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Report for the APRC

PRACTICAL USE OF HRI DISEASE PREDICTION MODELS (ADEM) AT A NETWORK OF SITES IN KENT.

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Abstract

Trials comparing grower managed plots to ADEM (Apple Disease forecasting system, East Malling) managed plots were carried out at several holdings. These trials involved a number of consultants and researchers and required close co-operation between farm managers and advisers.

The main conclusions were:

- The scab prediction part of ADEM was relatively easy to interpret. Savings could be made on scab sprays early in the season while still obtaining good disease control.
- The mildew prediction part of ADEM is more difficult to interpret. Management decision with regards to mildew sprays were very much an interaction between the adviser responsible for that site, the model and most of all the amount of mildew present in the particular orchard.
- The model should be used with good local weather forecasts and ideally a forward prediction should be build in to the ADEM model.
- The meteorological data collected are very localised but even though conditions in the surrounding might be different the output from the model still gives an indication of the disease risk present.
- Response time to an infection period is a problem for large farms where spray operations are taking place continuously, but for small to medium size farm spraying according to, especially, scab warnings could be feasible.
- During the 1996 season all advisers involved did acknowledge that ADEM is an aid to advisory, but is very much seen as an advisory tool rather than a farm management tool.

Introduction

The apple disease forecasting system ADEM has been developed and tested by HRI-East Malling. This forecasting system incorporates the Ventem and Podem models for scab and mildew disease forecasting. The system is based on information fed into the programme by a weather data logger situated in the orchard. This information is then used to run the ADEM programme and outputs are such that they can be interpreted for disease risk at any given time. Because of the costs and the complexity of the programme not many growers have taken up the ADEM system themselves. The aim of this project was to carry out trials on growers holdings comparing routinely sprayed plots with ADEM managed plots, hopefully showing the industry that it is feasible to incorporate ADEM into farm decisions.

During the first year of the project (1995) a total of ten sites were selected which either had Metos weather station in place already or otherwise Metos weather station were placed on these farms, in selected orchards. During this initial year we collected met data and looked at the potential savings that could have been made if we had sprayed the orchards according to the ADEM outputs. This allowed us to become familiar with the ADEM system.

During the second year of the project (1996, this report) selected orchards were split into blocks. These blocks either received the growers routine treatment or the ADEM generated treatment. The latter was with regard to both scab and mildew, two very different diseases.

Management of scab control - Scab (causal agent *Venturia inaequalis*) produces both ascospore (sexual stage) and conidia. In the beginning both spore types are present and of importance with regards to infection. From bud burst onwards infection can take place and both a routine and the ADEM managed spray programme would apply the first scab spray at bud burst. Depending on the spray interval the routine spray programme will apply scab sprays to the orchards at every 10/14 days until July, independent of the scab risk present.

The scab part of the ADEM disease forecasting programme will take into account if both ascospores and conidia are present, amount of inoculum present, development stage of the tree, temperature, humidity, rainfall and leaf wetness. All these factors together will calculate a scab risk e.i. when the likelihood of infection with scab will take place. ADEM managed spray programmes will take into account the amount of inoculum present, key stages (bud burst and petal fall), application of other pesticides, when the last spray was applied, weather forecast e.i. rain, and finally if the ADEM programme generates a scab warning. This approach is much more interactive and requires regular disease assessments by the grower and a regular assessments of the scab risks to assess the requirement to spray or not to spray.

Management of mildew control - Mildew (causal agent *Podosphaera leucothricha*) is a disease of relatively high temperatures and dry conditions. The first signs of mildew in the orchard are the primary mildews, developing from infections that took place in the previous growing season. From the primary mildews the secondary epidemic develops. As for scab, routine spraying takes place from pink bud until the extension growth comes to a halt at 10/14 day intervals.

The mildew part of the ADEM disease forecasting system takes into account the temperature, rainfall and amount of inoculum present. ADEM directed mildew spraying relies on the development of the mildew epidemic. If the amount of infection risk is increasing sprays could be applied, at reduced dosages depending on the risk. If the risk is decreasing spray intervals could be extended.

The two plots within the orchards were used to compare disease control, costs of fungicide application and the management practice between grower managed and ADEM managed plots.

Objectives

[1] to evaluate the Ventem system for apple scab and the Podem system for powdery mildew warnings (contained within ADEM) as an aid to managing disease control on commercial orchards sprayed according to predictions based on the model. To monitor cost/benefit, ease of use and disease levels on these sites (new for 1996).

[2] to determine the variation in ADEM warnings between orchard sites in Kent and assess the need for individual growers to have their own weather stations. This will indicate the most effective use of weather stations for running disease prediction models (started 1995).

[3] to compare output of weather data from two types of data loggers, Metos and TinyTalk. at the same location. In addition, TinyTalk loggers will be placed at other sites within the same locality of some Metos loggers in order to determine which data outputs give the critical differences in disease forecasts (started 1995).

Methods

Sites The sites selected were the same as 1995 and are summarised below.

Location	Grower	Variety	Type of trial	Monitored by
Rochester, Kent	Brice	Cox	Split orchard ¹	Martin Luton, ADAS
Sittingbourne, Kent	Doubleday	Bramley	Split orchard	Irene Koomen, ADAS
Marden, Kent	Jenner	Bramley	Split orchard	Nigel Jenner, ADAS
Linton, Kent	Firmin	Cox	Split orchard	Graham Moore, FAST
Colchester, Suffolk	Woods	Cox	None	John Chapman, FAST
Ash, Kent	Chandler	-	None	Angela Berrie, HRI-EM
Matfield, Kent	Charington	-	None	Angela Berrie, HRI-EM
East Malling, Kent	HRI	2	HRI trials ²	Angela Berrie, HRI-EM
Rocks, Kent	HRI	2	HRI trials	Angela Berrie, HRI-EM
Marden, Kent	Hall	-	None	John Knight, Willmot-Pertwee

¹ See experimental design

² See section on HRI trials

The first five sites were set up as part of this project, the additional five sites were sites which were already part of other trials but can add additional information to achieve our objectives or, such as the last site, is a site where a Metos weather station is located, providing additional meteorological data.

Experimental design

Orchards were split into two blocks. One block was managed by the grower and sprays applied according to their routine spray schedule. The other block was managed according to forecasts generated by ADEM. The ADEM blocks were managed by following a key stage approach. This involves applying scab sprays at the key stages bud burst and petal fall, but at any other time depending on the disease risk forecasted by ADEM. Mildew sprays were applied depending on the amount of mildew present in the orchard and the disease risk as forecasted by ADEM.

Choice of Fungicides

It was decided that, to make a real comparison between growers and ADEM managed blocks the choice of fungicide had to be similar in both blocks. This meant that the fungicides used in the ADEM managed plots were the same as the grower had chosen to use, even though the adviser responsible for the site might not have chosen these as the best option. The difference between the treatments lies mainly in timing of application and fungicide dose.

Communication

In general the following set up was used:

1. The Metos weather station was down loaded weekly and the ADEM programme run using the met data.
2. Grower/manager was informed of the disease risk for both scab and mildew and whether it was necessary to apply a fungicide in the ADEM managed block.
3. Grower/ manager would confirm any action that was taken with regards to 2.
4. Scab warnings generated by the ADEM programme were published in the advisory bulletins of both FAST and ADAS.

HRI trials

Sites

(a) Trial Plots

Code	Site	Cultivars
TL130-137	Rocks Farm, East Malling	Cox or M9 Malus pollinators
WM 135, 136, 142 132, 138, 141, 134, 137, 143	Wiseman Field, East Malling	Cox, Fiesta, Gala, Discovery Cox, Fiesta, Gala, Discovery, Saturn and 3 unnamed cultivars
WM 133, 139, 140	Wiseman Field, East Malling	Discovery, Saturn + 3 unnamed cvs. All above on M9

(b) Farm Plots

Code	Site	Cultivars
Hg 138	Rocks Farm, East Malling	Bramley, Worcester on M9
Hg 139	Rocks Farm, East Malling	Bramley, Falstaff on M9
TL 148	Rocks Farm, East Malling	Cox, Fiesta, Gala, Jonagold on M9
TL 149	Rocks Farm, East Malling	Bramley, Worcester on M9
CW 120/121	Church Field West, E Malling	Cox, Fiesta, Gala on M9
CW 106/107	Church Field West, E Malling	Cox, Discovery, Spartan on MM106
CW 108/109	Church Field West, E Malling	Cox, Discovery, Spartan on M9
CW 110	Church Field West, E Malling	Bramley, Crispin, Cox, Katy on M9

Treatments

(a) Trial Plots

Orchards TL 135, 136 managed for scab and mildew control according to a key-stage strategy where sprays applied routinely at bud burst and petal fall for scab, but at other times according to ADEM risk but taking into account weather forecast, pest sprays and other diseases such as mildew. Mildew sprays also managed using ADEM working to a threshold of 4.

Orchards TL 130, 134 managed using ADEM but scab sprays applied curatively according to scab risks. Mildew sprays are applied according to ADEM risk with threshold of 6.

Sprays on TL 131, 137 applied routinely on a ten day programme and TL 132, 133 unsprayed.

Orchards in Wiseman's field, WM 134, 137, 143 were left untreated; WM 135, 136, 142 received routine sprays at ten day intervals, and WM 132, 138, 141 and WM 133, 139, 140 were managed using ADEM (key-stage) for determining scab and mildew sprays.

The managed plots were assessed commercially for pest and disease every ten days. All plots were fully assessed for pest and disease at approximately monthly intervals. At harvest fruit was picked and assessed for pest and disease damage.

(b) Farm Plots

The orchards were managed for scab and mildew sprays according to ADEM key-stage strategies. All orchards were assessed commercially for pests and disease at ten day intervals. No detailed assessments were carried out.

Disease assessments

Disease assessments were made at two levels, full assessments and look/see assessments. The full assessments were made at set intervals during the season (see Table 1.). The look/see assessments were made every time a spray decision had to be made. The relevant orchard was very quickly assessed for the amount of disease present. This would generate an estimate of the amount of disease present e.g. low, moderate or high. This information is needed to be entered into the ADEM programme to obtain accurate forecasts for the specific orchard.

Table 1. Disease assessments for the 1996 season

Disease		Timing	Assessment
Powdery mildew	Primary blossom mildew	Early May	10 blossom trusses x 4 branches x 10 trees
	Primary vegetative mildew	May	mildewed shoots/tree
	Secondary mildew	Late June, late July & late August	5 leaves x 4 shoots x 10 trees
	Primary blossom mildew	May 1997	
Scab	Post-bloom	May	10 blossom trusses x 4 branches x 10 trees
	Extension growth	Late June, late July & late August	5 leaves x 4 shoots x 10 trees
	Fruit scab	At harvest	1000 fruit

Results

Scab risk

Table 2 summarises the scab risks across the sites for the period March till September. In comparison to last year there were in general less scab periods at most sites. When comparing sites it should be taken into account that some Metos machines were out of action for quite a few days, especially the Metos machines at Rochester and Marden (Great Sheephurst farm).

The settings of the ADEM model for Table 2 were Cox (a moderate susceptible variety), low ascospore dose and a moderate level of inoculum present.

Mildew risk

Figures 1 and 2 show the disease forecast and sporulation forecast patterns for Hempstead farm, nr Sittingbourne. These figures give some indication of the mildew epidemic during the 1996 season. Mildew risk is based on the sporulation forecast. If this is increasing mildew risk is high, if this is decreasing mildew risk is low(er).

These figures are only given as an example. The ADEM generated mildew table is difficult to interpret, this visual aid as shown in Figures 1&2 shows the development of the epidemic.

Table 2. Dates of scab periods recorded at all Metos sites - 1996

grower farm location monitor	Brice Mockbeggar Rochester ADAS	Doubleday Hempstead Sittingbourne ADAS	Jenner Gt Sh'phurst Marden ADAS	Firmin Wares Linton FAST	Woods Old Barn Colchester FAST	Chandler Goldstone Asf HRI	Charrington Cryals Matfield HRI	Wiseman Main Farm E. Malling HRI	Lynn Rocks E. Malling HRI	Hall L.Pattenden Marden J.Knight
March	21, 22	20, 21, 22	20, 21, 22	21	23	20, 21, 22	20, 21, 22	20	20, 21, 22	8, 20
April					10				22	22
May	24	24	2, 23, 24	22, 24, 26	1, 2, 10, 16 18, 22, 23 24, 26, 27	2, 10, 11 21, 21	22, 24, 26 27	24	24, 26	16, 22, 24, 26
June	8, 28	8	8, 28	8	8, 28	8, 22, 24	8, 28	8, 28	8, 28	8, 28
July	3, 4, 5, 24, 28, 29, 30		5, 30	5, 6, 23 30	1, 3, 5, 23 28, 29	1, 4, 5 23, 24	3, 5, 27 30	23, 24, 28 29, 30	5, 24, 30	1, 3
August	6, 9, 11, 12, 22, 25	11, 27, 29	9, 11 missing from 19-Aug	9, 11, 30	9, 11, 20, 23 27, 28, 29	10, 11, 12 20, 23, 24 26, 28, 29	9, 11, 12 14, 23, 24 28	9, 12, 20 23, 24, 25 28, 29	9, 11, 23 24, 25, 26 27, 29	9, 11, 12, 24, 30
September	19	2, 19, 23, 30		4, 6, 19 23, 26	2, 12, 19 23, 25, 26 27, 29, 30	8, 19, 21 23, 26, 27 30	12, 19, 23 25, 26, 29 30	3, 19, 23 25, 26, 27 29, 30	19, 23, 25 26, 29, 30	23, 30
Total scab periods 23/3 - 19/9	17	7	-	14	30	24	19	18	17	15
Logging period	15/3 - 19/9	13/3 - 28/9	20/3 - 19/8	5/3 - 24/9	23/3 - 29/9	15/3 - 30/9	13/3 - 30/9	12/3 - 30/9	18/3 - 30/9	1/3 - 30/9
Missing days	19	5	21	8	1	0	0	0	0	0

Figure 1. ADEM generated mildew disease forecast for Hempstead Farm, nr. Sittingbourne - 1996

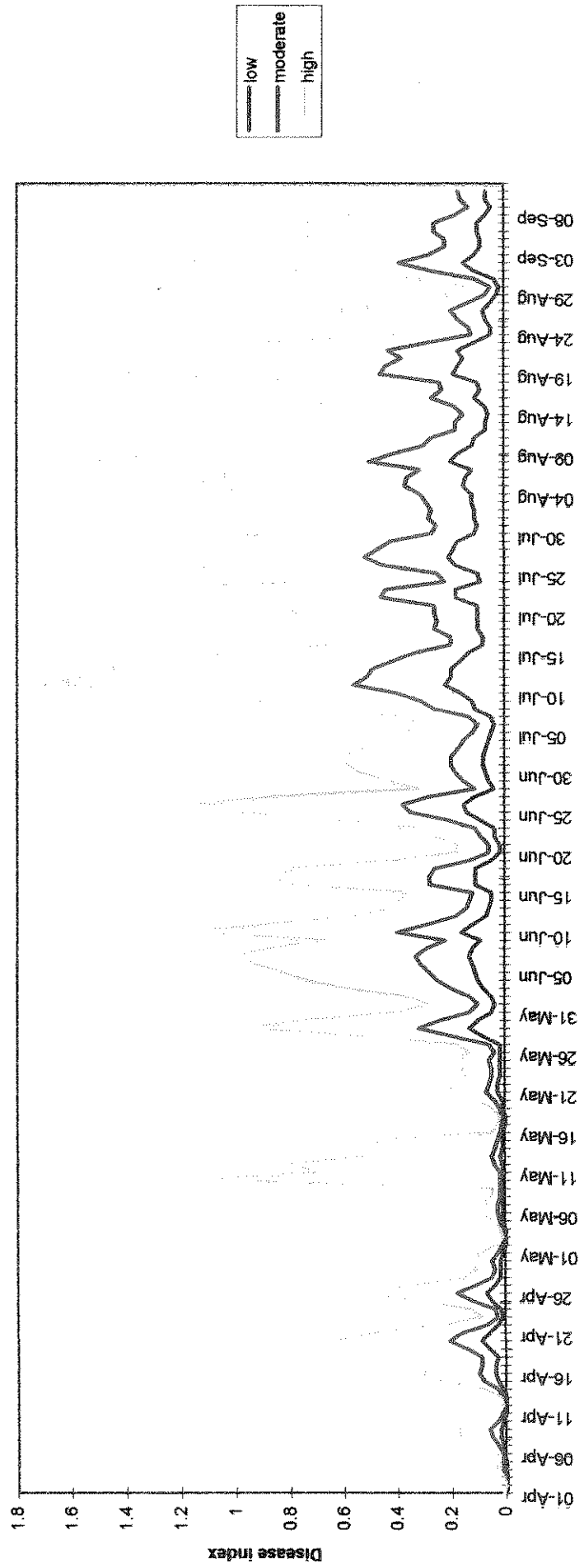
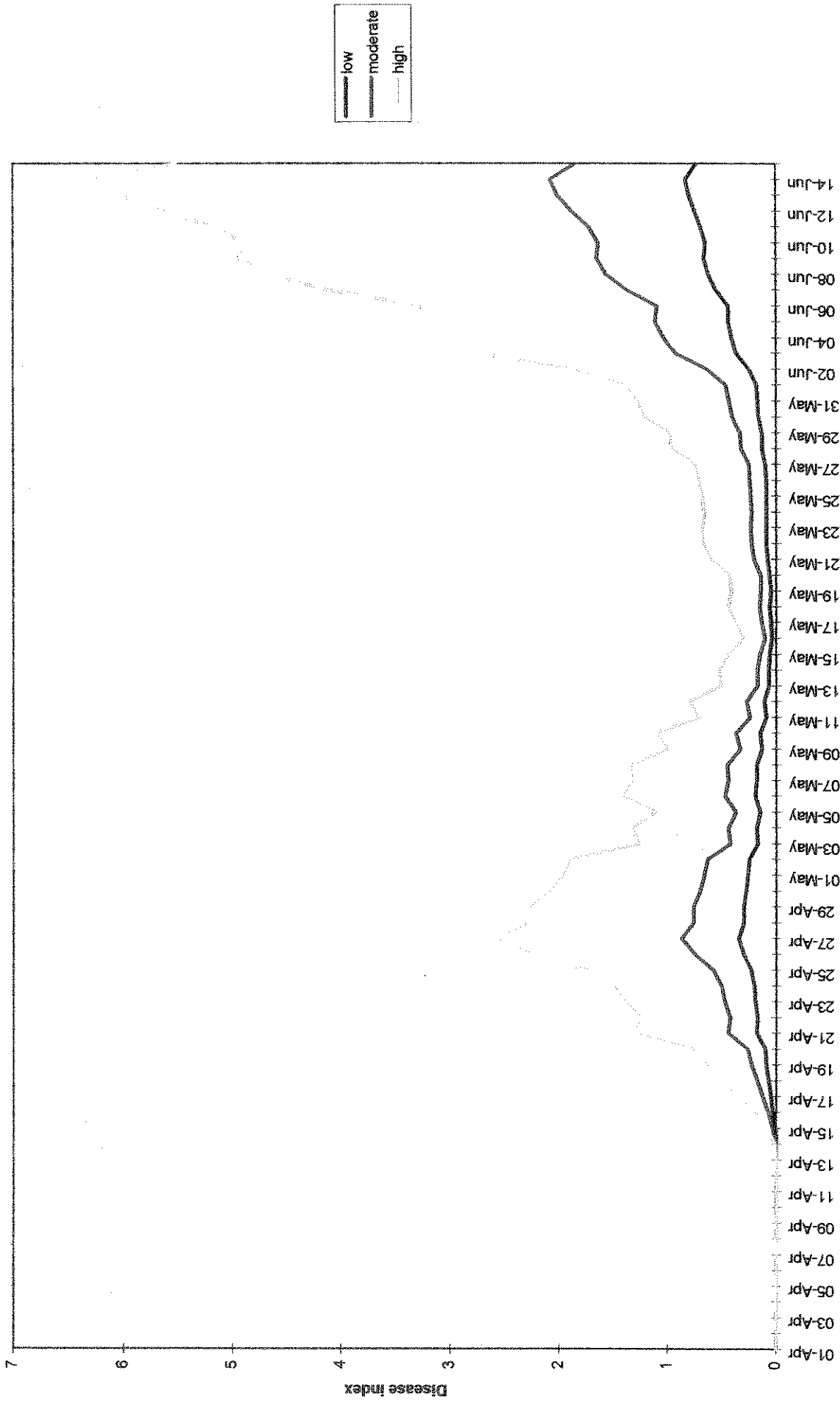


Figure 2. ADEM generated sporulation forecast for Hempstead Farm nr. Sittingbourne - 1996



low
moderate
high

Mockbeggar farm, Rochester, Kent

As for last year the amount of scab present in this orchard was zero, the amount of mildew was, however, extremely high (Table 3). In June the percentage of secondary mildew was well over 80% but was reduced to 31% by August.

In total two more sprays were applied in the grower managed block compared to the ADEM managed block (Table 4). These were both scab sprays in the early part of the season. The complete spray programmes for both grower and ADEM managed blocks are given in Appendix A. The trial was not completely successful at this site because :

- * Communication between farm manager and trial co-ordinator broke down because priorities of the manager lay elsewhere (strawberries).
- * Mildew epidemic could not be brought back to acceptable levels until late in the season.
- * Orchard was sprayed ULV for part of the season and conventional for another part of the season.

Table 3. Disease assessments at Mockbeggar Farm for 1996 (as % disease)

Powdery mildew	2/5	6/6	13/6	26/6	8/8
Primary blossom	1				
Primary vegetative	8.75				
Secondary		60	88	87.5	31
Scab					
Leaf scab			0	0	0
Fruit scab			0	0	0

Table 4. Summary of sprays for Mockbeggar Farm, 1996

Target	Spray rounds (no)		Costs *	
	Grower	ADEM	Grower	ADEM
Scab	12	10		
Mildew	14	14		
Total	17	15	£413.07	£357.63

* Calculation of costs are based on the prices for fungicides quoted in Appendix I.

This orchard was grubbed in the autumn of 1996, no disease assessment could be made in spring 1997.

Table 5 Sprays applied at Mockbeggar Farm - 1996

Grower managed plot

Date	Chemical	(%dose)	Target	Cost (£/ha)
29/3	Dithianon	(100%)	scab	27.72
10/4	Dithianon	(100%)	scab	27.72
22/4	Dithianon	(100%)	scab	27.72
23/4	Dorado	(133%)	scab + mildew	29.80
3/5	Captan	(29%)	scab	7.00
	Dorado	(133%)	scab + mildew	29.80
15/5	Captan	(16%)	scab	3.92
	Systhane	(32%)	scab + mildew	6.83
20/5	Captan	(16%)	scab	3.92
	Systhane	(18%)	scab + mildew	3.90
1/6	Captan	(16%)	scab	3.92
	Dorado	(67%)	scab + mildew	14.90
	Nimrod	(32%)	mildew	6.30
11/6	Captan	(16%)	scab	3.92
	Dorado	(67%)	scab + mildew	14.90
	Nimrod	(32%)	mildew	6.30
19/6	Dorado	(67%)	scab + mildew	14.90
	Nimrod	(41%)	mildew	8.10
26/6	Dorado	(67%)	scab + mildew	14.90
	Nimrod	(41%)	mildew	8.10
9/7	Systhane	(136%)	scab + mildew	29.25
16/7	Topas	(100%)	mildew	119.25
- 25/8	5X			
Total				413.07

ADEM managed plot

29/3	Dithianon	(100%)	scab	bud burst	27.72
23/4	Dorado	(133%)	scab + mildew		29.80
3/5	Captan	(29%)	scab		7.00
	Dorado	(133%)	scab + mildew		29.80
15/5	Captan	(16%)	scab		3.92
	Systhane	(32%)	scab + mildew		6.83
20/5	Captan	(16%)	scab		3.92
	Systhane	(18%)	scab + mildew		3.90
1/6	Captan	(16%)	scab		3.92
	Dorado	(67%)	scab + mildew		14.90
	Nimrod	(32%)	mildew		6.30
11/6	Captan	(16%)	scab		3.92
	Dorado	(67%)	scab + mildew		14.90
	Nimrod	(32%)	mildew		6.30
19/6	Dorado	(67%)	scab + mildew		14.90
	Nimrod	(41%)	mildew		8.10
26/6	Dorado	(67%)	scab + mildew		14.90
	Nimrod	(41%)	mildew		8.10
9/7	Systhane	(136%)	scab + mildew		29.25
16/7	Topas	(100%)	mildew		119.25
- 25/8	5X				
Total					357.63

Hempstead farm, Sittingbourne, Kent

The trial at this site was very successful. Apart from 2 Nimrod sprays applied to the ADEM plot early in the season due to a misunderstanding, sprays were applied as requested. Both the number of sprays directed at scab and mildew were reduced while still obtaining equal disease control compared to the grower managed plot.

Fruit scab at harvest was disproportionately high because this was assessed after harvest on fruit remaining on the tree which was of poorer quality than the bulk of the fruit, hence more scab was observed.

Table 6. Disease assessments at Hempstead Farm for 1996 (as % disease)

	16/5		3/6		17/6		27/6		15/7		17/9	
Powdery mildew	G ¹	A	G	A	G	A	G	A	G	A	G	A
Primary blossom	0	0										
Primary vegetative			0	0								
Secondary					0	0	2.5	2.5	7.5	2.5		
Prim. blossom '97	0	0										
Prim. vegetative '97	0	0										
Scab												
Post bloom			3	2								
Leaf scab					0	0	0	0	0	0		
Fruit scab											2.2	1.8
G= Grower managed plot A= ADEM managed plot												

Table 7. Summary of sprays for Hempstead Farm, 1996

Target	Spray rounds (no)		Costs	
	Grower	ADEM	Grower	ADEM
Scab	9	4		
Mildew	8	6 (+2)*		
Total	10	8 (+2)*	£210.65	£151.76 (+28.80)*

* Early in the season two extra mildew sprays were applied to this plot which had not been requested.

Table 8. Sprays applied at Hempstead Farm - 1996

Grower managed plot

Date	Chemical	(%dose)	target	Justification	Cost (£/ha)
3/4	Dithianon	(118%)	scab		32.76
23/4	Radspor	(73%)	scab		12.76
1/5	Manex	(40%)	scab		7.09
	Dorado	(75%)	scab + mildew		16.76
13/5	Manex	(40%)	scab		7.09
	Dorado	(75%)	scab + mildew		16.76
21/5	Manex	(40%)	scab		7.09
	Dorado	(75%)	scab + mildew		16.76
10/6	Manex	(40%)	scab		7.09
	Dorado	(75%)	scab + mildew		16.76
21/6	Manex	(40%)	scab		7.09
	Topas	(45%)	mildew		10.73
5/7	Manex	(40%)	scab		7.09
	Topas	(45%)	mildew		10.73
17/7	Manex	(40%)	scab		7.09
	Nimrod	(68%)	mildew		13.50
31/7	Nimrod	(68%)	mildew		13.50
Total					210.65

ADEM managed plot

3/4	Dithianon	(100%)	scab	bud burst	27.72
23/4	Radspor	(73%)	scab	rain forecast	12.76
1/5	Nimrod	(73%)	mildew	misunderstanding	14.40
13/5	Nimrod	(73%)	mildew	misunderstanding	14.40
24/5	Manex	(40%)	scab	scab period	7.09
	Dorado	(75%)	scab + mildew		16.76
10/6	Manex	(40%)	scab	petal fall	7.09
	Dorado	(75%)	scab + mildew		16.76
21/6	Topas	(50%)	mildew	very low level of mildew present	10.73
5/7	Topas	(50%)	mildew		10.73
17/7	Nimrod	(33%)	mildew		6.66
31/7	Nimrod	(33%)	mildew		6.66
Total					151.76

Great Sheephurst farm, Marden, Kent

No formal disease assessments were carried out at this site but look/see assessments (see) were carried out all the way through the season. Levels of both scab and mildew were in the 'low' category all the way through the season.

Confidence in the programme was such that, in combination with the fact that the beginning of the season was not very conducive for scab, an entire scab spray was omitted from the spray schedule on a whole farm base. This was the spray that should have been applied on the 12th of May. This spray was also omitted from the trial plot, if the trial had been carried out to it's full extent this spray should have been applied to the 'grower's' plot.

Table 9. Summary of sprays for Great Sheephurst Farm, 1996.

Target	Spray rounds (no)		Costs	
	Grower	ADEM	Grower	ADEM
Scab	9*	9		
Mildew	7	7		
Total	9*	9	£266.90	£233.79

* One extra scab spray should have been applied in the 'grower's' plot.

Table 10. Sprays applied at Great Sheephurst farm - 1996

Grower managed plot

Date	Chemical	(%dose)	Target	Justification	Cost (£/ha)
9/4	Captan	(40%)	scab	bud burst	23.50
23/4	Scala	(27%)	scab	green cluster	17.67
2/5	Captan	(13%)	scab		7.83
	Dorado	(40%)	scab + mildew		22.24
12/5	Spray skipped because of low scab risk				
22/5	Captan	(13%)	scab	petal fall	7.83
	Dorado	(40%)	scab + mildew		22.24
10/6	Captan	(13%)	scab		7.83
	Dorado	(40%)	scab + mildew		22.24
24/6	Captan	(13%)	scab		7.83
	Systhane	(39%)	scab + mildew		20.53
4/7	Captan	(27%)	scab		15.66
	Nimrod	(52%)	mildew		25.28
17/7	Captan	(27%)	scab		7.83
	Nimrod	(52%)	mildew		25.28
7/8	Captan	(27%)	scab		7.83
	Nimrod	(52%)	mildew		25.28
Total					266.90

ADEM managed plot

9/4	Captan	(40%)	scab	bud burst	23.50
23/4	Scala	(27%)	scab	green cluster	17.67
2/5	Captan	(13%)	scab	Metos down	7.83
	Dorado	(40%)	scab + mildew		22.24
22/5	Captan	(13%)	scab	petal fall	7.83
	Dorado	(40%)	scab + mildew		22.24
10/6	Captan	(13%)	scab	scab period	7.83
	Dorado	(40%)	scab + mildew		22.24
24/6	Captan	(13%)	scab	scab period	7.83
	Systhane	(39%)	scab + mildew		20.53
4/7	Captan	(27%)	scab		15.66
	Nimrod	(26%)	mildew	mildew low	12.64
17/7	Nimrod	(26%)	mildew	mildew low	12.64
7/8	Captan	(27%)	scab		7.83
	Nimrod	(52%)	mildew		25.28
Total					233.79

Wares farm, Linton, Kent

This site will be reported on separately by FAST. Table 11 only gives the disease assessments for this site.

Table 11. Disease assessments at Wares farm for 1996 (as % disease)

Powdery mildew	G ¹		A		G		10/5		A		G		19/6		A		G		27/7 (a)		A		G		27/7 (b)		A		G		28/10		A		
	Primary blossom	0.38	0.75																																
Secondary														-	22	7.5	2.5	3.75	2.5																
Scab																																			
Post bloom					0		0																												
Leaf scab										0		0		0	0		0		0		0		0		0		0		0		0		0		0
Fruit scab										0		0.5		1	(tree)	0		0		0		0		0		0		0		0		0		0	

G= Grower managed plot
A= ADEM managed plot

Old Barn farm, Colchester, Suffolk

The disease assessments for this site are given in Table 12. The trial could not be carried out at this site because the farm was under court order for bankruptcy, but the grower's spray programme is given in Table 13. Cost of the spray programme was calculated at £108/ha.

Table 12. Disease assessments (%) for Old Barn Farm- 1996

Scab

Date	Assessment	Bennys Bramley	Big Field East	Sample Size
22/7	Rosette scab	0.68	0	800 rosettes
22/7	Extension scab	2.5	0	80 shoots
3/8	Extension scab	5	0	80 shoots
3/8	Fruit scab	1	0	200 fruit
1/10	Extension scab	7.5	0	80 shoots
1/10	Overwintering scab	30	0	200 leaves

Mildew

Date	Assessment	Bennys Bramley	Big Field East	Sample Size
6/5	Primary blossom	0.5	0.25	800 blossoms
22/7	Primary vegetative	0.07	0.19	BB - 4200 shoots
22/7	Secondary vegetative	5	3.75	BFE - 2040 shoots
3/8	Secondary vegetative	12.5	7.5	80 shoots
1/10	Secondary vegetative	17.5	10	80 shoots

Orchard details: Bennys Bramley M26, planted 1980
 Big Field East Cox 106, planted 1988-1990

Table 13. Sprays applied at Old Barn farm - 1996

Date	Chemical	Rate/acre
11/4	Dithianon	7 fl ozs
24/4	Dithianon	7 fl ozs
6/5	Dithianon	5 fl ozs
	Dorado	2 fl ozs
21/5	Captan	12 ozs
	Dorado	2 fl ozs
10/6	Captan	12 ozs
	Dorado	2 fl ozs
20/6	Dorado	2 fl ozs
25/7	Bayleton	1.5 oz

HRI trials

Disease assessments and the sprays applied to plots and orchards are shown in Tables 14 - 33. Scab incidence was low even in untreated plots. Level of secondary mildew also varied considerably. Highest levels were recorded at Cryals Farm and in untreated plots at East Malling. In plots managed at East Malling secondary mildew levels increased in TL 148, CW 110, CW 106, CW 107 above the threshold and required adjustment of the programme by reducing spray interval to regain control. In other plots/orchards mildew level increased but does not require intensive spraying to reduce the incidence. In all the managed plots/orchards the fungicide use and sprays were reduced compared to the conventional routine programme applied in TL 131, 137 and WM 135, 136, 142.

Table 14. ASSESSMENTS OF PRIMARY AND SECONDARY MILDEW IFP TRIAL, WISEMAN FIELD, EAST MALLING 1996

Plot	Primary Blossom Mildew						Primary Veg. mildew						Secondary mildew % mitreweed shoots																																																																	
	C	G	F	D	Sa	35	C	G	F	D	Sa	35	C	G	F	D	Sa	35	C	G	F	D	Sa	35	C	G	F	D	Sa	35	C	G	F	D	Sa	35	18	25																																								
Untreated	0.3	0.1	0.1	0	0	0	4.4	0.8	1.6	0	0	0	NA											91.7	100	91.7	25	83.3	60	62.9	60	NA												NA																																		
IFP	0.2	0	0	0	0	0	0.3	0.1	0	0	0	0	0											8.3	3.3	1.7	0	0	0	0	0	10													21.7	2																																
FIFP													3.1											0	1.7	5	3.3	3.3	8.3	0	3.3	10										NA																		NA																		
Convent	0.1	0	0	0	0	0	0.5	0.1	0	0	0	NA											0	1.7	5	3.3	3.3	8.3	0	3.3	10										NA																		NA																			

Key:
 C Cox
 G Gala
 F Fiesta
 D Discovery
 Sa Saturn

NA = Not assessed

35]
 18]
 25]

Seedlings



Table 15. ASSESSMENT OF SECONDARY MILDEW IFP TRIAL, WISEMAN FIELD, EAST MALLING 1996

	Secondary mildew (% mildewed shoots)															
	25-Jul							14-Aug								
PLOT	C	G	F	D	Sa	35	18	25	C	G	F	D	Sa	35	18	25
Untreated					NA				82.5	100	100	25	67.5	60	50	45.4
IFP	16	29						20	27.5	30	12.5			25	13	7.5
FIFP					20							5				
Convent					NA				7.5	25	5	5				

Key:

- C Cox
- G Gala
- F Fiesta
- D Discovery
- Sa Saturn

NA= Not assessed

35]
18]
25]

Seedlings

Table 16. ASSESSMENTS OF SCAB IFP TRIAL, WISEMANS FIELD, EAST MALLING 1996

PLOT	% INFECTED TREES 26 June			% INFECTED DROPS (June)			% INFECTED FRUIT HARVEST 23 September		
	COX	GALA	FIESTA	COX	GALA	FIESTA	COX	GALA	FIESTA
IFP	0	33.3	6.7	3.3	1.2	3.1	0.4	6.1	0.8
FIFP	3.3	6.7	0	1.1	1	0	0	0.7	0.1
Conventional	0	No scab seen	0	0	0	0	0	0

Key

- C Cox
- G Gala
- F Fiesta

Table 17. Fungicide sprays applied to routine sprayed plots (WM 135, 136, 142) at Wisemans Field, East Malling in 1996. Apple cvs Cox, Discovery, Gala, Fiesta

Date	Growth stage	Target disease	Chemical	Rate/hectare*	Cost £/ha
28.3	Bud burst	Scab/canker	Radspor	1.5 L	17.40
11.4		Scab/canker	Radspor	1.5 L	17.40
25.4	Green cluster	Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	3.4 kg	23.80
2.5	Pink bud	Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	3.4 kg	23.80
21.5	Mid Bloom	Scab/mildew	Systhane	1.1 L	21.45
4.6	Petal fall	Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	0.85 kg	5.95
13.6		Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	0.85 kg	5.95
24.6		Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	0.85 kg	5.95
5.7		Mildew	Nimrod	1.1 L	19.80
		Scab	Captan 80	0.85 kg	5.95
15.7		Scab	Dithianon	0.75 L	18.90
		Mildew	Nimrod	1.1 L	19.80
26.7		Mildew	Nimrod	1.1 L	19.80
		Scab	Captan 80	0.85 kg	5.95
5.8		Mildew	Nimrod	1.1 L	19.80
Total cost/ha					338.95

*all chemicals applied at full label recommended rate.

Sprays target scab = 11
Sprays target mildew = 10

Table 18. Fungicide sprays applied to ADEM managed plots (key-stage sprays) (WM 132, 138, 141) at Wisemans Field, East Malling in 1996. Apple cultivars Cox, Discovery, Gala, Fiesta

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker - Key-stage	Radspor	1.5 L (100)	17.40
29.4	Green cluster	None	Scab, pest sprays needed	Captan 80	1.1 kg (32.4)	7.70
25.5	Blossom	Scab risk 24.5	Scab-high risk + mildew	Systhane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
5.6	Petal fall	None	Scab/mildew - Key-stage	Systhane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
13.6		None	Mildew	Systhane	1.1 L (100)	21.45
26.6			Mildew/scab	Nimrod Captan 80	0.8 L (72.7) 1.0 kg (29.4)	14.40 7.00
6.7			Mildew	Nimrod	1.1 L (100)	19.80
16.7			Mildew	Topas 100	0.5 L (100)	23.85
26.7			Mildew	Topas 100	0.5 L (100)	23.85
6.8			Mildew	Nimrod	1.1 L (100)	19.80
Total cost/ha						210.05

Sprays target scab = 5
Sprays target mildew = 8

Table 19. Fungicide sprays applied to ADEM managed plots containing scab resistant cultivars (key-stage sprays) (WM 133,139,140) at Wisemans field, East Malling in 1996. Apple cultivars Discovery, Saturn

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare* (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker - Key-stage	Radspor	1.5 L (100)	17.40
29.5	Early petalfall	None	Scab/mildew key-stage	Sythane Captan 80	1.1 kg (100) 0.85 kg (100)	21.45
5.6		None	Mildew	Sythane	1.1 L (100)	21.45
13.6		None	Mildew	Sythane	0.3 L (27.3)	5.85
26.6		None	Mildew	Nimrod	0.25 L (22.7)	4.50
5.7		None	Mildew	Nimrod	0.25 L (22.7)	4.50
15.7		None	Mildew	Nimrod	0.25 L (22.7)	4.50
26.7		None	Mildew	Nimrod	0.25 L (22.7)	4.50
6.8		None	Mildew	Nimrod	0.25 L (22.7)	4.50
Total cost/ha						94.60

Sprays target scab = 2
 Sprays target mildew = 8

Table 20. LEVELS OF PRIMARY AND SECONDARY MILDEW ASSESSED AT EAST MALLING HOME FARM 1996 IN PLOTS MANAGED USING ADEM

PLOT	Primary Blossom		Primary Veg		Secondary mildew % infected shoots															
	B	Cr	C	K	B	Cr	C	K	B	Cr	C	K	B	Cr	C	K	B	Cr	C	K
CW110 M9	9.5	Low	31.5	Low	3.6	Low	13.6	6.7	24.6	4	4.7	33	15.7	10	25.7	4	5.8	0	0	0
CW109/108 M9	C	D	S	VLow	C	D	S	Low	C	D	S	0	C	D	S	4	C	D	S	Low
CW106/107 MM106	1.6	L	L	1	L	L	29	30	8	Low	0	0	0	0	0	0	0	0	0	0
CW120/121 M9	C	F	G	VLow	C	F	G	Low	C	F	G	4	C	F	G	9	C	F	G	20

Key:

- B BRAMLEY
- Cr CRISPIN
- C COX
- K KATY
- D DISCOVERY
- S SPARTAN

SCAB INCIDENCE SPORADIC - OCCASIONAL INFECTED LEAF SEEN IN CW 106/107, CW108/109

L=Low

Table 21. Fungicide sprays applied to ADEM managed key-stage sprays) (CW 107,106) at East Malling in 1996. Apple cultivars Cox, Spartan, Discovery

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare* (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker - Key-stage	Radspor	1.5 L (100)	17.40
25.4	Green cluster	None	Scab, mildew pest sprays	Systhane Captan 80	1.1 kg (100) 0.85 kg (100)	21.45 5.95
14.5	Early bloom	None, mildew above threshold	Mildew	Systhane	0.75 L (100)	14.63
23.5	Blossom	None Scab risk 24.5	Scab/mildew - Rain forecast	Systhane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
4.6	Petal fall	None	Scab/mildew - Key-stage	Systhane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
14.6		None	Mildew	Systhane	1.1 L (100)	21.45
21.6		None, mildew	Mildew	Topas 100	0.5 L (100)	23.85
27.6		above threshold	Mildew/scab - Rain forecast	Nimrod Captan 80	1.1 L (100) 1.0 kg (29.4)	19.80 7.00
1.7			Mildew	Topas 100	0.3 L (100)	14.31
6.7		None, mildew	Mildew	Nimrod	1.1 L (100)	19.80
16.7		None	Mildew	Nimrod	0.8 L (72.7)	14.40
25.7		None	Mildew	Nimrod	0.8 L (72.7)	14.40
7.8		None	Mildew	Nimrod	1.1 L (100)	19.80
Total cost/ha						269.04

Sprays target scab = 5
 Sprays target mildew = 12plots (

Table 22. Fungicide sprays applied to ADEM managed plots (key-stage sprays) (CW 108/109) at East Malling in 1996. Apple cultivars Cox, Spartan, Discovery

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker - Key-stage	Radspor	1.5 L (100)	17.40
25.4	Green cluster	None	Scab/mildew - Pest sprays	Systhane Captan 80	1.1 kg (100) 0.85 kg (100)	21.45 5.95
23.5	Blossom	None (Scab risk 24.5)	Scab/mildew - Rain forecast	Systhane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
4.6	Petal fall	None	Scab/mildew - Key-stage	Systhane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
14.6		None	Mildew	Systhane	1.1 L (100)	21.45
25.6		None	Mildew/scab - Rain forecast	Nimrod Captan 80	0.8 L (72.7) 1.0 kg (29.4)	14.40 7.00
6.7		None	Mildew	Nimrod	0.8 L (72.7)	14.40
16.7		None	Mildew	Nimrod	0.8 L (72.7)	14.40
25.7		None	Mildew	Nimrod	0.8 L (72.7)	14.40
7.8		None	Mildew	Nimrod	0.8 L (72.7)	14.40
Total cost/ha						205.45

Sprays target scab = 5
 Sprays target mildew = 9

Table 23. Fungicide sprays applied to ADEM managed plots (key-stage sprays) (CW 110) at East Malling in 1996. Apple cultivars Cox, Bramley, Katy, Crispin

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker - Key-stage	Radspor	1.5 L (100)	17.40
25.4	Green cluster	None	Scab/mildew - Pest sprays	Sythane Captan 80	1.1 kg (100) 0.85 kg (100)	21.45 5.95
23.5	Blossom	None (Scab risk 24.5)	Scab/mildew - Rain forecast	Sythane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
4.6	Petal fall	None	Scab/mildew - Key-stage	Sythane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
14.6		None	Mildew	Sythane	1.1 L (100)	21.45
27.6		None	Scab/mildew - Rain forecast	Nimrod Captan 80	1.1 L (100) 1.0 kg (29.4)	19.80 7.00
1.7		None, mildew	Mildew	Topas 100	0.3 L (60)	14.31
6.7		over threshold	Mildew	Nimrod	1.1 L (100)	19.80
16.7		None	Mildew	Topas 100	0.5 L (100)	23.85
25.7		None	Mildew	Nimrod	0.8 L (72.7)	14.40
7.8		None	Mildew	Nimrod	1.1 L (100)	19.80
Total cost/ha						240.01

Sprays target scab = 5
 Sprays target mildew = 10

Table 24. Fungicide sprays applied to ADEM managed plots (key-stage sprays) (CW 120/121) at East Malling in 1996. Apple cultivars Cox, Fiesta, Gala

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker - Key-stage	Radspor	1.5 L (100)	17.40
25.4	Green cluster	None	Scab/mildew - Pest sprays	Sythane Captan 80	1.1 kg (100) 0.85 kg (100)	21.45 5.95
23.5	Blossom	None (Scab risk 24.5)	Scab/mildew - Rain forecast	Sythane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
4.6	Petal fall	None	Scab/mildew - Key-stage	Sythane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
14.6		None	Mildew	Sythane	1.1 L (100)	21.45
25.6		None	Mildew Scab (rain forecast)	Nimrod Captan 80	0.8 L (72.7) 1.0 kg (29.4)	14.40 7.00
6.7		None	Mildew	Nimrod	0.8 L (72.7)	14.40
16.7		Mildew over	Mildew	Topas 100	0.5 L (100)	23.85
25.7		threshold	Mildew	Topas 100	0.5 L (100)	23.85
7.8		None	Mildew	Nimrod	1.1 L (100)	19.80
Total cost/ha						224.35

Sprays target scab = 5
 Sprays target mildew = 9

Table 25. LEVELS OF PRIMARY AND SECONDARY MILDEW ASSESSED AT ROCKS FARM (PLOTS TL 130-137) 1996

Treatment	Primary mildew			Secondary mildew % mildewed leaves							
	% Mildewed blossoms 14-May	% mildewed veg shoots		June		24-Jun	04-Jul	15-Jul	22-Jul	25-Jul	05-Aug
		10-Jun	13-Jun	13-Jun	June	24-Jun	04-Jul	15-Jul	22-Jul	25-Jul	05-Aug
Untreated	6.7	12.9	NA	80	NA	NA	NA	NA	80	NA	NA
*ADEM 1	0	0.2	1.3	3.5	1	NA	11.3	6.3	6.3	3.5	4.3
*ADEM 2	0.4	0.3	0	3	0	0	4.8	5.8	5.8	6.3	0
Routine	0.15	0.1	NA	2.8	NA	NA	NA	4	4	NA	NA

*ADEM 1

key stage management and mildew threshold

4

NA=Not assessed

*ADEM 2

Curative spraying and mildew threshold

6

Table 26. LEVELS OF SCAB RECORDED AT ROCKS FARM (PLOTS TL 130-137) 1996

TREATMENT	% INFECTED TREES 07-Jun	% INFECTED FRUITLET DROPS June	% INFECTED SHOOTS 20-Jul	% INFECTED FRUITS HARVEST 16-Sep	% INFESTED LEAVES LATE SCAB October
Untreated	10	3.5	0	1.2	18.3
ADEM 1	0	1.3	0	0.05	3.5
ADEM 2	3.4	0.8	0	0.3	11.5
Routine	0	0	0	0	0.5

ADEM 1 Key stage
 ADEM 2 Curative spraying

Table 27. Fungicide sprays applied to ADEM (2)¹ managed plots (key-stage sprays) (TL 130, 134) at Rocks Farm, East Malling in 1996. Apple cultivar Cox

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker	Radspor	1.5 L (100)	17.40
29.5	late bloom	Scab period 24.5	Scab/mildew scab	Systhane Captan 80	1.1 L (100) 0.8 kg (100)	21.45 5.95
5.6	Petal fall	None	Mildew	Systhane	0.8 L (73)	15.60
14.6		None	Mildew	Systhane	0.8 L (73)	15.60
25.6		None	Mildew	Nimrod	0.8 L (73)	14.40
5.7			Mildew	Nimrod	0.8 L (45)	9.00
17.7			Mildew	Topas 100	0.5 L (100)	23.85
27.7			Mildew	Topas 100	0.8 L (100)	23.85
6.8			Mildew	Nimrod	1.1 L (100)	19.80
Total cost/ha						166.90

¹ADEM (2) managed = sprays applied curatively only for scab in response to ADEM warnings and mildew sprays managed according to ADEM risks but acting at a higher threshold (6).

Sprays target scab = 2
Sprays target mildew = 8

Table 28. Fungicide sprays applied to routine treatment plots at Rocks Farm (TL 131, 137) East Malling in 1996. Apple Cultivars Cox

Date	Growth stage	Target disease	Chemical	Rate/hectare*	Cost £/ha
28.3	Bud burst	Scab/canker	Radspor	1.5 L	17.40
15.4		Scab/canker	Radspor	1.5 L	17.40
25.4	Green cluster	Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	3.4 kg	23.80
3.5	Pink bud	Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	3.4 kg	23.80
21.5	Mid Bloom	Scab/mildew	Systhane	1.1 L	21.45
6.6	Petal fall	Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	0.85 kg	5.95
13.6		Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	0.85 kg	5.95
24.6		Scab/mildew	Systhane	1.1 L	21.45
		Scab	Captan 80	0.85 kg	5.95
6.7		Mildew	Nimrod	1.1 L	19.80
		Scab	Captan 80	0.85 kg	5.95
16.7		Mildew	Nimrod	1.1 L	19.80
		Scab	Captan 80	0.85 kg	5.95
25.7		Mildew	Nimrod	1.1 L	19.80
		Scab	Captan 80	0.85 kg	5.95
6.8		Mildew	Nimrod	1.1 L	19.80
Total cost/ha					326.00

*all chemicals applied at full label recommended rate.

Sprays target scab = 11
Sprays target mildew = 10

Table 29. Fungicide sprays applied to ADEM (1) managed plots (key-stage sprays) (TL 135,136) at Rocks Farm, East Malling in 1996. Apple cultivars Cox

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker - Key-stage	Radspor	1.5 L (100)	17.40
27.4	Green cluster	None	Scab - Pest sprays	Captan 80	1.1 kg (32.4)	7.70
25.5	Blossom	Scab risk 24.5	scab risk high + mildew	Sythane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
5.6	Petal fall	None	Scab/mildew - Key-stage	Sythane Captan 80	0.8 L (72.7) 0.85 kg (100)	15.60 5.95
14.6		None	Mildew	Sythane	0.8 L (72.7)	15.60
26.6		None	Mildew Scab	Nimrod Captan 80	0.8 L (72.7) 1.0 kg (29.4)	14.40 7.00
5.7			Mildew	Nimrod	0.5 L (45.5)	9.00
16.7			Mildew	Topas 100	0.5 L (100)	23.85
27.7			Mildew	Topas 100	0.5 L (100)	23.85
6.8			Mildew	Nimrod	1.1 L (100)	19.80
Total cost/ha						187.55

Sprays target scab = 5
 Sprays target mildew = 8

Table 30. LEVELS OF PRIMARY AND SECONDARY MILDEW ASSESSED AT ROCKS FARM, 1996
IN PLOTS HG 139, TL 148, TL 149, MANAGED USING ADEM

PLOT	Secondary mildew % infected shoots									
	Primary Blossom	Primary Veg	3.6	13.6	24.6	4.7	15.7	25.7	5.8	
HG 139	9.5	31.5	B Fa	B Fa	B Fa	B Fa	B Fa	B Fa	B Fa	
	VL VL	VL VL	L L	3.6	4	3	20	4	0	
TL 148	G F C J	G F C J	G F C J	G F C J	G F C J	G F C J	G F C J	G F C J	G F C J	
	VL VL VL VL	VL VL VL VL	L L L L	50	20	0	5	7	4.2	
TL 149	B W	B W	B W	B W	B W	B W	B W	B W	B W	
	VL VL	VL VL	L L	3.3	0	0	10	0	4.8	

Key:

- B BRAMLEY
- Fa FALSTAFF
- G GALA
- C COX
- F FIESTA
- J JONAGOLD
- W WORCESTER

SCAB INCIDENCE SPORADIC - OCCASIONAL INFECTED LEAF SEEN IN TL 148

L=Low

VL=Very Low

Table 31. Fungicide sprays applied to ADEM managed plots (Key-stage) (Hg 139, TL 149) at Rocks Farm, East Malling in 1996. Apple cultivars Bramley, Falstaff, Worcester

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker - Key-stage	Radspor	1.5 L (100)	17.40
25.4	Green cluster	None	Scab, mildew scab	Systhane Captan 80	1.1 kg (100) 0.85 kg (100)	21.45 5.95
25.5		Scab risk 24.5	Scab/mildew Scab	Systhane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
5.6	Petal fall	None	Scab/mildew - Scab	Systhane Captan 80	0.8 L (72.7) 0.85 kg (100)	15.60 5.95
14.6		None	Mildew	Systhane	0.8 L (72.7)	15.60
26.6			Mildew scab	Nimrod Captan 80	0.8 L (72.7) 1.0 kg (29.4)	14.40 7.00
5.7			Mildew	Nimrod	0.5 L (45.5)	9.00
16.7			Mildew	Topas 100	0.5 L (100)	23.85
25.7			Mildew	Nimrod	0.8 L (72.7)	14.40
6.8			Mildew	Nimrod	1.1 L (100)	19.80
Total cost/ha						197.80

Sprays target scab = 5
 Sprays target mildew = 9

Table 32. Fungicide sprays applied to ADEM managed plots (key-stage sprays) (TL 148) at Rocks Farm, East Malling in 1996. Apple cultivars Cox, Fiesta, Gala, Jonagold

Date	Growth stage	ADEM risk scab	Disease/ justification	Chemical	Rate/hectare (% dose)	Cost £/ha
28.3	Bud burst	None	Scab/canker - Key-stage	Radspor	1.5 L (100)	17.40
25.4	Green cluster	None	Scab/mildew - Pest sprays	Systhane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
23.5	Blossom	Rain forecast scab risk 24.5	Scab/mildew	Systhane Captan 80	1.1 L (100) 0.85 kg (100)	21.45 5.95
5.6	Petal fall	None	Scab/mildew - Key-stage	Systhane Captan 80	0.8 L (72.7) 0.85 kg (100)	15.60 5.95
14.6		Mildew risk above threshold	Mildew	Systhane	1.1 L (100)	21.45
21.6			Mildew	Topas 100	0.5 L (100)	23.85
27.6			Mildew	Nimrod	1.1 L (100)	19.80
			Scab	Captan 80	1.0 kg (29.4)	7.00
1.7			Mildew	Topas 100	0.3 L (60)	14.31
5.7			Mildew	Nimrod	0.5.1 L (45.5)	9.00
16.7			Mildew	Topas 100	0.5 L (100)	23.85
25.7			Mildew	Nimrod	0.8 L (72.7)	14.40
6.8			Mildew	Nimrod	1.1 L (100)	19.80
Total cost/ha						247.21

Sprays target scab = 5
 Sprays target mildew = 11

Table 33. Incidence of powdery mildew in two sprayed commercial orchards - Molland (Ash, East Kent), Reservoir (Matfield) in 1996 on cv Cox

Date Assessed	% mildewed blossom or shoots	
	Molland	Reservoir
8 May (Primary blossom)	0.25	-
6 June (Primary veg)	0	2.0
12/13 June - Secondary mildew	8.8	47.5
20 June	16.3	56.3
26 June	13.8	41.3
3 July	27.5	31.3
11 July	20.0	36.3
17.18 July	18.8	27.5
24,25 July	27.5	28.8
1 August	-	25.0
7/8 August	16.3	18.8

Trace levels of scab seen in both orchards. Sporadic in occurrence.

Appendix I

Price of chemicals on which the costings are based

Chemical	Active ingredient	Price (£/l or £/kg)	Rate (100%)
Captan		7.00	3.4 kg/ha
Dithianon		25.20	1.1 l/ha
Dorado	pyrifenox	74.50	300ml/ha
Manex	maneb + zinc	3.15	5.6 l/ha
Nimrod	bupirimate	18.00	1.1 l/ha
Radspor	dodine	11.60	1.5 l/ha
Scala	pyrimethanil	36.00	75 ml/ha
Systhane	myclobutanil	19.50	1.1 l/ha
Topas 100EC	penconazole	47.70	0.5 l/ha