

MORLEY RESEARCH CENTRE**Management of light leaf spot and canker in winter oilseed rape
(HGCA sponsored, OS07/1/94).***J B S Freer***Summary**

Two cultivars with differing disease resistance to light leaf spot (*Pyrenopeziza brassicae*) and phoma or stem canker (*Leptosphaeria maculans*), Bristol with a NIAB rating of 2 for light leaf spot and Rocket with a rating of 4 for phoma were treated with a range of fungicides. The active ingredients used were flusilazole plus carbendazim (as Punch C), carbendazim (as Bavistin), tebuconazole (as Folicur), difenconazole (as Plover) and prochloraz (as Sportak 45). Treatments were applied as split doses in the autumn and at stem extension in the spring or as a single dose in the autumn. A full dose of Punch C was applied in the autumn and spring as an additional treatment. Phoma was evident at the time of the autumn application and light leaf spot developed on Bristol during the winter. There were significant differences between treatments and this resulted in yield increases where Punch C or Plover were used either as a split application or as a single autumn application.

Object

To develop a scheme for the management of light leaf spot and canker in contrasting varieties of oilseed rape and identify the most appropriate fungicides for the control of these diseases.

Method

Two cultivars showing different disease resistance characteristics to light leaf spot and stem canker were selected from the NIAB Recommended and Descriptive Lists of Oilseed Crops.

Not for publication without the Director's consent. This report deals primarily with only one year's work, so any conclusions given are provisional.

Table 1. *NIAB disease resistance ratings*

Cultivar	Light leaf spot	Stem canker
Bristol	2	5
Rocket	7	4

The fungicides selected were from those which would control both diseases and applications were designed to provide data on the efficacy of different active ingredients at two timings.

Plots were drilled on 7 September 1994. All treatments were applied according to Morley's standard operating procedures full details of which appear in the Appendix.

The autumn treatments were applied on 24 November 1994 and the stem extension treatments on 4 April 1995.

Foliar disease assessments were done by assessing ten plants per plot. Disease was assessed on a whole plant basis. A record of the percentage area infected for a given disease on an individual plant (severity) and the proportion of plants with symptoms (incidence) was made. The autumn samples were incubated for 24h in polythene bags at room temperature before assessment to encourage the development of symptoms of light leaf spot.

Table 2. *Fungicide programmes applied, products used and dose applied*

Fungicide programme		Application rate (l or kg/ha) and timing	
Product	Active ingredient (concentration g ai/l or kg)	Autumn	Stem extension
Untreated			
Punch C	flusilazole (250) + carbendazim (125)	0.8	0.8
Punch C		0.8	
Punch C		0.4	0.4
Bavistin	carbendazim (500)	1.0	
Bavistin		0.5	0.5
Folicur	tebuconazole (250)	1.0	
Folicur		0.5	0.5
Plover	difenconazole (250)	0.5	
Plover		0.25	0.25
Sportak	prochloraz (450)	1.1	
Sportak		0.55	0.55

Stem disease was assessed at pod ripening. Ten plants per plot were examined for light leaf spot, recording the percent area of the stem affected. Stem cankers were recorded on a 0-4 scale where 0 = no disease, 1 = less than half stem girdled by a lesion (\pm penetration), 2 = more than half stem girdled by a lesion (\pm penetration), 3 = whole stem girdled by a lesion (\pm penetration) and 4 = plant dead. A disease index on a 0 to 100 scale was calculated using the formula:

$$\frac{a + b + 2 \times c + 3 \times d + 4 \times e}{a + b + c + d + e} \times 100/5$$

where a, b, c, d & e were plants in each category of the scale.

Crop height and inter raceme distance was assessed by measuring plants after swathing.

Results

Table 3. *Percentage plant leaf area infected by Phoma leaf spot on 14 December 1994*

Fungicide programme (rate of product/ha)		Variety		
Autumn	Stem extension	Bristol	Rocket	Mean
Untreated		1.36	1.08	1.22
Punch C (0.8l)	Punch C (0.8l)	0.70	0.76	0.73
Punch C (0.8l)		0.69	0.46	0.58
Punch C (0.4l)	Punch C (0.4l)	0.76	0.57	0.66
Bavistin (1.0 kg)		1.11	0.64	0.88
Bavistin (0.5 kg)	Bavistin (0.5 kg)	1.09	0.94	1.01
Folicur (1.0 l)		0.83	0.65	0.74
Folicur (0.5 l)	Folicur (0.5 l)	0.92	0.69	0.81
Plover (0.5 l)		0.77	0.47	0.62
Plover (0.25 l)	Plover (0.25 l)	0.64	0.59	0.62
Sportak (1.1 l)		0.55	0.73	0.64
Sportak (0.55 l)	Sportak (0.55 l)	0.82	0.57	0.70
LSD			NS	0.024
Mean		0.85	0.68	
LSD			NS	
SE per plot (44 df)				±0.2060
CV (%)				26.9

At the time of application on 24 November phoma leaf spotting was evident. All treatments significantly reduced the leaf area affected by leaf spotting but there was no difference between varieties and no interaction between fungicide programme and variety.

Table 4. Incidence of plants affected by *Phoma* leaf spot on 14 December 1994(%)

Fungicide programme (rate of product/ha)		Variety		
Autumn	Stem extension	Bristol	Rocket	Mean
Untreated				
Punch C (0.8l)	Punch C (0.8l)			
Punch C (0.8l)				
Punch C (0.4l)	Punch C (0.4l)			
Bavistin (1.0 kg)				
Bavistin (0.5 kg)	Bavistin (0.5 kg)			
Folicur (1.0 l)				
Folicur (0.5 l)	Folicur (0.5 l)			
Plover (0.5 l)				
Plover (0.25 l)	Plover (0.25 l)			
Sportak (1.1 l)				
Sportak (0.55 l)	Sportak (0.55 l)			
LSD				
Mean				
LSD				
SE per plot (52 df)				
CV (%)				

The incidence of phoma leaf spotting high [REDACTED]

Table 5. *Percentage plant affected by light leaf spot on 4 April 1995*

Fungicide programme (rate of product/ha)		Variety		
24 Nov 1994	4 April 1995	Bristol	Rocket	Mean
Untreated		4.60	0.00	2.30
Punch C (0.8l)	Punch C (0.8l)	0.51	0.00	0.25
Punch C (0.8l)		1.12	0.00	0.56
Punch C (0.4l)	Punch C (0.4l)	1.09	0.00	0.54
Bavistin (1.0 kg)		2.73	0.00	1.38
Bavistin (0.5 kg)	Bavistin (0.5 kg)	2.44	0.13	1.28
Folicur (1.0 l)		1.09	0.00	0.54
Folicur (0.5 l)	Folicur (0.5 l)	0.87	0.13	0.50
Plover (0.5 l)		2.46	0.00	1.23
Plover (0.25 l)	Plover (0.25 l)	3.90	0.00	1.95
Sportak (1.1 l)		0.80	0.00	0.40
Sportak (0.55 l)	Sportak (0.55 l)	2.19	0.03	1.11
LSD			1.29	0.91
Mean		1.98	0.02	
LSD			0.39	
SE per plot (44 df)				±0.783
CV (%)				78.0

Bristol was more prone to light leaf spot than Rocket. Folicur and Sportak were the most effective treatments at reducing the level of disease.

Table 6. Percentage plant leaf area affected by *Phoma* leaf spot on 4 April 1995(%)

Fungicide programme (rate of product/ha)		Variety		
24 Nov 1994	4 April 1995	Bristol	Rocket	Mean
Untreated		0.17	0.20	0.18
Punch C (0.8l)	Punch C (0.8l)	0.00	0.00	0.00
Punch C (0.8l)		0.00	0.07	0.03
Punch C (0.4l)	Punch C (0.4l)	0.03	0.00	0.02
Bavistin (1.0 kg)		0.17	0.03	0.10
Bavistin (0.5 kg)	Bavistin (0.5 kg)	0.03	0.03	0.03
Folicur (1.0 l)		0.07	0.13	0.10
Folicur (0.5 l)	Folicur (0.5 l)	0.03	0.00	0.02
Plover (0.5 l)		0.00	0.00	0.00
Plover (0.25 l)	Plover (0.25 l)	0.00	0.00	0.00
Sportak (1.1 l)		0.03	0.00	0.02
Sportak (0.55 l)	Sportak (0.55 l)	0.13	0.00	0.07
LSD			NS	0.105
Mean		0.056	0.039	
LSD			NS	
SE per plot (44 df)				±0.090
CV (%)				190.6

Table 7. % stem area affected by phoma 20 July 1995

Fungicide programme (rate of product/ha)		Variety		
Autumn	Stem extension	Bristol	Rocket	Mean
Untreated		8.00	9.13	8.57
Punch C (0.8l)	Punch C (0.8l)	3.70	4.97	4.33
Punch C (0.8l)		3.13	7.67	5.40
Punch C (0.4l)	Punch C (0.4l)	5.97	7.57	6.77
Bavistin (1.0 kg)		5.83	10.77	8.30
Bavistin (0.5 kg)	Bavistin (0.5 kg)	7.20	10.83	9.02
Folicur (1.0 l)		6.27	8.63	7.45
Folicur (0.5 l)	Folicur (0.5 l)	7.50	8.10	7.80
Plover (0.5 l)		4.30	6.97	5.63
Plover (0.25 l)	Plover (0.25 l)	36.3	7.33	5.48
Sportak (1.1 l)		6.07	9.80	7.93
Sportak (0.55 l)	Sportak (0.55 l)	7.07	8.93	8.00
LSD			NS	1.72
Mean		5.72	8.39	
LSD			1.23	
SE per plot (44 df)				±1.48
CV (%)				20.9

Split doses of Punch C, Folicur or Plover significantly reduced the canker index as did the autumn and spring full dose of Punch C. The split dose of Bavistin or Sportak did not reduce the canker index significantly. The autumn applications were not effective in reducing

Table 7. *Light leaf spot on stem (% stem area) 20 July 1995*

Fungicide programme (rate of product/ha)		Variety		
Autumn	Stem extension	Bristol	Rocket	Mean
Untreated		6.93	0.00	6.93
Punch C (0.8l)	Punch C (0.8l)	1.87	0.00	1.87
Punch C (0.8l)		1.80	0.00	1.80
Punch C (0.4l)	Punch C (0.4l)	4.83	0.00	4.83
Bavistin (1.0 kg)		6.90	0.00	6.90
Bavistin (0.5 kg)	Bavistin (0.5 kg)	6.90	0.00	6.90
Folicur (1.0 l)		3.27	0.00	3.27
Folicur (0.5 l)	Folicur (0.5 l)	3.37	0.00	3.37
Plover (0.5 l)		3.17	0.00	3.17
Plover (0.25 l)	Plover (0.25 l)	3.80	0.00	3.80
Sportak (1.1 l)		4.17	0.00	4.17
Sportak (0.55 l)	Sportak (0.55 l)	5.97	0.00	5.97
LSD				2.441
Mean		4.41	0.00	
LSD				
SE per plot (22 df)				±1.44
CV (%)				32.7

Table 8. *Stem canker index 20 July 1995*

Fungicide programme (rate of product/ha)		Variety		
Autumn	Stem extension	Bristol	Rocket	Mean
Untreated		61.1	54.4	57.8
Punch C (0.8l)	Punch C (0.8l)	11.1	31.1	21.1
Punch C (0.8l)		12.8	31.1	21.9
Punch C (0.4l)	Punch C (0.4l)	29.4	42.8	36.1
Bavistin (1.0 kg)		46.1	43.9	45.0
Bavistin (0.5 kg)	Bavistin (0.5 kg)	50.0	53.3	51.7
Folicur (1.0 l)		36.7	40.0	38.3
Folicur (0.5 l)	Folicur (0.5 l)	46.7	52.2	49.4
Plover (0.5 l)		7.8	31.7	19.7
Plover (0.25 l)	Plover (0.25 l)	13.9	38.9	26.4
Sportak (1.1 l)		36.7	47.8	42.2
Sportak (0.55 l)	Sportak (0.55 l)	45.0	49.4	47.2
LSD			NS	11.01
Mean		33.1	43.1	
LSD			6.60	
SE per plot (44 df)				±9.43
CV (%)				24.8

Table 9. Seed yield t/ha at 91% dry matter

Fungicide programme (rate of product/ha)		Variety		
Autumn	Stem extension	Bristol	Rocket	Mean
Untreated		4.98	4.35	4.66
Punch C (0.8l)	Punch C (0.8l)	5.19	4.68	4.94
Punch C (0.8l)		5.22	4.71	4.96
Punch C (0.4l)	Punch C (0.4l)	5.18	5.01	5.10
Bavistin (1.0 kg)		4.81	4.71	4.77
Bavistin (0.5 kg)	Bavistin (0.5 kg)	4.97	4.50	4.74
Folicur (1.0 l)		5.19	4.58	4.88
Folicur (0.5 l)	Folicur (0.5 l)	5.10	4.66	4.88
Plover (0.5 l)		5.32	5.22	5.27
Plover (0.25 l)	Plover (0.25 l)	4.99	4.98	4.99
Sportak (1.1 l)		5.05	4.72	4.89
Sportak (0.55 l)	Sportak (0.55 l)	4.99	4.76	4.87
LSD			NS	0.293
Mean		5.08	4.74	
LSD			0.627	
SE per plot (44 df)				±0.252
CV (%)				5.1

Punch C and Plover applied as a single dose in the autumn or split autumn and stem extension increased yield significantly. There was no interaction with variety nor was there a significant difference between varieties.

Discussion

Disease levels were moderate in the 1994/5 season mainly due to higher than average rainfall during September and October (Figure 1) and this resulted in significant yield responses to fungicide programmes. The weather conditions that are conducive for light leaf spot and phoma infection are:

Light leaf Spot

Cool, wet conditions favour the spread of this disease and although associated with northern Britain in recent years, recent dry seasons have meant that whilst this disease can be found in early spring the crop grows away from the disease. Early autumn infections can be very damaging but are unusual in East Anglia.

Phoma leaf spot

Periods of high humidity or rainfall that causes spores to be released from rape stubble debris. Symptoms can appear rapidly in warm conditions but can take 4-6 weeks to develop when temperatures are nearer 0°C. After initial infection from airborne spores, local infection is spread by water splash.

Significant rainfall to trigger the release of spores occurred by mid to late October. Assessments of disease at the time of autumn application on 24 November showed high levels of the disease already present. As the fungicides are only mostly active as protectants the may have been applied too late, however Punch C and Plover have some curative activity and these two chemicals reduced disease and gave significant yield benefit.

By mid-March levels of phoma had developed and there were signs of light leaf spot on Bristol.

Appendix

This is an abbreviated version of the standard operating procedures used at Morley Research Centre.

1 Plot layout

1.1 Plots were sown with an Oyjord drill. The drilled plots were 18 m long and 1.56 m wide from outside row to outside row (14 rows at 12.0 cm spacing). Plots were separated by a buffer of the same size with a 54 cm gap between successive plots and buffers. This gave an effective plot width of 2.10 m, which was used for harvest yield calculations. Treatments were applied to the plot and to half of the buffer at each side.

1.2 Common treatments such as insecticides and herbicides were applied across all plots with farm machinery using wheelings, 18 m apart. For harvest purposes, plot length was reduced to 15 m.

2 Weather records

2.1 Weather data were obtained from a Hardi Metpole. Recordings are taken every thirty minutes.

3 Harvest details

3.1 Plots were swathed using a Haldrup swather designed for plot work. Plots were cut from west to east.

3.2 Plots were harvested using a Sampo 2010 combine which was modified for plot work and used electronic weighing (Novatech M864 Loadmeter). Trials were harvested by replicate.

4 Post harvest determinations

4.1 Moisture content was determined by taking a 100 g sub sample, oven drying for 24 hours at 100 - 102° C, and weighing at ambient temperature.

Field details

Site W Hamilton and Son, The Rosery Farm, Little Stonham, Suffolk

Crop Winter oilseed rape

Variety Bristol and Rocket

Previous crop 1993 set aside
1992 winter wheat
1991 winter wheat

Soil type and series Sandy clay loam over chalky boulder clay (Hanslope/Ashley series)

Soil analysis (mg/l)

pH	P	K	Mg
7.8	31	165	64

Seed C1 generation

Seedrate 7.5 kg/ha

Date sown 7 September 1994

Nutrients applied	Fertiliser	Rate (kg/ha)
Nitrogen		290 kg/ha
Sulphur		40 kg/ha S

Cultivations ploughed
power harrowed and rolled