

Suitability of early ripening 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', 'Jaboulay', '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, the cultivar 'Merchant', which matures about five days after 'Burlat', and which had low susceptibility to leaf spots (*Blumeriella jaapii* R.), high specific cumulative yield and good fruit size would be suitable for organic production. With some restrictions (low specific cumulative yield), the very early ripening cultivar 'Bigarreau Moreau' could also be of interest to growers. None of the local cultivars can be recommended for commercial production because fruits were too small ('Sämling von Sauerbrunn' and 'Marzer Kirsche') or because of high susceptibility to mechanical fruit damage in years with rainfall during the harvest period ('Jaboulay').

Keywords: sweet cherry, ripening time, cultivar suitability, *Rhagoletis cerasi*.

Introduction

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 & 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).

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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.

Material 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 'Sämling von Sauerbrunn', 'Marzer Kirsche' and 'Jaboulay') and the late cultivar 'Sumtare' as control for cherry fruit fly infestation, were planted in the research orchard of the university located on the north-eastern periphery of Vienna. 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 BS' and 'Bigarreau Moreau BS'). The planting distance was 4 x 2.5 m. Assessments were done yearly from 2006 following scientific standards.

Results

The analysis of cherry fruit fly (*R. cerasi*) infestation over four years (2009-2012) showed no or, in some years, only a very low infestation on the very early (late May – early June) ripening cultivars 'Early Lory', 'Bigarreau Moreau BS', 'Bigarreau Burlat BS', 'Jaboulay', '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 'Sämling von Sauerbrunn' (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 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 1).

Table 1: Assessment of infestation of cherry fruit fly (*Rhagoletis cerasi*) larvae in fruits of 13 cherry cultivars one day after harvest from 2009-2012 in eastern Austria.

Cultivar	2009			2010			2011			2012			2009-12	
	Harvest Date	damaged fruits (%)	*	Harvest Date	damaged fruits (%)	*	Harvest Date	damaged fruits (%)	*	Harvest Date	damaged fruits (%)	*	mean (%)	*
Big. Burlat BS	28.5.-10.6.	0,0	a	5.-8.6	0,0	a	30.5.-2.6.	0,0	a	25.-29.5.	0,0	a	0,00	a
Big. Burlat VG	2.-10.6.	0,0	a	10.-13.6.	0,3	a	2.-4.6.	0,0	a	5.6.-9.6.	1,0	a	0,31	a
Big. Moreau BS	25.-28.5.	0,0	a	5.6.	0,0	a	30.5.	0,0	a	25.5.	0,0	a	0,00	a
Big. Moreau VG	25.-28.5.	0,0	a	5.6.	0,0	a	30.5.	1,0	a	25.-29.5.	0,1	a	0,28	a
Early Lory	25.5.-1.6.	0,0	a	5.6.	0,0	a	30.5.	0,5	a	25.5.	0,0	a	0,13	a
Hybrid 222	2.-10.6.	0,0	a	2.-10.6.	1,8	ab	2.-4.6.	0,0	a	2.6.-9.6.	0,5	a	0,56	a
Jaboulay	28.5.-10.6.	0,0	a	5.-8.6	0,0	a	30.5.-4.6.	0,0	a	29.5.-2.6.	0,5	a	0,13	a
Marzer Kirsche	28.5.-2.6.	0,0	a	8.-10.6.	0,0	a	30.5.-2.6.	0,0	a	29.5.-2.6.	0,0	a	0,00	a
Merchant	5.-10.6.	0,5	a	8.-10.6.	1,0	a	4.6.	0,0	a	2.6.-5.6.	1,3	a	0,69	a
Merton Premier	2.-10.6.	0,2	a	8.-13.6.	0,5	a	2.-4.6.	0,0	a	29.5.-2.6.	0,1	a	0,20	a
Sämling von Sauerbrunn	5.-10.6.	n.e.	a	10.-13.6.	3,5	b	4.6.	0,0	a	2.6.-5.6.	0,0	a	1,17	a
Sumtare	26.6.	40,5	b	30.6.	9,0	c	26.6.	10,3	b	28.6.	18,0	b	19,44	b
Valeska	2.-10.6.	0,0	a	10.-13.6.	1,5	ab	2.-8.6.	0,3	a	5.6.-9.6.	1,5	a	0,83	a

* = ANOVA, different letters show significance (S-N-K test, P<0.05)

n.e. = not evaluated

The most important agronomic results are summarized in table 2. The reference cultivars 'Bigarreau Moreau' (both provenances) and 'Bigarreau Burlat type BS' performed well overall. 'Bigarreau Moreau' is interesting because of its large, firm and very tasty fruit and very early ripening time. However, it has vigorous growth and therefore low cumulative yield efficiency. 'Bigarreau Burlat type BS' 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 BS' 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'.

Table 2: Summarized results of growth and yield assessments of 13 organically grown cherry cultivars from 2006-2012.

Cultivar	Yield (t · ha ⁻¹)		Average Fruit Weight (g) at yield		Marketable Fruits at yield (%)		Trunk Traverse Area end of 20		specific yield 2006-12	
	sum 2006-1	*	mean 2007-12	*	mean 2007-12	*	(cm ²)	*	(kg · cm ⁻²)	*
Big. Burlat BS	42,3	de	6,7	de	87,0	bcd	121,1	abc	0,37	cdef
Big. Burlat VG	33,3	cd	5,8	bc	92,8	de	79,0	ab	0,44	ef
Big. Moreau BS	33,4	cd	6,3	cd	92,3	cde	150,7	bc	0,22	ab
Big. Moreau VG	27,2	bc	6,4	cd	92,0	cde	165,2	c	0,17	a
Early Lory	43,7	de	6,1	bc	83,2	b	73,1	a	0,60	g
Hybrid 222	39,9	de	5,8	bc	91,8	cde	108,2	abc	0,39	cdef
Jaboulay	33,4	cd	5,9	bc	82,0	b	102,9	abc	0,35	bcde
Marzer Kirsche	46,5	e	4,8	a	85,6	bc	164,8	c	0,29	abcd
Merchant	35,3	cd	7,1	e	88,1	bcde	86,8	ab	0,41	def
Merton Premier	49,0	e	5,5	b	94,2	e	148,3	bc	0,35	bcde
Sämling von Sauerbrunn	21,4	ab	4,7	a	88,2	bcde	80,3	ab	0,26	abc
Sumtare	15,9	a	6,0	bc	57,8	a	63,6	a	0,27	abc
Valeska	43,0	de	4,9	a	90,3	cde	89,2	ab	0,48	f

* = ANOVA, different letters show significance (S-N-K test, P<0.05)

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 fruit characteristics: 'Marzer' and 'Sämling von Sauerbrunn' were too small, and 'Jaboulay' was susceptible to mechanical fruit damage. 'Jaboulay', however, could be of interest to home gardeners because of its early ripening time, large fruit size and good taste quality.

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A longer and more detailed version of this work can be found in:

- A. Spornberger, S. Ostojic, J. Telfser, D. Buvac & H. Keppel (2013): Suitability of Sweet Cherry (*Prunus avium* L.) Cultivars for Organic Production - Results of a Long Term Trial in Eastern Austria. *J AM POMOL SOC*, 67 (4), 196-204.