Suitability of sweet cherry cultivars for organic production in eastern Austria

S. Ostojic[1], J. Telfser[1], A. Spornberger[1], H. Keppel[1]

Abstract

The intention of the trial was to find out the suitability of old and new early ripening cherry cultivars in organic production. In autumn 2003, 13 cultivars were planted in the research orchard of the Institute in the East of Vienna. All cultivars were grafted on Gisela5 rootstock and cultivated organically. Between 2004 and 2009 yield and growth characteristics, as well as susceptibility to plant diseases and pests (especially fruit damages by the cherry fruit fly Rhagoletis cerasi *L.) were evaluated.*

Based on the statistically analysed data originating from 5 years of research in total, recommendations for growers can be given.

Keywords: Sweet cherry, organic production, suitability, quality

Introduction

Production of sweet cherries (Prunus avium) has a long tradition in Eastern Austria. Local cultivars have been gradually replaced by new ones, and data of the performance of both, especially in an organic production system have not been existing so far. The cherry fruit fly *Rhagoletis cerasi* is the most important problem in organic growing, only cultivars, which are ripen in the first two cherry weeks are not affected. Therefor a number of new and old early mature cultivars are compared in a field trial for various parameters in order to get a complete picture of the cultivars and their suitability for organic farmers.

Material and Methods

In autumn 2003, in total thirteen sweet cherry cultivars were grafted in 2002 on Gisela5® dwarf rootstocks and planted in the research orchard of the BOKU located on the north-eastern periphery of Vienna: namely Bigarreau Burlat VG (type 1 from the research orchard), Bigarreau Burlat Schreiber (type 2 from a nursery), Bigarreau Moreau VG (trees without branches and cultivated organically in the nursery of the research orchard), Bigarreau Moreau Schreiber (trees with branches from a conventional nursery), Early Lory, Hybrid 222, Langstielige, Marzer Kirsche, Merchant, Merton Premier, Schachl, Valeska and Sweetheart (as late mature cultivar and positive control for the occurrence of cherry fly). All trees were distributed among 8 blocks (8 single trees as repetitions for each variant) in a completely randomized system.

The climate is pannonian, warm and dry in general, with usually less than 600 mm annual precipitation. The trees were formed into spindle and in the first years only the competitor were cut; the first pruning has been done after harvest in 2008, in July. No commercial or organic fertilizers were used. The soil was mechanically cultivated in order to keep the rows free of weed, and the areas between the rows were mown regularly. Very few spraying treatments were made, only in 2008 and 2009 one treatment per year with Myco-Sin and Sulphur for moist application against pathogenic fungi and Neudosan against aphids, respectively, were done during spring.

[1]University of Natural Resources and Applied Life Sciences, Department of Applied Plant Sciences and Plant Biotechnology, Gregor Mendel Str. 33, A-1180 Vienna, Austria; andreas.spornberger@boku.ac.at

Between 2004 and 2009 all important growth, yield and plant health characteristics were evaluated. Some of the data (pests, diseases, gummosis, growth intensity and branching angles) were acquired by assessment, where numerical values in range 0 (none) to 9 (extreme) were used. Yield was determined on site by measuring the weight of harvested marketable fruits for each of the trees, which were harvested two times a week. Only ripen fruits were harvested, so each tree was harvested at least twice.

Regarding disease control, during yield all not marketable and rotten fruits (infested with *Monilia fructigena)* were counted and thrown down onto the ground. Eventually, the amount of fruit 'removed' this way was put in relation to total amount of fruit for each tree and the results were evaluated. The trunk circumferences have been measured every year after the growing season in 40 cm hight. The specific yield (kg per cm^2) was calculated dividing the cumulative yield over the last 5 years (kg) with the area of trunk transverse section (cm^2) after the year 2009.

In 2009, the amount of cherry fruit fly (*R. cerasi)* larvae was determined by the slightly modified Schweizerischer Obstverband 'Madenbefallskontrolle' method (http://www.swissfruit.ch, 2009). One day after harvesting, 50 cherries per tree were submerged in 1 l of water saturated with salt and after an hour the larvae were counted. The amount of larvae on each of the harvesting days were calculated and added to the total amount of larvae per tree and cultivar.

All data were evaluated using the SPSS 15.0.1 for Windows. The evaluation analysis used was GLM (general linear models), more precisely the Multivariate analysis.

Results

The pest assessment in 2009 showed no significant occurrence of Black bean aphid (*Aphis fabae*, Aphididae), however small populations of the aphid have been noticed on the cultivars 'Schachl', 'Bigarreau Moreau' and 'Bigarreau Burlat', with very small differences between the cultivars. Cherry Leaf Spot (*Blumeriella jaapii*) was assessed as well and it turned out that in 2009 the cultivar 'Sweetheart' suffered most damage from the pathogen, while the performance of 'Merton Premier' was the better than of any other cultivar (table 1). In 2009 a small amount of gummosis was noticed on the trunks and lower branches of the 'Bigarreau Moreau' VG and 'Bigarreau Moreau' Schreiber cultivars (Table 1). Evaluation of the data from previous years showed that, just like in 2009, there was no population explosion of Black bean aphid. The intense outbreak of *B. japii* in 2008 affected some cultivars more than the others, 'Bigarreau Burlat' VG and 'Hybrid 222' suffered at most, the Merchant showed the highest tolerance level (Table 1).

The growth parameters evaluation has shown that the cultivars 'Merton Premier', 'Hybrid 222' and 'Sweetheart' tend to branch intensively, while 'Schachl' and 'Bigarreau Moreau' VG branch moderately (Table 3). Branching angles assessment has indicated that branches of the cultivars 'Langstielige', 'Marzer Kirsche' and 'Bigarreau Morreau' were much steeper than those of other cultivars, which is considered to be unfavorable trait. On the other hand, the cultivars 'Early Lory', 'Merchant' and 'Sweetheart' had more flat branches (Table 3). The trunk growth (cm) data analysis in 2009 pointed out quite a difference between narrow trunks of 'Sweetheart', 'Early Lory' and 'Langstielige' and broad trunks of 'Bigarreau Moreau', 'Marzer Kirsche' and 'Merton Premier' on the other hand (table 3). After the statistical analysis of the 2009 total yield data (kg), there were significant differences between 'Sweetheart' (a) and 'Early Lory' and 'Bigarreau Burlat' Schreiber, respectively (d). The difference was confirmed by evaluating the specific cumulative yield data from 2006 to 2009, which has shown that all cultivars and their yield values can be assigned in 6 homogeneous subgroups (table 2).

Table 1: Disease, Pest and Gummosis evaluation of all 13 standard cultivars in 2007, 2008 and 2009 (Mean Values).

Cultivar	Black Bean Aphid (0 – 9)			Cherry Leaf Spot (0 – 9)		Gummosis (0 – 9)
	2007	2008	2009	2008	2009	
Big. Burlat VG	0.25	0.38	0.00	7.75	2.63	0.00
Big. Burlat Schreiber	0.06	0.38	0.25	4.00	1.75	0.25
Big. Moreau VG	0.56	0.63	0.25	5.88	0.75	3.13
Big. Moreau Schreiber	0.31	1.38	0.25	4.00	0.75	3.25
Marzer Kirsche	0.06	0.38	0.00	4.75	1.00	0.25
Merton Premier	0.00	0.14	0.00	4.75	0.00	0.00
Valeska	0.13	0.13	0.00	5.13	1.50	0.00
Hybrid 222	0.00	0.13	0.00	7.13	2.13	0.00
Schachl	0.81	0.00	0.63	5.75	0.88	0.00
Sweetheart	0.00	1.25	0.00	6.00	5.25	0.25
Langstielige	0.00	0.25	0.00	5.50	1.00	0.75
Early Lory	0.00	1.25	0.00	5.25	1.00	0.25
Merchant	0.00	1.00	0.00	2.75	0.25	0.00

Table 2: Results of growth and yield (mean values).

Cultivar	Marketable Yield per Cultivar in 2009 (kg)	Specific Yield per Cultivar in 2009 (kg/cm2)	Average Fruit Weight in 2009 (g)	Trunk Traverse Section in 2009 (cm2)	Cumulative Specific Yield for each cultivar 2006 – 2009	*Statistics Specific Yield 2006-2009
Big. Burlat VG	7.53	0.13	5.00	57.16	0.35	e
Big. Burlat Schreiber	12.17	0.14	5.82	90.11	0.30	cde
Big. Moreau VG	5.47	0.05	6.64	116.05	0.13	a
Big. Moreau Schreiber	6.75	0.06	6.66	109.40	0.17	ab
Marzer Kirsche	9.48	0.09	4.69	113.21	0.21	abc
Merton Premier	10.94	0.11	5.08	100.50	0.33	de
Valeska	8.48	0.13	4.21	64.63	0.33	e
Hybrid 222	8.05	0.11	5.25	79.52	0.32	de
Schachl	7.25	0.10	5.89	75.87	0.26	bcde
Sweetheart	2.83	0.08	5.35	40.27	0.23	abcd
Langstielige	5.67	0.09	4.04	57.22	0.19	ab
Early Lory	12.85	0.22	6.32	55.54	0.53	f
Merchant	8.08	0.12	6.43	64.58	0.36	e

*Anova with S-N-K-test: different letters symbolize a significant difference ($P<0.05$)

Non-marketable fruit amount included fruit damaged by birds (feeding damage) and *M. fructigena* (Table 3). Generally, the later ripening cultivars with dense fruit clusters like ‘Sweetheart’ were more prone to *M. fructigena* than the others, like ‘Bigarreau Moreau’ and ‘Bigarreau Burlat’. Some fruit were prematurely dropped by physiologically disordered trees and these were not included in non-marketable fruit amount.

Table 3: Amount of fruit with cherry fruit fly (*Rhagoletis cerasi L.*) larvae and amount of marketable fruit for 2007- 2009 (Mean Values) including the ripening time in 2009.

Cultivar	% fruits with Cherry Fruit Fly (*Rhagoletis cerasi*) larvae in 2009 (%)	Amount of Marketable Fruit (%)			Harvesting Events in 2009	
		2007	2008	2009	First	Last
Big. Burlat VG	0.00%	99.19%	71.59%	97.35%	02-Jun	10-Jun
Big. Burlat Schreiber	0.00%	98.27%	54.83%	92.24%	28-May	10-Jun
Big. Moreau VG	0.00%	98.54%	87.09%	97.14%	25-May	28-May
Big. Moreau Schreiber	0.00%	98.36%	85.02%	96.10%	25-May	28-May
Marzer Kirsche	0.00%	99.04%	52.04%	95.28%	28-May	02-Jun
Merton Premier	0.16%	98.24%	80.68%	97.85%	02-Jun	10-Jun
Valeska	0.00%	97.59%	57.26%	95.49%	02-Jun	10-Jun
Hybrid 222	0.00%	97.86%	73.97%	98.14%	02-Jun	10-Jun
Schachl	0.00%	94.77%	60.84%	90.14%	28-May	10-Jun
Sweetheart	40.50%	44.57%	30.90%	39.52%	26-Jun	26-Jun
Langstielige*	not evaluated	99.09%	59.38%	96.12%	05-Jun	10-Jun
Early Lory	0.00%	97.64%	74.92%	91.49%	25-May	01-Jun
Merchant	0.50%	97.86%	66.91%	97.26%	05-Jun	10-Jun

Discussion

The cherry fruit fly data analysis of 2009 showed that some sweet cherry cultivars (‘Merchant’ 0.50%, ‘Merton Premier’ 0.16%) ripening at the end of the third week were already affected by the larvae in fruit, however at a low level (table 3). The later ripening control cultivar ‘Sweetheart’ (40.50%) was strongly affected and can not be recommended for organic growers.

The cultivar ‘Langstielige’ also showed no particularly interesting results in any category, thus rendering it unsuitable for organic production in general. Other cultivars showed unbalanced expression of their traits. While some of the cultivars provide higher total yield, there was no significant differences found when it comes to the specific yield (yield in relation to trunk transverse section). The cultivar ‘Merchant’ tends to be the best option in most cases. ‘Bigarreau Moreau’, is quite interesting cultivar due to its big firm fruit (6.64 and 6.66 g, respectively) and the fact that it is early ripening cultivar, which is favourable considering price. Its only drawback is the most intense growth of all cultivars and therefore low cumulative specific yield. Alternative to this could be ‘Merton Premier’ or ‘Schachl’, although the latter had some issues with growth as well (very steep and scarce branches). Although the cultivar ‘Early Lory’ (= ‘Earlise’) has a very early harvest time and showed excellent yield and a high fruit weight in 2009 (6.32 g), the fruit quality (taste) was not satisfactory. Taking some of its other traits (many not marketable fruits in 2008 and 2009) into account, it would be hard to recommend this cultivar for organic production. Maybe it needs also stronger rootstock and more intensive pruning. The same applies to the cultivar ‘Valeska’ – the fruit size, in addition, was rather small (4.21 g).

References

Schweizerischer Obstverband, Determining occurrence of the Cherry fruit fly in sweet cherry fruit, 2009, PDF file: http://www.swissfruit.ch/m/mandanten/239/download/NV_Kirschen_d.pdf