Alternatives for copper fungicide against scab on Jonagold apple

Alternativen für Kupfer gegen Schorf auf Jonagold

P.J. Jansonius, J. Bloksma[1], B. Heijne, R.H.N. Anbergen[2]

Zusammenfassung

Der Schorfdruck war extrem stark in diesem Experiment mit 3 jährigem Jonagold. Der Basisbekämpfung war in alle Behandlungen mit einer niedrigen Dosierung Schwefel (Thiovit) und obendrauf unterschiedlichen Behandlungen auf Momente von schweren Infektion durch Schorfwammodel DLV-Welte.

Die Schorfbekämpfung mit Schwefelkalk (Objekt 6) und Flüssigschwefel (Objekt 7) sind ähnlich mit Kupfer (Objekt 5). In dieser hohen Dosierung besteht das Risiko von Blattschädigung. Nach der Blüte war deutliche Phytotoxicität zu sehen aber das hatte keine Einfluss auf Berostung oder Fruchtansatz. MycoSin (Objekt 7) und niedrige Dosierung Schwefel (Objekt 3) zeigten signifikant geringere Schorfwirkung.

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 1999 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 DLV-Welte. 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 products were added (treatments 4-7). During and after flowering the dosages were reduced. The liquid sulphur formulation Heliosoufre was used as a comparison with Thiovit sulphur. The conventional fungicide Scala (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 phytotoxicity, fruit russeting and effects on fruit set and June drop were registered. Fruit russeting was scored on a scale from 1-9, where 1 = no

[1] Louis Bolk Institute, Hoofdstraat 24, NL-3972 LA Driebergen, the Netherlands, tel. 0031-343-517814; email: p.jansonius@louisbolk.nl and j.bloksma@louisbolk.nl

[2] Fruit Reasearch Station FPO, Postbox 200, NL 6670 AE Zetten

russeting 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 imperfections in the timing of the spraying can explain this.
Lime sulphur and the liquid sulphur product Heliosoufre 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 heliosoufre. 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 russeting between treatments 3, 4, 5, 6, 7 and 8 were small.

Scab infestation and side effects / *Schorfbefall und Nebenwirkungen*

Agent 11x between 2th of April and 27th of May	**Dosage**[3] In kg or litres* per ha	**% scab = *% Schorf***				**Side effects on crop = *Nebenwirkung auf Pflanze***			
		On cluster leaf	**old long shoots**	**young long shoots**	**on fruit**	**Leaf damage**[1]	**Seeds per fruit**	**% drop**	**Fruit russeting**[2]
		11 May	1,2,5 June		Harvest	28 April	July	July	Harvest
1 Untreated		42 e	99 d	96 d	98 f	0 a	4,2 b	75 a	2,6 cde
2 Scala	0.75*	0 a	15 a	48 b	16 b	--	--	--	2,3 ab
3 Thiovit suphur	2-5	14 cd	67 bc	74 c	73 de	1,0 ab	--	74 a	2,6 bcd
4 Thiovit + Thiovit	4-10	18 d	66 bc	87 cd	65 cde	1,6 b	3,6 a	70 a	2,6 cdef
5 Thiovit + Copper-OH	2-5 + 0,3-0,7	6 bc	60 bc	78 cd	50 c	1,6 b	3,8 ab	66 a	2,9 efg
6 Thiovit + Lime sulphur	2-5 + 20-25*	3 b	54 b	73 c	59 cd	5,8 c	3,5 a	74 a	2,8 def
7 Thiovit + Mycosin	2-5 + 10	18 d	80 cd	81 cd	85 ef	2,2 b	3,9 ab	75 a	3,0 fg
8 Heliosoufre	3-6*	10 c	66 bc	79 cd	64 cde	9,0 c	3,4 a	77 a	3,2 g

1)= The leaf damage index ranges from 0 (no damage), 3 (smaller leaf), 6 (smaller leaf with brown edges) to 9 (=bumpy, small leaf and brown petals).
2)= The fruit russeting index ranges from 1 (=smooth), 3 (1-3%), 5 (=4-11%), 7 (=12-33%) to 9 (>30% rough surface area).
3)= The dosage is modified according to the developmental stage of the crop and the temperature; the minimum and maximum are stated in the table.
4)= Results in one column followed by the same letter do not differ at a 0,05 level.

Conclusions

Lime sulphur and Heliosoufre 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 damage to the leaves after bloom, this did not lead to severe russeting 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 severe in this experiment with 3 year old Jonagold. In all objects the basic treatment was low dosage of sulphur (Thiovit) and beside that an extra treatment was sprayed at moments of stark infection predicted by scab warning program DLV-Welte. 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 fytotoxicity. After flowering leave damage was visible but without consequences for russeting or fruit set. Mycosin (object 7) and low dosage of sulphur were less effective for scab control.