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## Yields of the Field Experiments 1996

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### Annuals

#### Rothamsted Research

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96/R/WW/1

WINTER WHEAT

PREDICTION OF WEED COMPETITION

**Object:** To predict the yield response of winter wheat to competition from three contrasting weed species - Delafield.

**Sponsors:** J.W. Cussans, P.J.W. Lutman.

**Design:** 3 randomised blocks of 3 x 6 plots.

**Whole plot dimensions:** 3.0 x 8.0.

**Treatments:** All combinations of:-

<b>1. SPECIES</b>	<b>Weed species:</b>		
SM	<i>Stellaria media</i> (chickweed)		
AM	<i>Alopecurus myosuroides</i> (black-grass)		
GA	<i>Galium aparine</i> (cleavers)		
<b>2. DENSITY</b>	<b>Average weed density, plants per m<sup>2</sup>:</b>		
	SM	AM	GA
0	0	0	0
2	3.8	19.9	2.1
4	10.9	28.8	3.8
8	29.8	57.7	4.1
16	90.3	92.8	9.6
32	130	183	24.9

**NOTE:** Target weed densities, plants per m<sup>2</sup>: SM, AM: 0, 40, 80, 160, 320 and 640, GA: 0, 3, 6, 12, 24 and 48 respectively.

**Experimental diary:**

01-Aug-95 : B : Straw baled.  
14-Sep-95 : B : Ploughed and furrow pressed.  
03-Oct-95 : T : Weeds broadcast.  
          : B : Rotary harrowed, Mercia, dressed Sibutol, drilled at 380 seeds per m<sup>2</sup>.  
16-Jan-96 : T : SPECIES AM: Ally at 30 g in 220 l.  
          : T : DENSITY 0: Panther at 2.0 l in 220 l.  
08-Mar-96 : B : 34.5% N at 116 kg.  
15-Apr-96 : B : 34.5% N at 463 kg.  
08-Aug-96 : B : Hand harvested.

Previous crops: Linseed 1994, set-aside 1995.

**NOTE:** Weed and crop densities were assessed in November and March. Assessments of weed and crop growth and leaf area were taken in November, March, April, May and June. Soil nitrogen and water content were measured in March. Weed seed production was estimated in July and at harvest grain and straw were sampled for nitrogen content.

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GRAIN TONNES/HECTARE

\*\*\*\*\* Tables of means \*\*\*\*\*

DENSITY SPECIES	0	2	4	8	16	32	Mean
SM	7.97	8.44	8.42	8.06	7.25	6.89	7.84
AM	8.14	8.00	7.83	7.71	6.78	7.23	7.61
GA	8.17	7.88	8.39	7.80	7.54	7.38	7.86
Mean	8.09	8.11	8.21	7.86	7.19	7.17	7.77

\*\*\* Standard errors of differences of means \*\*\*

SPECIES	DENSITY	SPECIES DENSITY
0.186	0.263	0.456

\*\*\*\*\* Stratum standard errors and coefficients of variation \*\*\*\*\*

Stratum	d.f.	s.e.	cv%
BLOCK.WP	34	0.559	7.2

GRAIN MEAN DM% 88.5

PLOT AREA HARVESTED 0.00020

96/W/WW/1

WINTER WHEAT

VARIETY, SULPHUR AND NITROGEN

**Object:** To measure yield and quality response to sulphur fertilizer on two varieties of wheat - Woburn, Stackyard AI.

**Sponsors:** S.P. McGrath, F. Zhao.

**Design:** 3 randomised blocks of (2 x 6) + 6 plots

**Plot dimensions:** 3.0 x 10.0.

**Treatments:** All combinations of:-

1. **NITROGEN** Nitrogen fertilizer (kg N) as 34.5% N at growth stage 32 in addition to a basal dressing of 180 kg N:

N1	None
N2	50

2. **SULPHUR** Sulphur fertilizer (kg S) as gypsum (17.5% S) at growth stage 23:

S0	0
S1	10
S2	20
S3	40
S4	70
S5	100

plus 6 extra plots

3. **EXTRA** Variety, timing (growth stage (GS)) and rates of nitrogen fertilizer as urea (kg N), sulphur as ammonium sulphate or gypsum (kg S):

	Variety	N as urea	S as (NH <sub>4</sub> )SO <sub>4</sub>	S as gypsum	Timing (GS)
EUS0	Hereward	50.0	0	0	65
EUS1	Hereward	41.2	10	0	65
EUS2	Hereward	32.6	20	0	65
EUS3	Hereward	32.6	20	20	65 (gypsum at GS 23)
RNS0	Riband	0	0	0	-
RNS2	Riband	0	0	20	23

**NOTE:** All treatments were sown to variety Hereward, except RNS0 and RNS2 which were sown to Riband.

**Experimental diary:**

14-Sep-95 : B : Ploughed.  
23-Sep-95 : B : Rolled.  
05-Oct-95 : B : Rotary harrowed.

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**Experimental diary:**

05-Oct-95 : T : All plots except RNS0, RNS2: Hereward, dressed Sibutol, drilled at 375 seeds per m<sup>2</sup>.  
          : T : **EXTRA** RNS0, RNS2: Riband, dressed Sibutol, drilled at 375 seeds per m<sup>2</sup>.  
13-Nov-95 : B : Panther at 2.0 l in 200 l.  
08-Mar-96 : B : 34.5% N at 116 kg.  
11-Mar-96 : T : **SULPHUR** S1-S5, **EXTRA** EUS3, RNS2: Gypsum applied.  
16-Apr-96 : B : 34.5% N at 406 kg.  
30-Apr-96 : B : Halo at 1.5 l in 200 l.  
02-May-96 : T : **NITROGEN** N2: 34.5% N at 145 kg.  
06-Jun-96 : B : Silvacur at 1.0 l in 300 l.  
10-Jul-96 : T : **EXTRA** EUS0, EUS1, EUS2, EUS3: Urea applied.  
          : T : **EXTRA** EUS1, EUS2, EUS3: Ammonium sulphate applied.  
18-Jul-96 : T : **EXTRA** EUS0, EUS1, EUS2, EUS3: Urea applied.  
          : T : **EXTRA** EUS1, EUS2, EUS3: Ammonium sulphate applied.  
19-Aug-96 : B : Combine harvested.

**NOTE:** Plants were sampled monthly April to August for nitrogen and sulphur content. Grain was analysed for nitrogen and sulphur content and bread making quality. Soils were sampled in autumn, spring and at harvest for sulphur content.

96/W/WW/1

GRAIN TONNES/HECTARE

\*\*\*\*\* Tables of means \*\*\*\*\*

SULPHUR	S0	S1	S2	S3	S4	S5	Mean
<b>NITROGEN</b>							
N1	6.24	7.43	6.71	6.86	6.32	6.76	6.72
N2	7.13	6.47	7.02	6.68	6.27	7.07	6.77
Mean	6.68	6.95	6.86	6.77	6.30	6.91	6.74
<b>EXTRA</b>	EUS0	EUS1	EUS2	EUS3	RNS0	RNS2	Mean
	6.52	7.08	6.30	7.14	7.87	8.19	7.18

Grand mean 6.89

\*\*\* Standard errors of differences of means \*\*\*

NITROGEN	SULPHUR	NITROGEN SULPHUR & EXTRA
0.212	0.367	0.519

\*\*\*\*\* Stratum standard errors and coefficients of variation \*\*\*\*\*

Stratum	d.f.	s.e.	cv%
BLOCK.WP	34	0.636	9.2

GRAIN MEAN DM% 90.1

PLOT AREA HARVESTED 0.00176



96/R/WW/2

WINTER WHEAT

WATER STRESS AND WEED COMPETITION

**Object:** To study the competitive effects of weeds in winter wheat, with and without irrigation - Delafield.

**Sponsors:** J.W. Cussans, P.J.W. Lutman.

**Design:** 4 randomised blocks of 2 plots split into 4 sub-plots.

**Whole plot dimensions:** 8.0 x 30.0.

**Sub-plot dimensions:** 4.0 x 15.0.

**Treatments:**

Whole plots

1. IRRIGATN                   Irrigation:

I                   Irrigated  
0                   None

Sub-plots

2. WEED                   Weed species sown:

-                   None  
SM                *Stellaria media* (chickweed)  
AM                *Alopecurus myosuroides* (black-grass)  
GA                *Galium aparine* (cleavers)

**Experimental diary:**

14-Sep-95 : B : Ploughed and furrow pressed.  
02-Oct-95 : T : WEED SM, AM: Seed broadcast at 320 seeds per m<sup>2</sup>.  
          : T : WEED GA: Seed broadcast at 24 seeds per m<sup>2</sup>.  
          : B : Rotary harrowed, Mercia, dressed Sibutol, drilled at  
                  380 seeds per m<sup>2</sup>.  
16-Jan-96 : T : WEED AM: Ally at 30 g in 220 l.  
          : T : WEED -: Panther at 2.0 l in 220 l.  
08-Mar-96 : B : 34.5% N at 116 kg.  
15-Apr-96 : B : 34.5% N at 463 kg.  
14-May-96 : T : IRRIGATN I: Irrigated 25 mm.  
05-Jun-96 : T : IRRIGATN I: Irrigated 30 mm.  
18-Jun-96 : T : IRRIGATN I: Irrigated 25 mm.  
26-Jun-96 : T : IRRIGATN I: Irrigated 25 mm.  
04-Jul-96 : T : IRRIGATN I: Irrigated 25 mm.  
15-Jul-96 : T : IRRIGATN I: Irrigated 25 mm.  
15-Aug-96 : B : Hand harvested.

Previous crops: Linseed 1994, set-aside 1995.

96/R/WW/2

- NOTES: (1) Weed and crop populations were assessed at emergence and in November and February. Weed and crop biomass and green area were assessed on six occasions through the season. Seed production of black-grass and cleavers were measured. Components of yield were assessed at harvest.
- (2) Weeds failed to establish on two plots, with treatment combinations:-

IRRIGATN	I0	I1
WEED	SM	SM

Estimated values were used in the analysis.

**GRAIN TONNES/HECTARE**

\*\*\*\*\* Tables of means \*\*\*\*\*

WEED	-	SM	AM	GA	Mean
IRRIGATN					
I	7.06	5.13	6.87	3.75	5.70
0	7.20	4.94	6.24	6.07	6.11
Mean	7.13	5.03	6.55	4.91	5.91

\*\*\* Standard errors of differences of means \*\*\*

WEED	IRRIGATN*
	WEED
0.494	0.698

\* Within the same level of IRRIGATN only

\*\*\*\*\* Stratum standard errors and coefficients of variation \*\*\*\*\*

Stratum	d.f.	s.e.	cv%
BLOCK.WP.SP	16	0.988	16.7

GRAIN MEAN DM% 89.8

SUB-PLOT AREA HARVESTED 0.00020



96/R/WW/3

WINTER WHEAT

PLANT N INDICATORS

**Object:** To relate chlorophyll concentrations in individual leaves of w. wheat to nitrogen supply and crop yield - Pastures.

**Sponsors:** P.B. Barraclough, S. Haysman.

**Design:** 4 randomised blocks of 10 plots.

**Whole plot dimensions:** 3.0 x 17.0.

**Treatments:**

N	Timing and rate of nitrogen (kg N):			
	Early March	Mid- April	Mid- May	Total
1	40	80	0	120
2	40	80	20	140
3	40	80	40	160
4	40	80	60	180
5	40	80	80	200
6	40	80	100	220
7	40	120	0	160
8	40	160	0	200
9	40	200	0	240
10	40	240	0	280

**Experimental diary:**

29-Jul-95 : B : Straw baled.  
05-Aug-95 : B : PK as (0:20:32) at 1407 kg.  
25-Sep-95 : B : Ploughed and furrow pressed.  
26-Sep-95 : B : Rotary harrowed, Hereward, dressed Panoctine, drilled at 380 seeds per m<sup>2</sup>.  
23-Oct-95 : B : Avadex BW Granular at 22.5 kg.  
20-Nov-95 : B : MSS Iprofile at 2.6 l with Stomp 400 SC at 2.6 l in 200 l.  
28-Feb-96 : B : Tiger 90 (90% S) at 35 kg.  
07-Mar-96 : B : 34.5% N at 116 kg.  
03-Apr-96 : T : N 1, 2, 3, 4, 5, 6: 34.5% N at 232 kg.  
          : T : N 7: 34.5% N at 348 kg.  
          : T : N 8: 34.5% N at 464 kg.  
          : T : N 9: 34.5% N at 580 kg.  
          : T : N 10: 34.5% N at 696 kg.  
30-Apr-96 : B : Starane 2 at 1.0 l with Barclay Holdup at 2.3 l in 200 l.  
29-May-96 : T : N 2: 34.5% N at 58 kg.  
          : T : N 3: 34.5% N at 116 kg.  
          : T : N 4: 34.5% N at 174 kg.  
          : T : N 5: 34.5% N at 232 kg.  
          : T : N 6: 34.5% N at 290 kg.

96/R/WW/3

**Experimental diary:**

07-Jun-96 : B : Alto 100 SL at 0.6 l with Mallard 750 EC at 0.4 l in  
320 l.

15-Aug-96 : B : Combine harvested.

Previous crops: W. beans 1994, w. oats 1995.

**NOTE:** Plant numbers and soil nitrogen were measured in March. Chlorophyll meter readings were taken on nine occasions. Growth analysis measurements were made on five occasions, this included dry matter and nitrogen content of leaf and shoots, growth area index, leaf area and chlorophyll in leaves. Grain and straw were analysed for nitrogen content.

**GRAIN TONNES/HECTARE**

\*\*\*\*\* Tables of means \*\*\*\*\*

N	
1	9.64
2	9.98
3	10.18
4	10.46
5	10.36
6	10.53
7	10.19
8	10.68
9	10.87
10	10.74
Mean	10.36

\*\*\* Standard errors of differences of means \*\*\*

N  
0.186

\*\*\*\*\* Stratum standard errors and coefficients of variation \*\*\*\*\*

Stratum	d.f.	s.e.	cv%
BLOCK.WP	27	0.263	2.5
GRAIN MEAN DM%	85.3		
PLOT AREA HARVESTED	0.00253		

96/R/WW/6

WINTER WHEAT

HERBICIDE RESISTANT BLACK-GRASS

**Object:** To evaluate the efficacy of different herbicides on a herbicide-resistant black-grass population and to determine any changes in the degree of resistance in the progeny of surviving plants - Claycroft.

**Sponsor:** S.R. Moss.

**Design:** 4 blocks of 15 plots.

**Whole plot dimensions:** 3.0 x 12.0.

**Treatments:**

HERBICIDE	Herbicide type, rate of active ingredient and timing (black-grass growth stage):
1	None (duplicated)
3	Isoproturon at 2.5 kg at two leaf stage
4	Tri-allate at 2.24 kg pre-emergence, plus isoproturon at 2.5 kg at two leaf stage
5	Trifluralin at 0.96 kg pre-emergence, plus isoproturon at 2.5 kg at two leaf stage
6	Pendimethalin at 2.0 kg pre-emergence, plus isoproturon at 2.5 kg at two leaf stage
7	Tri-allate at 2.24 kg plus trifluralin at 0.96 kg pre-emergence, plus isoproturon at 2.5 kg at two leaf stage
8	Tri-allate at 2.24 kg plus trifluralin at 0.96 kg pre-emergence, isoproturon at 2.5 kg at two leaf stage and at 2.1 kg at one tiller stage
9	Tri-allate at 2.24 kg plus trifluralin at 0.96 kg pre-emergence, isoproturon at 2.5 kg at two leaf stage and fenoxaprop-P-ethyl at 0.069 kg at one tiller stage
10	Tri-allate at 2.24 kg plus trifluralin at 0.96 kg pre-emergence, isoproturon at 2.5 kg at two leaf stage clodinafop-propargyl at 0.06 kg at one tiller stage
11	Tri-allate at 2.24 kg plus trifluralin at 0.96 kg pre-emergence, isoproturon at 1.5 kg plus simazine at 0.25 kg at two leaf stage
12	Fenoxaprop-P-ethyl at 0.069 kg at two leaf stage
13	Fenoxaprop-P-ethyl at 0.069 kg at one tiller stage
14	Clodinafop-propargyl at 0.06 kg at two leaf stage
15	Clodinafop-propargyl at 0.06 kg at one tiller stage

**Experimental diary:**

- 20-Sep-95 : B : Ploughed and furrow pressed.
- 22-Sep-95 : B : Rolled.
- 10-Oct-95 : B : Gramoxone 100 at 3.0 l in 260 l.
- 12-Oct-95 : B : Rotary harrowed.

96/R/WW/6

**Experimental diary:**

- 13-Oct-95 : B : Rotary harrowed Mercia, dressed Sibutol, drilled at 380 seeds per m<sup>2</sup>.
- 17-Oct-95 : B : Draza at 5.5 kg.
- 18-Oct-95 : T : **HERBCIDE** 5, 7, 8, 9, 10, 11: Portman Trifluralin at 2.0 l in 220 l.  
: T : **HERBCIDE** 6: Stomp 400 SC at 5.0 l in 220 l.
- 19-Oct-95 : T : **HERBCIDE** 4, 7, 8, 9, 10, 11: Avadex BW Granular at 22.4 kg.
- 10-Jan-96 : T : **HERBCIDE** 11: Atlas Simazine at 0.5 l with Stefes IPU at 3.0 l in 220 l.  
: T : **HERBCIDE** 12: Cheetah Super at 1.25 l in 220 l.  
: T : **HERBCIDE** 3, 4, 5, 6, 7, 8, 9, 10: Stefes IPU at 5.0 l in 220 l.  
: T : **HERBCIDE** 14: Topik at 0.25 l in 220 l.
- 02-Apr-96 : T : **HERBCIDE** 8: Stefes IPU at 4.2 l in 220 l.  
: T : **HERBCIDE** 9, 13: Cheetah Super at 1.25 l in 220 l.  
: T : **HERBCIDE** 10, 15: Topik at 0.25 l in 220 l.
- 18-Apr-96 : B : 34.5% N at 586 kg.
- 12-Jun-96 : B : Monicle at 1.0 l in 300 l.
- 20-Aug-96 : B : Combine harvested.

Previous crops: W. wheat 1994 and 1995.

**NOTE:** Black-grass and wheat plants were counted in December. Black-grass heads were counted in June.



96/R/WW/6

GRAIN TONNES/HECTARE

\*\*\*\*\* Tables of means \*\*\*\*\*

HERBCIDE

1	5.17
3	7.03
4	7.48
5	7.54
6	7.33
7	7.19
8	7.19
9	7.01
10	7.25
11	6.99
12	6.13
13	5.78
14	6.99
15	6.15

Mean 6.69

\*\*\* Standard errors of differences of means \*\*\*

HERBCIDE

0.256 min.rep  
0.222 max-min

HERBCIDE

max-min 1 v any of the remainder  
min.rep Any of the remainder

\*\*\*\*\* Stratum standard errors and coefficients of variation \*\*\*\*\*

Stratum	d.f.	s.e.	cv%
BLOCK.WP	43	0.362	5.4
GRAIN MEAN DM%	88.2		
PLOT AREA HARVESTED	0.00219		



96/R/WW/10

WINTER WHEAT

PHEROMONES IN WINTER WHEAT

**Object:** To test the effects of aphid sex pheromones on aphid parasitoids in w. wheat - Great Field I/II.

**Sponsors:** R. Glinwood, W. Powell.

**Design:** 4 x 4 Latin square balanced for neighbours.

**Whole plot dimensions:** 6.0 x 6.0.

**Treatments:**

PHERMONE	Pheromone nepetalactone, vials per plot:
C	None
L1	1
L2	2
L3	3

**Experimental diary:**

29-Jul-95 : B : Straw baled.  
05-Aug-95 : B : PK as 0:20:32 at 1407 kg.  
12-Sep-95 : B : Ploughed and furrow pressed.  
13-Oct-95 : B : Spring-tine cultivated.  
20-Oct-95 : B : Rotary harrowed, Hereward, dressed Sibutol, drilled at 380 seeds per m<sup>2</sup>.  
23-Oct-95 : B : Avadex BW Granular at 22.5 kg.  
12-Mar-96 : B : 34.5% N at 116 kg.  
16-Apr-96 : B : 34.5% N at 470 kg.  
29-Apr-96 : B : Ally at 30 g with Barclay Holdup at 2.3 l in 200 l.  
13-May-96 : T : PHERMONE L1, L2, L3: Nepetalactone placed in the crop.  
13-Jun-96 : B : Alto 100 SL at 0.6 l with Mallard 750 EC at 0.4 l in 300 l.  
19-Aug-96 : B : Combine harvested.

Previous crops: W. wheat 1994 and 1995.

**NOTE:** Aphid populations were monitored from June to August.

96/R/WW/10

GRAIN TONNES/HECTARE

\*\*\*\*\* Tables of means \*\*\*\*\*

    PHERMONE

C	8.34
L1	8.17
L2	8.02
L3	8.04

Mean	8.14
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\*\*\* Standard errors of differences of means \*\*\*

    PHERMONE

    0.278

\*\*\*\*\* Stratum standard errors and coefficients of variation \*\*\*\*\*

Stratum	d.f.	s.e.	cv%
ROW.COL	6	0.393	4.8

GRAIN MEAN DM% 89.2

PLOT AREA HARVESTED 0.00138