.84	29.58
Merišor	20.50	17.69	21.15	19.78	30.41	29.45	27.41	29.09
Nesvadská	16.18	21.18	21.86	19.74	25.41	26.83	27.92	26.72
PCR	20.03	21.18	19.83	20.35	25.83	29.41	31.13	28.79
Plameň	19.00	19.42	21.15	19.85	28.60	29.30	27.60	28.50
Rubinova	19.82	21.16	19.41	20.13	25.88	29.63	20.03	25.18
Slovakia	15.15	15.38	14.93	15.15	17.02	19.88	20.01	18.97
Zlata	15.88	20.14	19.64	18.55	27.15	29.83	24.58	27.19
Zorka	15.98	17.13	20.08	17.73	25.15	29.84	30.52	28.50
Average	17.52	18.78	19.76		25.10	27.59	26.98	

of growing according to VALŠÍKOVÁ et al. (1996) were used. The varieties of vegetable pepper were evaluated by Descriptors for *Capsicum* (COLLECTIVE 1995). We compared the results in the years 2000–2003 and they are presented in Tables 1–5. All shown attributes introduce average values acquired by analyses of ten fruits in three frequents. Quantitative parameters were evaluated by measuring the length and width of pepper fruits. Ten fruits in three frequents were weighed on Sartorius 1264 MP digital scales. Ascorbic acid content in green fruits was determined by Tillmanns titration method, but in red fruits by the use of Whatman chromatographic paper. Other characteristics were found out visually (VITEKOVÁ 2002; KRÁLOVÁ, VALŠÍKOVÁ 2003).

RESULTS AND DISCUSSION

In Table 1 we documented the name of the variety, country of origin, name of breeding station, year of registration in the Slovak Republic and suitability for growing. In the evaluated collection of varieties there were 10 Slovak varieties, 4 Czech varieties, 4 Moldavian varieties and 1 Hungarian variety. Advisable varieties for growing under plastic tunnels or in greenhouses are: Amy, Imelská, Nesvadská and PCR. Suitable varieties for field conditions are: Almapaprika, Citrina, Fok, Golde, Granova, Maryša, Plameň, Rubinova, Slovakia, Zlata and Zorka. Andrea, Lýdia, Lumina and Merišor can be indicated as universal types of pepper variety.

Table 2 shows the duration of vegetation period, fruit shape, number of cells and fruit wall thickness. The varieties Slovakia, Citrina, PCR and Rubinova were very early and early. Medium late maturity was found in Andrea and Granova. All other varieties displayed medium maturity. At the same time we tested the fruit shape in longitudinal section. Tapered shaped fruits were found in the varieties Andrea, Imelská and Nesvadská. Almapaprika had an almost round shape of the fruit, and Golde and Granova were almost blocky shaped. The remaining varieties had an elongate conical shape, but Citrina could keep a conical or blocky shape. The number of cells was 2–3, 3, or 3–4. The thickness of the pepper fruit wall ranged between 4 mm and 9 mm. Lydia variety has the thinner wall and the thickest fruit wall was found in the varieties Almapaprika and Merišor.

Table 5. Evaluation of fruit colour, taste and their weight

Variety	Fruit colour		Fruit taste in botanical maturity	Fruit weight (g)			
	in technical maturity	in botanical maturity		2001	2002	2003	average
Almapaprika	light green	light red	sweet	49.20	58.30	59.40	55.63
Amy	white yellow	light red	sweet	114.00	118.50	120.60	117.70
Andrea	yellow green	light red	sweet	78.80	88.60	92.10	86.50
Citrina	yellow green	light red	sweet	87.80	96.30	98.70	94.26
Fok	light green	light red	very pungent	45.00	47.10	46.30	46.10
Golde	yellow	red	sweet	128.00	121.80	120.60	123.46
Granova	green	light red	sweet	113.00	115.80	117.60	115.46
Imelská	light green	red	pungent	134.00	137.40	139.10	136.83
Lumina	yellow green	light red	sweet	110.00	118.00	120.30	116.10
Lýdia	yellow green	light red	sweet	121.00	127.10	129.20	125.76
Maryša	light green	red	sweet	98.70	100.80	102.60	100.70
Merišor	light green	deep red	sweet	83.60	89.30	91.70	88.20
Nesvadská	light green	red	medium pungent	126.00	132.40	134.60	131.00
PCR	light green	red	pungent	83.90	98.80	96.50	93.06
Plameň	dark green	red	very pungent	68.00	72.00	70.60	70.20
Rubinova	green	deep red	sweet	98.70	100.80	101.60	100.36
Slovakia	light green	red	sweet	118.00	122.00	123.10	121.03
Zlata	yellow	light red	sweet	89.90	94.10	93.70	92.56
Zorka	light green	red	sweet	96.80	99.50	101.70	99.33
Average				97.07	102.03	103.15	

Table 3 shows the size of pepper fruits. There are data on the length and width of fruits in 2001–2003 and their average values. The longest fruits (between 116.20 and 163.6 mm) were measured in the varieties Amy, Fok, Imelská, Lumina, Lýdia, Nesvadská, Plameň and Slovakia. The biggest average fruit width was found in varieties Imelská (82.23 mm), Merišor (83.46 mm), Amy (71.00 mm), and Nesvadská (70.70 mm).

The content of ascorbic acid, which should not be lower than 10 mg/1,000 g, is also an important indicator of vegetables quality. We evaluated the ascorbic acid content in green fruits and in red fruits as well. The results are shown in Table 4. The average content of ascorbic acid in green fruits during the period of observations was highest in varieties Maryša (21.59 mg per 1,000 g), PCR (20.35 mg/1,000 g) and Rubinova (20.13 mg per 1,000 g). The lowest ascorbic acid content in green pepper was measured in varieties Slovakia (15.15 mg per 1,000 g), Golde (15.62 mg/1,000 g) and Citrina (15.86 mg/1,000 g). In red fruits the highest ascorbic acid content was found out in varieties Lydia (30.40 mg per 1,000 g), Amy (30.06 mg/1,000 g) and Granova (29.89 mg/1,000 g). The average content of ascorbic acid in green fruits was highest in 2003 (19.76 mg per 1,000 g). In red fruits the average ascorbic acid content was highest in 2002, namely 27.59 mg/1,000 g. The achieved results of ascorbic acid content are in agreement with the results of trials with another assortment of sweet pepper (VALŠÍKOVÁ 1981).

Taste characteristics of fruits are an important trait of pepper fruit quality. In the tested assortment varieties Imelská, Nesvadská, PCR, Fok, and Plameň are pungent. The remaining varieties are sweet (Table 5). As regards the weight of pepper fruits, the highest average weight was reached in varieties Imelská – 136.83 g, Nesvadská – 131.00 g and Lýdia – 125.76 g. The lowest average weight was found in varieties Fok – 46.10 g, Almapaprika – 55.63 g and Plameň – 70.20 g.

CONCLUSION

In the experimental years 2001–2003 a total 19 varieties of vegetable pepper was tested. Four varieties Amy, Imelská, Nesvadská and PCR are suitable for growing under plastic tunnels or in greenhouse. Eleven varieties Almapaprika, Citrina, Fok, Golde, Granova, Maryša, Plameň, Rubinova, Slovakia, Zlata and Zorka have been bred for field growing. The remaining varieties can be

used under plastic tunnels, in greenhouses and for field growing as well. The most popular varieties of consumers and producers in Slovakia have very early, early or medium maturity, fruits with conical or tapered shape, thick flesh, big size and yellow green or light green colour. These requirements are met by the varieties Imelská, Lumina, Maryša, Nesvadská, Rubinova and Slovakia. Perhaps 70% of consumers prefer sweet peppers and 30% of consumers like peppers with hot taste. Producers-exporters give a priority to sweet tasted peppers.

Our results in Tables 1–5 confirm a wide variability range of pepper varieties in all traits, and a high biological potential of pepper sorts.

References

COLLECTIVE, 1995. Descriptors for *Capsicum*. Rome, IPGRI: 49.

KRÁLOVÁ J., VALŠÍKOVÁ M., 2003. Štúdium genofondu zeleninovej papriky v roku 2002. Genofond. Informačný spravodajca VÚRV, č. 7: 13–15.

VALŠÍKOVÁ M., 1981. Morfologické znaky zeleninovej papriky. Sborník ÚVTIZ – Zahradnictví, *8*: 191–198.

VALŠÍKOVÁ M. et al., 1996. Produkčné systémy vybraných druhov zelenín. I. časť. Nové Zámky, VŠÚZŠP: 201.

VITEKOVÁ A., 2002. Monitoring of genetic resource collections of vegetables and medicinal plants in the year 2000. Scientific and Research Papers, No 11. Nové Zámky, Research Institute of Vegetables: 120–125.

Received for publication January 26, 2004
Accepted after corrections March 29, 2004

Hodnotenie sortimentu papriky

ABSTRAKT: V rokoch 2001–2003 sme experimentálne sledovali vybrané biologické, morfologické a hospodárske vlastnosti sortimentu paprík. Pestované odrody zeleninovej papriky sme hodnotili pomocou medzinárodného klasifikátora pre papriku. Výsledky pozorovaní sú dokumentované v tab. 1–5. Všetky uvedené hodnoty sú priemerné, získané analýzou desiatich plodov v troch opakovaniach. Veľkostné parametre sa získali meraním pomocou pravítka – tých paprík, ktoré sa vážili. Ostatné vlastnosti sa zisťovali vizuálne. Obsah vitamínu C v zelených plodoch sme stanovovali titráciou a v červených plodoch pomocou chromatografického papiera značky Watman. Hmotnosť plodov je výsledkom váženia desiatich plodov na digitálnych váhach značky Sartorius 1264 mp. Sledované znaky sú dôležitým ukazovateľom vlastností jednotlivých odrôd pre rôzne spôsoby pestovania a súčasne sú využiteľné pri šľachtiteľskej práci. Pri komplexnom hodnotení sa najlepšie ukázali odrody: Imelská, Nesvadská na rýchlenie, Slovakia a Lumina na rýchlenie aj na poľné pestovanie, a na poľné pestovanie boli najvhodnejšie odrody: Golde, Rubinova, Maryša a Citrina. Týmto sledovaním dokumentujeme aj veľkú variabilitu sortimentu paprík vo všetkých znakoch, ale aj široký biologický potenciál papriky.

Kľúčové slová: zeleninová paprika; sortiment; biologické, morfologické a technologické vlastnosti; hodnotenie

Corresponding author:

Doc. Ing. MAGDALÉNA VALŠÍKOVÁ, Ph.D., Výskumný ústav zeleninársky, Andovská 6, 940 01 Nové Zámky, Slovenská republika
tel.: + 421 35 640 07 95, fax: + 421 35 640 18 92, e-mail: valsikovam@vuznz.sk