

Project title: To Determine the Efficacy of Test Fungicides when Applied at Test Rates to Blackcurrants in the UK for the Control of Botrytis

Project number: SF 12 (179)

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Location: Angus, Scotland

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Authentication

'I, the undersigned, hereby declare that this work was performed under my direction. The study was conducted according to the procedures herein described and this report represents a true and accurate record of the results obtained.'

A Foster BSc
Study Director

Date

1 Summary

The aim of this study was to compare the efficacy of the test fungicides UK456 and UK633 with the standard treatments Bravo, Scala and Teldor, used alone and in sequence with the test materials for the control of foliar diseases on Blackcurrants (*Ribes nigrum*).

A single trial was located in Angus, central Scotland on Blackcurrants (cv. Ben Tirran). Applications of the test materials were made using a portable mist blower delivering a spray volume of 1000 l.ha⁻¹. To coincide with normal commercial applications for disease control, the application timings were at crop growth stages BBCH 65, BBCH 73 and BBCH 80.

Event	Trial 1
Application A	17 May 2000
Application B and Phytotoxicity Assessment	16 June 2000
Application C and Phytotoxicity Assessment	11 July 2000
Phytotoxicity Assessment	25 July 2000
Phytotoxicity and Disease Assessment	01 August 2000
Yield, Disease and Phytotoxicity Assessment	08 August 2000

No problems were encountered during the mixing and applications of the fungicides UK456, UK633, Bravo, Scala and Teldor. No phytotoxicity resulted from the applications of the treatments.

Foliar disease levels were extremely low in 2000 due to the unfavourable weather conditions.

The control of foliar diseases achieved by the fungicides UK456 and UK633 were statistically similar to the standard products.

Compared to the untreated, yield increases of between 7% and 30% were recorded after treatment. A spray programme of UK456 followed by 2 applications of UK633 provided the greatest increase in yield. However in terms of yield, statistically significant differences between the treatments were not observed in this trial.

2 Introduction

The aim of this study was to determine the efficacy of the test fungicides UK456, UK633, Bravo, Scala and Teldor in Blackcurrants (*Ribes nigrum*).

The study was conducted on a crop of Blackcurrants, in Angus, Central Scotland.

Experimental Start Date:	17 May 2000
Experimental Completion Date:	08 August 2000
Study Completion Date:	See date of Study Director's signature on Authentication (page 2).

The study was conducted in accordance with Inveresk Protocol No. 399087 unless otherwise stated. The protocol had been prepared to meet the requirements of the Pesticide Safety Division (PSD) of the Ministry of Agriculture in the UK and the regulatory requirements of EEC Directive 91/414.

All data generated and recorded during this study, including a copy of the final report, will be stored in the Scientific Archives of Inveresk Research International Limited for 5 years after issue of the final report. At the end of the 5 year period the Sponsor will be consulted regarding the disposal, transfer or continued storage of raw data.

3 Experimental Procedure

The following test materials were supplied by the Sponsor on 12 May 2000.

UK456 (WG), off white granules containing 50% w/w tolyluanid

UK633 (WG), dark grey granules containing 16.7% w/w fenhexamid and 33% w/w tolyluanid

The standard commercial test materials, Bravo (chlorothalonil 500 g/l), Teldor (fenhexamid 51% w/w) and Scala (pyrimethalin 400 g/l) were purchased by Inveresk Research on 09 May 2000.

The materials were logged into the Dispense System[®] at Inveresk by the Test Material Controller and stored at room temperature. Archive samples of the test material (100 mg) were taken and retained under the above conditions.

3.1 Location, Design, Construction and Labelling of the Test System

3.1.1 Location

The study was conducted on one crop of Blackcurrants, in Angus, Central Scotland. (cv Ben Tirran). The location is a traditional growing area for Blackcurrants within the UK.

Trial 1: Bankhead of Kinloch Farm, Meigle, Cupar Angus, Scotland (Ordnance Survey Map No. 53, Grid Reference NO 262 438).

3.1.2 Design

The trial comprised of 6 treatments in a randomised block design with 4 replicates. The individual plot size was 3.0 x 8.0 m (3 rows x 8.0 m).

3.1.3 Construction

The trial plots were marked with glassfibre canes.

3.1.4 Labelling

Each plot was labelled using a plastic tag. The plot numbers were written on the tag and these placed on the cane, in the bottom left hand corner of the plot. The trial was identified by writing the project number and trial number on the tag of Plot 101.

3.2 *Application of the Test Materials*

Applications of the test materials were made at the rates outlined in Table 1 using a mist blower. The mist delivered a water volume of 1000 l.ha⁻¹.

Application A was timed to be week beginning 15 May 2000 (BBCH65).
Application B was timed to be 28 days after Application A (BBCH73).
Application C was timed to be 21 days before harvest (BBCH80).

3.3 *Formulation and Mixing*

Each pre-weighed test material was mixed with 25.0 litres of water and applied to individual plots within each replicate in turn. The mist blower was primed prior to application of each treatment. The nozzle was directed at both sides of the Blackcurrant bushes and application continued to the point of run off (Figure 1).

Application and weather details taken following the application are presented in Table 2.

3.3.1 *Figure 1 Application of Test Materials*



3.4 *Mixing and Application Assessments, and Necrosis, Chlorosis, Vigour Reduction, Disease Control and Yield*

3.4.1 *Mixing and Application*

Observations were made for any difficulty in the mixing or application of the test chemicals.

3.4.2 *Necrosis*

Assessments of necrosis were made at each assessment timing by observing the crop in the untreated control and estimating the percent leaf area affected by symptoms of necrosis in treated plots relative to the untreated plots.

3.4.3 Chlorosis

Assessments of chlorosis were made at each assessment timing by observing the crop in the untreated control and estimating the percent leaf area affected by symptoms of chlorosis in treated plots relative to the untreated plots.

3.4.4 Vigour Reduction

Vigour reduction was assessed at each assessment timing by observing the crop in the untreated control and estimating the percent reduction in vigour in the treated plots (height, thinning, biomass) relative to the untreated control.

Assessments of phytotoxicity were carried out prior to each application and again at 14 and 21 days after the final application.

3.4.5 Disease Control

Assessment of disease control was carried out by firstly examining the untreated control plots at each application and recording the diseases present on the leaves and berries. At subsequent visits the percentage control in each plot was recorded in relation to the untreated control plot in each replicate.

3.4.6 Yield

Yield was determined in Trial 1 by harvesting by hand 5.0 metres of row length within each plot. The Blackcurrants collected from each plot were weighed and the results recorded.

4 Results

4.1 Mixing and Application

No problems were encountered during the mixing or application of the test material formulations.

4.2 Selectivity

Selectivity data obtained for each treatment are presented in Table 3 and in Appendix 1.

Two way analysis of variances is performed by PRM (Pesticide Research Manager) on the data together with LSD (Least Significant Difference) test allowing the letter test to be performed at the 95% confidence level.

Values with letters in common are not significantly different at the 95% confidence limit.

4.3 Efficacy

Efficacy data obtained for each treatment are presented in Table 4 and Appendix 1.

Two way analysis of variance is performed by PRM (Pesticide Research Manager) on the data together with LSD (Least Significant Difference) test allowing the letter test to be performed at the 95% confidence level.

Values of leaf area affected by disease are used and the percentage control by treatment calculated against the untreated control. The value being presented in brackets on the table.

Values with letters in common are not significantly different at the 95% confidence limit.

4.4 Yield

Yield per 5.0 metre row were compared using LSD (Least Significant Difference) test. Data are presented in Table 5.

The percentage difference in yield by treatment was calculated against the untreated control. The values being presented in brackets on the table.

Values with letters in common are not significantly different at the 95% confidence limit.

5 Discussion

5.1 Mixing and Application

No problems were encountered during the mixing or application of the test material formulations.

5.2 Selectivity

Assessments of percentage necrosis, percentage chlorosis and percentage vigour reduction were carried out following the chemical applications (see Table 3). Crop damage as a result of treatment application was not observed during the trial. The tabulated results are therefore presented as percent phytotoxicity.

5.3 Disease Control

5.3.1 Control of Botrytis

An original objective of this study was to evaluate the control of Botrytis on Blackcurrants following treatment application. Unfortunately, due to unfavourable weather conditions Botrytis disease did not occur during the trial period and therefore could not be assessed.

5.3.2 Control of Leaf Spot

Compared to the untreated, the incidence of Leaf Spot (*Drepanopeziza ribis*) found to be significantly less on plots where each of the fungicide spray programmes had been applied. Three consecutive applications of Bravo at 4.2 l.ha⁻¹ (Treatment 5) demonstrated the highest reduction of leaf spot (ca 80% control). An application of UK456 at 1.7 kg.ha⁻¹ followed by two applications of UK633 at 3.0 kg.ha⁻¹ (Treatment 6) was the next most effective treatment (ca 60% control). The results for all treatments are presented in Table 4 and Appendix 1.

5.4 Yield

The control of Leaf Spot by each of the sequential spray programmes (Treatments 2-6 inclusive) resulted in the corresponding increase in recorded yield. Compared to the untreated, all treatments performed well, however statistically, no significant differences were observed between the treatments. The highest increase in yield, (an additional 30% per 5.0 metre row length) was achieved following the application of Treatment 6. The results of the yield assessment are presented in Table 5 and Appendix 1.

6 Tables

Table 1 **Test Material Details**

Treatment No.	Product	Formulation	Rate of Application (kg or l.ha ⁻¹)
1	Untreated	-	-
2	Scala	SC	2.0
	Scala	SC	2.0
	Scala	SC	2.0
3	UK456	WG	1.7
	UK456	WG	1.7
	UK456	WG	1.7
4	UK 456	WG	1.7
	Teldor	WG	1.5
	Teldor	WG	1.5
5	Bravo	SC	4.2
	Bravo	SC	4.2
	Bravo	SC	4.2
6	UK456	WG	1.7
	UK633	WG	3.0
	UK633	WG	3.0

SC = Soluble Concentrate
WG = Wettable Powder

Table 2 Application Details Trial 1, Bankhead of Kinloch, Meigle

Trial 1	Application A	Application B	Application C
Application Date	17 May 2000	16 June 2000	11 July 2000
Application time	1330	1300	1250-1750
Air Temperature (°C)	12.4	16.2	15.3
Soil Temperature (°C)	15.1	16.0	16.6
Wind Speed (ms ⁻¹)	2.8	1.2	1.2
Relative Humidity (%)	69	72	46
Percent Cloud Cover	85	75	30
Leaf Surface Condition	Dry	Dry	Dry
Soil Surface Condition	Slightly Moist	Moist	Dry
Crop Growth Stage (BBCH)	65	73	80
Sprayer Type	Mist Blower	Mist Blower	Mist Blower
Type of Application	Foliar Mist	Foliar Mist	Foliar Mist
Nozzle Type	Atomiser Mist Vent	Atomiser Mist Vent	Atomiser Mist Vent
Spray Volume (l.ha ⁻¹)	2000	2000	2000
Spray Volume Mixed (l)	25.0	25.0	25.0
Crop	Blackcurrants	Blackcurrants	Blackcurrants
Variety	Ben Tiran	Ben Tiran	Ben Tiran

Table 3 Trial 1 Phytotoxicity

Crop Code Part Rated Rating Data Type Rating Unit Rating Date Trt-Eval Interval				RIBINI Plot Phyto Percent 16 Jun 00 30DAA1	RIBINI Plot Phyto Percent 11 Jul 00 25DAA2	RIBINI Plot Phyto Percent 25 Jul 00 14DAA3	RIBINI Plot Phyto Percent 01 Aug 00 21DAA3	RIBINI Plot Phyto Percent 08 Aug 00 28DAA3
Trt No.	Treatment Name	Rate/Unit	BBCH Growth Stage					
1	Untreated							
2	Scala	2.0 l.ha ⁻¹	65	0 a	0 a	0 a	0 a	0 a
	Scala	2.0 l.ha ⁻¹	73	0 a	0 a	0 a	0 a	0 a
	Scala	2.0 l.ha ⁻¹	80	0 a	0 a	0 a	0 a	0 a
3	UK456	1.7 kg.ha ⁻¹	65	0 a	0 a	0 a	0 a	0 a
	UK456	1.7 kg.ha ⁻¹	73	0 a	0 a	0 a	0 a	0 a
	UK456	1.7 kg.ha ⁻¹	80	0 a	0 a	0 a	0 a	0 a
4	UK456	1.7 kg.ha ⁻¹	65	0 a	0 a	0 a	0 a	0 a
	Teldor	1.5 kg.ha ⁻¹	73	0 a	0 a	0 a	0 a	0 a
	Teldor	1.5 kg.ha ⁻¹	80	0 a	0 a	0 a	0 a	0 a
5	Bravo	4.2 l.ha ⁻¹	65	0 a	0 a	0 a	0 a	0 a
	Bravo	4.2 l.ha ⁻¹	73	0 a	0 a	0 a	0 a	0 a
	Bravo	4.2 l.ha ⁻¹	80	0 a	0 a	0 a	0 a	0 a
6	UK456	1.7 kg.ha ⁻¹	65	0 a	0 a	0 a	0 a	0 a
	UK633	3.0 kg.ha ⁻¹	73	0 a	0 a	0 a	0 a	0 a
	UK633	3.0 kg.ha ⁻¹	80	0 a	0 a	0 a	0 a	0 a
LSD (P=.05)				0	0	0	0	0
Standard Deviation				0	0	0	0	0
CV				0	0	0	0	0
Mean				0	0	0	0	0
Bartlett's x2				0	0	0	0	0
P(Bartlett's x2)				0	0	0	0	0
Replicate F				0	0	0	0	0
Replicate Prob(F)				1	0	1	1	1
Treatment F				0	0	0	0	0
Treatment Prob(F)				1	1	1	1	1

Means followed by same letter do not significantly differ (P=.05, LSD)

DAA = Days after Application

RIBINI = Blackcurrants (*Ribes nigrum*)

Table 4 Trial 1 Disease Assessment

Disease Assessed				Leaf Spot	Leaf Spot
Crop Code				RIBINI	RIBINI
Part Rated				Leaves	Leaves
Rating Unit				Percent	Percent
Rating Date				01 Aug 00	08 Aug 00
Trt-Eval Interval				21DAA3	28DAA3
Trt No.	Treatment Name	Rate/Unit	BBCH Growth Stage		
1	Untreated			6.8 a (0%)	7.8 a (0%)
2	Scala	2.0 l.ha ⁻¹	65	4.8 ab (30%)	4.8 b (39%)
	Scala	2.0 l.ha ⁻¹	73		
	Scala	2.0 l.ha ⁻¹	80		
3	UK456	1.7 kg.ha ⁻¹	65	3.3 bc (52%)	3.3 bc (58%)
	UK456	1.7 kg.ha ⁻¹	73		
	UK456	1.7 kg.ha ⁻¹	80		
4	UK456	1.7 kg.ha ⁻¹	65	3.0 bc (56%)	3.3 bc (58%)
	Teldor	1.5 kg.ha ⁻¹	73		
	Teldor	1.5 kg.ha ⁻¹	80		
5	Bravo	4.2 l.ha ⁻¹	65	1.3 c (81%)	1.3 c (84%)
	Bravo	4.2 l.ha ⁻¹	73		
	Bravo	4.2 l.ha ⁻¹	80		
6	UK456	1.7 kg.ha ⁻¹	65	2.8 bc (59%)	3.0 bc (61%)
	UK633	3.0 kg.ha ⁻¹	73		
	UK633	3.0 kg.ha ⁻¹	80		
LSD (P=.05)				2.30	2.50
Standard Deviation				1.53	1.66
CV				42.11	42.82

Means followed by same letter do not significantly differ (P=.05, LSD)

DAA = Days after Application

RIBINI = Blackcurrants (*Ribes nigrum*)

Table 5 Trial 1 Crop Yield

Assessment Crop Code Part Rated Rating Unit Rating Date Trt-Eval Interval				Yield RIBINI Currants Kg/5.0 Metre Row 08 Aug 00 28DAA3
Trt No.	Treatment Name	Rate/Unit	BBCH Growth Stage	
1	Untreated			14.90 a (100%)
2	Scala	2.0 l.ha ⁻¹	65	18.70 a (126%)
	Scala	2.0 l.ha ⁻¹	73	
	Scala	2.0 l.ha ⁻¹	80	
3	UK456	1.7 kg.ha ⁻¹	65	18.53 a (124%)
	UK456	1.7 kg.ha ⁻¹	73	
	UK456	1.7 kg.ha ⁻¹	80	
4	UK456	1.7 kg.ha ⁻¹	65	16.02 a (107%)
	Teldor	1.5 kg.ha ⁻¹	73	
	Teldor	1.5 kg.ha ⁻¹	80	
5	Bravo	4.2 l.ha ⁻¹	65	18.72 a (126%)
	Bravo	4.2 l.ha ⁻¹	73	
	Bravo	4.2 l.ha ⁻¹	80	
6	UK456	1.7 kg.ha ⁻¹	65	19.37 a (130%)
	UK633	3.0 kg.ha ⁻¹	73	
	UK633	3.0 kg.ha ⁻¹	80	
LSD (P=.05)				5.228
Standard Deviation				2.874
CV				16.23

Means followed by same letter do not significantly differ (P=.05, LSD)

DAA = Days after Application

RIBINI = Blackcurrants (*Ribes nigrum*)

7 Appendices

Appendix 1 Plot Data Summary

Inveresk Research

Fungicide efficacy on Blackcurrants in the U.K.

Trial ID: 399087T1
Location: Meigle

Investigator: A Foster
Study Dir.: Jeff Old

Pathogen Code	PHYTO	PHYTO	L SPOT	BOTRCI	PHYTO	L SPOT	BOTRCI	RIBNI				
Crop Code	RIBINI	RIBINI	RIBINI	RIBINI	RIBINI	RIBINI	RIBINI	RIBNI				
Part Rated	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	PLOT	BERRY				
Rating Data Type	AREA	AREA	AREA	AREA	AREA	AREA	AREA	YIELD				
Rating Unit	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	kg/ 5m				
Rating Date	25-Jul-00	01-Aug-00	01-Aug-00	01-Aug-00	08-Aug-00	08-Aug-00	08-Aug-00	08-Aug-00				
Tri-Eval Interval	69DAAA	76DAAA	76DAAA	76DAAA	83DAAA	83DAAA	83DAAA	83DAAA				
PRM Data Type	APC	APC	APC	APC	APC	APC	APC	APOC				
# Subsamples, Dec.								2				
Trt No.	Treatment Name	Rate	Rate Unit	Plot								
1	Untreated			101	0.0	0.0	8.0	0.0	0.0	9.0	0.0	11.70
				202	0.0	0.0	5.0	0.0	0.0	6.0	0.0	18.50
				304	0.0	0.0	5.0	0.0	0.0	6.0	0.0	14.50
				406	0.0	0.0	9.0	0.0	0.0	10.0	0.0	
				Mean =	0.0	0.0	6.8	0.0	0.0	7.8	0.0	14.90
2	Scala	2.0	L/HA	102	0.0	0.0	8.0	0.0	0.0	8.0	0.0	14.60
2	Scala	2.0	L/HA	203	0.0	0.0	4.0	0.0	0.0	4.0	0.0	15.75
2	Scala	2.0	L/HA	302	0.0	0.0	2.0	0.0	0.0	3.0	0.0	25.75
				405	0.0	0.0	5.0	0.0	0.0	4.0	0.0	
				Mean =	0.0	0.0	4.8	0.0	0.0	4.8	0.0	18.70
3	UK456	1.7	KG/HA	103	0.0	0.0	4.0	0.0	0.0	3.0	0.0	15.10
3	UK456	1.7	KG/HA	206	0.0	0.0	2.0	0.0	0.0	2.0	0.0	17.50
3	UK456	1.7	KG/HA	305	0.0	0.0	4.0	0.0	0.0	4.0	0.0	23.00
				402	0.0	0.0	3.0	0.0	0.0	4.0	0.0	
				Mean =	0.0	0.0	3.3	0.0	0.0	3.3	0.0	18.53
4	UK456	1.7	KG/HA	104	0.0	0.0	2.0	0.0	0.0	2.0	0.0	15.40
4	Teldor	1.5	KG/HA	201	0.0	0.0	1.0	0.0	0.0	1.0	0.0	15.40
4	Teldor	1.5	KG/HA	303	0.0	0.0	3.0	0.0	0.0	3.0	0.0	17.25
				404	0.0	0.0	6.0	0.0	0.0	7.0	0.0	
				Mean =	0.0	0.0	3.0	0.0	0.0	3.3	0.0	16.02
5	Bravo	4.2	L/HA	105	0.0	0.0	1.0	0.0	0.0	1.0	0.0	14.90
5	Bravo	4.2	L/HA	204	0.0	0.0	2.0	0.0	0.0	2.0	0.0	22.00
5	Bravo	4.2	L/HA	306	0.0	0.0	1.0	0.0	0.0	1.0	0.0	19.25
				401	0.0	0.0	1.0	0.0	0.0	1.0	0.0	
				Mean =	0.0	0.0	1.3	0.0	0.0	1.3	0.0	18.72
6	UK456	1.7	KG/HA	106	0.0	0.0	3.0	0.0	0.0	3.0	0.0	15.60
6	UK633	3.0	KG/HA	205	0.0	0.0	3.0	0.0	0.0	4.0	0.0	21.50
6	UK633	3.0	KG/HA	301	0.0	0.0	1.0	0.0	0.0	1.0	0.0	21.00
				403	0.0	0.0	4.0	0.0	0.0	4.0	0.0	
				Mean =	0.0	0.0	2.8	0.0	0.0	3.0	0.0	19.37