Which strawberry-varieties are suitable for organic fruit growers?

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Abstract

Different new strawberry varieties, partly available from organic propagation, partly only available from conventional production were tested on organic cultivated percels at the LVWO Weinsberg in the years 2007-2009. The main focus was on the occurrence of foliar diseases like leaf spot and mildew, plant losses caused by Verticillium sp., yield and fruit damages by Botrytis cinerea.

The early ripening variety 'Clery' was used as standra, which is planted in the most organic strawberry fields. As in the years 2006-2008 'Clery' had a middle yield and was susceptible for infections with leaf spot, plant losses caused by Verticillium were rare. Botrytis was seen, when rain fell during blossom, so at first the sepals were infected and afterwards the green fruits. 'Vima Zanta' and 'Sonata' had good yields and the fruit taste was rated positive in different degustations. In early spring growers should have a look on the occurrence of mites.

Berneck 1 comes from Switzerland, a crossing with offspring of Fragaria vesca. This cultivar belongs to the middle ripening group, had high yields, taste was very interesting, but the fruits could be easily bruised. In 2009 heavy symptoms of mildew were seen on leaves and fruits. 'Malwina' was one of the latest ripening varieties, had dark red fruits with a slightly sour taste and was susceptible for leaf spot. From the varieties 'Antea', 'Asia', 'Betty', 'Sallybright', 'Daroyal', 'Cassandra', 'Elianny' and others the first impressions about taste and yield under organic conditions were collected in the season 2009.

Keywords: Strawberry, cultivars, organic fruit production, *Botrytis cinerea*

Introduction

The selection of well-tasting and robust cultivars is an important factor for a successful production of organic strawberries. Other factors are effective control of weeds and good managing of marketing of this only few days perishable fruit. The fruit-grower often has to make a compromise between taste, hardness of the fruit, yield and picking performance. *Verticillium sp.* can cause great losses of plants in the field, especially in hot summers. During the last few years - 1998-2004 in the orchard Katzental, since 2004 in the experimental orchard Heuchlingen - weather conditions have changed very extremely in the picking season: Partly high temperatures and dry weather, partly thundery showers were typically. So the conditions for occurrence of different diseases (e. g. *Botrytis cinerea)* were very variable.

Material and Methods

In an organic cultivated plot of the experimental orchard of the LVWO Weinsberg different strawberry cultivars were tested. The experiments started in August 2006, 2007 and 2008 at a site, where 4,0 microsclerotiae/g dry soil were found, so that the infection risk for *Verticillium* sp. was middle. In 2007 and 2008 potted plants mainly from organic propagation were planted with 1,0 m x 0,3 m distance, water was given by drip hoses.

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Table 1: Experiment 1 - planted in August 2006 (number of potted plants/cultivar, propagation)

propagation	4 x 25 plants	2 x 25 plants	1 x 25 plants
organic	'Clery', 'Darselect', 'Korona'	'Berneck 1'	'Malwina' (delivering very late)
conventional		'Aroma Auslese', 'Fraroma'	'EM 1103' ='Amelia', 'EM 1259', 'St. Pierre'

Experiment 2 - planted in August 2007:
The following cultivars were tested: ‘Clery’, ‘Darselect’, ‘Aroma Auslese’, ‘Berneck 1’, ‘Mieze Nova’, ‘Vima Zanta’ (25 potted plants/cultivar, only organic propagation).

Table 2 - Experiment 3 - planted in August 2008 (25 plants/cultivar)

plant material	frigo-plants (planted in July)	unpotted plants	potted plants
conventional	'Antea', 'Asia', 'Betty', 'Daroyal', 'Delia', 'Sallybright'	'Cassandra', 'Elianny'	'Praline'

During the whole duration of the experiments the vigour, infections by leaf-diseases (four classes: weak / weak to middle / middle / heavy infections), losses by soil-borne diseases and striking details during blossom were evaluated. The yield was registered in the first and in the second picking season and divided in these classes:

- size of healthy fruits: < 25 mm, 25-30 mm, > 30 mm
- damages like deformations by low temperatures, infections by *Botrytis cinerea*, leathery berries, other losses (sunburst, snails, birds, beetles, hail, mildew)

As marketable yield the weight of all fruits > 25 mm were summarized. Additionally the average fruit weight was evaluated from the classes 25-30 mm and > 30 mm. Based on this data a rough estimation of the capacity of the yield was done.

In summer 2008 and 2009 tasting experiments were organized with organic fruit growers and other interested people, the people should form an opinion on colour and form, taste, hardness and judge, if they would buy the cultivars on the market.

Results

After warm winter months, in 2007 in April and at the beginning of May the weather conditions were dry and warm, then some rainy days followed. The strawberry-season started extremely early (in field, not covered with mulch film) on May 10th and ended for the most cultivars on June 22nd. The first days of June were dry, later it rained on several days, often combined with thunderstorms.

In 2008 there were different conditions in spring, the first three weeks of April were rainy with slight frost of -2.9°C on April 8th. In May it was dry and warm except for May 30th (60 mm rain with strong hail). In June another heavy rain fell (52 mm), the remaining harvest had more dry weather. The first cultivars started to ripe on May 27th, the most cultivars ended on June 27th, as it is normal for the region of Weinsberg.

Between the last third of March and middle of April 2009 it was dry and warm, followed from three extreme wet days in the middle of April. May was very rainy, maximum temperatures were seldom above 25 °C, so that the plants had a good water-supply in the soil and size of the fruits was excellent. The first strawberries ripened about May 25th, the season went on until end of June. During picking season maximum temperature was often below 25 °C, rain fell nearly every second day before middle of June.

In table 3 the susceptibility for leaf spot (*Mycosphaerella fragariae*) of different cultivars is described. For the cultivars tested in experiment 3 only the first impressions can be used for the grading. The infection level may increase in the second year (2010) without use of plant protection agents.

Table 3: Sensibility of the tested cultivars for leaf spot (*Mycosphaerella fragariae*)

infections	exp. 1 (2006-2008)	exp. 2 (2007-2009)	exp. 3 (2008-2009)
weak	'EM 1259'	'Darselect'	'Sallybright', 'Cassandra', 'Elianny', 'Antea'
weak-middle	'Darselect', 'Aroma Auslese', 'St. Pierre', 'Fraroma'	'Sonata', 'Berneck 1',	'Daroyal', 'Betty'
middle	'Korona', 'EM 1103', 'Berneck 1'		'Asia', 'Praline', 'Delia'
heavy	'Clery', 'Malwina'	'Clery', 'Mieze Nova', 'Aroma Auslese'	

In table 4 the estimation of potential yield is summarized for the cultivars of experiment 1 and 2. Because of different plant material and damages of some plants by deer it is too early for judging about yield of cultivars of experiment 3.

The general level of yield of strawberries in these organic experiments varied from year to year very heavily. Especially the quality of plant material of organic plant propagation was different (vigor, root zone), even the infections by leaf spot on the young plants (especially on 'Malwina' the infections of leaf spot were heavy). In some years the best cultivars had more than 600 g marketable fruits/plant (e. g. ‘Berneck 1’ and ‘EM 1259’ in 2008, second year), in other years the best cultivars had only 400 g marketable yield because of losses by hail (reduction at 30-50 %). Because of lacking repetitions of many cultivars and different plant material when planted in the trials a statistical analysis was not reasonable. In early spring growers should have a look on the occurrence of mites at 'Vima Zanta' and 'Sonata'.

Table 4: Potential yield of the tested cultivars

yield	exp. 1 (2006-2008)	exp. 2 (2007-2009)
low-middle	'Fraroma'	'Mieze Nova', 'Darselect'
middle	'Clery', 'Aroma Auslese' 'EM 1103', 'Korona' 'St. Pierre'	'Clery', 'Aroma Auslese'
middle-high	'Darselect'	'Berneck 1'
high	'EM 1259', 'Berneck 1'	'Sonata', 'Vima Zanta'

The main reasons for losses of yield were: Feeding damages by snails, birds or beetles (together up to 200 g/plant), hail, deformations (especially at ‘Darselect’, partly at ‘Aroma Auslese’), Botrytis (2007: ‘Clery’ 20-30 g/plant, ‘Berneck 1’ 8 g/plant, 2008: ‘Clery’ 10-20 g/plant, ‘Berneck 1’ 15-20 g/plant) or small fruits in the second year (‘Korona’, ‘Mieze Nova’). ‘Berneck 1’ seems to be susceptible to mildew (*Spaerotheca macularis).* Mildew needs temperatures of 18-25 °C combined with high humidity (Scherer, 1989). In 2009 several fruits of ‘Berneck 1’ were infected and had to be sorted out.

A very important factor for possibilities to sell organic produced strawberries is the taste of the fruits. Figure 1 shows the results of a degustation in summer 2008 with 28 persons involved, who work in different parts of LVWO Weinsberg (not only in department fruit-growing). The favourites were ‘Clery’, ‘Mieze Nova’, ‘Sonata’, ‘Vima Zanta’, ‘Fraroma’ and ‘Aroma Auslese’.

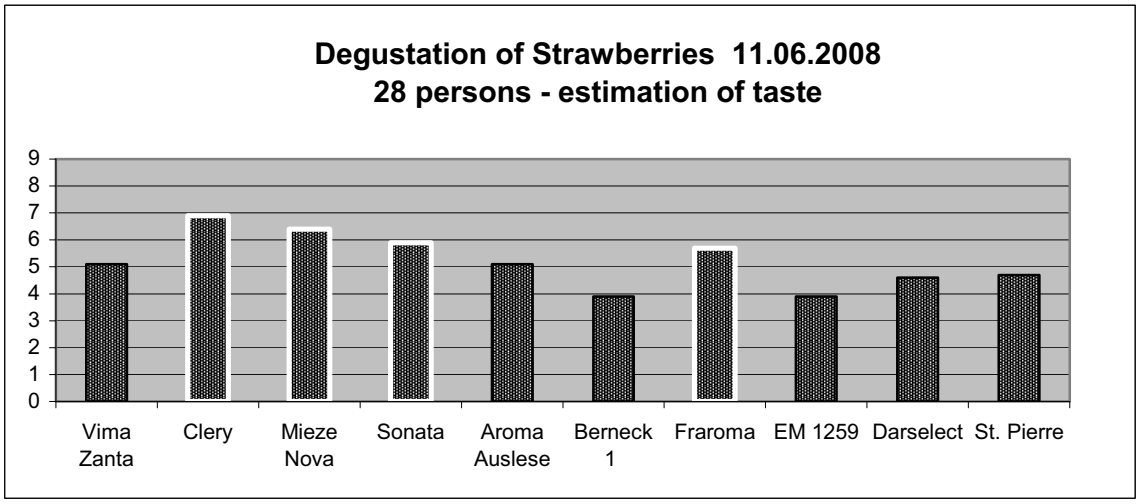

Figure 1: Results of a strawberry-degustation (1-9, 9=excellent) on June 11th 2008, 28 people

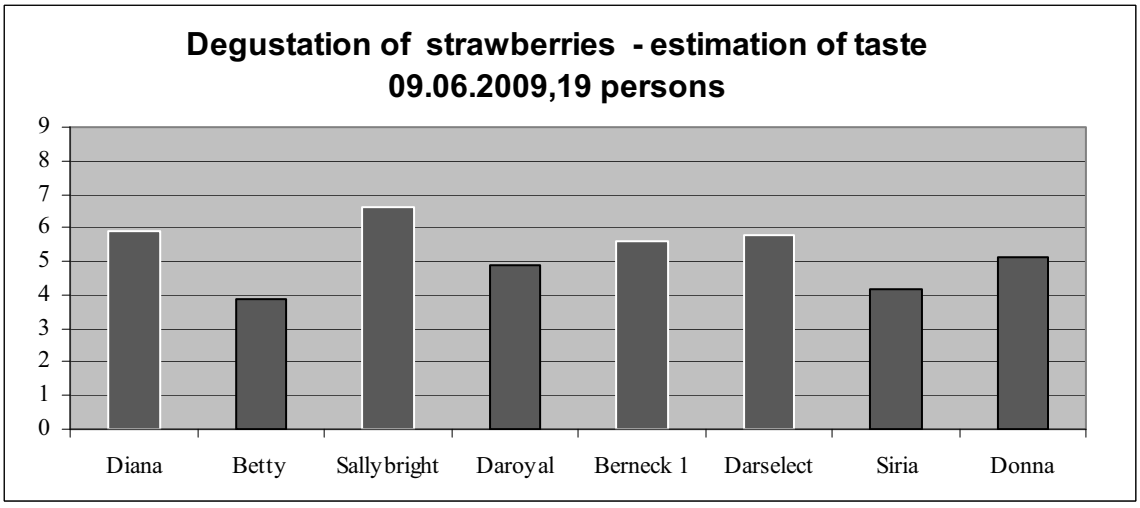

Figure 2: Results of a strawberry-degustation (1-9, 9=excellent) on June 6th 2009, 19 people

In summer 2009 a similar test was organized for a mixed group of advisers and fruit-growers, who have to do with strawberries very often. Here cultivars were tested, which partly were grown in the organic and partly in the conventional experimental plot.

Figure 2 presents the opinion of this group about the tasted cultivars, the best notes received ‘Sallybright’, ‘Diana’, ‘Berneck 1’ and ‘Darselect’.

As a conclusion of these results of organic strawberry-testing the cultivars ‘Clery’, ‘Sonata’, ‘Darselect’ and ‘Vima Zanta’ are interesting for organic fruit growers. ‘Berneck 1’ had a good taste, ripened about 10 days later, but in 2009 was susceptible for mildew on leaves and fruits. ‘Malwina’ was very late ripening, had a dark red colour and tasted more sourly. Cultivars with a clear wild strawberry-aroma like ‘Fraroma’, ‘Mieze Nova’, ‘Aroma Auslese’ or ‘Praline’ had some disadvantages (yield lower, partly soft skin), so that they are only

suitable for a smaller group of customers. ‘Daroyal’, ‘Elianny’ and ‘Sallybright’ should be grown at first in smaller plots on organic farms for own experiences, as far as plants are available from organic propagation (licences of cultivars!).

Discussion

A striking detail of all degustations – some results with smaller groups are not discussed here – was, that cultivars, which have a strong aroma like wild strawberries, were accepted either clearly or were refused at all, even in combination with a dark red colour. The less the persons had to do with fruit growing, the more variation in colour, form and taste they tolerated. Especially older people, who still know the cultivar ‘Senga Sengana’, liked ‘Berneck 1’, ‘Praline’ or ‘Aroma Auslese’. Younger people were astonished at the great variety in strawberry-taste, here would be a potential for different marketing strategies of organic grown strawberries.

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