Apple cultivars bred in Holovousy. Part 2 – Fruit characteristics and their storage potential

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Abstract

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In continuation of a previous study concerning tree performance and yield characteristics of 20 Holovousy-bred apple cultivars, their fruit characteristics and storage potential were evaluated during 2006–2011 in comparison to commercial standards (Golden Delicious and Jonagold). Fruits of Meteor cv. had the longest storage potential, exceeding six months. It was followed in this respect by cvs Rubimeg, Zuzana, Rucla and Angold that were better than both standards. Mean fruit sizes of cvs Meteor, Angold, Mivibe, Nabella and Zuzana were larger than the standards. Fruits of cultivar Rubinstep were evaluated as the most attractive. In this respect also Rubimeg, Meteor and Rucla were remarkable. Regarding total taste Rucla cv. was the clear winner, followed by cvs Meteor, Rubinstep, Rubimeg and Angold. Regarding total fruit quality cvs Meteor, Rucla and Rubinstep were better than standards. Besides these cultivars, Angold, Fragrance, Julia and Selena were evaluated on the level comparable to standards.

Keywords: time of consumption; fruit size; fruit appearance; fruit taste; total fruit quality

This paper is focused on the evaluation of fruit quality of apple cultivars bred in Holovousy, as a continuation of a previous study concerning their vigour and yield performance. At present, only 10 of these cultivars were mutually compared in some respects (Blažek, Křelinová 2006). Incidence of storage diseases on some of these new cultivars was also an object of a previous paper (Blažek et al. 2006). Some parameters of these cultivars during their cold storage life were also studied previously (Goliáš et al. 2008). Standard procedures of fruit evaluation in different cultivars during public tasting are given in a range of publications (e.g. Blažek, Paprštein 2010). A more complete comparison of the entire cultivar group was the principal aim of the study.

MATERIAL AND METHODS

This study took place in Holovousy during 2007–2011. Fruit samples from each cultivar, the mean weight being around 3 kg, were usually obtained each year from every cultivar harvested at two or three different terms during its optimal harvest maturity period. All samples were immediately introduced into cold storage after their harvest, and remained there permanently throughout their total storage life at temperature regulated within 2 or 3°C. During this period every fruit sample was organoleptically evaluated at least two times in the case of autumn cultivars, and usually 3 or 4 times for later ripening cultivars. Resultant upon these evaluations, the length of the consumption matu-

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Table 1. Mean values of the main fruit characteristics

Cultivar	Fruit weight (g)	Fruit appearance	Red over-colour extension (%)	Flesh juiciness	Flesh firmness	Total taste	Acidity	Flavour
Angold	227.8	6.6	68.5	6.2	5.7	7.0	4.5	5.9
Clijo	172.2	5.9	71.4	5.6	4.5	6.4	6.0	5.7
Dima	147.5	6.8	66.3	6.1	5.8	6.2	5.9	5.6
Fragrance	195.0	7.2	86.7	5.9	6.2	6.3	6.8	6.9
Golden Delicious	193.4	7.1	8.2	5.4	5.5	6.5	6.2	6.0
Jarka	177.9	7.3	61.9	5.5	5.4	5.9	6.0	5.5
Jonagold	229.1	7.8	66.1	5.8	5.6	6.8	5.7	6.3
Julia	146.3	7.5	98.6	5.0	7.0	6.6	5.5	5.8
Klára	138.6	5.7	71.0	4.4	5.9	5.7	6.3	4.6
Meteor	252.0	7.8	84.3	7.2	5.7	7.5	4.4	6.8
Miodar	161.8	7.4	92.5	6.1	4.6	6.3	4.4	5.2
Mivibe	216.5	6.6	86.8	6.3	5.2	6.4	6.2	6.8
Nabella	206.4	6.5	61.1	4.3	4.3	5.5	6.8	6.8
Produkta	185.7	5.9	0	6.0	5.5	5.1	4.0	3.9
Resista	178.3	6.0	19.7	4.9	5.3	5.8	7.3	5.1
Rubimeg	187.1	7.8	91.4	5.8	5.9	7.2	6.5	6.4
Rubinstep	184.0	8.1	86.9	7.0	5.8	7.4	6.6	6.7
Rucla	159.3	7.7	90.0	7.4	7.5	7.7	5.9	7.3
Selena	188.6	7.2	76.8	6.5	5.1	6.6	5.5	6.5
Vysočina	199.2	6.1	81.3	4.4	4.0	5.9	5.4	5.0
Zita	125.6	5.4	53.2	6.9	5.6	6.3	4.0	5.2
Zuzana	201.0	5.3	45.0	6.1	7.7	5.3	3.2	5.8

rity period of each cultivar was estimated. For these evaluations, several fruits per sample were taken in random from cold storage the previous day and placed into laboratory temperature (approx. 20°C). The evaluation itself consisted of weighing fruits, estimation of colour coverage area (%) and judging of fruit appearance using rating scale 1–9. Subsequently, inner fruit characteristics (flesh juiciness, flesh fitness, total taste, acidity and flavour) were recorded using the same rating scale (1–9) after fruit cutting. All data were summarised in Table 1. These data were tested by analysis of variance. Cultivar means were separated by the Turkey's least significance difference test at $P < 0.05$.

Besides our own evaluations, some results from the public sessions of tasting of apple varieties organised by our institute (twice a year during 1998–2011) were included in the study. They involved evaluation of the best cultivars and advanced selections of every particular year. Number of participants on these sessions fluctuated from 33 to more than 200 people. These public evaluations of anonymously given evaluations of variety samples were also based on a 1–9 rating scale, but were finalized by a total score obtained by summing of all single characteristics and providing a double value for total taste. The most important characteristics were included in Tables 2 and 3.

RESULTS AND DISCUSSION

Season of consumption maturity

The earliest ripening of all 22 mutually compared cultivars was cv. Nabella (Fig. 1). Its fruit were suit-

Table 2. The best Holovousy cultivars in January public tastings in comparison to standard ones

Cultivar	Year	The highest values from public panel tastings from 1998–2011					
		points in total	final succession	flesh firmness	flesh juiciness	total taste	fruit appearance
Meteor	2003	46.5	1	6.3	6.8	6.7	7.3
	2006	44.6	1	6.1	6.3	6.2	7.5
	2007	45.7	2	6.0	6.7	6.4	8.1
	2010	45.2	1	6.2	6.3	6.5	7.6
Angold	2004	45.5	3	6.2	6.8	6.7	7.7
	2007	44.6	4	6.3	6.9	6.4	7.4
	2010	44.9	3	6.7	6.8	6.2	7.6
	2011	45.3	3	6.2	6.8	6.6	7.4
Rubínstep	2005	45.0	6	6.3	6.1	6.5	7.3
	2006	42.9	12	5.1	6.1	5.7	7.4
	2008	44.9	4	6.4	6.1	6.5	7.4
	2011	45.2	4	6.4	6.3	6.7	6.8
Rucla	2002	42.5	17	5.9	6.4	6.4	6.6
	2006	42.9	11	6.2	6.3	6.3	6.5
	2007	44.2	5	6.5	6.4	6.7	6.6
	2008	44.2	11	6.4	6.4	6.6	7.0
Golden Delicious	2004	44.2	7	6.4	5.9	6.6	7.1
	2005	44.7	9	6.5	6.4	6.8	7.0
	2007	43.6	9	6.2	6.0	6.4	7.3
	2008	44.2	10	6.5	6.3	6.6	7.1
Jonagold	1998	45.5	5.	6.6	6.7	6.0	7.5
	2002	44.7	7	6.6	6.6	6.9	7.4
	2010	43.9	10	6.3	6.3	6.3	7.2
	2011	43.3	11	6.2	6.4	6.6	7.1

able for consuming from the beginning of October till Christmas time. The period of storage duration acceptance was not much less for either cv. Selena or Vysočina. On the contrary, the longest consumption period was recorded cv. Meteor. Its total consumption period exceeded six months. In a decreasing order of consumption period length, Meteor was followed by cvs Rubimeg, Zuzana, Rucla and Angold. Suitability of their fruit's acceptance for consumption ended during June. In both standard cultivars, this characteristic was about one month shorter.

Fruit size

The mean fruit weight of cv. Meteor was 252 g, unequivocal to all other cultivars (Table 1). In a decreasing order it was followed by cvs Angold, Mivibe, Nabella and Zuzana. Their mean fruit weight was higher than 200 g. These figures correspond quite well to previous publication of these cultivars (Blažek, Křelinová 2006). Mean fruit size of standard cv. Golden Delicious is also in agreement to data from some publications (Bergh, Lötze 2006). On the contrary the smallest mean fruit size (126 g) was recorded on summer cv. Zita. It was followed in this respect by storable cv. Karla having mean fruit weight 139 g.

Fruit appearance

Fruits of cv. Rubinstep were evaluated as the most attractive. The cvs Jonagold, Rubimeg, Meteor (Fig. 2a) and Rucla (Fig. 2b) were found not to differ

Table 3. The best Holovousy cultivars in May public tastings in comparison to standard

Cultivar	Year	The highest values from public panel tastings from 1998–2011					
		points total	final succession	flesh firmness	flesh juiciness	total taste	fruit appearance
Meteor	2004	46.2	2	6.4	7.0	6.4	7.3
	2006	48.1	1	6.7	6.9	7.0	7.8
	2007	44.9	2	6.0	6.5	6.3	7.5
	2011	43.6	2	6.4	6.6	6.7	7.5
Angold	2004	45.4	4	6.2	7.0	6.6	7.3
	2005	43.7	4	6.0	6.4	5.8	7.9
	2009	42.7	5	6.0	6.3	6.1	6.4
	2011	41.9	9	6.1	6.7	6.1	7.2
Rucla	2004	42.9	11	6.4	6.1	6.2	6.8
	2006	44.8	5	6.5	6.4	6.6	7.1
	2007	43.6	11	6.4	6.5	6.4	6.4
	2011	40.0	14	6.2	6.0	6.1	6.2
Rubínstep	2004	42.1	18	5.9	5.8	6.0	5.9
	2005	42.3	14	5.6	5.6	5.7	7.4
	2011	42.8	4	6.5	6.2	6.4	7.2
Rubimeg	2004	43.6	7	6.3	6.6	6.1	6.6
Golden Delicious	2004	41.7	24	6.2	5.3	6.1	7.0
	2005	41.6	23	6.0	5.8	6.1	6.2
	2006	41.4	27	5.8	5.4	6.2	5.2
	2010	40.8	14	5.9	6.2	6.3	7.6
Jonagold	2006	42.7	17	6.2	6.7	5.8	6.6
	2007	43.0	17	5.9	6.0	6.3	7.1
	2008	42.9	8	6.3	6.6	6.6	5.8
	2010	39.5	23	5.9	5.7	5.9	7.8

significantly from it in attractiveness. Also, summer cv. Julia was outstanding in this characteristic, being nearly completely red in its extent of over colour. The cultivars with the lowest values for fruit appearance recorded were Zuzana, Zita, Klára, Clijo and Produkta, with the last cultivar being completely without any over colour.

Flesh juiciness

The highest content of juice was recorded in cv. Rucla, followed by cvs Meteor, Rubinstep and Zita. On the contrary, the driest fleshed cultivars were Nabella, Vysočina and Klára. Commercial standard cv. Jonagold was classified mid-range whereas Golden Delicious resembled cultivars with a lower content of juice.

Flesh firmness

Zuzana cv. was the most outstanding in flesh firmness but was closely followed by cv. Rucla. The summer cv. Julia was classified at the third position. Mean values of cultivars in the next sequence were much less. On the other hand, relatively the softest was the flesh of cvs Vysočina, Nabella and Clijo. The both standard cultivars were classified in the mean beneath the middle.

Total taste

In this most important criterion cv. Rucla was classified at the top position followed within minimal difference by cvs Meteor and Rubinstep.

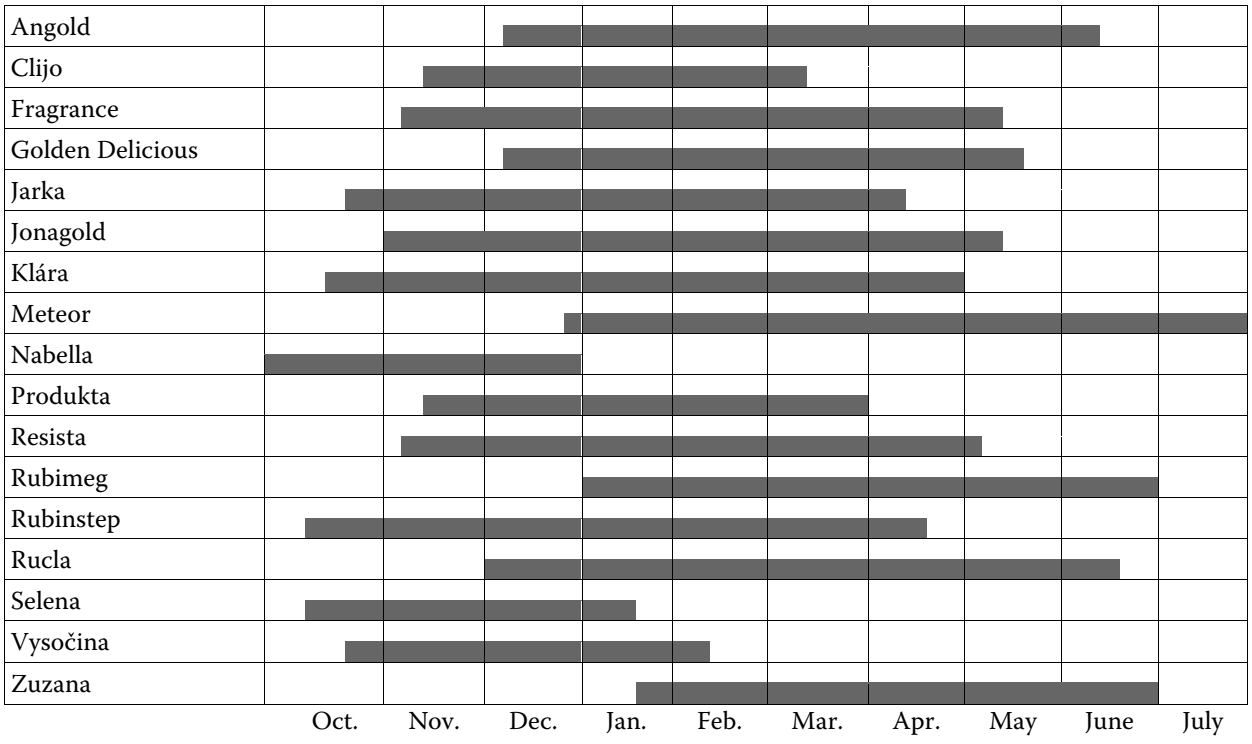

Fig. 1. Mean time of fruit consume maturity between 2007–2011

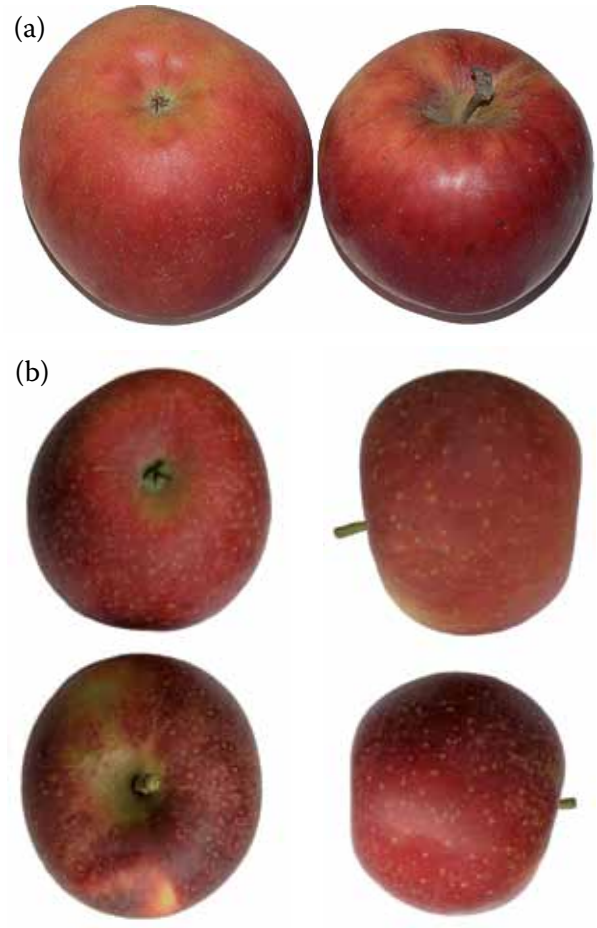

Fig. 2. Fruits of Meteor (a) and Rucla (b)

Cultivars following these were Rubimeg, Angold, Jonagold, Julia, Selena and Golden Delicious. Contrariwise by the lowest values of this scoring were in the mean evaluated cvs Produkta, Zuzana and Nabella.

The character of the taste was more sweet in case of cvs Rubinstep and Rubimeg (similarly to cv. Golden Delicious), whereas the taste in case of cvs Angold and Meteor was relatively more acid. By the highest level of acidity was distinguished by cv. Zuzana.

Besides its taste cv. Rucla excelled also in the mean rating of flavour. In this respect was followed by cvs Fragrance, Nabella, Mivibe, Meteor and Rubinstep. In the opposite as the poorest in flavour cvs Produkta and Klára were evaluated.

Total fruit quality

On the basis of all evaluated characteristics cvs Meteor, Rucla and Rubinstep have significantly better fruit quality than standard cvs Jonagold and Golden Delicious. In addition to these, the best also include cvs Angold, Fragrance, Julia and Selena, seeming to be fully comparable with these standards. Especially in the case of standard cv. Golden Delicious, fruit quality could be largely influenced

by climatic and some other factors (Drake, Spayd 1983; Lafer 2006).

A certain level of superiority was found in some of our cultivars, indicated by the results of public tastings from 1998–2011. In these January-organised events, cvs Meteor, Angold and Rubinstep obtained the most frequent first positions (Table 2). Also cv. Rucla was on these sessions more or less comparable to standards. In the case of May sessions of these public tasting cv. Meteor was unambiguously regarding total performance number one (Table 3). Beside this taste leader also cvs Angold, Rucla, Rubinstep and Rubimeg were frequently better than standards.

Our data concerning fruit quality of standards are in the main comparable to those from some previous studies in our country (Paprštein et al. 2006).

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