Alternatives for copper fungicide against scab on Jonagold apple
Alternativeen voor Kupfer gegen Schorf auf Jonagold

P. J. Janssen, J. Bokmaa, B. Heijne, R. H. N. Anbeeg

Zusammenfassung
Der Schorftrick war extrem stark in diesem Experiment mit 3 jährigem Jonagold. Der Basisbelegung war in alle Behandlungen mit einer niedrigen Dosierung Schwefl (Thiovil) und oberflächen ungleichmäßigen Behandlungen auf Motten von schweren Infektion durch Schorfkrankheit mit DL-V-Weite. Die Schäden in den Kulturpflanzen mit Schwefl (Objekt 6) und Flüssigpulvern (Objekt 7) sind ähnlich gleich wie Kupfer (Objekt 5). In dieser hohen Dosierung bestand das Risiko den Blatterblatt beim Erhaltung der Blätter keine Schäden auf Beratung oder Fruchtilstand. Mysitoff (Objekt 7) und niedrige Dosierung Schwefl (Objekt 3) zeigen signifikant geringere Schäden.

Introduction
Copper is currently the strongest fungicide available to organic fruit growers. Unfortunately it is not environmentally safe and it has a bad image with the consumer. As a result, there is pressure to abandon copper altogether. In 1990 the Fruit Research Station FPQ and the Louis Bolk Institute carried out a spray trial to assess the potential of various alternatives.

Method and materials
The trial was carried out on 3-year-old Jonagold trees under high infection pressure. Spraying was done with a motor sprayer and spray gun. Trees were sprayed to the point of runoff. Treatments were scheduled to be done with the help of the scab-forecasting program DL-V-Weite. The aim was to spray just before the onset of rain. The basic spray was Thiovil sulphur. When a heavy release of ascospores was predicted and/or when temperatures were below 15 °C, a higher dosage was used (treatments 3 and 8) or other products were added (treatments 4-7). During and after flowering the dosages were reduced. The liquid sulphur formulation Heliosulphur was used as a comparison with Thiovil sulphur. The conventional fungicide Selsp (6 applications) was used as a reference.

The entire field was sprayed with 3 kg/ha Funguram (copper) on 13 and 25 March to eliminate any differences in conidia production that might have existed as a result of experiments of the year before. From the beginning of June, the entire field was sprayed only with Thiovil.

Scab incidence, leaf phytotoxicity, fruit rusketing and effects on fruit set and June were measured. Fruit rusketing was scored on a scale of 1-5, where 1 = no rusketing and 5 = more than 33% of the surface is rusketed.

Results, see table

Discussion
The overall scab incidence was extremely high. A high infection pressure in the field and some irregularities in the timing of the spraying can explain this. Lime sulphur and the liquid sulphur product Heliosulphur were approximately as effective as Funguram. All products were sprayed at a relatively high dosage. This resulted in visible damage to the leaves, especially with lime sulphur and Heliosulphur. This damage had no effect on fruitset and June drop.

During the course of the season, the initial differences levelled out to some extent. At harvest, scab incidence on the fruit was very high. Treatments 3 and 7 were significantly worse than treatments 4, 5, 6 and 8. The differences in rusketing between treatments 3, 4, 5, 6, 7 and 8 were small.

Scab incidence and side effects / Schorfbelastung und Nebenwirkungen

<table>
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<tr>
<th>Agent</th>
<th>% of leaves</th>
<th>% of fruits</th>
<th>Leaf</th>
<th>Seeds</th>
<th>% of fruits</th>
<th>Fruit</th>
<th>Scab incidence</th>
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<td>Thiovil</td>
<td>1-5</td>
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<td>Thiovil + Copper-OH</td>
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<td>Thiovil + Lime sulphur</td>
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<td>Funguram</td>
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</tbody>
</table>

Conclusions
Lime sulphur and Heliosulphur produced results that were comparable to Funguram.

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Alternatives for copper fungicide against scab on Jonagold apple

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Zusammenfassung


Introduction

Copper is currently the strongest fungicide available to organic fruit growers. Unfortunately it is not environmentally safe and it has a bad image with the consumer. As a result, there is pressure to abandon copper altogether. In 1996 the Fruit Research Station FPO and the Louis Bolk Institute carried out a spray trial to assess the potential of various alternatives.

Method and materials

The trial was carried out on 3-year-old Jonagold trees under high infection pressure. Spraying was done with a motor sprayer and spray gun. Trees were sprayed to the point of runoff. Treatments were scheduled was done with the help of the scab-forecasting program D.W.V.-Walde. The aim was to spray just before the onset of rain. The basic spray was Thiovit sulphur. When a heavy release of ascospores was predicted and/or when temperatures were below 15 °C, a higher dosage was used (treatments 3 and 8) or other treatments were added (treatments 4-7). During and after flowering the dosages were reduced. The liquid sulphur formulation Heliosolfe was used as a comparison with Thiovit sulphur. The conventional fungicide Scat (6 applications) was used as a reference.

The entire field was sprayed with 3 kg/ha Funguran (copper) on 13 and 25 March to eliminate any differences in conidia production that might have existed as a result of experiments of the year before. From the beginning of June, the entire field was sprayed only with Thiovit.

Scab incidence, leaf phyllostixtity, fruit russetting and effects on fruit set and June drop were registered. Fruit russetting was scored on a scale of 1-10, where 1 = no russetting and 9 = more than 33% of the surface is russeted.

Results, see table

Discussion

The overall scab incidence was extremely high. A high infection pressure in the field and some repercussions in the timing of the spraying can explain this. Lime sulphur and the liquid sulphur product Heliosolfe were approximately as effective as Funguran. All products were sprayed at a relatively high dosage. This resulted in visible damage to the leaves, especially with lime sulphur and Heliosolfe. This damage had no effect on fruitset and June drop.

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Scab infestation and side effects / Schorfbelag und Nebenwirkungen

Agtm: 1X between 20th of April and 27th of May

DOSAGE in kg of lime ha\-1

On cluster leaf old long shoots young long shoots

Leaf damage* Seeds per fruit % drop Fruit russeting*% 1. May 1.3. June Harvest 25 April July July Harvest

1. Unsprayed 62 e 99 d 92 d 96 e 0 a 4.2 b 75 a 2.5 cde

2. Scat 0.75* 5 a 15 x 44 b 19 c 22 x 1.6 ab - 64 a 2.5 cd

3. Thiovit sulphur 0.5 14 c 57 bc 74 c 43 de 1.6 ab 1.6 ab - 74 a 2.5 cd

4. Thiovit + Thiovit 4-10 16 c 65 bc 87 cd 66 cde 1.6 b 1.6 a 70 a 2.5 cd

5. Thiovit + Copper-Oh 0.5 6.3-5.7 7 b 60 bc 69 c 50 c 1.6 b 1.6 ab 66 a 2.5 cd

6. Thiovit + Lime sulphur 0.5 2.5-2.5 8 5 b 54 b 73 c 59 cd 1.6 c 1.6 a 70 a 2.5 cd

7. Thiovit + Mycelon 0.5 10 16 a 80 cd 81 cd 65 ef 1.6 b 3.9 ab 75 e 3.0 fg

8. Heliosolfe 3.5 5 10 c 66 bc 76 c 94 cd 1.6 c 1.6 ab 77 a 3.2 g

1. The leaf damage index ranges from 0 (no damage), 1 (smaller leaf, 5 (smaller leaf with brown edge) to 9 (thorny, small leaf and brown petals)

2. The fruit russetting index ranges from 1 (firmness, small leaf and brown petals)

Conclusions

Lime sulphur and Heliosolfe produced results that were comparable to Funguran.
When used at a high dosage, both products have the risk of causing phytotoxic effects. Although we observed visible foliage in the leaves after bloom, this did not lead to severe rusting of the fruit or reduction of the number of fruits. Mycosin and the lower dosage of Thiovit were significantly less effective.

Summary
Scab pressure was always in this experiment with 3-year-old Jonagold. In all objects the basic treatment was how dosage of sulphur (Thovit) and CHN that an extra treatment was sprayed at moments of strong infection predicted by scab warning program DLV-Weite. Lime sulphur (object 6) and liquid sulphur (object 7) were as effective as copper (object 5). In this high dosage there is a risk of phytotoxicity. After flowering leaf damage was visible but without consequences for rusting of fruit set. Mycosin (object 7) and low dosage of sulphur were less effective for scab control.

Abstract
In the project "Optimizing of organic apple production in the Southwest of the Netherlands" we did work for a better understanding of the life-cycles of pear scab and found a management strategies in organic farming. We didn't start the possibilities of lowering but also how to prevent an infection of the fungus. We did not have any fertilizers of which we started the preparations. We didn't stop spraying etc. The best treatment was a combination of copper and sulphur. In addition, a combination of sulphur and copper is used. There is a perspective in the use of lime-sulphur. Possibly in 1985 there have been good results in experiments with lime-sulphur as a take dormant spray in Oregon (USA). There should be experiments for the use of lime-sulphur in the season. What we all work is, how is the profitability and how is the effect of other following materials. Fertilizers will be done in 2000 in California (USA) models are under development to forecast infestation risk. It is a combination of the species and cultivars models for sustainable fruit production (1984) with infection conditions from the NAL-fruit-vegetable model. This model only works with high temperatures.

1. Einleitung
In ökologisch bewirtschafteten Böden ist Birnenschorf der Teiljahre ein zunehmendes Problem. Geänderte Zwischenjahre steigen die Beimengungen.

2. Fragestellung
- Ist es möglich, vorbeugende Maßnahmen zu nehmen, gibt es Ergebnisse in Literatur oder Praxis?
- Was sind die verschiedenen Ergebnisse mit der Bekämpfung von Birnenschorf?
- Gibt es andere Bekämpfungsmöglichkeiten ausserdem Mieten wie Kupfer und Schwefel?

3. Birnenschorf allgemein
Birnenschorf ist in der ganzen Welt bekannt, überall wo Birnen wachsen Es gibt

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