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82/W/WW/2 Growth and Yield on Contrasted Sites - Winter Wheat

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82/W/WW/2

WINTER WHEAT

GROWTH AND YIELD ON CONTRASTED SITES

Object: To study the effects of a range of factors on the incidence of pests and diseases and on the growth and yield of w.wheat grown on light and heavy land and to determine the extent to which differences between the sites can be eliminated by appropriate combinations of factors - Woburn Butt Close I (BC - light land) and Broad Mead II (BM - heavy land).

Sponsors: F.V. Widdowson, P.J. Welbank, A.H. Weir.

Design: Half replicate of 2⁶, arranged as 16 whole plots split into 2 sub plots, plus 20 extra sub plots (BC) 32 whole plots, plus 20 extra plots (BM).

Whole plot dimensions: 3.00 x 30.5 (BC)
3.00 x 15.2 (BM)

Treatments: Combinations of:-

Whole plots

1. SOWDATE Dates of sowing:

23 SEPT	23 September, 1981
23 OCT	23 October

Sub plots (BC), whole plots (BM)

2. WINTER N Amounts of nitrogen fertilizer applied, as 'Nitro-Chalk', on 1 Feb, 1982 (kg N):

BC	BM
0	0
60	30

3. N RATE Amounts of nitrogen fertilizer applied, as 'Nitro-Chalk', in spring (kg N):

BC	BM
120	30
180	90

4. N TIME Times of applying spring fertilizer:

EARLY	All except 40 kg N (BC), 30 kg N (BM) on 11 Mar; remainder on 11 May
LATE	All except 40 kg N (BC), 30 kg N (BM) on 15 Apr; remainder on 25 May

5. IRRIGATN Irrigation:

NONE	None
FULL	Full (112.5 mm BC, 137.5 mm BM) to lessen deficit of 25 mm to 12.5 mm

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6. AUT PEST Autumn pesticide:

NONE	None
ALDICARB	Aldicarb at 5.0 kg worked into seedbed

Plus all combinations of the following (all given irrigation and aldicarb, but not winter nitrogen):

Whole plots

1. S DATE N Dates of sowing and times of applying nitrogen fertilizer:

23 SEPT NE	Sown 23 Sept, N applied at N TIME EARLY (timing and division as above)
23 OCT NL	Sown 23 Oct, N applied at N TIME LATE (timing and division as above)

Sub plots (BC), whole plots (BM)

2. N SCALE Amounts of nitrogen fertilizer applied in spring (kg N):

BC	BM
0	0
90	0
150	60
180	90
210	120
240	150

Plus all combinations of the following (all given 180 kg N (BC), 90 kg N (BM) in spring, aldicarb and winter nitrogen):

Whole plots

1. SDATE NX Dates of sowing and times of applying nitrogen fertilizer:

BC	BM	
SE 180E	SE 90E	Sown 23 Sept, N applied at N TIME EARLY (duplicated on BM only)
SL 180L	SL 90L	Sown 23 Oct, N applied at N TIME LATE (duplicated on BM only)

Sub plots (BC), whole plots (BM)

2. IRRIG X Irrigation:

NONE	None
FULL	Full to lessen a deficit of 25 mm to 12.5 mm

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Irrigation was applied as follows (mm water):

Butt Close I (BC)		Broad Mead II (BM)	
17 May	12.5	18 May	12.5
18 May	12.5	19 May	12.5
19 May	12.5	20 May	25
20 May	12.5	21 May	25
2 June	12.5	1 June	12.5
8 June	12.5	10 June	12.5
12 July	12.5	13 July	12.5
13 July	12.5	14 July	12.5
19 July	12.5	20 July	12.5
Total	112.5	Total	137.5

Standard applications:

Butt Close I (BC) and Broad Mead II (BM): Manures: (0:14:28) at 360 kg. Chelated manganese applied on two occasions (as 'Vytel' at 2.8 l on the first and 1.4 l on the second occasion) in 280 l to (BM) only. Weedkillers: Chlortoluron at 5.6 l in 280 l, mecoprop (as 'Herrifex DS' at 4.2 l on two occasions to (BM) only and at 4.9 l to both) in 280 l. Fungicides: Benomyl at 0.24 kg in 280 l, triadimefon with captafol (as 'Bayleton CF' 2.0 kg) in 280 l on two occasions the second with the pirimicarb. Insecticides: Omethoate at 0.64 l in 280 l, pirimicarb at 0.14 kg in 280 l. Growth regulator: Chlormequat at 1.4 kg in 280 l.

Seed: Avalon, sown at 200 kg.

Cultivations, etc.:-

Butt Close I (BC): Deep-tine cultivated: 20 Aug, 1981. Spring-tine cultivated: 10 Sept. Previous crops: S. barley 1980, potatoes 1981. Broad Mead II (BM): Heavy spring-tine cultivated twice: 10 Sept, 1981. Mecoprop applied: 19 Nov, 23 Mar, 1982. Manganese applied: 17 May, 7 June. Previous crops: W. wheat 1980, potatoes 1981. (BC) and (BM): PK applied: 11 Sept, 1981. Aldicarb applied, rotary cultivated and seed sown for SOWDATE 23 SEPT: 23 Sept. Aldicarb applied, rotary cultivated and seed sown for SOWDATE 23 OCT: 23 Oct. Chlortoluron applied: 28 Oct. Growth regulator applied to SOWDATE 23 SEPT: 26 Mar, 1982, SOWDATE 23 OCT: 22 Apr. Mecoprop applied: 26 Mar. Omethoate applied: 5 Apr. Benomyl applied: 22 Apr. 'Bayleton CF' applied, with the pirimicarb on the second occasion: 2 June, 14 June. Combine harvested: 12 Aug.

NOTE: Measurements were made of plant and shoot numbers, dry weight of tops and ears, leaf area and N, P and K contents during growth. Weekly measurements were made of soil moisture (between April and harvest). Plant water stress and stomatal resistance were measured. Disease assessments were made during the growing season. Soil samples were taken in autumn and spring to determine N contents.

82/W/WW/2 BUTT CLOSE I (BC)

MAIN FACTORIAL PLOTS

GRAIN TONNES/HECTARE

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

N RATE	120	180	MEAN
SOWDATE			
23 SEPT	6.89	8.26	7.57
23 OCT	6.49	8.38	7.43
MEAN	6.69	8.32	7.50
N TIME	EARLY	LATE	MEAN
SOWDATE			
23 SEPT	7.56	7.59	7.57
23 OCT	7.55	7.32	7.43
MEAN	7.55	7.45	7.50
N TIME	EARLY	LATE	MEAN
N RATE			
120	6.56	6.81	6.69
180	8.54	8.09	8.32
MEAN	7.55	7.45	7.50
WINTER N	0	60	MEAN
SOWDATE			
23 SEPT	6.91	8.23	7.57
23 OCT	6.92	7.95	7.43
MEAN	6.91	8.09	7.50
WINTER N	0	60	MEAN
N RATE			
120	6.17	7.21	6.69
180	7.66	8.97	8.32
MEAN	6.91	8.09	7.50
WINTER N	0	60	MEAN
N TIME			
EARLY	7.02	8.08	7.55
LATE	6.81	8.10	7.45
MEAN	6.91	8.09	7.50
IRRIGATN	NONE	FULL	MEAN
SOWDATE			
23 SEPT	7.34	7.80	7.57
23 OCT	6.98	7.88	7.43
MEAN	7.16	7.84	7.50

82/W/WW/2 BUTT CLOSE I (BC)

MAIN FACTORIAL PLOTS

GRAIN TONNES/HECTARE

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

IRRIGATN	NONE	FULL	MEAN
N RATE			
120	6.39	6.99	6.69
180	7.93	8.70	8.32
MEAN	7.16	7.84	7.50
IRRIGATN	NONE	FULL	MEAN
N TIME			
EARLY	7.18	7.92	7.55
LATE	7.14	7.76	7.45
MEAN	7.16	7.84	7.50
IRRIGATN	NONE	FULL	MEAN
WINTER N			
0	6.74	7.09	6.91
60	7.58	8.60	8.09
MEAN	7.16	7.84	7.50
AUT PEST	NONE	ALDICARB	MEAN
SOWDATE			
23 SEPT	7.59	7.56	7.57
23 OCT	7.21	7.65	7.43
MEAN	7.40	7.60	7.50
AUT PEST	NONE	ALDICARB	MEAN
N RATE			
120	6.42	6.96	6.69
180	8.38	8.25	8.32
MEAN	7.40	7.60	7.50
AUT PEST	NONE	ALDICARB	MEAN
N TIME			
EARLY	7.48	7.62	7.55
LATE	7.32	7.58	7.45
MEAN	7.40	7.60	7.50
AUT PEST	NONE	ALDICARB	MEAN
WINTER N			
0	6.95	6.88	6.91
60	7.85	8.33	8.09
MEAN	7.40	7.60	7.50

82/W/WW/2 BUTT CLOSE I (BC)

MAIN FACTORIAL PLOTS

GRAIN TONNES/HECTARE

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

AUT PEST	NONE	ALDICARB	MEAN
IRRIGATN			
NONE	6.89	7.43	7.16
FULL	7.91	7.78	7.84
MEAN	7.40	7.60	7.50

EXTRA PLOTS

N SCALE	0	90	150	180	210	240	MEAN
S DATE N							
23 SEPT NE	1.98	5.58	5.51	8.57	7.73	8.95	6.39
23 OCT NL	1.78	5.01	7.85	7.05	8.13	6.55	6.06
MEAN	1.88	5.30	6.68	7.81	7.93	7.75	6.22

IRRIG X	NONE	FULL	MEAN
SDATE NX			
SE 180E	7.83	8.62	8.23
SL 180L	7.54	8.29	7.92
MEAN	7.69	8.46	8.07

GRAND MEAN 7.29

SED FOR TABLES EXCEPT THOSE INVOLVING S DATE N, N SCALE, SDATE NX, IRRIG X AND WINT NX ARE

MARGINS OF 2 WAY TABLES	0.161
TWO WAY TABLES	0.228

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

STRATUM	DF	SE	CV%
WP	10	0.456	6.1

GRAIN MEAN DM% 85.3

PLOT AREA HARVESTED 0.00202

82/W/WW/2 BROAD MEAD II (BM)

MAIN FACTORIAL PLOTS

GRAIN TONNES/HECTARE

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

N RATE	30	90	MEAN
SOWDATE			
23 SEPT	7.77	8.67	8.22
23 OCT	7.56	7.96	7.76
MEAN	7.67	8.31	7.99
N TIME	EARLY	LATE	MEAN
SOWDATE			
23 SEPT	8.21	8.24	8.22
23 OCT	7.73	7.78	7.76
MEAN	7.97	8.01	7.99
N TIME	EARLY	LATE	MEAN
N RATE			
30	7.78	7.55	7.67
90	8.16	8.47	8.31
MEAN	7.97	8.01	7.99
WINTER N	0	30	MEAN
SOWDATE			
23 SEPT	8.05	8.39	8.22
23 OCT	7.64	7.87	7.76
MEAN	7.85	8.13	7.99
WINTER N	0	30	MEAN
N RATE			
30	7.61	7.73	7.67
90	8.09	8.54	8.31
MEAN	7.85	8.13	7.99
WINTER N	0	30	MEAN
N TIME			
EARLY	7.84	8.10	7.97
LATE	7.86	8.16	8.01
MEAN	7.85	8.13	7.99
IRRIGATN	NONE	FULL	MEAN
SOWDATE			
23 SEPT	8.09	8.36	8.22
23 OCT	7.91	7.60	7.76
MEAN	8.00	7.98	7.99

82/W/WW/2 BROAD MEAD II (BM)

MAIN FACTORIAL PLOTS

GRAIN TONNES/HECTARE

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

IRRIGATN	NONE	FULL	MEAN
N RATE			
30	7.56	7.77	7.67
90	8.44	8.19	8.31
MEAN	8.00	7.98	7.99
IRRIGATN	NONE	FULL	MEAN
N TIME			
EARLY	7.85	8.09	7.97
LATE	8.15	7.87	8.01
MEAN	8.00	7.98	7.99
IRRIGATN	NONE	FULL	MEAN
WINTER N			
0	7.79	7.91	7.85
30	8.21	8.06	8.13
MEAN	8.00	7.98	7.99
AUT PEST	NONE	ALDICARB	MEAN
SOWDATE			
23 SEPT	7.97	8.48	8.22
23 OCT	7.48	8.04	7.76
MEAN	7.72	8.26	7.99
AUT PEST	NONE	ALDICARB	MEAN
N RATE			
30	7.51	7.83	7.67
90	7.94	8.69	8.31
MEAN	7.72	8.26	7.99
AUT PEST	NONE	ALDICARB	MEAN
N TIME			
EARLY	7.72	8.22	7.97
LATE	7.73	8.29	8.01
MEAN	7.72	8.26	7.99
AUT PEST	NONE	ALDICARB	MEAN
WINTER N			
0	7.59	8.11	7.85
30	7.86	8.41	8.13
MEAN	7.72	8.26	7.99

82/W/WW/2 BROAD MEAD II (BM)

MAIN FACTORIAL PLOTS

GRAIN TONNES/HECTARE

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

AUT PEST IRRIGATN	NONE	ALDICARB	MEAN
NONE	7.75	8.24	8.00
FULL	7.69	8.27	7.98
MEAN	7.72	8.26	7.99

EXTRA PLOTS

N SCALE S DATE N	0	60	90	120	150	MEAN
23 SEPT NE	7.22	8.25	7.58	8.95	8.71	7.99
23 OCT NL	7.55	8.21	6.90	8.76	7.83	7.80
MEAN	7.39	8.23	7.24	8.85	8.27	7.89

IRRIG X SDATE NX	NONE	FULL	MEAN
SE 90E	8.06	8.56	8.31
SL 90L	7.91	8.39	8.15
MEAN	7.99	8.48	8.23

GRAND MEAN 8.00

SED FOR TABLES EXCEPT THOSE INVOLVING S DATE N, N SCALE, SDATE NX
AND IRRIG X ARE

MARGINS OF 2 WAY TABLES 0.190
TWO WAY TABLES 0.269

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

STRATUM	DF	SE	CV%
WP	10	0.539	6.7

GRAIN MEAN DM% 86.1

PLOT AREA HARVESTED 0.00202