Influence of plastic cover on fruit-quality and monilia laxa infestations with organically produced apricots

L. Wurm[1] and W. Urschler[1]

Abstract

In the years 2005 to 2007 a plastic cover was tested in a testing area planted with apricots and operated according to the regulations for organic production.
Compared to the untreated control, fruit below the plastic cover showed decreased coloration. Monilia laxa infestations below the plastic cover could not be fully prevented, but were reduced considerably also by copper applications during flowering in 2007. Yield of the variant treated with copper, however, remained below average.
Losses due to rot during storage were smallest with the covered variant.

Keywords: apricot, organic production, *Monilia laxa*, plastic cover

Introduction

In integrated apricot production clear tendencies can be recognized: For the fresh market Orangered, Goldrich and Bergeron are established varieties, Pinkcot, Sylvercot, Kioto and Bergarouge will gain importance in the future. Ungarische Beste is the first choice, if one wants to offer processing products of highest quality, and it is also the number 1 variety with ex-farm and drive-by sales in the Wachau. Yield losses due to Monilia laxa twig blight or other diseases have become rare, since sufficiently effective plant protection agents are available.
Fruit quality enhancing measures, like manual fruit thinning, have become standard treatments. While integrated apricot production is increasing, there is practically no organic cultivation of apricot in Austria because of two reasons: On the one hand the prices which can be obtained with integrated production are rather high at the moment, on the other hand there is hardly an efficient plant protection method against Monilia laxa twig blight, an enormous risk for organic apricot cultivation.

Material and Methods

In order to investigate, whether an economic organic farming of apricots is possible, an apricot orchard (planting year 1998) of the LFZ Klosterneuburg was changed over to organic farming conditions in 2005. The cultivars Ungarische Beste, Goldrich and Bergeron, both trained as spindle (4 x 2 m) and hedge (4 x 4 m), were tested. In the winter 2004/2005 in this test orchard a frame was built as a basis for a plastic cover (Brändlin system). In the following years it was used for covering some rows of apricots with plastic from the balloon stage on. 2005 and 2006 the plastic cover remained until harvest in some rows, in the remaining rows it was rolled up at the beginning of June. In 2007 plastic covers were already taken off of all the rows at the end of May. The temperature gradient under and outside of the plastic cover was measured by means of calibrated thermohygrographs. The mechanical tree row management was performed with a Clemens and a Tournesol clearing plough.

[1] L. Wurm, Lehr- und Forschungszentrum für Wein- und Obstbau Klosterneuburg, A-3400, lothar.wurm@hblawo.bmlfuw.gv.at
[1] W. Urschler, Lehr- und Forschungszentrum für Wein- und Obstbau Klosterneuburg, A-3400

In direct plant protection measures the European Union guideline 2092/91 and the Austrian permission regulations served as basis. Against different caterpillar-species (for example Operophtera brumata) one to three treatments with a Bacillus thuringiensis product and/or a treatment with a Pyrethrum product were carried out per year. At bud break and leaf fall the whole orchard was treated with copper. From the stage of flowering on only a few rows were treated with copper (the variant "copper"). In 2007 applications were: On March, 8th, 1000 g copper per ha and on March, 16th, 250 g copper per ha.

The following factors can be differentiated:

cultivar	Goldrich, Ungarische Beste, Bergeron
Training system	spindle (4 x 2 m), hedge (4 x 4 m)
organic variant	control, copper-flower-treatment (not with spindle), plastic cover

Variants in all:

- Goldrich-spindle-control
- Goldrich-spindle-plastic cover
- Goldrich-hedge-control
- Goldrich-hedge-plastic cover
- Goldrich-hedge-copper-flower-treatment

- Ungarische Beste-spindle-control
- Ungarische Beste-spindle-plastic cover
- Ungarische Beste-hedge-control
- Ungarische Beste-hedge-plastic cover
- Ungarische Beste-hedge-copper-flower-treatment

- Bergeron-spindle-control
- Bergeron-spindle-plastic cover
- Bergeron-hedge-control
- Bergeron-hedge-plastic cover
- Bergeron-hedge-copper-flower-treatment

As soon as at the beginning of April 2007 the Monilia infections became visible, the infected shoots per tree were counted, at harvest time tree weight and fruit number per tree were determined.
In summer 2007 all organic variants of a cultivar and an integrated variant from another orchard were stored for four days at 10 °C and afterwards three days at 20 °C. Before storage and after taking the fruit out of storage the fruit flesh firmness (Durofel appliance), the contents of soluble dry substance and fruit acids were determined and each fruit was examined for fruit rot infestation.

Figure 1: apricot spindle in bloom with plastic cover

Results

2005 and 2006 no Monilia laxa twig blight infections could be observed. Also other diseases or pests caused only slight damages (Operophtera brumata for example). The fruit set of all variants was high. Only varietal influence on crop quantity and fruit size could be determined. The temperature measurements during bloom showed that the minimum temperature under the plastic cover remains approx. 0.5 to 1 °C higher with calm and cloudless weather conditions. The maximum temperatures in summer with no wind increase by approx. 5 to 7 °C above the level in the open land. Plastic cover up to harvest caused decreased fruit coloration. For this reason this variant was not any longer pursued in 2007 and at the end of May the plastic cover was taken off. 2007 for the first time substantial *Monilia laxa* twig blight infections occured. Monilia laxa infestations under the plastic cover could not be fully prevented, but were reduced considerably also by copper applications (see Table 1 and Figure 2). Differences between spindle and hedge are due to the larger crown volume of the hedge. There was no varietal influence (Table 2).

The evaluation of the fruit yield per tree shows a somewhat more differentiated picture (Table 3 and Figure 3). Again the larger crown volume of the hedge is to be considered. The plastic cover stimulated significantly increased yields, while control and the copper variants were on an equally low level. The application of copper had obviously negatively affected the fruit set. Goldrich produced significantly higher yields than Ungarische Beste and Bergeron (Table 4).

Table 1: average number infected shoots per tree (Tukey-HSD, Alpha = 0,05; values of a sub group differ statistically by chance)

VARIANT	N	Sub group		
		1	2	3
Plastic cover spindle	65	10,3		
Copper hedge	60	10,4		
Plastic cover hedge	20	18,3		
control spindle	35		47,0	
control hedge	25			98,9
signifikance		0,90	1,0	1,0

Table 2: average number infected shoots per tree of cultivars over all variants (Tukey-HSD, Alpha = 0,05)

cultivar	N	Sub group
		1
Goldrich	83	21,9
Ungarische	62	28,9
Bergeron	60	36,1
signifikance		0,06

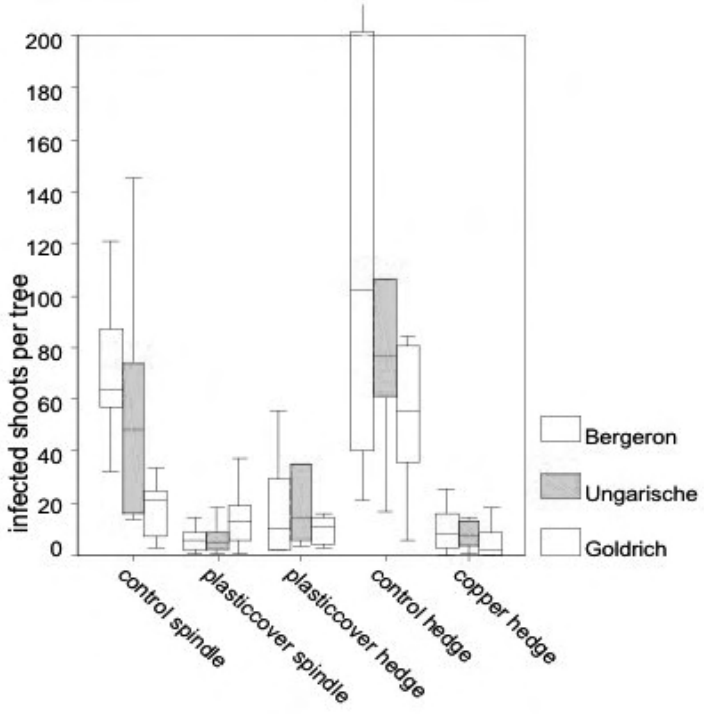

Figure 2: average number infected shoots per tree

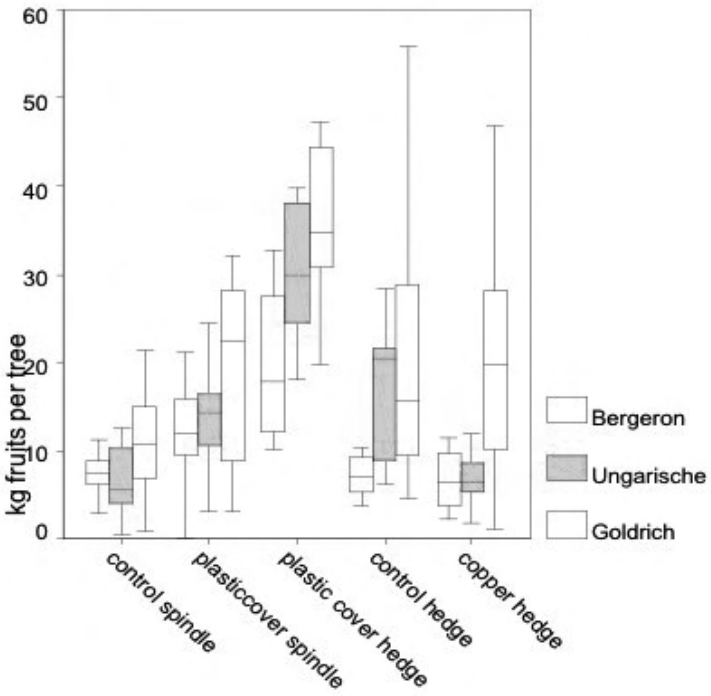

Figure 3: yield per tree 2007 in kg

Likewise a significant, positive effect of the plastic cover could be observed in the context of the storage trial (Figure 4). Considering all cultivars only somewhat more than 3% of the fruit from plastic cover showed symptoms of fruit rot, the other variants, also the IP-variant, had more than 10%. The normally rather rot-sensitive cultivar Ungarische Beste did not differ from the two other cultivars in this attempt. An effect of the plastic cover or the copper treatment on the fruit flesh firmness, the content of soluble dry substance and fruit acids was not given. Sensory evaluations by means of triangle test confirmed the results (no significant effect of organic variant on flavour and analyzed substances) of these investigations. However, a significant varietal influence was detected again (table 5, 6 and 7).

Table 3: yield per tree 2007 in kg (Tukey-HSD, Alpha = 0,05)

VARIANT	N	Sub group		
		1	2	3
Control spindle	35	8,7		
Copper hedge	60	12,2	12,2	
Plastic cover spindle	65		15,8	
Control hedge	25		16,2	
Plastic cover hedge	20			30,2
signifikance		0,4	0,3	1,0

Table 4: yield per tree 2007 in kg of cultivars over all variants (Tukey-HSD, Alpha = 0,05)

cultivar	N	Sub group	
		1	2
Bergeron	60	9,9	
Ungarische	62	12,6	
Goldrich	83		20,5
signifikance		0,15	1,0

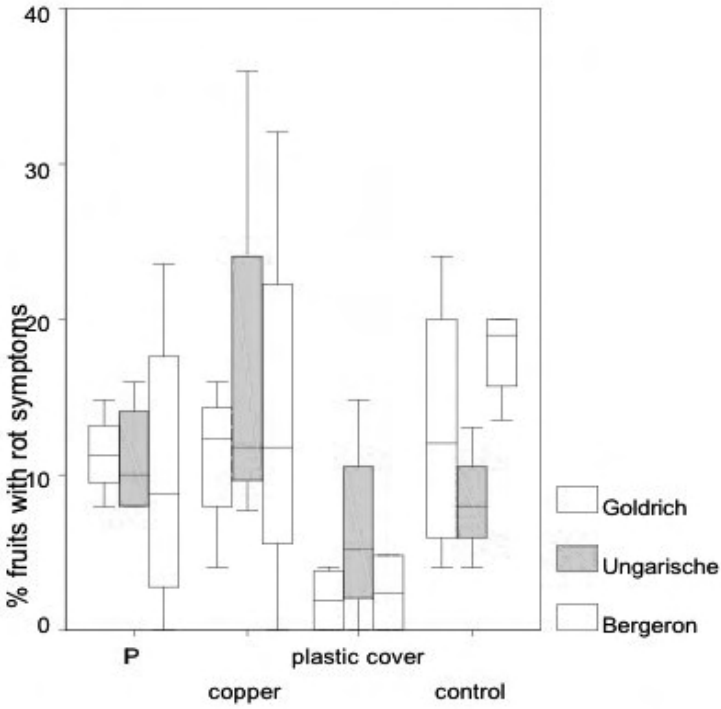

Figure 4: % fruits with rot symptoms after seven days (four days 10°C, three days 20°C) of storage

Table 5: content of soluble dry substance in °Oechsle at the beginning of storage (cultivars over all variants; Tukey-HSD, Alpha = 0,05)

cultivar	N	Sub group	
		1	2
Goldrich	16	46,5	
Bergeron	16	48,0	
Ungarische	16		51,5
signifikance		0,46	1,0

Table 6: content of fruit acids (calculated as tartaric acid) in g per litre at the beginning of storage (cultivars over all variants; Tukey-HSD, Alpha = 0,05)

cultivar	N	Sub group	
		1	2
Ungarische	16	18,8	
Bergeron	16		22,3
Goldrich	16		22,5
signifikance		1,0	0,94

Table 7: fruit flesh firmness (Durofel-unit) at the beginning of storage (cultivars over all variants; Tukey-HSD, Alpha = 0,05)

cultivar	N	Sub group	
		1	2
Ungarische	16	53,4	
Bergeron	16	58,6	58,6
Goldrich	16		64,4
signifikance		0,23	0,16

Discussion

After three years organic apricot production seems to be feasible in principle. Plastic cover until approx. six weeks before harvest begins promotes the fruit set and the yield and improves the shelf-life of the fruit. Decreased coloration of the fruit becomes a problem only if the plastic cover remains until harvest. The cover does not guarantee full protection from frosts, but a slight temperature increasing effect could be determined. A combination of plastic cover and heating methods could be interesting. These advantages, however, are opposed by the high costs of a plastic cover, the work expenditure for applying and removing the plastic cover and the wind susceptibility of the tested system. By means of copper treatments into the bloom the Monilia laxa infestation could be inhibited to a large extent in 2007, fruit set, however, remained below average. Further attempts for the optimization of the copper treatment and for testing other products against Monilia laxa twig blight are necessary.

References

Audubert, A., Lichou, L. (1989) : L' abricotier. 1 Auflage -Paris: Éditions Ctifl 1989

Lichou, L. (1998) : Abricot- Les variétés, mode d'emploi. 1.Auflage -Paris: Éditions Ctifl 1998

ÖSTAT 2002 : Obstanlagen nach Produktionsrichtung 2002 und 1997

Osaer, A., Vaysse, P., Berthoumieu, J.F., Audubert, A., Trillot, M. (1998): Gel de printemps. 1.Auflage -Paris: Éditions Ctifl 1998

Süle, S. 1999: Strategies for the control of apricot decline. Mitt. Klosterneuburg 49 (6): 250-252

Thomas, A. (2005): Bessere Monilia-Bekämpfung durch neue Forschungsergebnisse? Tagungsband Bundessteinobstseminar 2005 DLR Rheinpfalz