Raspberry (Rubus idaeus L.) varieties for organic production

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Abstract

At the State research station for viticulture and fruit in Weinsberg four floricane raspberry varieties were tested. The plantation was done in the soil under permanent rain cover. The fertilizer is applied together with the irrigation. `M. Freya` is the earliest ripening variety, but yield, fruit weight and further fruit characteristics are not satisfying all demands of the market. `Malahat` plants are productive. Fruits are dark red with a conical shape and a pleasant flavour. `Glen Fyne` plants are vigorous and productive. Fruit colour is lighter than that of `Malahat`, presenting a round fruit shape and a typical and harmonical flavor. In comparison to the above mentioned varieties, `Glen Ample` plants are most productive with the best fruit weight. Ripening period is later and fruit quality corresponds to the demands of the market. Red spider mite (Tetranychus urticae) and raspberry blossom weevil (Anthonomus rubi) were found in some years, a control was not necessary. Predators were applied regularly and preventively.

Keywords: Rubus idaeus L., raspberry varieties, rain cover, yield, ripening time, pests and diseases

Introduction

Primocane raspberries for exclusive autumn production are thought to be quite easy for organic production due to a yearly new start of growth and production without an increase of pests and diseases. In Germany there is a market for summer bearing raspberries and the earlier the market can be supplied the better the prices for the producer. But summer raspberry production is more difficult because of the biennal cycle of growth and fruiting, which leads to a higher density of the plantation, the chance for overwintering pests and diseases increases and therefore the vigour and lifetime of the plants might be reduced. The varieties `Glen Ample`, `Glen Fyne`, `Malahat` and `Malling Freya` were chosen for testing yield, fruit size, ripening time and susceptibility for pests and diseases under a permanent rain cover. Conventionally soil grown floricane raspberries are expected to produce a yield of 100 kg / 100 m² and a fruit weight of at least 4,0 g / fruit. The chosen varieties are expected to differ in ripening time. The rain cover should prevent diseases.

Material and Methods

In 2013 the soil was loosened and prepared for planting. The planting was done in May and June 2014 directly in the soil. The plants were plug plants, produced by the nurseries Kraege (Germany) and Hengartner (Switzerland). A certificate of exemption is available. In each plot of 3.0 m length, 15 plants of each variety (`Glen Ample`, `Glen Fyne`, `Malahat` and `Malling Freya`) were planted (planting distance 0.33 m). The distance between the planted plots is 3.0 m. There are 8 plots of each variety. The plants are trained in the hedge system with 3 wires. A drip irrigation is installed. There are two drip hoses, hanging on the lower wire on both sides of the plants. The irrigation is automatically organized by light, the duration depends on the plant physiology. Just before the planting a nutrition of 40 kg / ha of Bio-Agenosol was applied. Afterwards the plants were fertigated with OPF (2015 -2018), respectively Vinasse (2019). An application of either 5 or 8 g of nitrogen per week and meter, depending on the plant development, was planned.

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The canes grown in 2014 were cut down completely in winter 2014 / 2015 to allow a good homogeneity of the stock in the following year. In the years 2016 until 2019 the young shoots were removed once in the beginning of May. Two to three times per season a mechanical weed control was done (Ladurner maschine) in combination with manual removal between the plants.
No pesticides were used. Beneficial insects (*Phytoseiulus persimilis*) were applied preventively about every two weeks from the middle of May until the end of August. Pests were visually noticed but no special observations were made.
A statistical analysis was done for yield and fruit weight with the SAS Statistical Package, Release 9.4 (SAS Institute, 2012).

Results and Discussion
All plants of all varieties produced canes of a sufficient length, meaning at least 160 cm. The average length (table 1) of the years 2016 and 2017 shows that canes of the variety `M. Freya` are shorter than the ones of the other varieties. This tendency continued in the following years. Besides the cane length also the regeneration of new shoots of `M. Freya` plants are reduced (data not shown). The vigour was so poor, that the plants were removed already after the season 2018. In 2019 a reduced number of canes was also found in the other varieties.
Table 2 shows the development of yield and fruit weight of the four varieties. `Glen Ample` is the most productive variety, followed by Glen Fyne whereas the lowest yield was recorded for `M. Freya`. The development of the yield shows the biggest amount in the first production year with a decline in the following years and kind of alternating in the varieties `G. Ample` and `G. Fyne`. There were losses recorded from the total amount of the yield. These were damages of the fruit, too small fruit, sunburn or overripe fruit, but no losses due to grey mould (*Botrytis cinerea*) infection or other diseases. The marketable yield of the varieties `G. Ample` and `G. Fyne` represent about 85 to 90 % of the total yield. The constantly high percentage of loss in the variety `M. Freya` can be explained by a high percentage of malformed and crumbly fruit. The average fruit weight of each variety was biggest in the first production year. Only `G. Ample` fruit were bigger than 4.0 g yearly. Yield and fruit of `G. Ample` were significantly better than these of `M. Freya`.
The earliest ripening variety was `M. Freya` with a harvest begin on 7th of June in average of the years 2016 until 2019. Glen Ample harvest starts 16 days later (table 3).
According the flavour, `G. Fyne` and `Malahat` fruit were well-balanced convincing with a typical intense aroma. In contrast, `G. Ample` fruit are found to be more acidic, whereas fruit of `M. Freya` is not so pleasant. Glen Ample fruit shows the best shelf life (data not shown).
In all years the plantation was healthy and vigorous although there were some pests visually noticed. *Anthonomus rubi* (raspberry vine weevil) was found in the years 2016 and 2018, red spider mite (*Tetranychus urticae*) was observed especially in the years 2017 and 2018, the raspberry spider mite (*Neotetranychus urticae*) in 2017. In `Malahat` plants there was seen russet (*Phragmidium rubi-idaei*) in the years 2016 and 2018. There was no infection found with fruit rot (*Botrytis cinerea*) and no cane diseases were noticed.
In average of the four production years all varieties achieved a total yield of 100 kg / 100 m², i.e. more than 3 kg / meter. `G. Ample` was the significantly most productive variety in all years. The poor yield of `M. Freya` maybe explained with the short cane length, the reduced number of canes per plot and the small fruit. In trials at the research station in Weinsberg, Muster et al. (2004) have generally observed, that very early ripening varieties show a low productivity (for exp. `Resa`, `Fertödi Venus`). The positive aspect of `M. Freya` is the early ripening time. Glen Ample combines high yield with good fruit size and fruit quality plus a fairly good ripening time, which is still earlier than the harvest period of `Tulameen`. `Glen

Fyne` is interesting because of the high yield and a better flavour or rather less acidity. `Malahat` falls off because of less yield and fruit weight and is the only one which showed symptoms of russet infection.

Table 1: cane length of red raspberry varieties

variety	cane length cm	
	2016	2017
M. Freya	176	189
Malahat	194	265
Glen Fyne	226	244
Glen Ample	203	260

Table 2: Yield, non-marketable yield and fruit weight of raspberry varieties

variety	total yield kg / 100 m²					non marketable yield %	fruit weight g / fruit
	2016	2017	2018	2019	average	average	average
M. Freya	157	111	87		118	28.7	3.6
Malahat	186	113	105	109	128	17.7	4.0
G. Fyne	167	177	103	128	144	12.3	3.9
G. Ample	206	216	86	183	173	14.6	5.0
sign	0.05	0.01	n.s.	0.01	0.01	0.01	0.01
LSD	53.08	43.71	-	73.40	29.00	5.20	0.37

Table 3: Harvest development in percentage of the total yield

variety	percentage of total yield		
	5%	50%	95%
M. Freya	7.6	17.6	1.7
Malahat	18.6	28.6	10.7
Glen Fyne	21.6	3.7	15.7
Glen Ample	22.6	3.7	15.7

References

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