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77/W/CS/174 Sowing Dates and Ccn - S. Wheat, Barley and Oats

Rothamsted Research

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77/W/CS/174

SOWING DATES AND CCN

Object: To study the residual effects of sowing date and the effect of a nematicide and a soil sterilant on the incidence of cereal cyst-nematode (*Heterodera avenae*) (CCN) and the yield of three cereals in a soil known to contain a fungal parasite of the nematode - Woburn, Butt Close.

Sponsor: B.R. Kerry.

The third year, spring wheat, barley and oats.

For previous years see 75/W/M/1 and 76/W/CS/174.

Design: Single replicate of 36 plots split into 2.

Whole plot dimensions: 2.13 x 6.70.

Treatments: All combinations of:-

Whole plots

1. CROP(76) Crop (cumulative 1975-76):

WHEAT
BARLEY
OATS

2. SOW DATE(76) Sowing date (cumulative 1975-76):

AUTUMN
SPRING

3. NEMACIDE(77) Nematicide (cumulative 1975-77):

NONE None
OXAMYL Oxamyl at 8.8 kg

4. CROP(77) Crop in 1977, (all spring sown):

WHEAT
BARLEY
OATS

Sub plots

5. STERILNT Sterilant

NONE None
FORMALIN Formalin at 3000 l in 109000 l. To SOW DATE SPRING in 1976 only.
To SOW DATE AUTUMN in 1977 only.

Basal applications: Manures: (20:14:14) at 380 kg combine drilled. Weedkillers: Paraquat at 0.84 kg ion in 280 l and later at 1.12 kg ion in 560 l. Ioxynil at 0.63 kg with mecoprop at 1.9 kg in 340 l, 2, 4-D at 0.56 kg plus dichloroprop at 2.2 kg in 340 l.

Seed: Wheat: Sappo, sown at 190 kg.
Barley: Julia, sown at 160 kg.
Oats: Manod, sown at 200 kg.

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Cultivations, etc.:— All cereals: First paraquat applied: 10 Aug, 1976. Second paraquat applied: 11 Oct. Ploughed: 15 Nov. Spring-tine cultivated with crumbler attached: 15 Feb, 1977. Formalin applied: 16 Feb. Oxamyl applied and these plots only rotary cultivated then all plots spring-tine cultivated with crumbler attached, seed sown: 30 Mar. Ioxynil with mecoprop applied: 18 May. 2, 4-D with dichlorprop applied: 2 June. Combine harvested: 5 Sept.

- NOTES: (1) Soil samples were taken in February for estimates of *Heterodera avenae* cysts and eggs.
- (2) Soil and plant samples were taken from plots not treated with oxamyl at weekly intervals from 8 June to 22 August for estimates of numbers of females and eggs of *H. avenae* and the amount of fungal parasitism of these stages.
- (3) Soil samples were taken on 7 Sept for population counts in plots not treated with oxamyl and from all plots a month later.

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GRAIN TONNES/HECTARE

***** TABLES OF MEANS *****

SOW DATE(76)	AUTUMN	SPRING	MEAN	
CROP(76)				
WHEAT	2.82	2.68	2.75	
BARLEY	2.64	2.94	2.79	
OATS	2.23	2.62	2.43	
MEAN	2.57	2.75	2.66	
NEMACIDE(77)	NONE	OXAMYL	MEAN	
CROP(76)				
WHEAT	1.82	3.69	2.75	
BARLEY	1.73	3.86	2.79	
OATS	1.62	3.24	2.43	
MEAN	1.72	3.60	2.66	
NEMACIDE(77)	NONE	OXAMYL	MEAN	
SOW DATE(76)				
AUTUMN	1.69	3.44	2.57	
SPRING	1.75	3.75	2.75	
MEAN	1.72	3.60	2.66	
CROP(77)	WHEAT	BARLEY	OATS	MEAN
CROP(76)				
WHEAT	2.82	3.37	2.07	2.75
BARLEY	2.56	3.73	2.09	2.79
OATS	2.24	3.24	1.80	2.43
MEAN	2.54	3.45	1.99	2.66
CROP(77)	WHEAT	BARLEY	OATS	MEAN
SOW DATE(76)				
AUTUMN	2.37	3.33	2.00	2.57
SPRING	2.70	3.56	1.98	2.75
MEAN	2.54	3.45	1.99	2.66

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GRAIN TONNES/HECTARE

***** TABLES OF MEANS *****

CROP(77) NEMACIDE(77)	WHEAT	BARLEY	OATS	MEAN
NONE	1.65	2.37	1.14	1.72
OXAMYL	3.43	4.52	2.84	3.60
MEAN	2.54	3.45	1.99	2.66

STERILNT CROP(76)	NONE	FORMALIN	MEAN
WHEAT	2.75	2.76	2.75
BARLEY	2.72	2.87	2.79
OATS	2.22	2.64	2.43
MEAN	2.56	2.75	2.66

STERILNT SOW DATE(76)	NONE	FORMALIN	MEAN
AUTUMN	2.43	2.70	2.57
SPRING	2.69	2.81	2.75
MEAN	2.56	2.75	2.66

STERILNT NEMACIDE(77)	NONE	FORMALIN	MEAN
NONE	1.60	1.84	1.72
OXAMYL	3.52	3.67	3.60
MEAN	2.56	2.75	2.66

STERILNT CROP(77)	NONE	FORMALIN	MEAN
WHEAT	2.46	2.62	2.54
BARLEY	3.25	3.65	3.45
OATS	1.97	2.00	1.99
MEAN	2.56	2.75	2.66

SOW DATE(76) NEMACIDE(77) CROP(76)	AUTUMN NONE	OXAMYL	SPRING NONE	OXAMYL
WHEAT	1.88	3.77	1.75	3.61
BARLEY	1.70	3.58	1.75	4.13
OATS	1.48	2.98	1.75	3.49

SOW DATE(76) CROP(77) CROP(76)	AUTUMN WHEAT	BARLEY	OATS	SPRING WHEAT	BARLEY	OATS
WHEAT	2.84	3.36	2.26	2.80	3.38	1.87
BARLEY	2.29	3.63	2.01	2.82	3.83	2.17
OATS	1.99	2.99	1.72	2.49	3.48	1.89

NEMACIDE(77) CROP(77) CROP(76)	NONE WHEAT	BARLEY	OATS	OXAMYL WHEAT	BARLEY	OATS
WHEAT	1.87	2.35	1.22	3.77	4.39	2.91
BARLEY	1.66	2.22	1.30	3.45	5.24	2.88
OATS	1.41	2.55	0.89	3.07	3.93	2.72

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GRAIN TONNES/HECTARE

***** TABLES OF MEANS *****

NEMACIDE(77)	NONE				OXAMYL		
CROP(77)	WHEAT	BARLEY	OATS	WHEAT	BARLEY	OATS	
SOW DATE(76)							
AUTUMN	1.73	2.19	1.14	3.02	4.47	2.85	
SPRING	1.56	2.55	1.13	3.85	4.57	2.82	

SOW DATE(76)	AUTUMN		SPRING				
STERILNT	NONE	FORMALIN	NONE	FORMALIN			
CROP(76)							
WHEAT	2.60	3.04	2.89	2.48			
BARLEY	2.62	2.67	2.82	3.07			
OATS	2.08	2.39	2.36	2.88			

NEMACIDE(77)	NONE		OXAMYL				
STERILNT	NONE	FORMALIN	NONE	FORMALIN			
CROP(76)							
WHEAT	1.79	1.84	3.70	3.68			
BARLEY	1.62	1.83	3.81	3.91			
OATS	1.39	1.84	3.04	3.44			

NEMACIDE(77)	NONE		OXAMYL				
STERILNT	NONE	FORMALIN	NONE	FORMALIN			
SOW DATE(76)							
AUTUMN	1.47	1.91	3.39	3.50			
SPRING	1.73	1.76	3.64	3.85			

CROP(77)	WHEAT		BARLEY		OATS		
STERILNT	NONE	FORMALIN	NONE	FORMALIN	NONE	FORMALIN	
CROP(76)							
WHEAT	2.80	2.84	3.43	3.31	2.01	2.12	
BARLEY	2.44	2.68	3.47	3.99	2.24	1.94	
OATS	2.14	2.34	2.84	3.64	1.67	1.93	

CROP(77)	WHEAT		BARLEY		OATS		
STERILNT	NONE	FORMALIN	NONE	FORMALIN	NONE	FORMALIN	
SOW DATE(76)							
AUTUMN	2.16	2.58	3.14	3.52	1.99	2.00	
SPRING	2.75	2.65	3.35	3.77	1.96	2.00	

CROP(77)	WHEAT		BARLEY		OATS		
STERILNT	NONE	FORMALIN	NONE	FORMALIN	NONE	FORMALIN	
NEMACIDE(77)							
NONE	1.52	1.77	2.24	2.51	1.05	1.23	
OXAMYL	3.39	3.47	4.26	4.78	2.90	2.77	

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	CROP(76)	SOW DATE(76)	NEMACIDE(77)	CROP(77)
SED	0.213	0.174	0.174	0.213
TABLE	STERILNT	CROP(76)	CROP(76)	SOW DATE(76)
		SOW DATE(76)	NEMACIDE(77)	NEMACIDE(77)
SED	0.089	0.302	0.302	0.246

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GRAIN TONNES/HECTARE

***** STANDARD ERRORS OF DIFFERENCES OF MEANS *****

TABLE	CROP(76) CROP(77)	SOW DATE(76) CROP(77)	NEMACIDE(77) CROP(77)	CROP(76) STERILNT
SED	0.370	0.302	0.302	0.240
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:				
CROP(76)				0.155

TABLE	SOW DATE(76) STERILNT	NEMACIDE(77) STERILNT	CROP(77) STERILNT	CROP(76) SOW DATE(76) NEMACIDE(77)
SED	0.196	0.196	0.240	0.427
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:				
SOW DATE(76)	0.127			
NEMACIDE(77)		0.127		
CROP(77)			0.155	

TABLE	CROP(76) SOW DATE(76) CROP(77)	CROP(76) NEMACIDE(77) CROP(77)	SOW DATE(76) NEMACIDE(77) CROP(77)	CROP(76) SOW DATE(76) STERILNT
SED	0.523	0.523	0.427	0.339
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:				
CROP(76).SOW DATE(76)				0.219

TABLE	CROP(76) NEMACIDE(77) STERILNT	SOW DATE(76) NEMACIDE(77) STERILNT	CROP(76) CROP(77) STERILNT	SOW DATE(76) CROP(77) STERILNT
SED	0.339	0.277	0.416	0.339
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:				
CROP(76).NEMACIDE(77)	0.219			
SOW DATE(76).NEMACIDE(77)		0.179		
CROP(76).CROP(77)			0.268	
SOW DATE(76).CROP(77)				0.219

TABLE	NEMACIDE(77) CROP(77) STERILNT
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SED	0.339
EXCEPT WHEN COMPARING MEANS WITH SAME LEVEL(S) OF:	
NEMACIDE(77).CROP(77)	

***** STRATUM STANDARD ERRORS AND COEFFICIENTS OF VARIATION *****

STRATUM	DF	SE	CV%
WP	4	0.523	19.7
WP.SP	16	0.380	14.3

GRAIN MEAN DM% 82.9

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STRAW TONNES/HECTARE

***** TABLES OF MEANS *****

SOW DATE(76)	AUTUMN	SPRING	MEAN	
CROP(76)				
WHEAT	2.46	2.21	2.34	
BARLEY	2.32	2.21	2.27	
OATS	1.94	2.16	2.05	
MEAN	2.24	2.20	2.22	
NEMACIDE(77)	NONE	OXAMYL	MEAN	
CROP(76)				
WHEAT	1.64	3.03	2.34	
BARLEY	1.59	2.94	2.27	
OATS	1.43	2.66	2.05	
MEAN	1.56	2.88	2.22	
NEMACIDE(77)	NONE	OXAMYL	MEAN	
SOW DATE(76)				
AUTUMN	1.59	2.88	2.24	
SPRING	1.52	2.87	2.20	
MEAN	1.56	2.88	2.22	
CROP(77)	WHEAT	BARLEY	OATS	MEAN
CROP(76)				
WHEAT	2.62	1.90	2.48	2.34
BARLEY	2.55	1.95	2.29	2.27
OATS	2.17	1.87	2.10	2.05
MEAN	2.45	1.91	2.29	2.22
CROP(77)	WHEAT	BARLEY	OATS	MEAN
SOW DATE(76)				
AUTUMN	2.55	1.86	2.31	2.24
SPRING	2.35	1.96	2.27	2.20
MEAN	2.45	1.91	2.29	2.22
CROP(77)	WHEAT	BARLEY	OATS	MEAN
NEMACIDE(77)				
NONE	1.74	1.39	1.53	1.56
OXAMYL	3.15	2.43	3.05	2.88
MEAN	2.45	1.91	2.29	2.22
STERILNT	NONE	FORMALIN	MEAN	
CROP(76)				
WHEAT	2.32	2.35	2.34	
BARLEY	2.19	2.34	2.27	
OATS	1.95	2.15	2.05	
MEAN	2.15	2.28	2.22	

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STRAW TONNES/HECTARE

***** TABLES OF MEANS *****

STERILNT SOW DATE(76)	NONE	FORMALIN	MEAN
AUTUMN	2.15	2.33	2.24
SPRING	2.16	2.23	2.20
MEAN	2.15	2.28	2.22

STERILNT NEMACIDE(77)	NONE	FORMALIN	MEAN
NONE	1.44	1.67	1.56
OXAMYL	2.87	2.89	2.88
MEAN	2.15	2.28	2.22

STERILNT CROP(77)	NONE	FORMALIN	MEAN
WHEAT	2.28	2.62	2.45
BARLEY	1.88	1.94	1.91
OATS	2.31	2.27	2.29
MEAN	2.15	2.28	2.22

SOW DATE(76)	AUTUMN		SPRING	
NEMACIDE(77)	NONE	OXAMYL	NONE	OXAMYL
CROP(76)				
WHEAT	1.76	3.16	1.51	2.91
BARLEY	1.69	2.95	1.50	2.93
OATS	1.33	2.54	1.54	2.79

SOW DATE(76)	AUTUMN			SPRING		
CROP(77)	WHEAT	BARLEY	OATS	WHEAT	BARLEY	OATS
CROP(76)						
WHEAT	2.81	1.92	2.65	2.43	1.89	2.31
BARLEY	2.77	1.90	2.29	2.34	2.00	2.30
OATS	2.06	1.75	1.99	2.28	2.00	2.21

NEMACIDE(77)	NONE			OXAMYL		
CROP(77)	WHEAT	BARLEY	OATS	WHEAT	BARLEY	OATS
CROP(76)						
WHEAT	1.78	1.39	1.74	3.46	2.41	3.22
BARLEY	1.92	1.28	1.57	3.19	2.62	3.01
OATS	1.53	1.50	1.28	2.81	2.25	2.92

NEMACIDE(77)	NONE			OXAMYL		
CROP(77)	WHEAT	BARLEY	OATS	WHEAT	BARLEY	OATS
SOW DATE(76)						
AUTUMN	1.91	1.32	1.56	3.19	2.40	3.06
SPRING	1.58	1.47	1.50	3.12	2.46	3.04

SOW DATE(76)	AUTUMN		SPRING	
STERILNT	NONE	FORMALIN	NONE	FORMALIN
CROP(76)				
WHEAT	2.27	2.65	2.37	2.05
BARLEY	2.27	2.37	2.11	2.32
OATS	1.89	1.98	2.01	2.32

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STRAW TONNES/HECTARE

***** TABLES OF MEANS *****

NEMACIDE(77)	NONE		OXAMYL	
STERILNT	NONE	FORMALIN	NONE	FORMALIN
CROP(76)				
WHEAT	1.55	1.73	3.10	2.96
BARLEY	1.47	1.72	2.92	2.96
OATS	1.32	1.55	2.58	2.74

NEMACIDE(77)	NONE		OXAMYL	
STERILNT	NONE	FORMALIN	NONE	FORMALIN
SOW DATE(76)				
AUTUMN	1.47	1.72	2.82	2.94
SPRING	1.42	1.62	2.91	2.84

CROP(77)	WHEAT		BARLEY		OATS	
STERILNT	NONE	FORMALIN	NONE	FORMALIN	NONE	FORMALIN
CROP(76)						
WHEAT	2.52	2.72	1.99	1.81	2.45	2.51
BARLEY	2.20	2.91	1.82	2.08	2.56	2.03
OATS	2.11	2.23	1.81	1.93	1.92	2.28

CROP(77)	WHEAT		BARLEY		OATS	
STERILNT	NONE	FORMALIN	NONE	FORMALIN	NONE	FORMALIN
SOW DATE(76)						
AUTUMN	2.27	2.82	1.84	1.87	2.33	2.30
SPRING	2.29	2.41	1.91	2.02	2.29	2.25

CROP(77)	WHEAT		BARLEY		OATS	
STERILNT	NONE	FORMALIN	NONE	FORMALIN	NONE	FORMALIN
NEMACIDE(77)						
NONE	1.52	1.97	1.39	1.39	1.42	1.65
OXAMYL	3.04	3.27	2.36	2.50	3.20	2.90

STRAW MEAN DM% 81.0

PLOT AREA HARVESTED 0.00041