

Main characteristics of new plum cultivars bred at Holovousy

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Abstract

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Three new plum cultivars named Kamir, Samera and Simona were evaluated together with standard cultivars (Čačanská Lepotica, Čačanská Raná and Hanita) in a trial orchard established in the spring of 2004. These cultivars differ significantly among each other in tree vigour. Cv. Simona is the least vigorous whereas cv. Kamir the most. Regarding fruit harvest time, cv. Simona is the earliest one (early August), whereas cv. Kamir is the latest one (early September). The fruit size of the new cultivars, except for cv. Simona is comparable to the standards used in this study. The most productive in the first years of evaluation was cv. Kamir but later on its productivity was slightly reduced by its stronger tree vigour. Cv. Simona had moderately smaller yield than cv. Kamir but its yield efficiency was the highest due to its smaller canopy size. Fruit characteristics of all the new cultivars were practically on the same level as those of the standard cultivars. A certain advantage of the new cultivars is their uniform dark blue fruit colour that could be better accepted by consumers.

Keywords: tree vigour; time of flowering; time of harvest; yield; fruit characteristics

In 2011 variety registration for three new plum cultivars was made in the Czech Republic. They were selected following long-term evaluation of seedlings obtained from cross pollination of valuable cultivars. Cv. Kamir, originally designated HL 1044, was selected from the progeny of cvs Sentjabrskaja Sliva and Čačanská Najbolja. Cv. Samera (HL 672) originates from progeny of cvs Stanley and Čačanská Lepotica. Cv. Simona (HL 5931) was selected from progeny originated from open pollination of cv. Čačanská Lepotica.

For evaluation of the new cultivars three standard ones cvs Čačanská Lepotica, Čačanská Raná and Hanita were included for comparison. These standard cultivars are at present commonly grown in the Czech Republic and recommended for valu-

able commercial plum growing (MICHELS, KIRCHMANN 2002; HARTMANN 2007; CHALOUPKA 2011).

During the last two decades a majority of new plum cultivars were bred in Germany (HARMANN 1998, 2006). The results of their evaluation were published recently (JACOB 2007; GADŽE et al. 2011).

Methodological procedures used in the present study were mainly taken over from our previous evaluation of new plum cultivars (BLAŽEK 2011; BLAŽEK, PIŠTĚKOVÁ 2012).

MATERIAL AND METHODS

The experimental orchard of plum cultivars budded on St. Julien A rootstock was established at

Holovousy in 2004. One-year-old nursery trees obtained after summer budding were planted in spacing of 5 by 1 m. From each cultivar at least 3 trees were grown and evaluated.

Climatic conditions at Holovousy are characterised by the average annual temperature of 8.1°C and the average annual rainfall of 650 mm. The soil is medium loam sandy with a rather deep cultivated layer on gravelly substrate. The orchard was located at the elevation of 280 m and it was situated on a very gentle slope facing the north.

Orchard management was based on using mown grass kept in driveways and herbicide strips (1.5 m) based upon application of contact herbicides along the rows of trees. Trees were trained as spindles using wooden stakes as supports at the beginning to help in the process of tree canopy training in the first years. No irrigation was applied in the orchard. Spraying treatments against pests and diseases were conducted according to the recommendations for commercial orchards.

The following records were taken annually: tree canopy parameters, trunk cross-sectional area, time of flowering, flower set, tree canopy density (1 – very thin; 9 – very dense), length of annual shoots, time of fruit ripening, yield per tree, mean fruit mass and mean fruit size. Samples of fruits were sensorial evaluated regarding fruit characteristics using 1–9 rating scales, in which number 9 designates the best performance. The following items were rated: fruit colour, flesh firmness, juiciness, taste, flavour and fruit total quality. At the same time content of soluble solids in fruits was recorded using a standard refract meter.

Data were statistically evaluated by the analysis of variance (ANOVA).

RESULTS AND DISCUSSION

Tree vigour

The evaluated cultivars differed significantly one to each other in the main parameters of tree vigour (Table 1). The least vigorous were trees of the new cv. Simona. Its canopy volume was acceptable for the dense planting system used in this study even in the final year of the evaluation without any restrictive tree pruning. Also cv. Samera seems to be still acceptable for this type of orchard. It developed, however, significantly denser tree canopies that require, therefore, more thin pruning. Trees of the third novelty, cv. Kamir, were significantly more vigorous. Cv. Kamir requires plantings of lower density in its production orchards.

The most vigorous in this study was the standard cv. Čačanská Raná, whose trees reached their final canopy size already during the fourth growing season. They should be, therefore, properly planted using a spacing of double size within the row. Regarding the two remaining standard cultivars, their tree vigour is more or less in agreement with earlier studies (BLAŽEK, PIŠTĚKOVÁ 2012). According to the latest results from Serbia, the standard cv. Čačanská Lepotica is distinguished from the majority of new cultivars by the smallest values of trunk cross sectional area (MILOŠEVIĆ, MILOŠEVIĆ 2011). This is also in agreement to our present findings.

Time of flowering

The mean year dates of flowering for the evaluated cultivars expressed in calendar days are given

Table 1. Mean tree parameters after 2012 season

| Cultivar | Trunk cross-section area (cm ²) | Canopy volume (m ³) | Canopy density (scale 1–9) | Mean length of annual shoots (cm) |
|------------------------|---|---------------------------------|----------------------------|-----------------------------------|
| Čačanská Lepotica | 28.1 | 2.0 | 4.9 | 28.1 |
| Čačanská Raná | 37.4 | 2.9 | 3.2 | 61.1 |
| Hanita | 35.2 | 2.1 | 5.3 | 32.5 |
| Kamir | 41.2 | 2.4 | 4.9 | 48.9 |
| Samera | 31.9 | 1.8 | 7.4 | 38.6 |
| Simona | 25.5 | 1.1 | 4.7 | 22.4 |
| LSD (<i>P</i> = 0.05) | 3.23 | 0.19 | 0.47 | 4.57 |

Table 2. Time of flowering and flower set

| Cultivar | Start of flowering (in calendar days) | | | | | | Flower set (scale 1–9) | | | | | |
|-------------------|---------------------------------------|------|------|------|------|-------|------------------------|------|------|------|------|-----|
| | 2008 | 2009 | 2010 | 2011 | 2012 | Ø | 2008 | 2009 | 2010 | 2011 | 2012 | Ø |
| Čačanská Lepotica | 110 | 104 | 119 | 110 | 115 | 111.6 | 8 | 7 | 4 | 6 | 7 | 6.4 |
| Čačanská Raná | 107 | 103 | 117 | 108 | 114 | 109.8 | 8 | 6 | 5 | 8 | 7 | 6.8 |
| Hanita | 111 | 105 | 119 | 109 | 115 | 111.8 | 6 | 6 | 4 | 8 | 6 | 6.0 |
| Kamir | 108 | 104 | 119 | 110 | 114 | 111.0 | 8 | 7 | 4 | 8 | 7 | 6.8 |
| Samera | 111 | 106 | 120 | 112 | 117 | 113.2 | 6 | 5 | 4 | 7 | 6 | 5.6 |
| Simona | 112 | 107 | 121 | 111 | 116 | 113.4 | 4 | 7 | 5 | 6 | 6 | 5.6 |

in Table 2. These dates fluctuated in the observed period of 5 years roughly within 2 weeks, and were dependent with on course of the spring season temperatures. For cv. Čačanská Raná, the standard cultivar, was the earliest followed by cv. Kamir, flowering on average one day later. On the contrary, the latest in this respect were cvs Samera and Simona, having a mean start of flowering two days later. It also seems that the start of flowering of every cultivar in each year was also slightly influenced by its flower set level. The data concerning standard cultivars are generally in agreement with our previous study (BLAŽEK, PIŠTĚKOVÁ 2012).

Time of harvest

The mean time of the start of fruit ripening according to cultivars is given in Table 3. The earliest among the novelties was cv. Simona, having fruits ready for harvest on August 12 (calendar days (cd) – 224) nearly 12 days after cv. Čačanská Lepotica. Within the whole observed period the start of harvest season for cv. Simona fluctuated between Au-

gust 3 and August 18. The second of our novelty cultivars cv. Samera reached the stage in the mean nearly 10 days later on August 22 (cd – 234). The latest one, however, was cv. Kamir with a mean date of its harvest start on September 7 (cd – 250), nearly 18 days after the standard cultivar Hanita. Regarding the whole observed period, the start of harvest stage for cv. Kamir fluctuated between August 25 and September 21. The harvest time of standards was relatively in a good proportion to our previous findings (BLAŽEK, PIŠTĚKOVÁ 2012).

Fruit size

The average fruit mass of the evaluated cultivars is shown in Table 3 as well.

Among the novelties, cv. Kamir had the largest fruits on average, more or less comparable to the standard cv. Čačanská Lepotica. During the evaluated period its mean fruit mass fluctuated between 28.0 and 61.5 g. The shape of the cv. Kamir fruits was slightly more round in comparison to the standard cv. Čačanská Lepotica. Also, the second

Table 3. Time of fruit harvest and main parameters of fruits

| Cultivar | Start of fruit harvest (in calendar days) | | | Fruit mass (g) | | | Fruit size (mm) | | |
|--------------------|---|-----|-----|----------------|------|------|-----------------|-------|-------|
| | Mean | Min | Max | Mean | Min | Max | Length | Width | Depth |
| Čačanská Lepotica | 212.7 | 203 | 225 | 44.3 | 25.5 | 79.2 | 44.3 | 37.3 | 38.6 |
| Čačanská Raná | 203.8 | 190 | 216 | 52.8 | 36.5 | 76.8 | 51.4 | 39.1 | 39.9 |
| Hanita | 231.4 | 224 | 239 | 29.4 | 20.8 | 39.0 | 42.1 | 33.3 | 33.1 |
| Kamir | 249.9 | 237 | 264 | 47.1 | 28.0 | 61.5 | 44.0 | 41.2 | 41.6 |
| Samera | 234.0 | 223 | 242 | 41.1 | 37.9 | 44.3 | 41.5 | 38.3 | 36.1 |
| Simona | 224.3 | 215 | 230 | 21.4 | 18.6 | 25.5 | 36.2 | 28.6 | 33.2 |
| LSD ($P = 0.05$) | 1.6 | | | 3.89 | | | 1.75 | 1.51 | 1.44 |

Table 4. Yield per tree and mean specific yield (kg)

| Cultivar | Yield/tree | | | | | Specific yield | |
|------------------------|------------|------|------|------|------|----------------------------|-----------------------------|
| | 2008 | 2009 | 2010 | 2012 | Mean | per 1 m ³ of CV | per cm ² of TCSA |
| Čačanská Lepotica | 10.4 | 6.7 | 3.5 | 5.9 | 6.6 | 3.3 | 0.24 |
| Čačanská Raná | 8.9 | 4.6 | 6.4 | 8.4 | 7.1 | 2.5 | 0.12 |
| Hanita | 6.1 | 10.5 | 8.3 | 12.2 | 9.3 | 4.5 | 0.29 |
| Kamir | 3.8 | 11.3 | 4.5 | 11.3 | 7.7 | 3.3 | 0.16 |
| Samera | 2.3 | 5.0 | 3.7 | 4.5 | 3.9 | 2.1 | 0.10 |
| Simona | 1.8 | 7.8 | 6.6 | 5.8 | 5.5 | 5.0 | 0.25 |
| LSD (<i>P</i> = 0.05) | 1.74 | 2.31 | 1.22 | 2.10 | 1.59 | 0.42 | 0.07 |

CV – canopy volume; TCSA – trunk cross-section area

novelty cv. Samera had a mean fruit size not much smaller than cv. Kamir, but its fluctuation in values of this characteristic within the evaluated years was much smaller. The last novelty cv. Simona generally had the smallest fruit size in this study, and only in two years it was more or less comparable in this characteristic to the standard cv. Hanita.

The range of values of fruit mass and fruit dimensions recorded in this study correspond pretty well to data published by researchers from Serbia (GADŽE et al. 2011).

Tree productivity

The results of yield evaluation are shown in Table 4. The highest yield among the new cultivars was recorded for trees of cv. Kamir. Its mean tree productivity, corresponding roughly to the yield of 15 t/ha, was practically the same as that of the best standard cultivars. The highest yield of cv. Kamir, which was the top one in the season, was recorded in 2009. Its productivity in the last years was somewhat negatively influenced by its tree vigour,

limited by dense tree spacing. The second novelty cv. Simona had moderately smaller yields than cv. Kamir but its specific yields were the highest ones due to its smaller canopy size. The lowest yield in this study were recorded on the third novelty cv. Samera. The productivity of this cultivar might be negatively influenced by poor flower pollination due to its late blooming and lower temperatures at the end of its flowering stage in 2012.

Fruit characteristics

The mean values of fruit characteristics of the evaluated cultivars presented in Table 5 show practically no difference between new cultivars and the standards. Their certain advantage is their uniform dark blue colour that could be better accepted by consumers than the lighter ones, especially that of cv. Čačanská Raná. Among the standard cultivars, only cv. Hanita was somewhat better evaluated especially in its taste, fruit total quality, and soluble solids content than the new ones. The results of fruit evaluation of the standard cultivars are mainly

Table 5. Main fruit characteristics (mean scores for all years)

| Cultivar | Fruit colour | Flesh firmness | Juiciness | Taste | Flavour | Total quality | Soluble solids (%) |
|-------------------|--------------|----------------|-----------|-------|---------|---------------|--------------------|
| Čačanská Lepotica | 8.3 | 6.2 | 5.8 | 6.5 | 6.1 | 6.8 | 16.4 |
| Čačanská Raná | 6.0 | 5.5 | 6.1 | 6.7 | 5.9 | 7.2 | 17.0 |
| Hanita | 7.9 | 6.1 | 6.4 | 7.9 | 7.1 | 7.9 | 18.4 |
| Kamir | 9.0 | 6.2 | 6.5 | 7.0 | 6.5 | 7.5 | 17.7 |
| Samera | 8.9 | 5.1 | 6.4 | 6.5 | 5.6 | 6.7 | 16.2 |
| Simona | 9.0 | 5.3 | 6.7 | 7.0 | 6.3 | 7.0 | 16.9 |

in agreement with our previous study (BLAŽEK et al. 2005).

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