Influence of application strategy of coconut soap on the development of sooty blotch on apple

Einfluss der Anwendungsstrategie von Biofa Cocana RF auf Regenfleckkrankheit des Apfels

Fuchs, J. G., Häseli[1], A. und L. Tamm

Abstract

Sooty blotch causes heavy losses in Swiss organic apple production. In 2000 and 2001 a late season application strategy with coconut soap (Biofa Cocana RF) was evaluated. Coconut soap reduced disease occurrence in all experiments. However, the efficacy was much higher in 2000 than in 2001, probably due to a much higher disease pressure in 2001.

Keywords

Regenflecken, sooty blotch, Gloeodes pomigena, coconut soap, Biofa Cocana RF, lime sulphur

Introduction

Sooty blotch, caused by *Gloeodes pomigena*, is a major disease on organic apple in Switzerland, especially under humid conditions. The pathogen is ubiquitous, and the disease development is very serious under wet and cool climatic conditions. As a result, sooty blotch development is particularly intensive in autumn on late maturing apple varieties.
Cultural techniques are insufficient to control the disease, and no sufficiently resistant varieties are known although varietal differences have been observed. Treatments with sulphur or coconut soap ("Biofa Cocana RF") during the growing season reduce disease incidence. However, experience from commercial orchards in Switzerland shows that control of sooty blotch is often insufficient, particularly late in the season (Tamm, 1995; Tamm, 1997). So far, treatments are not allowed in the last three weeks prior to harvest by the registration authorities. The potential of late treatments has not been studies so far. The aim of this study was therefore to evaluate if the intensification of treatments in the last four weeks prior to harvest (i) improves disease control, and (ii) hampers the quality of harvested fruit due to residues.

Materials and Methods

On farm experiments were performed 2000 and 2001 to evaluate if treatments of apple with "Biofa Cocana RF" close to harvest enhance the protection of the fruit against sooty blotch. In 2000, the trees were treated with a knapsack sprayer, and in 2001 with the sprayer used by the farmer for crop protection. "Biofa Cocana RF" was applied at 1%. Lime sulphur (1%) was used as an alternative. At present, lime sulphur is not authorized in Switzerland. Disease incidence and severity were evaluated at harvest. An apple with less than 5% surface covered with sooty blotch symptoms was considered as marketable.
Residues from by "Biofa Cocana RF" might cause foam problem when apples are processed due to its soap properties. A preliminary test for foam development was performed. Samples of 10 apples were one after another shaken 10 minutes in a 600 ml beaker filled with 200 ml distilled water. The remaining solution was then transferred to a 500 ml glass cylinder and vigorously shaked by hand 10 times. The height of foam formation was subsequently measured.

[1] FiBL, CH-5070 Frick

Results

Reduction of the disease development with lime sulphur and with "Biofa Cocana RF" was observed on all the experiments in 2000(Tab. 1). Disease incidence was clearly more reduced with two additional "Biofa Cocana RF" treatments in the autumn (Tab. 1). The lime sulphur treatment (4 applications) was almost as efficient as the treatments with 6 sprays of "Biofa Cocana RF", but the visible residues on harvested fruit were found unacceptably intensive. The efficiency of the treatments was also obvious in the marketability was assessments. All treatments increased consistently the number of marketable fruit in all experiments (Tab. 1).
In 2001, the reduction of the disease incidence after "Biofa Cocana RF" treatments was confirmed (Tab. 2). However, the treatments were not as efficient as in 2000, which led to a high proportion of unmarketable fruit (Tab. 2). The shift of the "Biofa Cocana RF" treatments towards late season did not improve the efficiency in 2001.
In 2000, residues on harvested fruit were evaluated. The treatment of the apple with "Biofa Cocana RF" closely to the harvest didn't cause any foam development by the wash water.

Discussion

"Biofa Cocana RF" reduces the incidence of the sooty blotch on apple. This reduction is comparable with lime sulphur treatments. As opposed to lime sulphur treatments "Biofa Cocana RF" does not leave visible residues on the fruit.
However, the efficiency of "Biofa Cocana RF" is not constant throughout all experiments. In 2000, the reduction of the disease was very good in all experiments, and the supplementary treatments in autumn enhanced the protection of the plants on a level which is satisfactory for the grower. In 2001, the protection of the apple was insufficient from the economical point of view in the majority of the experiments, even if the "Biofa Cocana RF" treatments were applied later in autumn and close to harvest. These heterogeneous results may be due to the variable infection conditions and the disease pressure in the field. In 2000, the climatic conditions were relatively dry and the disease pressure relatively low, and as a result, it was possible to control efficiently sooty blotch with "Biofa Cocana RF". The two supplementary treatments at the end of August and at the beginning of September gave additional protection to the apples during the phase

when the climatic conditions favour the disease development. 2001 was a rainy year, and the disease pressure was high throughout most of the season. Under such difficult conditions the protection of the fruit with "Biofa Cocana RF" was not sufficient, regardless if the treatments were earlier or later in the season. We suppose that heavy rains during the season washed the product off the apples too quickly which resulted in the loss of protection.

Conclusions

The protection of apple against sooty blotch with "Biofa Cocana RF" can be very efficient if the disease pressure is not to high. In difficult years like 2001, control is often insufficient. An intensification of the treatment frequency during rain period could help to reduce disease incidence, but it is questionable if this is compatible with the principles of organic apple production.

Tab. 1: Influence of treatment strategy on the development of sooty blotch, causing agent *Gloeodes pomigena*, on apple in 2000.

Treatment	disease incidence [% apple with symptoms]	disease severity [% fruit surface with lesions]	% commercial suitable fruits
Experiment 2000-1, harvest on 19th September (cultivar Glocken, locality CH-Pfyn)			
Control	88.1 ± 10.5	11.8 ± 2.5	40.8 ± 6.2
Lime sulphur	51.7 ± 15.3	1.1 ± 0.3	96.7 ± 2.9
Cocana normal	50.2 ± 9.2	1.7 ± 0.8	89.9 ± 13.2
Cocana late	36.7 ± 2.9	0.9 ± 0.5	95.0 ± 8.7
Experiment 2000-2, 1st harvest on 28th September (cultivar Resista, locality CH-Pfyn),			
Control	100.0 ± 0.0	13.0 ± 5.5	11.7 ± 16.1
Lime sulphur	20.0 ± 5.0	0.6 ± 0.5	95.0 ± 5.0
Cocana normal	50.0 ± 8.7	1.3 ± 0.2	93.3 ± 2.9
Cocana late	18.3 ± 7.6	0.3 ± 0.2	98.3 ± 2.9
Experiment 2000-2, 2nd harvest on 19th October (cultivar Resista, locality CH-Pfyn),			
Control	100 ± 0.0	44.7 ± 5.3	0.0 ± 0.0
Lime sulphur	56.7 ± 11.5	2.5 ± 0.5	83.3 ± 11.5
Cocana normal	80.0 ± 20.0	6.8 ± 1.3	60.0 ± 10.0
Cocana late	20.0 ± 10.0	0.5 ± 0.2	100.0 ± 0.0
Experiment 2000-3, harvest on 10th October (cultivar Idared, locality CH-Wettingen),			
Cocana normal	85.0 ± 8.7	7.6 ± 2.8	58.3 ± 17.6
Cocana late	63.3 ± 2.9	2.5 ± 0.8	81.7 ± 12.6

Control: No treatment
Lime sulphure: 1%. Treatments on 6th, 17th and 31th July and 14th August
Cocana normal: Biofa Cocana RF 1%. Treatments on 6th, 17th and 31th July and 14th August
Cocana late Biofa Cocana RF 1%. Treatments like Cocana normal, and on 24th August and 4th September

Each value is the mean of three replicates, with four trees (experiment 2: 5 trees) per replicate.

Tab. 2: Influence of treatment strategy on the development of sooty blotch, causing agent *Gloeodes pomigena*, on apple in 2001 (part 1).

Treatment	disease severity [% fruit surface with lesions]		% commercial suitable fruits	
Experiment 2001-1 (cultivar Topaz, locality CH-Pfyn, harvest on 28th September)				
Control	39.8 ± 20.6		0	
Cocana normal	21.3 ± 13.4		9	
Cocana late	21.4 ± 13.6		7	
Experiment 2001-2 (cultivar Resista, locality CH-Pfyn)				
	1st harvest (8th October)	2nd harvest (17th October)	1st harvest (8th October)	2nd harvest (17th October)
Control	38.8 ± 19.3	-	0	-
Cocana normal	6.0 ± 16.0	23.0 ± 12.1	39	1
Cocana late	14.3 ± 9.8	24.7 ± 11.0	10	0
Experiment 2001-3, (cultivar Glocken, locality CH-Pfyn)				
	1st harvest (3rd October)	2nd harvest (12th October)	1st harvest (3rd October)	2nd harvest (12th October)
Control	18.2 ± 14.4	-	9	-
Cocana normal	2.7 ± 3.7	7.8 ± 8.9	62	30
Cocana late	3.0 ± 5.3	7.1 ± 9.9	70	46
Experiment 2001-4 (cultivar Maigold, locality CH-Pfyn, harvest on 10th October)				
Control	53.4 ± 26.6		0	
Cocana normal	16.7 ± 13.4		13	
Cocana late	11.9 ± 12.8		29	

Control: No treatment
Cocana normal: Biofa Cocana RF 1%. Experiments 2001-1 to 2001-4: Treatments on 18th Juni; 7th, 16th and 24th July; 10th and 22th August; 3th September.
Cocana late Biofa Cocana RF 1%. Experiments 2001-1: Treatments on 16th and 28th July; 10th and 22th August; 3th, 10th and 18th September.
Experiments 2001-2: Treatments on 16th and 28th July; 10th and 22th August; 3th, 10th, 18th and 27th September; 10th October.
Experiments 2001-3 and 2001-4: Treatments on 16th and 28th July; 10th and 22th August; 3th, 10th, 18th and 27th September.

One hundred fruit per treatment were harvest and the disease incidence of each fruit was evaluated.

Tab. 3: Influence of treatment strategy on the development of sooty blotch, causing agent *Gloeodes pomigena*, on apple in 2001 (part 2).

Treatment	disease severity [% fruit surface with lesions]	% commercial suitable fruits
Experiment 2001-5 (cultivar Idared, locality CH-Feldmeilen, harvest on 12th October),		
Control	6.7 ± 5.6	23
Cocana normal	2.7 ± 3.7	57
Cocana late	0.4 ± 1.5	93
Experiment 2001-6 (cultivar Golden Delicious, locality CH-Feldmeilen, harvest on 16th October),		
Control	13.7 ± 12.1	2
Cocana normal	1.3 ± 2.8	80
Cocana late	0.3 ± 1.1	95
Experiment 2001-7 (cultivar Maigold, locality CH-Feldmeilen, harvest on 10th October),		
Control	13.9 ± 11.1	3
Cocana normal	4.1 ± 5.3	47
Cocana late	7.2 ± 6.8	23
Experiment 2001-8 (cultivar Idared, locality CH-Dietikon),		
Control	34.9 ± 23.6	0
Cocana normal	21.0 ± 14.6	4
Cocana late	11.8 ± 11.8	6

Control:	No treatment	
Cocana normal:	Biofa Cocana RF 1%.	Experiments 2001-5 to 2001-7: Treatments on 20th Juni; 10th and 23th July; 6th, 22th and 29th August Experiment 2001-8: Treatments on 20th Juni, 9th, 17th and 24th July, 6th and 21th August; 7th September.
Cocana late	Biofa Cocana RF 1%.	Experiments 2001-5 to 2001-7: Treatments on 23th July; 6th, 22th and 29th August; 6th, 21th and 26th September. Experiment 2001-8: Treatments on 6th, 17th, 21th and 31th August; 7th and 28th September.

One hundred fruit per treatment were harvest and the disease incidence of each fruit was evaluated

Literature Cited

Tamm, L. (1995). Wirkung von Pflanzenbehandlungsmitteln gegen die Russflecken *(Gloeodes pomigena)* und die Fliegenschmutzkrankheit *Schizothyrium sp.* an Apfel. *In* "Dossier Mittelprüfung 1995" (L. Tamm and E. Wyss, eds.), pp. 1–3. Forschungsinstitut für biologischen Landbau.

Tamm, L. (1997). Regenflecken: Praxiserfahrungen mit einer situationsspezifischen Anwendungsstrategie. *In* "8. Internationaler Erfahrungsaustausch über Forschungsergebnisse zum Ökologischen Obstbau". Fördergemeinschaft Ökologischer Obstbau E.V., Weinsberg, G.