

**MORLEY RESEARCH CENTRE****Winter oilseed rape: the management of light leaf spot and canker by genetic resistance and fungicides**

Sponsored by HGCA Oilseeds (HCGA OS07/01/94)

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**Summary**

Full recommended doses of Bavistin, Folicur, Plover, Punch C and Sportak were applied to the varieties Bristol and Nickel as a single application in the autumn or split between autumn and early stem extension. The full dose of Punch C was also applied at both timings. Disease levels on the leaves was very low throughout the season. However, at harvest stem canker levels were moderate but there was no yield response to fungicide treatment.

**Object**

To determine the effect of canker (*Leptosphaeria maculans*) and light leaf spot (*Pyrenopeziza brassicae*) on the yield of winter oilseed rape. To develop a scheme for the management of light leaf spot and canker in contrasting varieties of oilseed rape. To investigate the interaction of fungicide programmes, meteorological variables and geographical area within Great Britain on the expression of disease resistance in contrasting cultivars. To identify the most appropriate fungicides for the control of these diseases.

**Method**

Two cultivars which showed different resistance characteristics to light leaf spot and canker, were selected from the HGCA/NIAB Recommended and Descriptive Lists of Oilseed Crops 1995 (Table 1).

The trial was established at the Felix Thornley Cobbold Trust Farm, Otley, Ipswich, Suffolk with three replicates of a split plot design with varieties on main plots and fungicides completely randomised on sub plots. The crop was drilled on 6 September 1995 following winter barley. The trial received normal farm inputs of herbicide, nitrogen and insecticides. The crop established well but plant population was affected by dense populations of barley volunteers

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\*Not for publication without the Director's consent.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

Table 1. *Disease resistance ratings*

Cultivar	Light leaf spot	Canker
Bristol	2	5
Nickel	9	4

which, although completely controlled competed with the crop and resulted in stripes running at right angles though all plots. A mean population of 48 plants/m<sup>2</sup> was established on 18 October 1995. Treatments were applied as described in Table 2 using an OPS-type sprayer with a 4m boom at 200l/ha spray volume. Work was carried out carried out to Morley standard procedures and ADAS standard operating procedures. Rape stubble from the previous crop was spread over the plots after emergence in order to provide a source of inoculum to infect the plants.

Table 2. *Fungicides treatments*

Fungicide treatment		Timing (dose/ha)	
Product	active ingredient (g ai/l or kg)	autumn	stem extension
Nil		-	-
Punch C	flusilazole plus carbendazim (250 + 125)	0.8 l	0.8 l
Punch C	flusilazole plus carbendazim	0.4l	0.4l
Punch C	flusilazole plus carbendazim	0.8l	-
Bavistin	carbendazim (500)	1.0kg	-
Bavistin	carbendazim	0.5kg	0.5kg
Folicur	tebuconazole (250)	1.0l	-
Folicur	tebuconazole	0.5l	0.5l
Plover	difenconazole (250)	0.5l	-
Plover	difenconazole	0.25l	0.25l
Sportak 45	prochloraz (450)	1.1l	-
Sportak 45	prochloraz	0.55l	0.55l

The autumn treatments were applied on 29 November 1995 when the crop was at the 4-6 leaf stage. Spring treatments were applied on 17 April 1996 when the crop was at the early green bud/stem elongation stage. The trial was swathed on 24 July 1996 and combine harvested on 6 August 1996.

### Results

Disease levels were assessed on 21 December 1995 (22 days after application of the autumn treatments) and on 24 April 1996 (7 days after the application of the spring treatments and 105 days after the autumn treatments). On 2 August 1996 stem cankers were assessed. Due to the

#### Phoma leaf spot and stem canker

Table 3. % leaf area infected with phoma leaf spot 21 December 1995

Fungicide treatment (dose l/ha) and timing		Variety		
Autumn	Spring	Bristol	Nickel	Mean
Nil	Nil	0.04	0.09	0.06
Punch C (0.8)	Punch C (0.8)	0.03	0.01	0.02
Punch C (0.8)	Nil	0.01	0.01	0.01
Punch C (0.4)	Punch C (0.4)	0.03	0.02	0.02
Bavistin (1.0)	Nil	0.03	0.03	0.03
Bavistin (0.5)	Bavistin (0.5)	0.08	0.01	0.04
Folicur (1.0)	Nil	0.04	0.01	0.02
Folicur (0.5)	Folicur (0.5)	0.04	0.07	0.05
Plover (0.5)	Nil	0.05	0.03	0.04
Plover (0.25)	Plover (0.25)	0.07	0.01	0.04
Sportak 45 (1.1)	Nil	0.02	0.03	0.02
Sportak 45 (0.55)	Sportak 45(0.55)	0.03	0.00	0.02
LSD			NS	NS
Mean		0.04	0.03	
LSD			NS	
SE per Plot (50df)				0.041
CV(%)				118.0

unevenness of the crop, caused by the late removal of the barley volunteers no plant physiological measurements were made. There was no lodging and no difference in crop colour prior to harvesting.

Disease levels were very low during the autumn/winter period (Table 3). There was no response to fungicide treatment and there was no difference between varieties.

Table 4. % leaf area affected by phoma 24 April 1996

Fungicide treatment (dose/ha) and timing		Variety		
Autumn	Spring	Bristol	Nickel	Mean
Nil	Nil	0.8	0.7	0.7
Punch C (0.8)	Punch C (0.8)	0.5	0.3	0.4
Punch C (0.8)	Nil	0.4	0.3	0.4
Punch C (0.4)	Punch C (0.4)	0.3	0.4	0.4
Bavistin (1.0)	Nil	0.7	0.4	0.6
Bavistin (0.5)	Bavistin (0.5)	0.5	0.7	0.6
Folicur (1.0)	Nil	0.4	0.3	0.4
Folicur (0.5)	Folicur (0.5)	0.5	0.4	0.4
Plover (0.5)	Nil	0.4	0.4	0.4
Plover (0.25)	Plover (0.25)	0.3	0.3	0.3
Sportak 45 (1.1)	Nil	0.5	0.4	0.4
Sportak 45(0.55)	Sportak 45 (0.55)	0.7	0.4	0.6
LSD (SED)		0.26 (0.13)		0.17(0.08)
Mean		0.5	0.4	
LSD		NS		
SE per Plot (50df)				0.173
CV(%)				36.2

Whilst levels were still low at this time, Punch C, Folicur and Plover either applied as a single or split dose and the split application of Sportak reduced the % of leaf area affected by phoma spotting (Table 4).

Table 5. % plants with canker 2 August 1996

Fungicide treatment (dose/ha) and timing		Variety		
Autumn	Spring	Bristol	Nickel	Mean
Nil	Nil	9.3	9.2	9.3
Punch C (0.8)	Punch C (0.8)	4.7	3.3	4.0
Punch C (0.8)	Nil	6.3	4.3	5.3
Punch C (0.4)	Punch C (0.4)	5.7	4.0	4.8
Bavistin (1.0)	Nil	8.7	9.3	9.0
Bavistin (0.5)	Bavistin (0.5)	7.0	7.3	7.2
Folicur (1.0)	Nil	7.3	4.7	6.0
Folicur (0.5)	Folicur (0.5)	5.3	4.0	4.7
Plover (0.5)	Nil	6.3	3.0	4.7
Plover (0.25)	Plover (0.25)	4.0	3.7	3.8
Sportak 45 (1.1)	Nil	9.0	7.3	8.2
Sportak 45 (0.55)	Sportak 45 (0.55)	5.7	5.3	5.5
LSD			2.15	1.45
Mean		6.8	5.7	
LSD			NS	
SE per plot (50df)				
CV(%)				

The incidence of stem canker (Table 5) was reduced by the application of Punch C, Folicur, Plover either applied as a single or split dose and the split application of Sportak.

Table 6. Canker index 2 August 1996

Fungicide treatment (dose/ha) and timing		Variety		
Autumn	Spring	Bristol	Nickel	Mean
Nil	Nil	56.0	57.0	56.5
Punch C (0.8)	Punch C (0.8)	22.0	26.0	24.0
Punch C (0.8)	Nil	34.7	30.0	32.3
Punch C (0.4)	Punch C (0.4)	23.7	29.3	29.0
Bavistin (1.0)	Nil	42.7	46.0	44.3
Bavistin (0.5)	Bavistin (0.5)	46.7	42.0	44.3
Folicur (1.0)	Nil	42.7	36.0	39.3
Folicur (0.5)	Folicur (0.5)	28.0	27.3	27.7
Plover (0.5)	Nil	30.0	28.0	29.0
Plover (0.25)	Plover (0.25)	26.0	36.0	31.0
Sportak 45 (1.1)	Nil	49.3	36.7	43.0
Sportak 45 (0.55)	Sportak 45 (0.55)	32.7	37.3	35.0
LSD			NS	10.70
Mean		38.1	37.6	
LSD			NS	
SE per Plot (50df)				±9.23
CV(%)				24.4

All fungicide treatments reduced the stem canker index (Table 6). Bavistin, Autumn applied Folicur and Sportak were less effective than the other treatments.

**Light leaf spot**

Table 7. % leaf area infected with light leaf spot 21 December 1995

Fungicide treatment (dose/ha) and timing		Variety		
Autumn	Spring	Bristol	Nickel	Mean
Nil	Nil	0.02	0.02	0.02
Punch C (0.8)	Punch C (0.8)	0.03	0.00	0.01
Punch C (0.8)	Nil	0.00	0.01	0.01
Punch C (0.4)	Punch C (0.4)	0.00	0.00	0.00
Bavistin (1.0)	Nil	0.02	0.02	0.02
Bavistin (0.5)	Bavistin (0.5)	0.02	0.04	0.03
Folicur (1.0)	Nil	0.01	0.01	0.01
Folicur (0.5)	Folicur (0.5)	0.00	0.00	0.00
Plover (0.5)	Nil	0.00	0.01	0.01
Plover (0.25)	Plover (0.25)	0.00	0.08	0.04
Sportak 45 (1.1)	Nil	0.04	0.00	0.02
Sportak 45 (0.55)	Sportak 45 (0.55)	0.01	0.00	0.00
LSD (SED)		0.033 (0.016)		0.023 (0.011)
Mean		0.01	0.02	
LSD		NS		
SE per Plot (50df)				
CV(%)				

Incidence of light leaf spot was very low in the autumn/winter (Table 7) and had not increased when assessed on 24 April 1996 (Table 8).

Table 8. % leaf area infected with light leaf spot 24 April 1996

Fungicide treatment (dose/ha) and timing		Variety		
Autumn	Spring	Bristol	Nickel	Mean
Nil	Nil	0.04	0.00	0.02
Punch C (0.8)	Punch C (0.8)	0.00	0.00	0.00
Punch C (0.8)	Nil	0.01	0.00	0.01
Punch C (0.4)	Punch C (0.4)	0.00	0.00	0.00
Bavistin (1.0)	Nil	0.02	0.00	0.01
Bavistin (0.5)	Bavistin (0.5)	0.05	0.01	0.03
Folicur (1.0)	Nil	0.06	0.00	0.03
Folicur (0.5)	Folicur (0.5)	0.04	0.00	0.02
Plover (0.5)	Nil	0.01	0.00	0.00
Plover (0.25)	Plover (0.25)	0.00	0.00	0.00
Sportak 45 (1.1)	Nil	0.01	0.00	0.01
Sportak 45 (0.55)	Sportak 45 (0.55)	0.00	0.00	0.00
LSD			NS	NS
Mean		0.02	0.00	
LSD			NS	



**Yield**Table 9. *Seed yield (t/ha at 91% dm)*

Fungicide treatment (dose/ha) and timing	Variety				
	Autumn	Spring	Bristol	Nickel	Mean
Nil	Nil		4.31	4.56	4.43
Punch C (0.8)	Punch C (0.8)		4.11	4.80	4.46
Punch C(0.8)	Nil		4.30	4.76	4.53
Punch C (0.4)	Punch C (0.4)		4.29	4.67	4.48
Bavistin (1.0)	Nil		4.25	4.50	4.38
Bavistin (0.5)	Bavistin (0.5)		4.27	4.66	4.46
Folicur (1.0)	Nil		4.27	4.63	4.45
Folicur (0.5)	Folicur (0.5)		4.11	4.57	4.34
Plover (0.5)	Nil		4.32	4.74	4.53
Plover (0.25)	Plover (0.25)		4.35	4.67	4.51
Sportak 45 (1.1)	Nil		4.24	4.52	4.38
Sportak 45 (0.55)	Sportak 45 (0.55)		4.13	4.46	4.30
LSD				NS	NS
Mean			4.25	4.62	
LSD				NS	
SE per plot (50 df)					0.255
CV (%)					5.7

There were no significant differences between treatments. Disease levels were low during the spring and although levels of Phoma were higher prior to harvest the disease obviously had no effect on yield.

**Discussion**

In a very dry season disease pressure was low and although the application of fungicides did suppress phoma and light leaf spot the diseases were not at yield damaging levels and so their application was not economically justified. This suggests that an autumn spray should only be used when light leaf spot and especially phoma infect the crop early in the autumn when they are likely to pose the greatest threat to yield. Late phoma leaf spot infections appearing around late December tend not to develop into stem cankers in time to threaten yield. Spring applications to prevent light leaf spot have in the past been shown to be cost effective especially on the most susceptible varieties such as Bristol. Of the fungicides used, Bavistin showed for the second year that its effectiveness was limited. Sportak showed some benefit, particularly when applied

as a split application. Punch C and Plover gave the best all round disease control but a split application of Folicur gave good suppression of stem canker.

**Appendix**

Cropping details 1995/6 season.

**Field details**

<b>Site</b>	Felix Thornley Cobbold Trust Farm, Otley, Ipswich,			
Suffolk				
<b>Field reference</b>	Henley Road			
<b>Crop</b>	winter oilseed rape			
<b>Variety</b>	Apex (surrounding trial area)			
<b>Previous Crop</b>	1995 winter barley 1994 winter wheat 1993 linseed 1992 winter wheat			
<b>Soil type (and series)</b>	clay loam over chalky boulder clay (Hanslope series)			
<b>Soil analysis</b>	pH	P	K	Mg
May 1995 (mg/l)	8.1	11.4	132	53
Index		1	2-	2-
<b>Seed</b>	C2 generation			
<b>Seedrate</b>	7 kg/ha			
<b>Date sown</b>	6 September 1994			
<b>Nutrients applied</b>	Rate (kg/ha)			
20 September 1994	N	40		
1 February 1995	N	50		
11 March	N	70		
<b>Total</b>	N	<u>160</u>		
<b>Cultivations</b>	28 August 1994	disc, packer and rolled		
	30 August	disc, packer and rolled		

**Applications to crop**

<b>Date</b>	<b>GS</b>	<b>Item</b>	<b>Dose/ha</b>
13 October	3-4 leaf	Butisan S (metazachlor, 500g) Fusilade (fluazifop-P-butyl, 250g) Cyperkill (cypermethrin, 100g) Agral (non-ionic wetter)	1.3 l 375 ml 200 ml 400 ml
15 September	1-2 leaf	Decoy (methiocarb, 2% w/w)	3 kg
25 September	2 leaf	PBI Slug pellets (metaldehyde, 6%w/w)	7 kg
25 April	rosette	Cyperkill	250 ml
28 May	flowering	Hallmark (lambda-cyhalothrin, 50g) Bittersaltz (magnesium sulphate, ) Solubor (boron)	150 ml 4 kg 2.5 kg

## **Spray and assessment methods for oilseed trials**

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

### **Plot layout**

Plots were sown at 120 seeds/m<sup>2</sup> 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. Common treatments such as fertiliser, insecticides, herbicides and growth regulators were applied across all plots with farm machinery using wheelings, 18 m apart. For harvest purposes, plot length was reduced to 15 m.

### **Spraying details**

Treatments were applied using a CO<sub>2</sub> powered backpack sprayer, utilising 'Cornelius' vessels and a 4 m boom (eight nozzles at 0.5 m spacings) with Lurmark F 110 - 03 nozzles at 2 bar pressure, to give 200 l/ha spray volume at 1.6 m/s forward speed.

### **Agronomic factors**

Overall plant population was determined by making 50 counts of a 30.5 x 30.5 cm quadrat at random across the site.

### **Disease assessments**

Ten plants per plot were collected from the buffer strips along side the harvested area. These randomly selected plants were placed in polythene bags and stored at room temperature for 24 - 48 hours to incubate any disease present. Assessments were made according to ADAS standard operating procedure Nos. 012 and 014.

### **Weather records**

Weather data were obtained from a "Hardi Metpole". Recordings are taken every ten minutes and summarised every thirty minutes.

### **Harvest details**

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.

### **Post harvest determinations**

Moisture content was determined by taking a 200 g subsample, oven drying for 40 hours at 100 to 102° C, and weighing at ambient temperature.

**Experiment diary**

<b>Date</b>	<b>Treatments applied or action</b>
7 September 1994	Experiment sown
5 October	Spread stubble debris on harvest areas
24 November	Autumn treatments applied
14 December	Full disease assessment
4 April	Spring treatments applied
4 April	Full disease assessment
6 June	Crop height
17 July	Canker assessment and internode distance
12 July	Experiment swathed
24 July	Experiment harvested