

Study of some characteristics of vegetable pepper varieties

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ABSTRACT: In three test years an assortment of 15 varieties of vegetable pepper (*Capsicum annuum* L.) were grown in field conditions to study experimentally some of their morphological and biological properties. Mean plant height ranged from 435.7 mm (cv. Lastočka) to 636.7 mm (cv. Srbská). The smallest fruits had cultivars Čerešňová and Kecskeszarv with the weight of 4.86 g and 17.68 g. Average weight was the highest at varieties Pola kapia (92.23 g) and Melišor (91.92 g). The biggest length of mature leaves over 100 mm was measured at varieties Dolmy, Podarok Moldavy and Tuba; the smallest leaves according to length and width had variety Čerešňová. The mean vitamin C content in fruits about 2,000 mg/kg at green mature stage was found in cv. Bohatýr, Čerešňová and Podarok Moldavy. The highest vitamin C content in red fruits was analyzed at cv. Čerešňová (2,551.0 mg/kg) and Lastočka (2,422.2 mg/kg). Other observed characteristics were colour, shape and taste of fruits, colour of leaves and fruit wall thickness.

Keywords: vegetable pepper; assortment; evaluation

Vegetable pepper presents a very valuable vegetable for human nutrition; it has favourable material structure and particularly high content of vitamin C. It is therefore suitable for direct consumption as well as for processing. According to the taste of fruits pepper varieties can be distinguished as sweet and hot. Vegetable pepper is processed into various kinds of salads, meals and sterilized products. Pepper is also utilized as a raw material in frozen industry. In Slovak production practice up to a hundred of vegetable pepper varieties from domestic and foreign assortment are used. In the List of registered varieties for year 2005, 176 cultivars of *Capsicum annuum* L. are registered; 160 of them are sorts of vegetable pepper, 1 cherry pepper, 13 spice peppers and 2 hobby peppers. The huge amount of pepper varieties in a relatively small market space requires a continual testing of their properties. VALŠÍKOVÁ (1985) studied an assortment of vegetables to evaluate them in large-scale production. Other similar works evaluated vegetable cultivars from various views (VALŠÍKOVÁ, VITEKOVÁ 1999; VALŠÍKOVÁ et al. 2004; POKLUDA 2003). The present research is focused on the study of 15 varieties of *Capsicum annuum* L. as genetic resources for utilization in breeding works.

MATERIALS AND METHODS

Experiments were conducted in an open field of the Research Institute of Vegetables in Nové Zámky. The region of Nové Zámky is situated in

South Slovakia with the altitude of 120 m above sea level, the average rainfall 546 mm per year, and the average temperature 9.9°C per year. Fifteen cultivars of *Capsicum annuum* were included in the experiment. Peppers were grown by common agronomic technologies (VALŠÍKOVÁ et al. 1996). In the period between 2003 and 2005 selected morphological and biological characteristics were investigated by the Descriptor for *Capsicum* (COLLECTIVE 1995). Presented attributes introduce average values acquired by analyses of ten plants or fruits in three trials. Quantitative parameters were evaluated by measuring the length and width of leaves. Fruits were weighed on Sartorius 1264 MP digital scales; vitamin C content in green fruits was determined by Tillman's titration method, in red fruits by the use of Whatman chromatographic paper. Other characteristics were evaluated visually (KRÁLOVÁ, VALŠÍKOVÁ 2003; VITEKOVÁ 2002).

RESULTS AND DISCUSSION

The morphological characteristics of *Capsicum* varieties in Table 1 show the height of plants and weight of fruits. The highest plants were recorded during the given period in cultivar Srbská (636.7 mm) and the smallest plants had Lastočka (435.7 mm). The highest average fruit weight was measured at varieties Pola kapia (92.23 g) and Melišor (91.92 g); cherry pepper Čerešňová had tiny fruits with average weight of 4.86 g.

Table 1. Height of plants and weight of fruits

| Varieties of vegetable pepper | Average height of plants (mm) | | | | Average weight of fruits (g) | | | |
|-------------------------------|-------------------------------|-------|-------|---------|------------------------------|-------|-------|---------|
| | 2003 | 2004 | 2005 | Average | 2003 | 2004 | 2005 | Average |
| Alma Evita | 574 | 579 | 560 | 571.0 | 43.7 | 42.8 | 41.30 | 42.60 |
| Aurea | 600 | 590 | 590 | 593.3 | 78.5 | 76.2 | 73.48 | 76.06 |
| Bohatýr | 484 | 497 | 500 | 493.7 | 33.9 | 32.8 | 31.20 | 32.63 |
| Botond | 468 | 470 | 470 | 469.3 | 34.1 | 33.9 | 33.70 | 33.90 |
| Čerešňová | 608 | 610 | 630 | 616.0 | 4.62 | 4.98 | 4.98 | 4.86 |
| Dolmy | 605 | 618 | 620 | 614.3 | 58.3 | 62.9 | 61.01 | 60.74 |
| Fok | 478 | 480 | 480 | 479.3 | 40.6 | 42.8 | 43.90 | 42.43 |
| Jova | 489 | 493 | 490 | 490.7 | 38.6 | 39.2 | 38.60 | 38.80 |
| Kecskeszarv | 547 | 525 | 560 | 544.0 | 17.96 | 18.1 | 16.98 | 17.68 |
| Lastočka | 430 | 437 | 440 | 435.7 | 34.5 | 37.9 | 36.70 | 36.37 |
| Merišor | 593 | 607 | 620 | 606.7 | 93.6 | 91.3 | 90.86 | 91.92 |
| Podarok Moldavy | 447 | 458 | 462 | 455.7 | 61.3 | 62.9 | 58.20 | 60.80 |
| Pola kapia | 558 | 561 | 570 | 563.0 | 90.5 | 93.4 | 92.80 | 92.23 |
| Srbská | 630 | 640 | 640 | 636.7 | 25.9 | 27.4 | 24.43 | 25.91 |
| Tuba | 585 | 600 | 580 | 588.3 | 33.9 | 32.8 | 32.78 | 33.16 |
| Average | 539.7 | 544.3 | 547.5 | | 46.0 | 46.63 | 45.39 | |

In Table 2 are documented the mean length and width of leaves. Cultivars with large leaves were Dolmy, Podarok Moldavy and Tuba with average length between 106.0 and 113.3 mm. According to length and width of leaves the cherry pepper Čerešňová had the smallest leaves.

Data about the content of vitamin C in green and red fruits are presented in Table 3. The highest vitamin C content in green mature stage above 2,000 mg/kg was found in cultivars Bohatýr, Čerešňová and Podarok Moldavy. In red fruits the highest content of vitamin C was observed in varieties of Čerešňová

Table 2. Length and width of leaves

| Varieties of vegetable pepper | Average length of leaves (mm) | | | | Average width of leaves (mm) | | | |
|-------------------------------|-------------------------------|------|------|---------|------------------------------|------|------|---------|
| | 2003 | 2004 | 2005 | Average | 2003 | 2004 | 2005 | Average |
| Alma Evita | 94 | 92 | 92 | 92.7 | 52 | 54 | 52 | 52.7 |
| Aurea | 89 | 83 | 89 | 87.0 | 52 | 54 | 54 | 53.3 |
| Bohatýr | 86 | 84 | 84 | 84.7 | 40 | 42 | 40 | 40.7 |
| Botond | 95 | 99 | 98 | 97.3 | 46 | 48 | 49 | 47.7 |
| Čerešňová | 79 | 76 | 74 | 76.3 | 30 | 34 | 32 | 32.0 |
| Dolmy | 116 | 112 | 112 | 113.3 | 47 | 49 | 49 | 48.3 |
| Fok | 93 | 96 | 90 | 93.0 | 51 | 49 | 48 | 49.3 |
| Jova | 68 | 65 | 65 | 66.0 | 41 | 44 | 41 | 42.0 |
| Kecskeszarv | 89 | 86 | 87 | 87.3 | 49 | 45 | 49 | 47.7 |
| Lastočka | 82 | 82 | 82 | 82.0 | 43 | 46 | 41 | 43.3 |
| Merišor | 98 | 97 | 92 | 95.7 | 57 | 59 | 57 | 57.7 |
| Podarok Moldavy | 109 | 106 | 106 | 107.0 | 56 | 53 | 51 | 53.3 |
| Pola kapia | 97 | 95 | 95 | 95.7 | 52 | 54 | 52 | 52.7 |
| Srbská | 87 | 90 | 90 | 89.0 | 37 | 38 | 39 | 38.0 |
| Tuba | 106 | 109 | 103 | 106.0 | 43 | 43 | 42 | 42.7 |
| Average | 92.5 | 91.5 | 90.6 | | 46.4 | 47.5 | 46.4 | |

Table 3. Content of vitamin C in green and red fruits

| Varieties of vegetable pepper | Average vitamin content in green fruits (mg/kg) | | | | Average vitamin content in red fruits (mg/kg) | | | |
|-------------------------------|---|---------|---------|---------|---|---------|---------|---------|
| | 2003 | 2004 | 2005 | Average | 2003 | 2004 | 2005 | Average |
| Alma Evita | 1,984 | 1,976 | 1,958 | 1,972.7 | 2,351 | 2,331 | 2,370 | 2,350.7 |
| Aurea | 1,744 | 1,822 | 1,792 | 1,786.0 | 2,166 | 2,151 | 2,142 | 2,153.0 |
| Bohatýr | 2,028 | 2,041 | 2,091 | 2,053.3 | 2,093 | 2,084 | 2,116 | 2,097.7 |
| Botond | 1,985 | 1,977 | 1,944 | 1,968.7 | 2,002 | 2,011 | 2,002 | 2,004.9 |
| Čerešňová | 2,081 | 2,101 | 2,094 | 2,092.0 | 2,568 | 2,491 | 2,594 | 2,551.0 |
| Dolmy | 1,411 | 1,498 | 1,515 | 1,474.7 | 2,047 | 2,005 | 2,028 | 2,026.7 |
| Fok | 1,818 | 1,965 | 1,883 | 1,888.7 | 2,100 | 2,077 | 2,102 | 2,092.8 |
| Jova | 1,683 | 1,799 | 1,734 | 1,738.7 | 2,204 | 2,226 | 2,282 | 2,237.3 |
| Kecskeszarv | 1,982 | 2,001 | 1,972 | 1,984.8 | 2,288 | 2,413 | 2,340 | 2,346.9 |
| Lastočka | 1,925 | 1,877 | 1,773 | 1,858.3 | 2,483 | 2,331 | 2,453 | 2,422.2 |
| Merišor | 1,522 | 1,558 | 1,409 | 1,496.2 | 2,321 | 2,337 | 2,336 | 2,331.3 |
| Podarok Moldavy | 2,048 | 2,092 | 2,038 | 2,059.2 | 2,186 | 2,296 | 2,283 | 2,255.1 |
| Pola kapia | 1,546 | 1,588 | 1,577 | 1,570.3 | 2,041 | 2,028 | 2,039 | 2,036.0 |
| Srbská | 1,755 | 1,835 | 1,758 | 1,782.7 | 2,301 | 2,322 | 2,332 | 2,318.2 |
| Tuba | 1,988 | 1,955 | 1,955 | 1,966.0 | 2,263 | 2,221 | 2,282 | 2,255.3 |
| Average | 1,833.3 | 1,872.3 | 1,832.8 | | 2,227.6 | 2,221.6 | 2,246.7 | |

2,551.0 mg/kg and Lastočka 2,422.2 mg/kg. Average content of vitamin C in tested assortment was higher compared to the available data (KOPEC 1998).

Table 4 shows differences of cultivars in colour of fruit at green mature stage, shape of longitudinal section, shape of cross section, thickness of fruit wall, taste of fruit and colour of leaves (COLLECTIVE 1995). The fruit colour at green mature stage

is dark green at Čerešňová cultivar, medium green at Fok and Pola kapia. The others were light green, yellow green, green yellow, yellow, white yellow or white cream. The shape of longitudinal fruit cut is flattened at cultivars Alma Evita, Čerešňová and Merišor, triangulated at Podarok Moldavy and Tuba. Rest of sorts have conical and trapezium shape. Round shape of fruit diameter section was observed

Table 4. Other chosen morphology characteristics

| Varieties of vegetable pepper | Colour of fruits in green mature stage | Shape of fruits in longitudinal section | Shape of fruits in cross section | Average fruit wall thickness (mm) | Taste of fruits | Colour of leaves |
|-------------------------------|--|---|----------------------------------|-----------------------------------|-----------------|------------------|
| Alma Evita | white yellow | flattened | circled | 4 | sweet | medium green |
| Aurea | green yellow | trapezium | quadratic | 6–6.5 | sweet | medium green |
| Bohatýr | light green | trapezium | quadratic | 5–5.5 | sweet | medium green |
| Botond | yellow | flimsy conical | circled | 2 | sweet | dark green |
| Čerešňová | dark green | flattened | circled | 1.4 | hot | dark green |
| Dolmy | yellow green | conical | quadratic | 8 | sweet | medium green |
| Fok | medium green | trapezium | quadratic | 4 | hot | medium green |
| Jova | yellow green | flattened | circled | 6 | sweet | medium green |
| Kecskeszarv | yellow green | flimsy long | circled | 1.8 | hot | medium green |
| Lastočka | light green | conical | quadratic | 6 | sweet | medium green |
| Merišor | white cream | flattened | circled | 6 | sweet | medium green |
| Podarok Moldavy | light green | triangulated | quadratic | 5–6 | sweet | medium green |
| Pola kapia | medium green | trapezium | quadratic | 9 | sweet | dark green |
| Srbská | green yellow | trapezium | quadratic | 6 | sweet | dark green |
| Tuba | green yellow | triangulated | circled | 2 | hot | medium green |

at cultivars Alma Evita, Botond, Čerešňová, Kecskeszarv, Melišor, and Tuba. Thickness of fruit flesh wall ranged between 1.4 mm and 9 mm; thick-fleshed varieties were Aurea, Dolmy and Pola kapia; Botond, Čerešňová, Kecskeszarv and Tuba belong among varieties with thin fruit wall. The remaining cultivars had medium fruit flesh. As for taste, pungent taste of fruits was found at cultivars Čerešňová, Fok, Kecskeszarv and Tuba. Medium green colour of plant foliage prevailed; except cultivars Čerešňová, Pola kapia and Srbská with dark green leaves. The results of assortment evaluation brought different values. The significant variability depends on varieties. Similar conclusion was made by the study of root parsley cultivars (POKLUDA 2003).

CONCLUSION

In the assortment the medium plant height (435.7 to 544.0 mm) was identified at *Capsicum* cultivars Lastočka, Jova, Fok, Bohatýr, Botond, Podarok Moldavy and Kecskeszarv. The tall plants (563.0–636.7 mm) were recorded at cultivars Alma Evita, Aurea, Čerešňová, Dolmy, Merišor, Pola kapia, Srbská and Tuba. High fruit weight from 76.06 to 92.23 g had varieties Pola kapia, Merišor and Aurea; medium weight of fruits (42.43–60.8 g) was identified by cultivars Alma Evita, Fok, Dolmy, Podarok Moldavy; low weight (25.91–38.80 g) at Tuba, Srbská, Lastočka, Jova, Botond and Bohatýr; and very low (4.86–17.68 g) at Čerešňová and Kecskeszarv. The highest vitamin C content in green mature stage above 2,000 mg/kg was found in cultivars Bohatýr, Čerešňová and Podarok Moldavy. In red fruits the highest content of vitamin C was observed in varieties Čerešňová (2,551.0 mg/kg) and Lastočka (2,422.2 mg/kg). Other tested attributes were colour, shape, taste of fruits, colour of leaves and thickness of fruit wall. The study of various signs and char-

acteristics of pepper assortment enables to select biological material suitable for alternative growing technology. Results guide to a better orientation among a huge number of new cultivars. Obtained data can be used for breeding purposes.

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Štúdium niektorých vlastností odrôd zeleninovej papriky

ABSTRAKT: V trojročných pokusoch sa pestovalo 15 odrôd zeleninovej papriky (*Capsicum annuum* L.) v plných podmienkach. Experimentálne sa sledovali morfológické a biologické parametre. Priemerná výška rastlín sa pohybovala medzi 435,7 mm (odroda Lastočka) a 636,7 mm (Srbská). Najmenšie plody mali odrody Čerešňová a Kecskeszarv s hmotnosťou 4,86 g a 17,68 g. Najväčšia hmotnosť bola nameraná pri odrodách Pola kapia (92,23 g) a Melišor (91,92 g). Najdlhšie listy nad 100 mm boli namerané pri odrodách Dolmy, Podarok Moldavy a Tuba. Najmenšie listy podľa ich dĺžky a šírky mala odroda Čerešňová. Priemerný obsah vitamínu C nad 2 000 mg/kg v plodoch technologickej

zrelosti sa zistil pri odrodách Bohatýr, Čerešňová a Podarok Moldavy. Najviac vitamínu C v červených plodoch bolo v odrodách Čerešňová (2 551,0 mg/kg) a Lastočka (2 422,2 mg/kg). Ďalšie sledované vlastnosti boli farba, tvar a chuť plodov, farba listov a hrúbka oplodia plodov. Štúdium rôznych znakov a vlastností sortimentu papriky umožňuje vybrať vhodný biologický materiál pre rôzne technológie pestovania. Výsledky vedú k lepšej orientácii medzi veľkým množstvom nových odrôd. Získané údaje môžu byť využité pre šľachtiteľské práce.

Kľúčové slová: paprika zeleninová; sortiment; hodnotenie

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