MORLEY RESEARCH CENTRE

Control of downy mildew in spring beans, 1995

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Summary

In a dry season a crop of Victor spring beans showed no disease symptoms until early July when downy mildew and bean rust first appeared. Downy mildew remained at a low level but rust spread rapidly on unprotected plant parts. Fungicide treatments applied on 6 July at the end of flowering gave good control of rust and resulted in yield responses of up to 0.75 t/ha. The highest yield increases were produced by Bavistin DF and Bravocarb but these were not significantly better than some other treatments.

Apron Combi seed treatment applied to control primary seedling infection by downy mildew had no effect on rust but gave a yield reduction in these conditions.

Object

To assess the potential benefits of strategies for the control of downy mildew *(Peronospera viciae)* in a susceptible variety of spring field beans *(Vicia faba)* and evaluate some of the fungicides currently permitted in this crop.

Method

The treatments (Table 1) were applied to a crop of Victor spring field beans (NIAB rating for downy mildew resistance = 3) sown in plots at Morley on 22 March. The established plot size for all treatments was 24 m x 2.1 m and within each replicate neighbouring plots were separated by buffer plots of the same dimensions. Seed treatments were applied by Ciba Geigy to seed from the same stock as the untreated seed used for all other treatments. Sprays were applied in 200 l/ha through F110° 03 nozzles mounted on a hand held 4 m boom using a CO_2 pressurised knapsack sprayer. The trial received normal farm inputs of fertiliser, herbicide and insecticide. All work was carried out according to the standard operating procedures of Morley Research Centre.

*Not for publication without the Director's consent.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

Plant counts were made on 18 May. Disease levels were monitored throughout the season and a detailed assessment was carried out on 28 July. The trial was harvested on 18 August.

Table 1. *Fungicide treatments (product dose l or kg/ha)*

Seed treatment	Early flower spray (14 June)	Late flower spray (6 July)
Untreated	-	-
-	Folio (2.0)	Folio (2.0)
-	Folio (2.0)	-
-	-	Folio (2.0)
-	Folio (1.0)	Folio (1.0)
Apron Combi*	-	-
Apron Combi*	Folio (2.0)	Folio (2.0)
Apron Combi*	Folio (2.0)	-
Apron Combi*	-	Folio (2.0)
Apron Combi*	Folio (1.0)	Folio (1.0)
-	Rovral Flo (2.0)	Rovral Flo (2.0)
-	Rovral Flo (1.0)	Rovral (1.0)
-	Bavistin DF (1.1)	Bavistin DF (1.1)
-	Bavistin DF (0.5)	Bavistin DF (0.5)
-	Bravocarb (2.0)	Bravocarb (2.0)
-	Bravo (3.0)	Bravo (3.0)

*Apron Combi applied at 3.0 l/t seed

Table 2. *Active ingredient (g ai/ kg or l)*

Product	Active ingredient
Apron Combi	metalaxyl + thiabendazole + thiram (233 + 120 + 100)
Bavistin DF	carbendazim (500)
Bravo	chlorothalonil (500)
Bravocarb	carbendazim + chlorothalonil (100 + 450)
Folio	chlorothalonil + metalaxyl (500 + 75)
Rovral Flo	iprodione (255)

Results and discussion

Crop establishment

The seed was sown at a depth of 75-100 mm in good friable soil conditions with some moisture. Plant counts on 18 May showed that overall there was a satisfactory uniform population of 27 plants/m^2.

Disease

1995 was an exceptionally dry season for spring field beans (April to August rainfall at Morley totalled 132 mm compared to 237 mm long term average). Although downy mildew lesions were found on spring beans elsewhere on the farm by early June, none were observed on the trial area at this stage. Constant monitoring of the plots for disease showed that downy mildew and bean rust were not seen on this site until early July. Subsequently there was a rapid explosion of rust which resulted in defoliation of untreated plots and the unprotected upper parts of plants on those plots which had only received an early protectant spray. There appeared to be little development of downy mildew. Bean rust levels were assessed on 28 July (Table 3).

The critical factor appears to have been spray timing in relation to the spread of rust spores. Fungicide programmes which included a late flowering spray to protect the more vulnerable upper plant parts significantly reduced bean rust levels. Differences between the fungicides or the doses used were small. The seed treatment did not affect the levels of rust in July (Table 4).

Yield

In general there appears to be a good relationship between rust and yield (Table 3). The highest yields were produced by treatments involving a late flower spray, in particular where full doses of Bavistin DF or Bravocarb were used, although the yields from these treatments were not significantly different from a number of other treatments.

In addition, the results indicate that Apron Combi seed treatment had a small negative effect on yield in this trial (Table 5). Plant establishment resulting from individual treatments was not assessed but there were no obvious differences in population and the overall establishment was 27/m^2. As no differences in rust were recorded where Apron Combi was use, it is difficult to explain this yield effect.

The low incidence of downy mildew in this trial means that these results have no value in terms of developing a cost effective strategy for its control in field beans. However, in some seasons there may be added value from rust control where these fungicides with protectant activity are used primarily for the control of downy mildew.

Table 3. *Bean rust on 28 July (% whole plant) and yield (t/ha at 85% dm)*

Seed treatment	Early flower spray (14 June)	Late flower spray (6 July)	Bean rust	Yield
Untreated	-	-	55.0	2.53
-	Folio (2.0)	Folio (2.0)	20.0	2.97
-	Folio (2.0)		58.8	2.54
-		Folio (2.0)	20.0	2.93
-	Folio (1.0)	Folio (1.0)	25.0	2.86
Apron Combi	-	-	55.0	2.30
Apron Combi	Folio (2.0)	Folio (2.0)	26.3	2.63
Apron Combi	Folio (2.0)	-	56.3	2.23
Apron Combi	-	Folio (2.0)	22.5	2.49
Apron Combi	Folio (1.0)	Folio (1.0)	21.3	2.60
-	Rovral (2.0)	Rovral (2.0)	17.5	2.83
-	Rovral (1.0)	Rovral (1.0)	23.8	2.99
-	Bavistin DF (1.1)	Bavistin DF (1.1)	13.8	3.20
-	Bavistin DF (0.5)	Bavistin DF (0.5)	18.8	3.02
-	Bravocarb (2.0)	Bravocarb (2.0)	15.0	3.28
-	Bravo (3.0)	Bravo (3.0)	15.0	3.19
LSD			7.21	0.310
SE per plot (45 df)			±5.10	±0.219
CV (%)			17.6	7.9

Table 4. *Effect of seed treatment on bean rust on 28 July (% whole plant)*

Fungicides as foliar sprays		Seed treatment		
Early flowering	Late flowering	Nil	Apron Combi	Means
-	-	55.0	55.0	55.0
Folio (2.0)	Folio (2.0)	20.0	26.3	23.1
Folio (2.0)	-	58.8	56.3	57.5
-	Folio (2.0)	20.0	22.5	21.3
Folio (1.0)	Folio (1.0)	25.0	21.3	23.1
LSD		9.05		6.40
Means		35.8	36.3	
LSD		NS		
SE per plot (27 df)		±6.24		
CV (%)		17.3		

Table 5. *Effect of seed treatment on yield (t/ha at 85% dm)*

Fungicides as foliar sprays		Seed treatment		
Early flower	Late flower	Nil	Apron Combi	Means
-	-	2.53	2.30	2.42
Folio (2.0)	Folio (2.0)	2.97	2.63	2.80
Folio (2.0)	-	2.54	2.23	2.38
-	Folio (2.0)	2.93	2.49	2.71
Folio (1.0)	Folio (1.0)	2.86	2.60	2.73
LSD		0.317		0.224
Means		2.77	2.45	
LSD		0.142		
SE per plot (27 df)		±0.219		
CV (%)		8.4		

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Appendix

The following information is presented as an appendix which is available on request:

Field details
Experiment Diary
Method

Field details

Crop	Spring beans *(Vicia faba)*
Field reference	OS: TM 09NE/9745
Site	Brockholes field, Manor Farm, Morley
Previous crop	1994 Winter wheat 1993 Sugar beet 1992 Winter wheat
Soil type and series	Sandy loam over chalky boulder clay (Ashley series)

Soil analysis	**pH**	**P**	**K**	**Mg**
23 August 1994	8.0	(2)	(2)	(2)

Cultivations		
	17 December 1994	plough and press
	21 March 1995	power harrow

Experiment diary

Date	**Treatments applied or action**
22 March 1995	Trial drilled
22 March	Herbicide applied, Opogard (2.8 l/ha)
18 May	Herbicide applied, Basagran (1.5 l/ha) + plant counts
30 May	Herbicide applied, Basagran (1.5 l/ha)
14 June	Early flower fungicide treatments applied
28 June	Insecticide applied, Aphox (0.28 kg/ha)
6 July	Late flower treatments applied
28 July	Diseases recorded
18 August	Trial combined

Method

Plot layout

Plots were sown with C1 Victor spring bean seed at 40 seeds/m^2 using an Oyjord drill. The drilled plots were 24 m long and 1.56 m wide from outside row to outside row (14 rows at 12.0 cm spacing) separated by a gap of 60 cm. Adjacent plots were separated by buffers of the same dimensions and were laid out in randomised blocks. There were 4 replicates.

Common treatments such as fertiliser, insecticides, and herbicides were applied across all plots with farm machinery using wheelings, 24 m apart. For harvest purposes, plot length was reduced to 20 m.

Spraying details

Treatments were applied using a CO_2 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 0.5 x 0.5 m quadrat at random across the site.

Disease

The overall level of disease on a plant was determined by the following method. A standard (based on the appropriate key from the ADAS manual of disease assessment keys, 1976) was agreed between two experienced assessors and plots were assessed by walking along the gap between the harvest area and the buffer, examining the plot from both sides. The crop was examined at intervals and an appropriate disease level was agreed at the end of each plot.

Harvest details

Plots were harvested using a Claas Compact 25 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 500 g subsample, oven drying for 48 hours at 100-102°C and weighing at an ambient temperature.