

Preliminary results show rain roofs to have remarkable effect on diseases of apples

Bevillingsgiver:
Organic RDD programmet, NaturErhvervstyrelsen
Ministeriet for Fødevarer, Landbrug og Fiskeri
Foreningen PlanDanmark

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Rain roofs at the experimental orchard Department of Food Science, Årslev, DK

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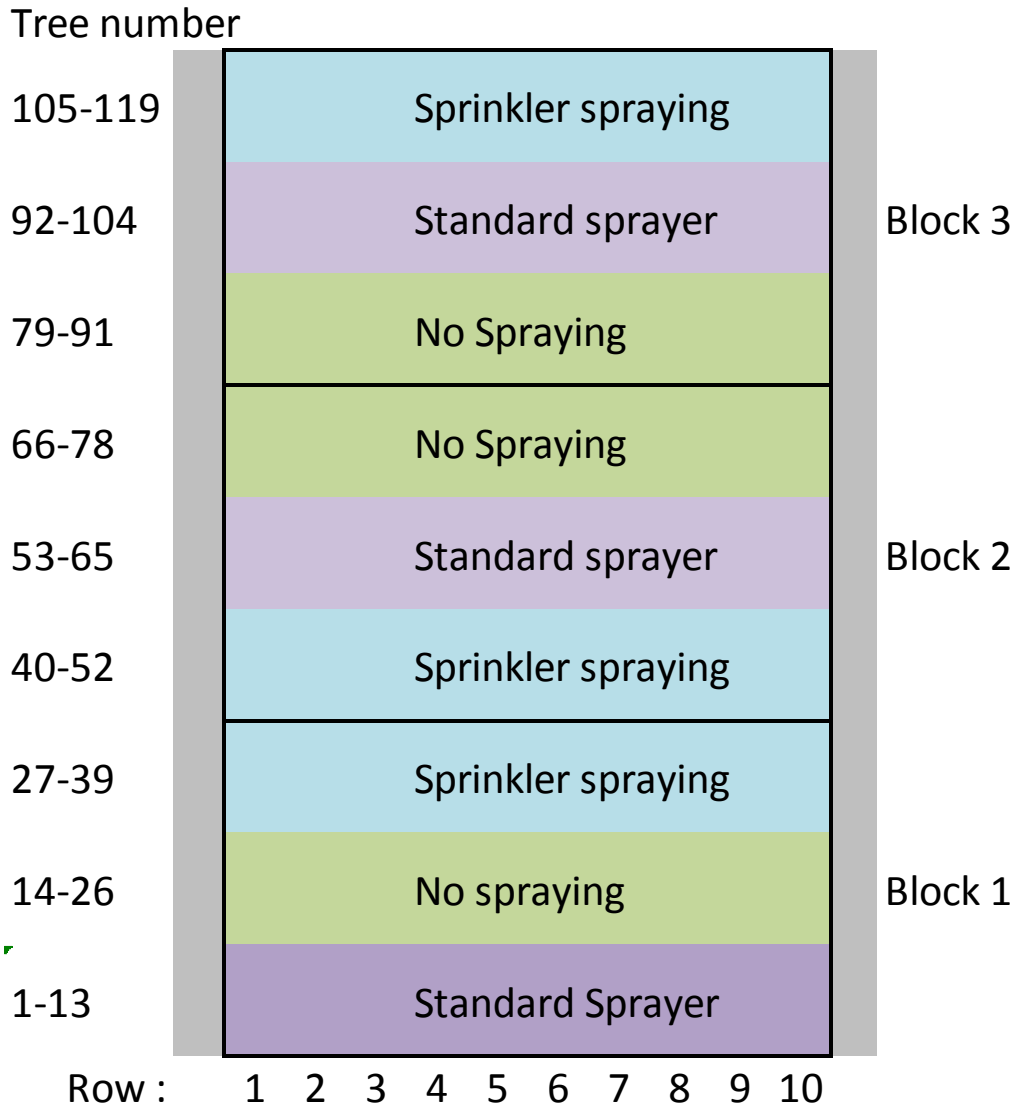
Experimental design

1m x 3,3 m /M9

Planted 2009



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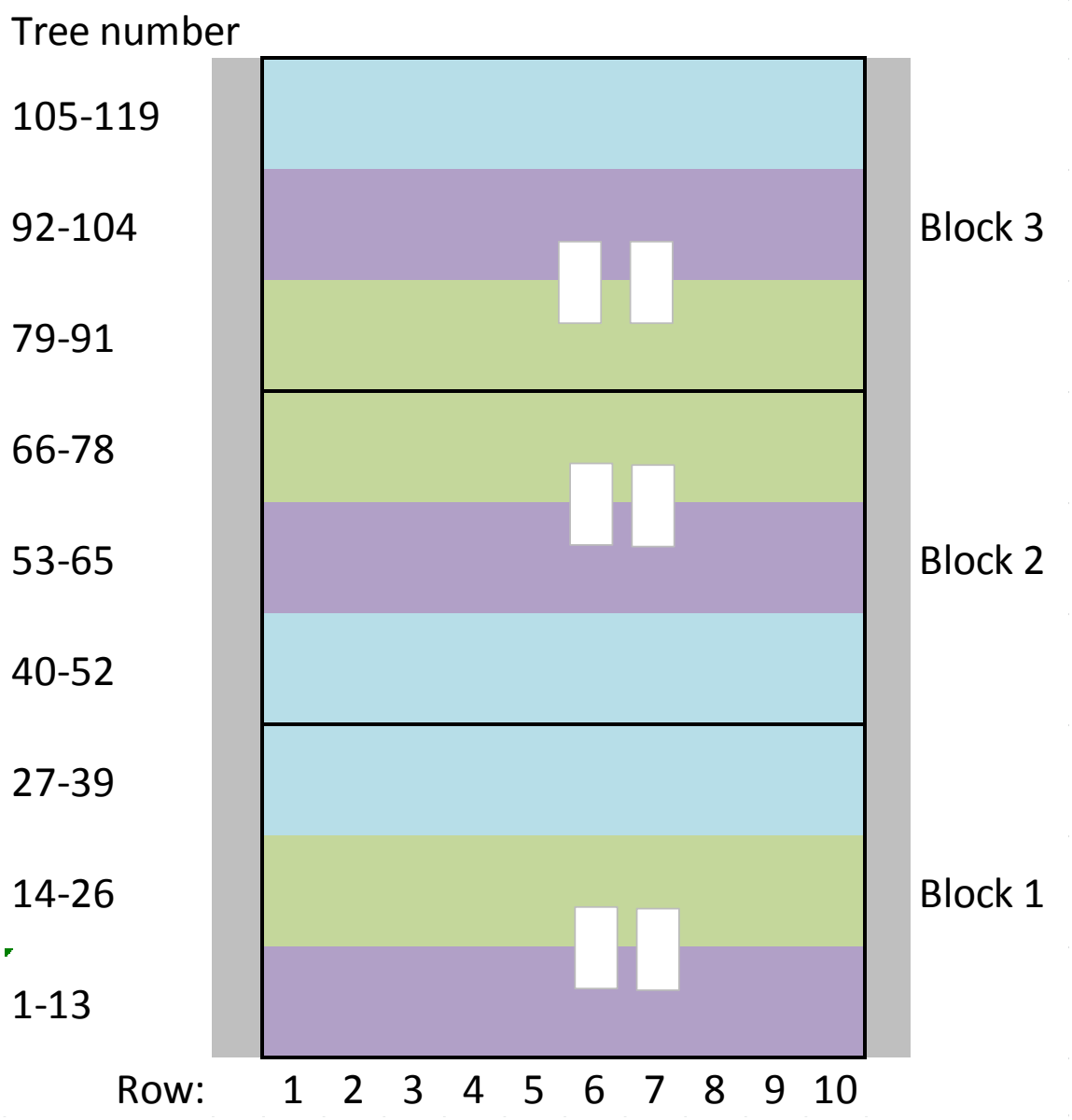
Location of the rain roofs



Roof 2012:

+/- spraying

Roof 2013:

No spraying

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Spray treatments applied in 2012 and the level of scab infection according to RIMpro

Preventive Kumulus 4 kg/ha	Scab infection level	Curative Potassium bicarbonate 5 kg/ha
8 April	Moderate primary infection	11. April
20 April	Severe primary infection	-
25 April	Severe primary infection	25 April
8 May	Very severe and long primary infection	10 May
	Severe fruit infection (Flowering)	11 May
14 May	Moderate Secondary leaf infection	
6 June	Severe secondary leaf infection	
9 June	Severe fruit infection	9 June
15 June	Severe fruit infection	
	Severe fruit infection	19 June
21 June	Severe leaf infection	23 June
	Severe leaf infection	25 June
29 June	Moderate fruit infection	30 June
5 July	Light fruit infection	
10 July	Moderate fruit infection	10 July
13 July	Severe and long leaf infection	
18 July	Moderate fruit infection	19 July
28 July	Moderate fruit infection	28 July
5 August	Severe leaf infection	
16 August	Severe leaf infection	
24 August	Light fruit infection	

Weather and number of sprays in 2012/13

Year	Weather conditions	No. of sprays
2012	Dry spring, very wet summer	18 S and 12 K
2013	Wet spring, dry summer	15 S and 8 K

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Effect on lenght of leaf wetness

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2013

2. Tree under roof

1. Tree under roof

1. Tree outside tree

Rain roof and Scab

% fruit with scab >1cm^2

Red Elstar	2012	2013
Unsprayed	72	61
Roof and unsprayed	2	0
Roof and sprayed	0	-
Sprayed	0	0
$LSD_{0.05}$	12	3

Rubens	2012	2013
Unsprayed	95	93
Roof and unsprayed	11	7
Roof and sprayed	1	-
Sprayed	3	3
$LSD_{0.05}$	23	7

Scab (*Venturia inaequalis*)

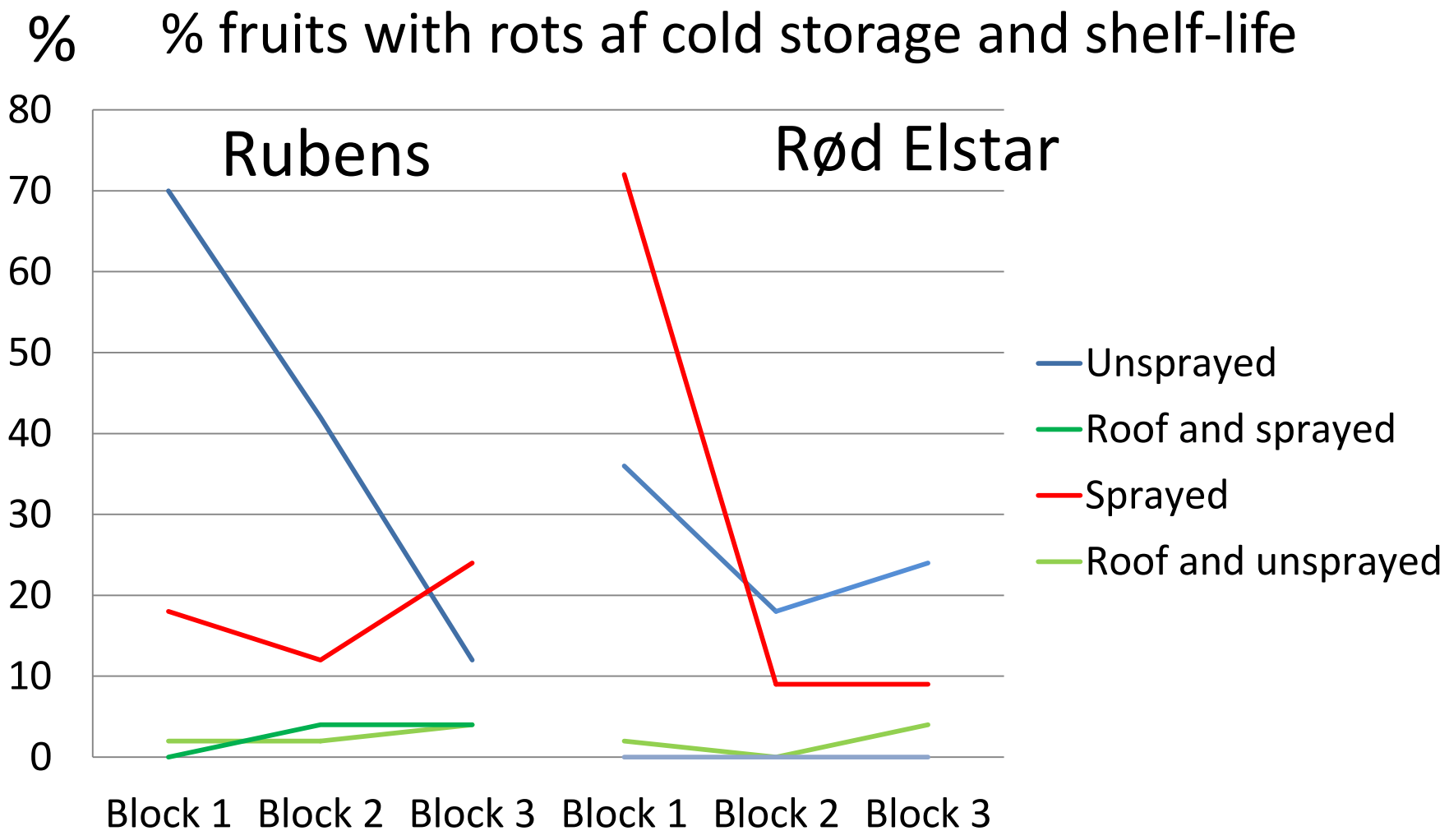
Rain roof and Rots

% fruit with rots after cold storage (ultimo Jan.) and 7-10 days shelf-life

Red Elstar	2012	2013
Unsprayed	41	13
Roof and unsprayed	3	0
Roof and sprayed	3	-
Sprayed	18	13
$LSD_{0.05}$	ns*	6

Rubens	2012	2013
Unsprayed	26	23
Roof and unsprayed	2	3
Roof and sprayed	0	-
Sprayed	30	14
$LSD_{0.05}$	ns*	0.6

Rainroof and Rots



Rain roof and Soothy blotch

% fruit with soothy blotch >10% surface area

Red Elstar	2012	2013
Unsprayed	5	1
Roof and unsprayed	0	0
Roof and sprayed	0	-
Sprayed	0	0
$LSD_{0.05}$	-	-

Rubens	2012	2013
Unsprayed	29	19
Roof and unsprayed	0	0
Roof and sprayed	0	-
Sprayed	0	0
$LSD_{0.05}$	-	-

Sodplet (*Glosodes pomigena*)

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Rain roof and yield

Treatment	2012		
	Kg/tree	Fruit/tree	g/fruit
Unsprayed	4.1	40	105
Roof and unsprayed	6.8	54	125
Roof and sprayed	6	49	124
Sprayed	6.6	52	127
$LSD_{0.05}$	2.2	ns	7

Treatment	2013		
	kg pr træ	Stk pr træ	g/frugt
Unsprayed	4.8	45	110
Roof and unsprayed	8.2	54	159
Sprayed	6.8	48	146
$LSD_{0.05}$	ns	ns	10

Red Elstar 2013

Unsprayed Roof Sprayed

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Rain roof and yield

Treatment	2012		
	Kg/tree	Fruit/tree	g/fruit
Unsprayed	0.9	14	59
Roof and unsprayed	5.5	46	117
Roof and sprayed	6	51	121
Sprayed	5.6	45	124
$LSD_{0.05}$	1.1	10	10

Treatment	2013		
	Kg/tree	Fruit/tree	g/fruit
Unsprayed	2.3	25	83
Roof and unsprayed	6.1	42	146
Sprayed	7.5	58	132
$LSD_{0.05}$	1.8	14	12

Rubens 2013

Unsprayed Roof Sprayed

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Rain roof and fruit quality

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Rain roof and russet

% fruit with russet >10% surface area

Red Elstar	2012	2013
Unsprayed	49	87
Roof and unsprayed	8	7
Roof and sprayed	7	-
Sprayed	36	48
$LSD_{0.05}$	30	10

Rubens	2012	2013
Unsprayed	0	12
Roof and unsprayed	2	2
Roof and sprayed	3	-
Sprayed	6	13
$LSD_{0.05}$	ns	7

Skrub på frugten (Rød Elstar)

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Rain roof and Fruit quality 2012

In 2012, no significant differences in Brix, firmness, or surface colour

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Rain roof and Fruit quality 2013

Red Elstar	Brix (%)	Firmness (kg)	Acid (mg/g)	Colour	Fruit weight (g)
Unsprayed	16.6	5.6	7.6	3.2	113
Roof and unsprayed	15.6	4.7	4.7	3	165
Sprayed	16.7	5.2	5.8	2.3	154
$LSD_{0.05}$	ns	ns	1	ns	20

Rubens	Brix (%)	Firmness (kg)	Acid (mg/g)	Colour	Fruit weight (g)
Unsprayed*	-	-	-	-	-
Roof and unsprayed	14.6	6.0	4.0	3.1	155
Sprayed	15.4	6.4	4.7	3.1	139
$LSD_{0.05}$	0.3	0.5	0.6	ns	6.8

* not enough fruit of sufficient size to evaluate fruit quality

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Rain roof after storm, October 2013

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Rain roof after storm, October 2013

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Advantages

- Possibility for truly unsprayed production also for scab and rot sensitive cultivars
- Effect on all encountered diseases – really good effect on rots
- Less russet on fruits
- Up till now no negative effects on fruit quality and yield
- Presumed protection against hail and sunburn

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Drawbacks

- Expensive to establish and maintain
- Will it work in really wet years?
- Cosmetically not nice to look at
- Insecurity about durability of both roof construction and plastic cover
- Will it affect secondary compounds in the fruit?
- Long term effect on insects?

Thank you..