ROTHAMSTED RESEARCH

Yields of the Field Experiments 1984

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84/R/B/1 Factors Limiting Yield - W. Barley

Rothamsted Research

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84/R/B/1

WINTER BARLEY

FACTORS LIMITING YIELD

Object: To study the importance of factors that may limit the yield of early-sown winter barley - Pastures.

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Design: Half replicate of 2^6 x 2 (E FUNG) arranged in 2 blocks of 32 plots + 10 extra plots in each block.

Whole plot dimensions: 3.0 x 15.2.

Treatments: Combinations of the following treatments, all variety Panda following a previous barley crop:-

1. SEEDRATE	Seed rate (seeds per m^2):	
	300	
	450	
2. WINTER N	Rates of nitrogen fertilizer in winter (kg N) as prilled urea (46% N):	
	0	None
	30+30	30 on 9 Nov, 1983, 30 on 1 Feb, 1984
3. SPRING N	Rates of nitrogen fertilizer in spring (kg N) as 'Nitro-Chalk' on 2 Apr:	
	90	
	150	
4. E FUNG	Early fungicides:	
	NONE	None
	TFSD	Triadimenol and fuberidazole seed dressing
5. L FUNG	Late fungicides:	
	NONE	None
	TR+CA+MA	Tridemorph at 0.52 kg in 220 l on 10 Feb, 1984. Carbendazim at 0.25 kg with prochloraz at 0.39 kg in 220 l on 27 Mar. Carbendazim at 0.15 kg with maneb at 1.6 kg and tridemorph at 0.038 kg in 220 l on 1 May and 21 May
6. GRTH REG	Growth regulator:	
	NONE	None
	CHLORMEQ	Chlormequat applied at GS 13, 24, 30, at 0.52 kg in 220 l on 21 Oct, 1983, 29 Nov, 21 Mar, 1984

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7. INSCTCDE — Insecticide:

NONE	None
CY	Cypermethrin at 0.02 kg in 220 l on 28 Oct, 1983

plus 8 extra treatments with variety Panda sown at 300 seeds per m^2 and given cypermethrin, late fungicides, no chlormequat and all combinations of the following:-

1. PRECROPX — Previous cropping:

OATS
FALLOW

2. N DIVX — Division of nitrogen fertilizer (kg N):

30+30+90	30 on 9 Nov, 1983, 30 on 1 Feb, 1984 (both as prilled urea) plus 90 as 'Nitro-Chalk' on 2 Apr
150	150 as 'Nitro-Chalk' on 2 Apr

3. E FUNGX — Early fungicide:

NONE	None
TFSD	Triadimenol and fuberidazole seed dressing

plus 8 extra treatments with variety Pirate sown at 300 seeds per m^2 and given cypermethrin, late fungicides, no chlormequat and all combinations of the following:-

1. PRECROPV — Previous cropping:

BARLEY
OATS

2. N DIVV — Division of nitrogen fertilizer (kg N):

30+30+90	30 on 9 Nov, 1983, 30 on 1 Feb, 1984 (both as prilled urea) plus 90 as 'Nitro-Chalk' on 2 Apr
150	150 as 'Nitro-Chalk' on 2 Apr

3. E FUNGV — Early fungicide:

NONE	None
TFSD	Triadimenol and fuberidazole seed dressing

plus 2 extra treatments following previous barley, with variety Panda and given no nitrogen fertilizer or chlormequat but given early fungicide, late fungicide and cypermethrin.

EXTRA NO	
SD 300	Seed sown at 300 seeds per m^2 (duplicated)
SD 450	Seed sown at 450 seeds per m^2 (duplicated)

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Basal applications: Manures: (0:18:36) at 280 kg. Weedkillers: Paraquat at 0.42 kg ion in 250 l on two occasions. Methabenzthiazuron at 2.4 kg in 250 l. Growth regulator: Mepiquat chloride with ethephon (as 'Terpal' at 2.8 l) in 220 l.

Cultivations, etc.:- Heavy spring-tine cultivated: 22 Aug, 1983. PK applied: 23 Aug. Heavy spring-tine cultivated: 7 Sept. First paraquat applied: 13 Sept. Second paraquat applied, rotary harrowed, seed sown: 19 Sept. Methabenzthiazuron applied: 24 Sept. Basal growth regulator applied: 25 Apr, 1984. Combine harvested: 26 July.

NOTES: (1) Samples were taken at the end of February, March and May for measurements of dry weight, shoot numbers, leaf area index and percentage N. Soil samples were taken in October 1983, November and February 1984, for amounts of nitrate and ammonium.
(2) Measurements were made of leaf diseases, take-all, eyespot, and barley yellow dwarf virus. Counts were made of aphids, and plants examined for stem borers.
(3) A cage was erected over the crop from late May to maturity to prevent damage by birds.

GRAIN TONNES/HECTARE

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

WINTER N	0	30+30	MEAN
SEEDRATE			
300	8.92	9.27	9.09
450	9.02	9.13	9.07
MEAN	8.97	9.20	9.08

E FUNG	NONE	TFSD	MEAN
SEEDRATE			
300	9.03	9.16	9.09
450	8.89	9.26	9.07
MEAN	8.96	9.21	9.08

E FUNG	NONE	TFSD	MEAN
WINTER N			
0	8.85	9.10	8.97
30+30	9.07	9.32	9.20
MEAN	8.96	9.21	9.08

L FUNG	NONE	TR+CA+MA	MEAN
SEEDRATE			
300	8.89	9.29	9.09
450	8.68	9.46	9.07
MEAN	8.79	9.38	9.08

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GRAIN TONNES/HECTARE

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

L FUNG WINTER N	NONE	TR+CA+MA	MEAN
0	8.69	9.25	8.97
30+30	8.88	9.51	9.20
MEAN	8.79	9.38	9.08

L FUNG E FUNG	NONE	TR+CA+MA	MEAN
NONE	8.69	9.23	8.96
TFSD	8.89	9.53	9.21
MEAN	8.79	9.38	9.08

SPRING N SEEDRATE	90	150	MEAN
300	8.89	9.30	9.09
450	8.87	9.28	9.07
MEAN	8.88	9.29	9.08

SPRING N WINTER N	90	150	MEAN
0	8.70	9.25	8.97
30+30	9.06	9.33	9.20
MEAN	8.88	9.29	9.08

SPRING N E FUNG	90	150	MEAN
NONE	8.69	9.22	8.96
TFSD	9.06	9.36	9.21
MEAN	8.88	9.29	9.08

SPRING N L FUNG	90	150	MEAN
NONE	8.62	8.96	8.79
TR+CA+MA	9.14	9.62	9.38
MEAN	8.88	9.29	9.08

INSCTCDE SEEDRATE	NONE	CY	MEAN
300	9.06	9.13	9.09
450	9.05	9.10	9.07
MEAN	9.06	9.11	9.08

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GRAIN TONNES/HECTARE

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

INSCTCDE WINTER N	NONE	CY	MEAN
0	9.01	8.94	8.97
30+30	9.11	9.29	9.20
MEAN	9.06	9.11	9.08

INSCTCDE E FUNG	NONE	CY	MEAN
NONE	8.93	8.98	8.96
TFSD	9.18	9.24	9.21
MEAN	9.06	9.11	9.08

INSCTCDE L FUNG	NONE	CY	MEAN
NONE	8.77	8.81	8.79
TR+CA+MA	9.34	9.42	9.38
MEAN	9.06	9.11	9.08

INSCTCDE SPRING N	NONE	CY	MEAN
90	8.83	8.92	8.88
150	9.28	9.30	9.29
MEAN	9.06	9.11	9.08

GRTH REG SEEDRATE	NONE	CHLORMEQ	MEAN
300	9.01	9.18	9.09
450	9.07	9.08	9.07
MEAN	9.04	9.13	9.08

GRTH REG WINTER N	NONE	CHLORMEQ	MEAN
0	8.90	9.05	8.97
30+30	9.18	9.21	9.20
MEAN	9.04	9.13	9.08

GRTH REG E FUNG	NONE	CHLORMEQ	MEAN
NONE	8.90	9.01	8.96
TFSD	9.18	9.24	9.21
MEAN	9.04	9.13	9.08

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GRAIN TONNES/HECTARE

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

GRTH REG L FUNG	NONE	CHLORMEQ	MEAN
NONE	8.74	8.84	8.79
TR+CA+MA	9.34	9.42	9.38
MEAN	9.04	9.13	9.08

GRTH REG SPRING N	NONE	CHLORMEQ	MEAN
90	8.85	8.90	8.88
150	9.23	9.35	9.29
MEAN	9.04	9.13	9.08

GRTH REG INSCTCDE	NONE	CHLORMEQ	MEAN
NONE	9.06	9.05	9.06
CY	9.02	9.21	9.11
MEAN	9.04	9.13	9.08

N DIVX PRECROPX	30+30+90	150	MEAN
OATS	9.30	9.89	9.59
FALLOW	8.56	8.54	8.55
MEAN	8.93	9.22	9.07

E FUNGX PRECROPX	NONE	TFSD	MEAN
OATS	9.40	9.79	9.59
FALLOW	8.46	8.64	8.55
MEAN	8.93	9.22	9.07

E FUNGX N DIVX	NONE	TFSD	MEAN
30+30+90	8.76	9.10	8.93
150	9.10	9.34	9.22
MEAN	8.93	9.22	9.07

PRECROPX	E FUNGX N DIVX	NONE	TFSD
OATS	30+30+90	9.08	9.52
	150	9.72	10.06
FALLOW	30+30+90	8.45	8.67
	150	8.47	8.61

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GRAIN TONNES/HECTARE

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

N DIVV / PRECROPV	30+30+90	150	MEAN
BARLEY	10.89	10.22	10.56
OATS	11.04	10.60	10.82
MEAN	10.97	10.41	10.69

E FUNGV / PRECROPV	NONE	TFSD	MEAN
BARLEY	10.55	10.57	10.56
OATS	10.63	11.01	10.82
MEAN	10.59	10.79	10.69

E FUNGV / N DIVV	NONE	TFSD	MEAN
30+30+90	10.73	11.20	10.97
150	10.44	10.37	10.41
MEAN	10.59	10.79	10.69

PRECROPV	E FUNGV / N DIVV	NONE	TFSD
BARLEY	30+30+90	10.82	10.97
	150	10.27	10.16
OATS	30+30+90	10.65	11.44
	150	10.61	10.58

EXTRA NO	SD 300	SD 450	MEAN
	6.95	6.81	6.88

GRAND MEAN 9.13

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

(NOT INCLUDING EXTRA PLOTS)
MARGIN OF TWO FACTOR TABLES 0.065
TWO FACTOR TABLES 0.093

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

STRATUM	DF	SE	CV%
BLOCK.WP	34	0.262	2.9

GRAIN MEAN DM% 86.2

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STRAW TONNES/HECTARE

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

WINTER N	0	30+30	MEAN
SEEDRATE			
300	5.01	5.79	5.40
450	4.97	5.76	5.36
MEAN	4.99	5.78	5.38

E FUNG	NONE	TFSD	MEAN
SEEDRATE			
300	5.42	5.38	5.40
450	5.25	5.48	5.36
MEAN	5.33	5.43	5.38

E FUNG	NONE	TFSD	MEAN
WINTER N			
0	4.94	5.04	4.99
30+30	5.73	5.82	5.78
MEAN	5.33	5.43	5.38

L FUNG	NONE	TR+CA+MA	MEAN
SEEDRATE			
300	5.38	5.43	5.40
450	5.25	5.48	5.36
MEAN	5.31	5.45	5.38

L FUNG	NONE	TR+CA+MA	MEAN
WINTER N			
0	4.90	5.08	4.99
30+30	5.73	5.82	5.78
MEAN	5.31	5.45	5.38

L FUNG	NONE	TR+CA+MA	MEAN
E FUNG			
NONE	5.28	5.39	5.33
TFSD	5.34	5.52	5.43
MEAN	5.31	5.45	5.38

SPRING N	90	150	MEAN
SEEDRATE			
300	5.21	5.59	5.40
450	5.18	5.55	5.36
MEAN	5.20	5.57	5.38

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STRAW TONNES/HECTARE

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

SPRING N	90	150	MEAN
WINTER N			
0	4.73	5.25	4.99
30+30	5.66	5.89	5.78
MEAN	5.20	5.57	5.38

SPRING N	90	150	MEAN
E FUNG			
NONE	5.09	5.58	5.33
TFSD	5.31	5.56	5.43
MEAN	5.20	5.57	5.38

SPRING N	90	150	MEAN
L FUNG			
NONE	5.15	5.47	5.31
TR+CA+MA	5.24	5.67	5.45
MEAN	5.20	5.57	5.38

INSCTCDE	NONE	CY	MEAN
SEEDRATE			
300	5.32	5.48	5.40
450	5.36	5.37	5.36
MEAN	5.34	5.42	5.38

INSCTCDE	NONE	CY	MEAN
WINTER N			
0	4.98	5.01	4.99
30+30	5.71	5.84	5.78
MEAN	5.34	5.42	5.38

INSCTCDE	NONE	CY	MEAN
E FUNG			
NONE	5.27	5.40	5.33
TFSD	5.42	5.45	5.43
MEAN	5.34	5.42	5.38

INSCTCDE	NONE	CY	MEAN
L FUNG			
NONE	5.24	5.38	5.31
TR+CA+MA	5.44	5.47	5.45
MEAN	5.34	5.42	5.38

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STRAW TONNES/HECTARE

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

INSCTCDE	NONE	CY	MEAN
SPRING N			
90	5.20	5.19	5.20
150	5.49	5.65	5.57
MEAN	5.34	5.42	5.38

GRTH REG	NONE	CHLORMEQ	MEAN
SEEDRATE			
300	5.44	5.36	5.40
450	5.38	5.35	5.36
MEAN	5.41	5.35	5.38

GRTH REG	NONE	CHLORMEQ	MEAN
WINTER N			
0	5.02	4.96	4.99
30+30	5.80	5.75	5.78
MEAN	5.41	5.35	5.38

GRTH REG	NONE	CHLORMEQ	MEAN
E FUNG			
NONE	5.27	5.39	5.33
TFSD	5.55	5.32	5.43
MEAN	5.41	5.35	5.38

GRTH REG	NONE	CHLORMEQ	MEAN
L FUNG			
NONE	5.36	5.26	5.31
TR+CA+MA	5.46	5.45	5.45
MEAN	5.41	5.35	5.38

GRTH REG	NONE	CHLORMEQ	MEAN
SPRING N			
90	5.24	5.15	5.20
150	5.58	5.56	5.57
MEAN	5.41	5.35	5.38

GRTH REG	NONE	CHLORMEQ	MEAN
INSCTCDE			
NONE	5.37	5.31	5.34
CY	5.45	5.39	5.42
MEAN	5.41	5.35	5.38

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STRAW TONNES/HECTARE

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

N DIVX	30+30+90	150	MEAN
PRECROPX			
OATS	5.69	5.63	5.66
FALLOW	7.44	7.57	7.51
MEAN	6.57	6.60	6.59

E FUNGX	NONE	TFSD	MEAN
PRECROPX			
OATS	5.51	5.82	5.66
FALLOW	7.35	7.67	7.51
MEAN	6.43	6.74	6.59

E FUNGX	NONE	TFSD	MEAN
N DIVX			
30+30+90	6.13	7.01	6.57
150	6.73	6.48	6.60
MEAN	6.43	6.74	6.59

	E FUNGX	NONE	TFSD
PRECROPX	N DIVX		
OATS	30+30+90	5.20	6.19
	150	5.82	5.44
FALLOW	30+30+90	7.06	7.83
	150	7.63	7.51

N DIVV	30+30+90	150	MEAN
PRECROPV			
BARLEY	6.07	5.32	5.69
OATS	5.76	5.12	5.44
MEAN	5.91	5.22	5.57

E FUNGV	NONE	TFSD	MEAN
PRECROPV			
BARLEY	5.76	5.63	5.69
OATS	5.22	5.66	5.44
MEAN	5.49	5.64	5.57

E FUNGV	NONE	TFSD	MEAN
N DIVV			
30+30+90	5.64	6.18	5.91
150	5.34	5.10	5.22
MEAN	5.49	5.64	5.57

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STRAW TONNES/HECTARE

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

PRECROPV	E FUNGV N DIVV	NONE	TFSD
BARLEY	30+30+90	6.07	6.06
	150	5.44	5.19
OATS	30+30+90	5.21	6.30
	150	5.23	5.01

EXTRA NO	SD 300	SD 450	MEAN
	3.54	3.36	3.45

GRAND MEAN 5.42

STRAW MEAN DM% 93.1

PLOT AREA HARVESTED 0.00252

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