New results from testing of different Sour cherry cultivars under organic cultivation

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Abstract

At the LVWO Weinsberg 30 different sour cherry cultivars were tested under organic cultivation methods. At Dresden-Pillnitz 11 similar cultivars have been evaluated since 2007, as part of a trial with more sites overall in Germany. Data about the phenology (bud breaking, duration and intensity of blossom), yield and loss of fruits were collected. Susceptibilities for infections by Monilia sp*. and* Blumeriella jaapii *were assessed. Great differences between the cultivars under organic conditions were found from 2007 to 2011 depending on the weather in each year. 2009 rain during blossom caused in Weinsberg heavy damages by* Monilia sp*., depending from the cultivar. 2010 still effects of this Monilia-infection influenced the yield, 2011 a very late frost at the beginning of May reduced the yield of the most cultivars. So in Weinsberg the summarized yield over all years was heavily influenced by the year 2011, best for 'Rubellit', 'Hartei', 'Safir', 'Jade', 'Ujfehertoi Fürtös' and 'Achat'. Not for all cultivars the estimation was the same in Dresden-Pillnitz and in Weinsberg, depending on the different weather conditions. This research work is part of the project "Evaluation and Optimizing of biological control methods of plum moth (*Cydia funeb*rana) and Monilia-disease in organic stone fruit production", granted by the Bundesprogramm Ökologischer Landbau und Nachhaltigkeit (FuE 06OE198).*

Keywords: Sour cherry, cultivars, *Monilia sp., Blumeriella jaapii,* organic cultivation

Introduction

Infections by *Monilia laxa* H. during blossom cause great losses in yield in organic sour cherry orchards, where often still the cultivar 'Schattenmorelle' is grown. Experiments about blossom sprayings to prevent infections by *Monilia sp.* without use of copper showed often non-uniform results. Therefore it is necessary to proof newer cultivars under the conditions of organic fruit growing. Important characteristics are type of growing, susceptibilities for *Monilia sp.* and *Blumeriella jaapii* R., flowering behaviour, yield, taste and suitability for fresh market or production of juice.

Material and Methods

Details about the tested cultivars, plant year and rootstock are described in table 1 for the organic grown trials in Weinsberg and Dresden-Pillnitz. The fertilization in Weinsberg e. g. was done with horn shavings in combination with foliar fertilizer Wuxal Aminoplant. In spring the trees were treated with Neemazal ®TS (if necessary) and preparations based on *Bacillus thuringiensis.* Beginning in 2007 in Weinsberg only few applications per year were done with wetting sulphur to prevent extreme infections by leaf spot, but not during the long time of harvest of the different cultivars. Data about the phenology (bud breaking, duration and intensity of blossom), yield and loss of fruits and growing type were collected.

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Susceptibilities for infections by *Monilia laxa* and *Blumeriella jaapii* and differences in the occurrence of aphids at end of June were assessed. In Dresden-Pillnitz the trees were planted with a different distance, the first branches are 80 cm high for mechanical harvesting. One part of the plot is not sprayed with organic plant protection agents. Average temperature per year in Dresden is about 0,8 °C lower than in Weinsberg resp. Heuchlingen, rainfall is comparable. In Dresden the climate is more continental, the winters are colder, vegetation period starts about 10 days later.

Table 1: Ripening groups of the tested cultivars (harvest data from Weinsberg)

Site/Rootstock/plant year, distance, number of trees	early	middle	late
	last third of June	beginning of July	middle of July
Weinsberg, Piku 3 December 2004 5 m x 5 m 3 trees/cultivar	'Ludwigs Frühe' 'Röhrigs Weichsel' 'Ciganymeggy 7' 'Erdi Nagygümölesü' 'Korai Pipacsmeggy' 'Favorit' 'Achat' 'Ciganymeggy 59'	'Debreceni Bötermö' 'Oblacinska' 'Ujfehertoi Fürtös' 'Kantorjanosi', 'Jade' 'Schukowskaja' 'Morina', 'Topas' 'Malike emleke' 'Csengödi'	'Hartei' 'Rubellit' 'Vowi' 'Schattenmorelle' 'Pitic de Jasi') (end of July
Weinsberg, Colt, April 2006, 5 m x 5 m, 23 trees		'Safir'	
Weinsberg,*Prunus avium* grafted in spring 2007, 5 m x 2.5 m, 6 resp. 15 trees/cultivar.		'Morina', 'Karneol' 'Pi-Sa 12,100' 'Pisa-13,1222' = Coralin	'Vowi'
Dresden-Pillnitz, *Prunus avium,* autumn 2007, 4.5 m x 2.5 m, plot divided in unsprayed and organic treatments, 12 or 14 trees/cultivar	'Achat'	'Ujfehertoi Fürtös' 'Jade', 'Morina', 'Topas' 'Safir', 'Korund' 'Pi-Sa 12,100' 'Pisa-13,1222' = Coralin	'Rubellit' 'Schattenmorelle'

For the occurrence of *Monilia laxa* the following scheme was used: All infected twigs and single infected blossom clusters were counted at end of June and were removed from the trees. Every year at end of August the symptoms of *Blumeriella jaapii* were divided in classes from 0 (= no symptoms at all) to 9 (= leaves fell down, tree nearly bare). As a summary from the years 2005, 2006 and 2007-2011 the cultivars were graded into seven groups of susceptibility for *Blumeriella jaapii* (table 3). Similar four groups for susceptibility for *Monilia sp.* were formed (low / middle + good regeneration / middle-high susceptible + moderate regeneration/ high susceptible +bad regeneration) mainly based on the results from 2009. The potential of regeneration from heavier Monilia-infections in the following year (based on a consequent removing of infected twigs and mummies) was influenced the grading of susceptibility for Monilia. Every year the marketable yield and loss per tree were evaluated (Weinsberg), but no statistical tests were done because of the low number of trees per cultivar. Meanwhile only one tree is still alive of 'Schattenmorelle', the standard variety at the moment, the others were damaged by mechanical weed control. In Dresden-Pillnitz in 2011 the trees were harvested by machine for the first time. The contents of sugar and acid of the juice were analysed for selected varieties in 2009 and 2011.

Results

In table 2 the most striking details about weather, infection risk of diseases and pests and level of yield are described. *Myzus cerasi* F. was watched only in 2011 on a low-middle level in Weinsberg, beneficial insects like ladybirds reduced the numbers of aphids soon.

Table 2: Level of infection-risk of different diseases and pests, frost, striking details from years 2007 to 2011 (Weinsberg)

year	**2007**	**2008**	**2009**	**2010**	**2011**
frost?	no	no	no	**2 x slight frost at BBCH 54/55, -0.6 °C at beginning of flowering**	**strong late frost at beginning of May, about 2 weeks after blossom**
risk for Monilia	no	low	**very high** (rain during blossom)	**middle-high**, mainly late flowering varieties	low
leaf spot	**very high**	**middle-high**	**very high**	middle	**middle-high**
reasons for losses of yield	slight hail	strong hail, some *Monilia* on fruits	cracking of fruits, damages by wind and birds	fruit fall, European cherry fruit fly, damages by frictions, birds, *Monilia* on fruits	damages of the fruits by frost, frictions round stalk of cherries, birds, some *Monilia* on fruits
further striking details	strong fruitfall after blossom		depending from variety bad fruit setting (bad weather during blossom)	long wet period in May, late effects from Monilia-infections in 2009, partly strong fruitfall, occasional cherry scab on leaves	strong fruitfall because of frost in May occasional cherry scab on leaves, early leaf fall by leaf spot and frost at end of October
level of yield	low	low	**middle**	low	**high**

Table 3: Susceptibilities for *Blumeriella jaapii* (Weinsberg, based on mean values 2007-2011, additional 2005+2006 for the cultivars planted in 2004)

Level	**susceptibility**	**varieties**
1-3	Very low	'Ludwigs Frühe', , 'Morina', 'Csengödi', 'Korai Pipacsmeggy', , 'Ujfehertoi Fürtös', 'Karneol'
4	Low-midle	'Erdi Nagyügümölesü', 'Oblacinska', 'Ciganymeggy 59', 'Kantorjanosi', 'Debreceni Bötermö', 'Schukowskaja', Pi-Sa 12,100, Pi-Sa 13,122 (Coralin)
5	middle	'Favorit', 'Rubellit', 'Ciganymeggy 7', 'Jade', 'Safir', 'Hartei', 'Schattenmorelle'
6	middle to high	'Röhrigs Weichsel', 'Pitic de Jasi', 'Malike emleke', 'Topas'
7	high	'Vowi'
8	High to very high	, 'Achat'
9	Nearly all leaves fallen down	

Leaf spot was evaluated at Dresden-Pillnitz, too, the susceptibilities there were similar with differences of one class, in the part of the plot with more treatments with wetting sulphur the infection-level was about 2-3 classes lower in comparison to the unsprayed plot. If varieties had an assessment of 6 or more at end of August, leaves fell down to soil 2-3 weeks earlier than in conventionally grown experiments. In worst case the nutrition of flowering buds for the next season was reduced (e. g. ‘Achat‘ at Weinsberg showed 2009 severe infections with leaf spot and very early leaf fall (Pfeiffer, 2010), 2010 only low level of flowering and yield).

Table 4: Susceptibilities for *Monilia sp.* (Weinsberg, mainly based on assessments in 2009 and 2010) considering the potential of the trees for regeneration

Infection level of blossom clusters and twigs, potential of regeneration	**varieties**
only few blossom clusters infected, seldom infected twigs	'Achat', 'Jade', 'Favorit', 'Ujfehertoi Fürtös', 'Karneol', 'Pi-Sa 12,100', 'Csengödi' (here too less blossom-setting)
middle - high number of infected blossom-clusters, seldom whole twigs infected **good regeneration**	'Ludwigs Frühe', 'Röhrigs Weichsel', 'Topas', 'Morina', 'Debreceni Bötermö', 'Korai Pipacsmeggy', 'Hartei', 'Ciganymeggy 59', 'Pi-Sa 13,122 (Coralin)', 'Safir' 'Erdi Nagyügümölesü' 2010 middle regeneration after strong infection in 2009, 2011 well regenerated
blossom clusters and twigs infected middle to heavy, trees very good branching habitus, **regeneration possible**	'Ciganymeggy 7', 'Oblacinska', ' 'Rubellit' (2009 only few infections, in 2010 middle-high because of latent infections in the wood)
middle to heavy infections on blossom clusters and twigs less branches and twigs **bad regeneration**	'Schattenmorelle', 'Vowi', 'Pitic de Jasi', 'Malike emleke', 'Kantorjanosi', 'Schukowskaja'

The last group of varieties should not be planted in organic orchards, because the risk of severe damages of wood and losses of yield by *Monilia* sp. is too high. In Dresden-Pillnitz *Monilia*-infections were observed seldom because of dry weather during blossom.

Table 5: Accumulated yield at site Dresden-Pillnitz 2009-2011 (kg/tree)

kg/tree	**potential of yield**	**varieties**
< 6	low	'Rubellit'
6 - 14	middle	'Topas', 'Pi-Sa 12,100', 'Morina', 'Pi-Sa 13,122 (Coralin), 'Ujfehertoi Fürtös'
14 - 18	high	'Korund', 'Achat'
18 - 23	very high	'Jade', 'Safir', 'Schattenmorelle'

Figure 1 shows the accumulated yield (kg/tree) at site Weinsberg only for the cultivars with a sufficient yield (reasons for lower yield of the other cultivars: see also table 2!) For some cultivars differences to Dresden-Pillnitz could be seen, mainly influenced by the weather during blossom, especially for cultivar 'Rubellit', which had the highest yield in Weinsberg in spite of *Monilia*-infections in 2009 and 2010. At Dresden-Pillnitz the cultivars 'Coralin', 'Safir', and 'Morina' were harvested well by machine similar to 'Schattenmorelle', on the

other side 'Jade' and 'Achat' seemed to be less suitable for harvesting by machine. Both cultivars have not so high contents of acid and a pleasant taste, so they could be sold on fresh market, too, for that purpose the fruits should be harvested with stalk. 'Coralin' (Pi-Sa 13,122) had also an interesting flavour. The highest content of acid had 'Topaz' (2009 31.6 g Acid/l Weinsberg, 2011 26.0 g/l in Dresden-Pillnitz), so 'Topaz' could be used for mixed juices, but the trees have a weaker growing habitus, so yield was only on a middle level up to now. Altogether the cultivars ‘Safir’, 'Ujfehertoi Fürtös', ‘Morina’, ‘Coralin’ seem be suitable for organic fruit growers, ‘Achat’ and ‘Jade’ for fresh or subscription marketing.

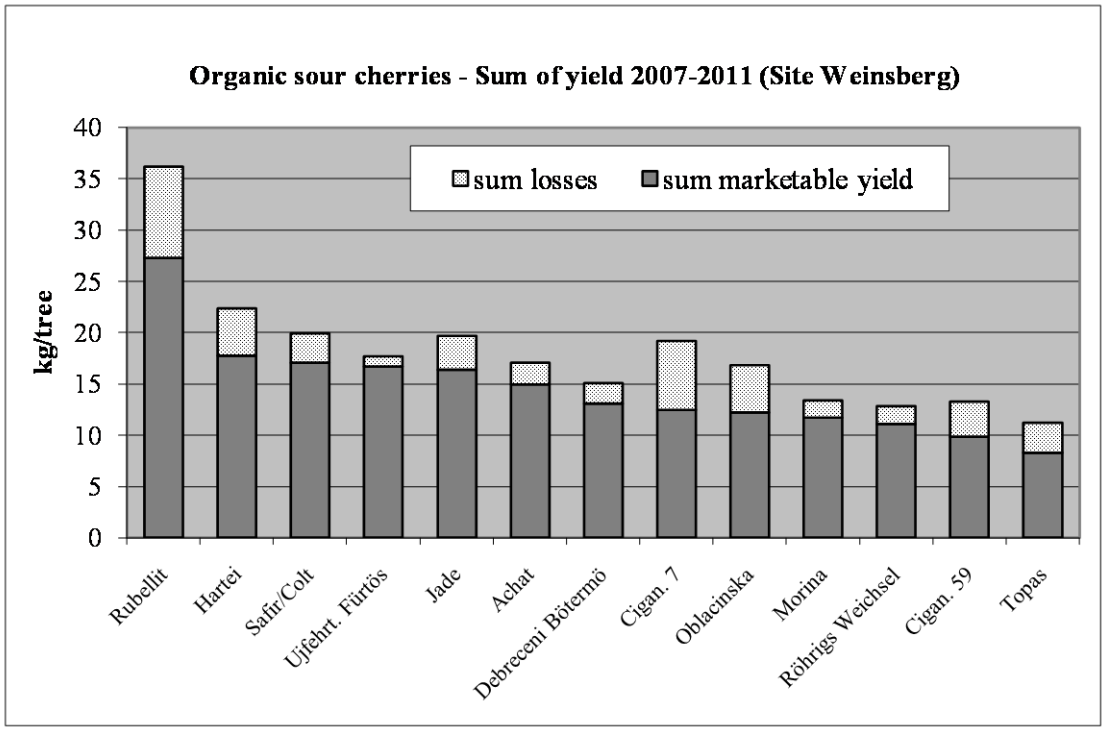

Figure 1: Accumulated yield 2007 to 2011, site Weinsberg, sorted on level of yield

Discussion

For the most cultivars similar results were found at both sites, Dresden-Pillnitz and Weinsberg, but weather conditions have been very different over the seven years in Weinsberg, so cultivars should be tested for further years. Because wetting sulphur can be used in organic fruit growing, a middle to high susceptibility for *Blumeriella jaa*pii is not as critical as a high susceptibility for *Monilia sp*. When the use of copper-products will be limited heavily in future, there are at the moment not so much alternative and effective preparations available (like tested in *Monilia*-trials of Rank 2007, Brinkmann 2008, Rank, 2009 and 2010, Obenaus 2010, Joseph, 2011, all summarized in Rueß *et al.,* 2012). So only cultivars with a low to middle susceptibility to *Monilia sp.* (with good regeneration of the trees) should be chosen by organic fruit growers, but imperatively combined with consequent removing of infected twigs and fruit mummies in the orchard.

Acknowledgements

Thanks to BLE for support research work within Bundesprogramm Ökologischer Landbau und Nachhaltigkeit and to all colleagues and seasonal workers of both research institutes for their engagement during picking season.

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