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Suitability of Sweet Cherry (*Prunus avium* L.) Cultivars for Organic Production – Results of a Long Term Trial in Eastern Austria

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Abstract

Although there has been a rising demand on the Austrian market in recent years, organic sweet cherry production has been limited particularly due to difficulty in controlling cherry fruit fly (*Rhagoletis cerasi* L.). Only cultivars that ripen very early are not affected by this insect pest. Fruit rots caused by *Monilinia* spp. are also difficult to control under organic production methods. This perennial trial aimed at defining the suitability of some old and new early-ripening cherry cultivars for organic production. In autumn 2003, eleven cultivars were planted in the Institute research orchard in eastern Austria. They had been grafted on the dwarfing rootstock Gisela5 and cultivated organically. Between 2006 and 2012, yield and growth characteristics, as well as susceptibility to plant diseases and pests (especially fruit damage caused by the cherry fruit fly), were evaluated.

Low (< 0.3% in the mean of four years) infestation with cherry fruit fly could be found on the very early (late May – early June) ripening cultivars 'Early Lory', 'Bigarreau Moreau', 'Bigarreau Burlat', 'Schachl', 'Marzer Kirsche' and 'Merton Premier'. Some later ripening cultivars, including 'Merchant', 'Bigarreau Burlat VG' and 'Valeska', which ripened in early June, were already infested by the larvae, but, in the most years at a level below the market tolerance of 2%, whereas the very late ripening control cultivar 'Sumtare' had about 20% of infested fruits.

Based on data gathered during seven years of evaluation, besides the very early ripening standard cultivar 'Bigarreau Burlat', which was not affected by fruit fly and showed good growth, yield and fruit quality characteristics and good fruit size (6.7 g per fruit), the cultivar 'Merchant', which matures about eight days after 'Burlat', and which had low susceptibility to leaf spots (*Blumeriella jaapii* R.), high specific cumulative yield (0.41 $kg \cdot cm^{-2}$) and good fruit size (7.1 g per fruit) would be suitable for organic production. With some restrictions, the very early ripening cultivar 'Bigarreau Moreau' (low specific cumulative yield of 0.17-0.22 $kg \cdot cm^{-2}$) could also be of interest to growers. None of the local cultivars can be recommended for commercial production because fruits were too small ('Langstielige' and 'Marzer Kirsche') or because of high susceptibility to mechanical fruit damage in years with rainfall during the harvest period ('Schachl').

The production of sweet cherries (*Prunus avium L.*) has a long tradition in Eastern Austria. However, organic production in Austria has been limited to being a niche segment within the industry with only about 20 ha of production (Ama, 2012), in spite of increased global demand in recent years (Holb and Schnabel, 2005). The most important limiting factor with organic production is the control of the cherry fruit fly (*Rhagoletis cerasi*). Only cultivars that ripen very early are not affected. In addition, fruit rots caused by *Monilinia* spp. are very difficult to control under organic production methods (Polesny et al., 1997; Tamm et al., 2004).

Compared to other fruits like apples, there has been only limited experience with organic growing of cherries. Significantly, there has been a lack of critical information, especially regarding the performance of cultivars. Therefore, a number of new and old early-maturing cultivars were compared in a field trial, in an organically managed orchard, for various parameters in order to evaluate their suitability for organic production.

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Materials and Methods

In autumn 2003, ten early ripening sweet cherry cultivars ('Bigarreau Burlat', 'Bigarreau Moreau', 'Early Lory', 'Hybrid 222', 'Merchant', 'Merton Premier', 'Valeska', and the local cultivars 'Langstielige', 'Marzer Kirsche' and 'Schachl') and the late cultivar 'Sumtare' as a control for cherry fruit fly infestation, were planted in the research orchard of the university located on the north-eastern periphery of Vienna (latitude: 48° 17' 17.5956", longitude: 16° 25' 42.1386", altitude: 181 m). All trees were grafted on Gisela5® dwarf rootstocks in 2002 and distributed in a completely randomized block system with eight single tree replications per cultivar. For the standard cultivars, two sources were used, one from the research orchard ('Bigarreau Burlat VG' and 'Bigarreau Moreau VG') and one from a nursery ('Bigarreau Burlat Schreiber' and 'Bigarreau Moreau Schreiber'). The planting distance was 4 x 2.5 m.

The climate during the vegetative growth phase in this area is warm and dry, with usually less than 600 mm of annual precipitation, about 65% of it between April and September. The minimum winter temperature can reach to -23°C in some years and frost at bloom sometimes occurs (ZAMG, 2010). The trees were formed into spindles and, in the initial years following establishment, only the branches in competitive positions within the canopy were cut; the first pruning was done in July 2008 and, after that, every year following harvest but during the summer period. The soil is a chernozem with pH 7.5 and 15% of active carbonate. The area between trees in the rows was mechanically cultivated in order to keep it free of weeds. No commercial or organic fertilizers were used, since green manuring was used in the tractor rows (*Medicago sativa* L.*, Trifolium repens* L.), which was mowed three times a year. In very dry periods the trees were irrigated with a mobile foliage sprinkler. Very few pesticide treatments were applied during the 2003 – 2012 period with, normally, only one application per year of *Bacillus thuringiensis* after blossom to control *Operophtera brumata* L.*,* and one with potassium soap (Neudosan, Neudorff, Germany) against aphids. After 2010, Neem oil was used as required against aphids and, in some years, one application of aluminum sulfate combined with a horsetail-extract (*Equisetum* spp.) (Myco-Sin, Andermatt CH) and sulfur one week before the first picking was used preventively against pathogenic fungi (e.g. *Monilinia fructigena* H.).

Over the 2006 to 2012 period, growth, yield and plant health characteristics were variously evaluated. Some of the data (pests, diseases, gummosis, growth intensity and branching angles) were acquired by scoring, where numerical values in a range between 0 (none), 1 (low) and 9 (extreme) were used. Yield was determined two times a week by measuring the total weights of harvested and marketable fruits. A subsample of 50 fruit per tree was taken to assess mean fruit weight. Only ripe fruits were selectively harvested so, in most cases, trees were harvested at least twice per growing season.

All non-marketable and rotten fruits (infested with *Monilinia fructigena)* were counted and discarded during harvest. The amount of fruit removed this way was assessed as a proportion of the total amount of fruit from each tree. Trunk circumferences were measured every year at the end of the growing season at 40 cm height. Yield efficiency ($kg \cdot cm^{-2}$) was calculated by dividing the cumulative yield from all years (kg) by the trunk cross-sectional area (cm^2) at the end of the 2012 season.

From 2009-2012, 50 cherries per tree (four replications per cultivar) were randomly selected one day after harvesting (for each harvest event) and visible larvae in the fruit, or exit holes to determine the presence of larvae that already left the fruit prior to harvest, were counted for the assessment of cherry fruit fly (*R. cerasi*) infestation.

In 2009, on three dates (29 May 2009, 4

June 2009, and 9 June 2009) a taste panel comprising 50 students from the University of Natural Resources and Life Sciences assessed a number of fruit characteristics. Ripe fruits (from four or five cultivars for each sample time) were presented in encoded bowls. Test subjects could taste fruits *ad libitum* and assessed visual appearance, fruit firmness, taste and flavor on a sheet with an unstructured 20 cm line ranging from very low to very high for each parameter; the scale was then measured and points recorded from 0 – 200 (Keppel 1997).

All measured data were statistically analysed with SPSS 18.0 for Windows, with a variance analysis (ANOVA) and subsequent S-N-K-test ($P \leq 0.05$), if the conditions of normal distribution and homogeneity of variance were met; if not, a non-parametrical procedure (Kruskal-Wallis-test) was used. Where applicable, the cultivar x year interaction was also calculated.

Results

The level of fungal disease infection differed yearly depending on weather conditions. In the four years assessed (2008-2012), 2010 was not evaluated because of very low infestation in that year. 'Bigarreau Burlat VG', 'Sumtare' and 'Langstielige' showed the highest infections with cherry leaf spot (*Blumeriella jaapii*), while 'Merton Premier' and 'Merchant' were the least affected cultivars (Table 1).

In autumn 2009, symptoms of gummosis on the trunks were evident, particularly on the trees of both types of 'Bigarreau Moreau'. All other cultivars were either not or only weakly affected (Table 1). In the following year, flower infection with *Monilinia laxa* H. occurred with 'Early Lory', 'Sumtare', both types of 'Bigarreau Moreau' and 'Merchant' all being significantly more infected than the other cultivars.

Table 1. Evaluation of disease incidence and gummosis on trees of 13 sweet cherry cultivars assessed from 2008 to 2012 in eastern Austria.

Cultivar	Cherry leaf spot (*Blumeriella jaapii*) (0-9)[z]					Gummosis on stem (0-9)	*Monilinia laxa* (% damaged flowers)
	18 Aug 2008	10 Aug 2009	7 Aug 2011	20 Aug 2012	Mean[x] 2008-2012	27 Oct 2009	2 May 2010
Big. Burlat VG	7.8 a[y]	2.6 b	5.4 b	2.6 a	4.6 a	0.0 b	4.2 c
Big. Burlat Schreiber	4.0 cd	1.8 b	4.1 bc	1.8 ab	2.9 cde	0.3 b	6.1 c
Big. Moreau VG	5.9 abc	0.8 b	4.0 bc	1.9 ab	3.1 bcd	3.1 a	12.1 b
Big. Moreau Schreiber	4.0 cd	0.8 b	3.5 bc	1.9 ab	2.5 def	3.3 a	13.7 ab
Marzer Kirsche	4.8 bcd	1.0 b	1.3 e	1.0 b	2.0 ef	0.3 b	2.8 c
Merton Premier	4.8 bcd	0.0 b	1.5 de	0.8 b	1.8 f	0.0 b	5.9 c
Valeska	5.1 abcd	1.5 b	2.9 cd	1.5 ab	2.8 cde	0.0 b	2.1 c
Hybrid 222	7.1 ab	2.1 b	4.3 bc	1.3 ab	3.7 abc	0.0 b	3.3 c
Schachl	5.8 abc	0.9 b	4.3 bc	1.9 ab	3.2 bcd	0.0 b	4.2 c
Sumtare	6.0 abc	5.3 a	4.5 bc	1.3 ab	4.3 a	0.3 b	16.8 ab
Langstielige	5.5 abc	1.0 b	7.5 a	2.0 ab	4.0 ab	0.8 b	4.9 c
Early Lory	5.3 abcd	1.0 b	4.8 bc	1.0 b	3.0 cd	0.3 b	19.4 a
Merchant	2.8 d	0.3 b	3.0 cd	1.3 ab	1.8 f	0.0 b	13.0 ab

[z] Evaluation method: 0 = no, 1 = light, 3 = medium, 5 = medium-heavy, 7 = heavy, 9 = severe infestation
[y] Means with different letters show significance (S-N-K test, $P \leq 0.05$)
[x] Cultivar x year interaction significant at $P \leq 0.05$

Table 2. Evaluation of aphid infestation on 13 sweet cherry cultivars assessed from 2007 to 2012 in eastern Austria.

Cultivar	Black cherry aphids (*Myzus prunavium* and *Myzus cerasi*) infestation (0 – 9)[z]						
	22 June 2007	27 May 2008	25 May 2009	26 May 2010	11 June 2011	13 June 2012	Mean[x] 2007-12
Big. Burlat VG	0.3[y]	0.4 ab	0.0	0.0	0.0	0.4	0.2 ab
Big. Burlat Schreiber	0.1	0.4 ab	0.3	0.1	0.0	2.3	0.5 ab
Big. Moreau VG	0.6	0.6 ab	0.3	0.0	0.4	1.4	0.5 ab
Big. Moreau Schreiber	0.3	1.4 a	0.3	0.1	0.4	1.4	0.6 a
Marzer Kirsche	0.1	0.4 ab	0.0	0.0	0.3	0.0	0.1 ab
Merton Premier	0.0	0.1 ab	0.0	0.0	0.4	0.0	0.1 ab
Valeska	0.0	0.1 ab	0.0	0.0	0.0	0.0	0.0 b
Hybrid 222	0.4	0.1 ab	0.0	0.0	0.5	0.8	0.3 ab
Schachl	0.3	0.0 b	0.6	0.0	0.1	0.0	0.2 ab
Sumtare	0.3	1.3 ab	0.0	0.0	0.3	0.0	0.3 ab
Langstielige	0.0	0.3 ab	0.0	0.0	0.0	0.5	0.1 ab
Early Lory	0.0	1.3 ab	0.0	0.0	0.3	0.0	0.3 ab
Merchant	0.0	1.0 ab	0.0	0.0	0.3	0.0	0.2 ab
	ns		ns	ns	ns	ns	

[z] Evaluation scheme: 0 = no, 1 = light, 3 = medium, 5 = medium-heavy, 7 = heavy, 9 = severe infestation

[y] Means with different letters show significance (S-N-K test, $P \leq 0.05$); ns = not significant

[x] Cultivar x year interaction significant at $P \leq 0.05$

Averaged over all years of assessment (2007-2012), the highest occurrences of black cherry aphids (*Myzus cerasi* P. and *M. prunavium* P.) were found on both types of 'Bigarreau Moreau' (0.64 and 0.53) and on 'Bigarreau Burlat Schreiber' (0.51). The incidence on 'Valeska' was very low (Table 2). Overall, the infestation levels were low, probably due to the organic pesticides that had been used.

Analysis of cherry fruit fly (*R. cerasi*) infestation over four years (2009-2012) showed no or, in some years, only a very low infestation with the very early (late May – early June) ripening cultivars 'Early Lory', 'Bigarreau Moreau Schreiber', 'Bigarreau Burlat Schreiber', 'Schachl', 'Marzer Kirsche' and 'Merton Premier'. Some later ripening cultivars, including 'Merchant' (0.69%, mean of 4 years), 'Bigarreau Burlat VG' (0.75%), 'Valeska' (0.83%) and 'Langstielige' (1.17%) that ripened in early June were already infested by the larvae but, in most cases at a level below the market tolerance of 2%. The observed differences in terms of ripening time over the four years made it evident that the two tested types of 'Bigarreau Burlat' were, in fact, two distinctly different cultivars. The later ripening cultivar 'Sumtare' (40.5% infestation in 2009 and 19.4% over four years) was heavily infested and cannot be recommended for organic production (Table 3).

Cumulative marketable yield over the 2006-2012 period showed significant differences among the cultivars with 'Sumtare' (15.9 $t \cdot ha^{-1}$) and 'Langstielige' (21.4) being the lowest yielding and 'Merton Premier' (49.0), 'Marzer Kirsche' (46.5), 'Early Lory' (43.7), 'Valeska' (43.0) and 'Bigarreau Burlat Schreiber' (42.3) the highest (Table 4). The rankings among cultivars within years were similar. Non-marketable fruit resulted from a combination of bird damage, splitting and infection by *M. fructigena*. Lowest marketable yields over six years of evaluation were observed with 'Sumtare' (57.8%) where losses were mainly caused by cherry fruit fly and *Monilia*. Other cultivars with very dense fruit clusters like 'Early Lory' (83.2%), 'Marzer Kirsche' (85.6%) and 'Bi-

Table 3. Assessment of infestation of cherry fruit fly (*Rhagoleetis cerasi*) larvae in fruits of 13 cherry cultivars one day after harvest from 2009-2012 in eastern Austria.

Cultivar	2009		2010		2011		2012		2009-2012
	Harvest date	Damaged fruits (%)	Harvest date	Damaged fruits (%)	Harvest date	Damaged fruits (%)	Harvest date	Damaged fruits (%)	Mean[y] (%)
Big. Burlat VG	2-10 June	0.0 b[z]	10-13 June	0.3 c	2-4 June	0.0 b	5-9 June	1.0 b	0.75 b
Big. Burlat Schreiber	28 May-1 June	0.0 b	5-8 June	0.0 c	30 May-2 June	0.0 b	25-29 May	0.0 b	0.00 b
Big. Moreau VG	25-28 May	0.0 b	5 June	0.0 c	30 May	1.0 b	29 May	0.1 b	0.28 b
Big. Moreau Schreiber	25-28 May	0.0 b	5 June	0.0 c	30 May	0.0 b	25 May	0.0 b	0.00 b
Marzer Kirsche	28 May-2 June	0.0 b	8-10 June	0.0 c	30 May-2 June	0.0 b	29 May-2 June	0.0 b	0.00 b
Merton Premier	2-10 June	0.2 b	8-13 June	0.5 c	2-4 June	0.0 b	29 May-2 June	0.1 b	0.20 b
Valeska	5-10 June	0.0 b	10-13 June	1.5 bc	2-8 June	0.3 b	5-9 June	1.5 b	0.83 b
Hybrid 222	2-10 June	0.0 b	2-10 June	1.8 bc	2-4 June	0.0 b	2-9 June	0.5 b	0.56 b
Schachl	28 May-1 June	0.0 b	5-8 June	0.0 c	30 May-4 June	0.0 b	29 May-2 June	0.5 b	0.13 b
Sumtare	26 June	40.5 a	30 June	9.0 a	26 June	10.3 a	28 June	18.0 a	19.44 a
Langstielige	5-10 June	-	10-13 June	3.5 b	4 June	0.0 b	2-5 June	0.0 b	1.17 b
Early Lory	25 May-1 June	0.0 b	5 June	0.0 c	30 May	0.5 b	25 May	0.0 b	0.13 b
Merchant	5-10 June	0.5 b	8-10 June	1.0 c	4 June	0.0 b	2-5 June	1.3 b	0.69 b

[z] Means with different letters show significance (S-N-K test, $P \leq 0.05$)

[y] Cultivar x year interaction significant at $P \leq 0.05$

Table 4. Marketable yield of 13 sweet cherry cultivars assessed from 2006 to 2012 in eastern Austria.

Cultivar	Yield ($t \cdot ha^{-1}$)							
	2006	2007	2008	2009	2010	2011	2012	Cumulative[y] 2006-2012
Big. Burlat VG	0.7 ab[z]	6.1 ab	4.8 ab	7.5 abc	4.6 bcd	3.3 d	6.2 ab	33.3 bc
Big. Burlat Schreiber	0.6 ab	6.8 ab	6.6 ab	12.2 a	5.5 ab	7.7ab	2.9 bcd	42.3 ab
Big. Moreau VG	0.2 b	3.1 b	5.9 ab	5.5 bc	3.5 bcd	6.5 abc	2.6 bcd	27.2 cd
Big. Moreau Schreiber	0.2 b	3.4 b	9.0 a	6.8 abc	4.3 bcd	7.0 abc	2.7 bcd	33.4 bc
Marzer Kirsche	0.7 ab	8.9 a	4.4 ab	9.5 ab	5.7 ab	9.6 a	7.8 a	46.5 a
Merton Premier	0.8 ab	10.9 a	9.0 a	10.9 ab	4.4 bcd	7.3 abc	5.5 abc	49.0 a
Valeska	0.9 ab	6.2 ab	5.8 ab	8.5 abc	7.7 a	7.1 abc	6.9 a	43.0 ab
Hybrid 222	0.9 ab	9.4 a	5.9 ab	8.1 abc	5.8 ab	4.4 cd	5.5 abc	39.9 ab
Schachl	0.6 ab	6.4 ab	4.8 ab	7.3 abc	4.5 bcd	6.6 abc	3.2 bcd	33.4 bc
Sumtare	1.2 a	2.6 b	1.8 b	2.8 c	2.0 d	4.3 cd	1.1 d	15.9 e
Langstielige	0.2 b	3.6 b	2.5 b	5.7 bc	2.5 bcd	3.8 cd	3.1 bcd	21.4 de
Early Lory	0.4 b	7.2 ab	9.2 a	12.8 a	2.8 bcd	9.0 a	2.2 cd	43.7 ab
Merchant	0.3 b	6.2 ab	8.9 a	8.1 abc	2.3 cd	4.4 cd	5.0 abc	35.3 bc

[z] Means with different letters show significance (S-N-K test, $P \leq 0.05$)
[y] Cultivar x year interaction significant at $P \leq 0.05$

Table 5. Proportion of marketable fruits at harvest from 13 sweet cherry cultivars assessed from 2007 to 2012 in eastern Austria.

Cultivar	Marketable fruit at harvest (%)						
	2007	2008	2009	2010	2011	2012	Mean[y] 2007-2012
Big. Burlat VG	99.7 a[z]	71.6 ab	97.4 a	82.5 abc	98.3 a	98.1 a	92.8 ab
Big. Burlat Schreiber	98.2 a	54.8 bcd	92.2 a	79.5 abc	97.2 ab	97.6 a	87.0 bcd
Big. Moreau VG	98.5 a	87.1 a	97.1 a	74.3 bc	97.9 ab	96.8 a	92.0 abc
Big. Moreau Schreiber	98.6 a	85.0 ab	96.1 a	80.0 abc	97.9 ab	95.2 a	92.3 abc
Marzer Kirsche	99.0 a	52.0 bcd	95.3 a	71.9 bcd	97.5 ab	97.5 a	85.6 cd
Merton Premier	99.2 a	80.7 ab	97.9 a	91.4 a	98.5 a	99.0 a	94.2 a
Valeska	98.9 a	57.3 abc	95.5 a	85.8 ab	96.0 ab	98.6 a	90.3 abc
Hybrid 222	99.7 a	74.0 abc	98.1 a	82.7 abc	98.3 a	98.8 a	91.8 abc
Schachl	93.9 b	60.8 abc	90.1 a	61.0 de	93.8 b	92.1 b	82.0 d
Sumtare	84.7 c	30.9 d	39.5 b	57.0 e	89.3 c	27.2 c	57.8 e
Langstielige	99.5 a	59.4 cd	96.1 a	76.8 bc	97.7 ab	98.9 a	88.2 abcd
Early Lory	97.6 a	74.9 abc	91.5 a	57.9 e	96.3 ab	90.5 b	83.2 d
Merchant	98.7 a	66.9 abc	97.3 a	69.9 cd	97.6 ab	98.8 a	88.1 abcd

[z] Means with different letters show significance (S-N-K test, $P \leq 0.05$)
[y] Cultivar x year interaction significant at $P \leq 0.05$

garreau Burlat Schreiber' (87.0%) were more prone to *M. fructigena,* especially in years with high rainfall during harvest. 'Schachl' (82.0%) was sensitive to mechanical fruit damage especially due to wind and rainfall during harvest (Table 5). The highest proportion of marketable yield was achieved with 'Merton Premier' (94.2%).

'Merton Premier', 'Hybrid 222', 'Sumtare' and 'Bigarreau Burlat VG' tended to

have intensive branching, while 'Schachl' and 'Bigarreau Moreau VG', 'Langstielige' and 'Early Lory' had only moderate branching (Table 6). Branch angles of 'Langstielige', 'Merton Premier', 'Schachl', 'Bigarreau Moreau VG' and Bigarreau Moreau Schreiber' were steeper, which is an unfavorable trait for spindle-training. In contrast, 'Early Lory', 'Merchant' and 'Sumtare' had flatter branches. Growth analysis in autumn 2012 showed small trunk cross-sectional areas for 'Sumtare', 'Early Lory', 'Bigarreau Burlat VG' and 'Langstielige', while 'Bigarreau Moreau' (both types), 'Marzer Kirsche' and 'Merton Premier' grew vigorously. Trunk cross-sectional areas were also used to evaluate specific cumulative yield from 2006 to 2012, which showed the lowest efficiencies in both types of 'Bigarreau Moreau' (0.17 and 0.22) and the highest efficiencies in 'Early Lory' (0.60), followed by 'Valeska', 'Bigarreau Burlat VG' and 'Merchant' (Table 6).

Fruit sizes in the research orchard were very low due to the extensive production conditions that were used (no fertilization, minimal pruning and little irrigation). 'Merchant' and 'Bigarreau Burlat Schreiber' had the highest average fruit weights, followed by both 'Bigarreau Moreau' types; while 'Langstielige', 'Marzer Kirsche' and 'Valeska' had the lowest (Table 7).

In the taste panel assessments 'Early Lory', 'Marzer Kirsche', 'Bigarreau Burlat VG' and 'Valeska' got fewer points in the assessment of visual appearance than 'Merchant', 'Bigarreau Moreau', 'Hybrid 222', 'Schachl' and 'Bigarreau Burlat Schreiber'. 'Marzer Kirsche', 'Merton Premier' and 'Early Lory' were assessed to have lower fruit firmness than 'Valeska' and 'Bigarreau Burlat Schreiber'. 'Early Lory' was also assessed to have poor taste quality compared to all of the other cultivars (Table 8).

Discussion and Conclusions

At harvest, all cultivars except the late ripening 'Sumtare' showed no or insignificant infestation with *R. cerasi* and therefore could be successfully grown using organic production protocols. The reference cultivars 'Bigarreau Moreau' (both provenances) and 'Bigarreau Burlat type Schreiber' performed well overall. 'Bigarreau Moreau' is interesting because of its large, firm and very tasty

Table 6. Growth characteristics, trunk cross-sectional area at the end of 2012 and cumulative yield efficiency of 13 sweet cherry cultivars assessed from 2006 to 2012 in eastern Austria.

Cultivar	Branch angle (2009) (1-9)[z]	Branch number (2000) (1-9)[y]	Trunk cross-sectional (end 2012) area (cm^2)	Specific yield (2006-2012) ($kg \cdot cm^{-2}$)
Big. Burlat VG	3.3 bcd[x]	6.0 ab	79.0 bc	0.44 bc
Big. Burlat Schreiber	3.5 bcd	5.1 ab	121.1 abc	0.37 bcde
Big. Moreau VG	2.6 cde	4.1 b	165.2 a	0.17 g
Big. Moreau Schreiber	2.4 de	4.8 ab	150.7 ab	0.22 fg
Marzer Kirsche	2.9 cde	4.9 ab	164.8 a	0.29 defg
Merton Premier	2.0 de	6.9 a	148.3 ab	0.35 cdef
Valeska	3.3 bcd	5.5 ab	89.2 bc	0.48 b
Hybrid 222	3.0 cde	6.3 ab	108.2 abc	0.39 bcde
Schachl	2.5 cde	4.1 b	102.9 abc	0.35 cdef
Sumtare	4.3 abc	6.3 ab	63.6 c	0.27 efg
Langstielige	1.3 e	4.3 b	80.3 bc	0.26 efg
Early Lory	5.3 a	4.3 b	73.1 c	0.60 a
Merchant	4.8 ab	5.3 ab	86.8 bc	0.41 bcd

[z] Evaluation score: 1 = extremely steep, 3 = steep, 5 = medium, 7 = flat, 9 = horizontal
[y] Evaluation score: 1 = very few, 3 = few, 5 = medium, 7 = many, 9 = very many
[x] Means with different letters show significance (S-N-K test, $P \leq 0.05$)

Table 7. Average fruit weight of 13 sweet cherry cultivars assessed from 2007 to 2012 in eastern Austria.

Cultivar	Average fruit weight (g) at harvest						
	2007	2008	2009	2010	2011	2012	Mean (2007-12)[y]
Big. Burlat VG	5.9 ab[z]	7.0 abc	5.0 bcd	5.6 cde	6.4 b	5.1 ab	5.8 cd
Big. Burlat Schreiber	8.1 a	6.4 abc	5.8 ab	8.6 a	6.0 b	5.5 a	6.7 ab
Big. Moreau VG	6.6 abc	6.2 bc	6.6 a	7.4 b	6.2 b	5.5 a	6.4 bc
Big. Moreau Schreiber	5.9 bc	6.2 bc	6.7 a	7.4 b	5.8 b	5.6 a	6.3 bc
Marzer Kirsche	4.8 c	5.1 d	4.7 cde	5.4 de	4.7 c	3.9 c	4.8 e
Merton Premier	4.9 c	6.0 bcd	5.1 bcd	5.8 cd	5.9 b	5.3 ab	5.5 d
Valeska	5.4 c	5.6 acd	4.2 de	5.0 e	4.8 c	4.3 bc	4.9 e
Hybrid 222	5.1 c	7.5 a	5.3 bc	5.7 cde	6.4 b	5.0 ab	5.8 cd
Schachl	6.4 ab	6.1 bcd	5.9 ab	6.3 c	5.8 b	4.9 ab	5.9 cd
Sumtare	5.7 ab	5.7 cd	5.4 bc	5.9 cd	7.6 a	5.9 a	6.0 cd
Langstielige	5.2 c	6.0 bcd	4.0 e	4.4 f	4.7 c	3.8 c	4.7 e
Early Lory	6.6 bc	5.7 cd	6.3 a	7.8 b	4.8 c	5.8 a	6.1 cd
Merchant	7.5 ab	7.2 ab	6.4 a	7.8 b	8.1 a	5.7 a	7.1 a

[z] Means with different letters show significance (S-N-K test, P≤0.05)
[y] Cultivar x year interaction significant at P≤0.05

Table 8. Summary of results from three tasting sessions with students from the University of Natural Resources and Life Sciences (29 May, 4 June and 9 June 2009; in total n = 150 subjects) with ten selected cultivars.

Cultivar	Visual appearance (0 – 200)	Fruit firmness (0 – 200)	Taste and flavor (0 – 200)
Big. Burlat VG	123 c[z]	123 ab[z]	120 a[y]
Big. Burlat Schreiber	152 a	132 a	130 a
Big. Moreau Schreiber	142 ab	118 bc	138 a
Marzer Kirsche	117 c	105 c	124 a
Merton Premier	129 bc	105 c	127 a
Valeska	124 c	129 a	132 a
Hybrid 222	143 ab	125 ab	121 a
Schachl	149 a	122 ab	142 a
Early Lory	114 c	106 c	85 b
Merchant	142 ab	120 ab	137 a

[z] Kruskal-Wallis Test; means with different letters significantly different at P≤0.05
[y] Anova; means with different letters show significance (S-N-K test, P≤0.05)

fruit and very early ripening time. However, it has vigorous growth and therefore low cumulative yield efficiency. 'Bigarreau Burlat type Schreiber' ripens only few days later than 'Bigarreau Moreau', showing good results regarding growth, yield and taste; however, it is susceptible to fruit rot in wet years. As mentioned above, the two tested types of 'Bigarreau Burlat' were found to be distinctly different cultivars. 'Bigarreau Burlat Schreiber' ripened a few days after 'Bigarreau Moreau' in the last week of May or first week of June in our trial and is identical to the reference cultivar 'Burlat' from published literature. The grafts of 'Bigarreau Burlat VG', which matured one week later and showed lower vigor and smaller fruits, were taken from trees in the Institute's research orchard that came from France 30 years ago, and have been distributed in Eastern Austria as 'Burlat'.

Although the cultivar 'Early Lory' (=

'Earlise') has a very early harvest time and showed less vigour, higher yields and similar fruit size to 'Bigarreau Moreau', some of its other traits including a high proportion of non-marketable fruits, susceptibility to *Monilinia* and low scores in the sensory assessment, were not satisfactory. The cultivar may perform better if it is grown on a stronger rootstock or if more intensive pruning is used. The same applies to the cultivar 'Valeska' – where, in addition, fruit size was rather small. The cultivars 'Bigarreau Burlat type VG', 'Merton Premier', 'Hybrid 222' and 'Merchant' each showed good characteristics overall. They all ripen in early June and, therefore, could already be infested by the first cherry fruit fly larvae by that time; however, infestations were negligible in this trial. 'Merchant' is the most desirable among these cultivars because of its larger fruit size. The local cultivars that were tested cannot be recommended for commercial production due to their poor fruit characteristics: 'Marzer' and 'Langstielige' were too small, and 'Schachl' was susceptible to mechanical fruit damage. 'Schachl', however, could be of interest to home gardeners because of its early ripening time, large fruit size and good taste .

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About the Cover:

'Best Ever' pear grown by Ron Meyer in Talent, Oregon.

'Best Ever' pear, which holds exceptionally well in common cool storage, originated as a cross of 'Comice' and 'Louis Pasteur' made by Frank Reimer at the Southern Oregon Experiment Station in 1935. It was known as OSU 2-301 during trials. The fruit resembles 'Comice' in shape, but is somewhat smaller, and darker green in color, covered with fine russet like 'Louis Pasteur'. The flesh is sweet, spicy, and very juicy, with a rich vinous flavor like that of 'Louis Pasteur'. It is harvested just before 'Bosc', about Sept. 15-20 in the Medford, Oregon area. It is generally marketed starting in January, and keeps well in conventional storage until April. Mike Thornily of Talent, Oregon planted 0.6 ha of 'Best Ever' in the 1980s. Today there's only one commercial grower, his neighbor, Ronald Meyer, who has 5 ha of 'Best Ever' on 'Old Home x Farmingdale 97' rootstock, mostly planted in 2002. The trees are quite productive and reasonably farmer-friendly, although they are moderately susceptible to fire blight. *(Photograph: David Karp)*