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Winter Wheat

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73/R/WW/1 and 73/W/WW/1

WINTER WHEAT

VARIETIES, N AND CCC

Object: To study the effects of chlormequat (CCC) and a range of nitrogen levels on growth and yield of a selection of the newer varieties of wheat grown on land in rotation or after several cereals. Nitrogen applied at flowering is also tested and flour quality is determined - Rothamsted (R) Delafield (pathogen free) and Meadow (pathogen infected) and Woburn (W) Horsepool Lane Close (pathogen free).

Sponsors: J.R. Moffatt, R. Moffitt.

Design: 4 randomised blocks of 8 plots, split into 4, with confounding, on Delafield (R) and Horsepool Lane Close (W).
3 randomised blocks of 9 plots, split into 4 on Meadow (R).

Whole plot dimensions: 4.27 x 27.1. Sub plot area harvested: 0.00173.

Treatments: All combinations of:-

Whole plots: Varieties		VARIETY
	Atou	AT
	Bouquet	BO
	Cappelle	CA
	Champlein, Meadow (R) only	CH
	Maris Freeman	MF
	Maris Huntsman	MH
	Maris Nimrod	MN
	Maris Templar	MT
	Maris Widgeon	MW
Sub plots:	2. Nitrogen fertiliser (kg N):	N
	63 in spring	63
	126 in spring	126
	189 in spring	189
	126 in spring plus 63 at flowering	126+63
	3. Chlormequat (kg):	CCC
	None	0.0
	1.7	1.7

NOTE: The test of chlormequat was omitted on Meadow (R). On Delafield (R) and Horsepool Lane Close (W) it was applied in 427 l.

73/R/W/1 and 73/W/W/1

Basal applications:

Delafield (R), and Meadow (R): Manures: (0:20:20) at 310 kg broadcast by machine. Weedkiller: Dicamba, mecoprop and MCPA ('Tetralex Plus' at 7.0 l in 220 l).

Horsepool Lane Close (W): Manures: (0:20:20) at 300 kg combine drilled. Weedkiller: Ioxynil at 0.63 kg plus mecoprop at 1.9 kg in 280 l.

Seed: Delafield (R) and Meadow (R): Varieties sown at 200 kg.

Horsepool Lane Close (W): Varieties sown at 190 kg.

Cultivations, etc.:-

Delafield (R): Deep-tine cultivated twice, PK applied, seed sown: 27 Oct, 1972. N applied: 6 Apr, 1973. Weedkiller applied: 16 Apr. CCC applied: 30 May. Late N applied: 12 June. Combine harvested: 23 Aug. Previous crops: Fallow 1971, potatoes 1972.

Meadow (R): Deep-tine cultivated: 6 Oct, 1972. Rotary harrowed: 25 Oct. PK applied, seed sown: 27 Oct. N applied: 5 Apr, 1973. Weedkiller applied: 16 Apr. Late N applied: 12 June. Combine harvested: 24 Aug. Previous crops: Barley 1971, 1972.

Horsepool Lane Close (W): Deep-tine cultivated: 17 Oct, 1972. PK applied, seed sown: 24 Oct. Weedkiller applied: 13 Apr, 1973. N applied: 17 Apr. CCC applied: 31 May. Late N applied: 13 June. Combine harvested: 17 Aug. Previous crops: Fallow 1971, potatoes 1972.

Standard errors per plot. Grain, tonnes/hectare:

Delafield (R):	Whole plot: 0.280 or 4.0% (13 d.f.)
	Sub plot: 0.603 or 8.5% (48 d.f.)
Meadow (R):	Whole plot: 0.398 or 7.8% (16 d.f.)
	Sub plot: 0.592 or 11.6% (54 d.f.)
Horsepool Lane Close (W):	Whole plot: 0.463 or 7.3% (13 d.f.)
	Sub plot: 0.510 or 8.0% (48 d.f.)

73/R/W#1 and 73/W/W#1

TABLE OF MEANS

DELAFIELD (R): PATHOGEN FREE

GRAIN: TONNES/HECTARE

VARIETY

	AT	PO	CA	MT	MH	MM	MP	MW	Mean
N									
63	7.62	6.99	6.93	7.27	8.41	8.35	8.55	6.75	7.61
126	7.32	6.29	5.24	7.38	8.75	7.92	8.35	6.09	7.17
189	6.09	5.17	4.83	6.24	7.97	6.47	7.65	4.91	6.17
126+63	7.57	6.46	6.05	7.03	8.42	8.47	8.62	5.59	7.28
CCC									
0.0	7.02	6.11	5.37	6.59	8.00	7.59	8.28	5.29	6.77
1.7	7.28	6.34	6.15	7.37	8.78	8.02	8.30	6.47	7.34
Mean	7.15	6.23	5.76	6.98	8.39	7.80	8.29	5.84	7.06

N

	63	126	189	126+63
CCC				
0.0	7.54	6.87	5.84	6.84
1.7	7.68	7.47	6.49	7.72

STANDARD ERRORS OF DIFFERENCES

VARIETY	N	CCC	VARIETY N	VARIETY CCC	N CCC
0.198	0.151	0.107	0.419	0.291	0.213

Except when comparing means with same level of

VARIETY	N	CCC
VARIETY	0.426	0.302
N		0.210
CCC		0.210

Mean D.M. % 85.7

73/R/WW/1 and 73/W/WW/1

MEADOW (R)

GRAIN: TONNES/HECTARE

VARIETY

	AT	BO	CA	CH	MF	MH	MN	MP	MW	Mean
N										
63	4.91	4.58	4.76	5.95	4.99	5.39	6.94	5.31	5.02	5.32
126	4.88	4.57	4.44	5.66	4.72	5.15	5.55	5.37	4.08	4.94
189	5.00	3.92	4.79	5.86	4.51	5.51	5.91	6.12	3.85	5.05
126+63	5.57	5.19	4.73	5.74	4.96	4.87	5.55	5.51	4.08	5.13
Mean	5.09	4.56	4.68	5.80	4.79	5.23	5.99	5.58	4.26	5.11

STANDARD ERRORS OF DIFFERENCES

VARIETY	N	VARIETY N
0.325	0.161	0.530
Except when comparing means with same level of		
VARIETY		0.483

Mean D.M. % 87.6

73/R/WW/1 and 73/W/WW/1

HORSEPOOL LANE CLOSE (W)

GRAIN: TONNES/HECTARE

	VARIETY								Mean
	AT	BO	CA	MF	MH	MN	MT	MW	
N									
63	6.49	6.04	6.24	6.29	7.37	7.40	6.82	6.05	6.59
126	6.46	6.24	5.25	6.51	7.48	7.06	7.05	5.77	6.48
189	5.97	5.70	4.92	5.65	7.55	6.63	6.92	5.05	6.05
126+63	6.37	6.50	5.18	5.89	7.43	7.04	7.38	5.14	6.37
CCC									
0.0	6.28	6.31	5.14	6.20	7.48	7.08	7.17	5.04	6.34
1.7	6.37	5.93	5.65	5.97	7.43	6.98	6.91	5.97	6.40
Mean	6.32	6.12	5.40	6.08	7.46	7.03	7.04	5.50	6.37

	N			
	63	126	189	126+63
CCC				
0.0	6.62	6.48	6.03	6.23
1.7	6.56	6.48	6.07	6.50

STANDARD ERRORS OF DIFFERENCES

VARIETY	N	CCC	VARIETY N	VARIETY CCC	N CCC
0.328	0.127	0.090	0.453	0.374	0.180

Except when comparing means with same level of

VARIETY	0.360	0.255	
N			0.226
CCC			0.226

Mean D.M. % 84.4

73/R/WW/2 and 73/BB/WW/2

WINTER WHEAT

GROWTH AND YIELD ON CONTRASTED SITES

Object: To try to account for yields and differences between yields of wheat on sites at Rothamsted and Broom's Barn by studying crop growth rates, nutrient uptake, water use etc., at a wide range of nitrogen levels, with and without irrigation. Also to study the interaction between site differences and crops (see also 73/R/BS/1 and BB/BS/1). Rothamsted (R) - Great Knott III, and Broom's Barn (BB) - New Piece.

Sponsors: P.J. Welbank, F.V. Widdowson.

Design: 3 randomised blocks of 2 plots, split into 6.

Whole plot dimensions:

Great Knott III (R): 15.2 x 48.0. Sub plot area harvested: 0.00434.
New Piece (BB): 15.2 x 45.7. Sub plot area harvested: 0.00413.

Treatments: All combinations of:-

Whole plots: 1. Irrigation:

	IRRIGN
None	0
Full irrigation	I

Sub plots: 2. Nitrogen fertiliser (kg N):

31	31
63	63
94	94
125	125
157	157
188	188

Total irrigation was 50.8 mm applied on 2 occasions (R) and 110.5 mm applied on 4 occasions (BB).

Basal applications (both fields): Manures: (0:20:20) at 1300 kg and Epsom salts at 900 kg worked into seedbed. (10:24:24) at 250 kg combine drilled. Weedkiller: MCPA, mecoprop and dicamba ('Tetralix Plus' at 7.0 l in 220 l (R) and 'Banlene Plus' at 5.6 l in 220 l (BB)).
Fungicide: Tridemorph at 0.53 kg in 220 l.

Seed: Cappelle, dressed with dieldrin, sown at 200 kg.

73/R/WW/2 and 73/BB/WW/2

Cultivations, etc.:-

Great Knott III (R): Basal PK and Epsom salts applied: 13 Oct, 1972.
Deep-tine cultivated: 16 Oct. Rotary cultivated: 17 Oct. Seed sown: 20 Oct. N applied: 13 Apr, 1973. Weedkiller applied: 26 Apr. Fungicide applied: 18 May. Irrigated 14 and 18 June. Combine harvested: 22 Aug. Previous crops: Barley 1971, beans 1972.

New Piece (BB): Deep-tine cultivated: 28 Sept and 2 Oct, 1972.
Basal PK and Epsom salts applied: 6 Oct. Seed sown: 10 Oct. N applied: 12 Apr, 1973. Weedkiller applied: 16 Apr. Fungicide applied: 15 May. Irrigated: 8, 14, 15 June and 5 July. Combine harvested: 16 Aug. Previous crops: Sugar beet 1971, beans 1972.

NOTE: Crop samples were taken throughout the season. The percentage of N, P and K was measured in all samples. The number of tillers or ear-bearing stems was counted, and the leaf areas measured at each sampling. Mildew (*Erysiphe graminis*) assessments were made. 1000 grain weights were determined. Soil moisture content was estimated by neutron probe weekly.

Standard errors per sub plot. Grain, tonnes/hectare:

Great Knott III (R): 0.260 or 4.1% (20 d.f.)

New Piece (BB): 0.288 or 5.1% (20 d.f.)

73/R/Ww/2 and 73/BB/Ww/2

TABLES OF MEANS

GREAT KNOTT III (R)

GRAIN: TONNES/HECTARE

	N						Mean
	31	63	94	125	157	188	
IRRIGN							
O	7.47	6.61	6.27	6.56	6.07	6.31	6.55
I	6.88	6.23	5.96	5.72	5.63	5.52	5.99
Mean	7.18	6.42	6.12	6.14	5.85	5.91	6.27

STANDARD ERRORS OF DIFFERENCES

	N	IRRIGN* N
	0.150	
*Within the same level of IRRIGN only		0.207

STRAW: TONNES/HECTARE

O	7.25	8.19	8.31	8.38	8.15	8.17	8.07
I	6.03	8.15	8.75	7.68	8.13	7.78	7.75
Mean	6.64	8.17	8.53	8.03	8.14	7.97	7.91

Mean D.M. % Grain 82.5
Straw 83.4

73/R/WW/2 and 73/BB/WW/2

NEW PIECE (BB)

GRAIN: TONNES/HECTARE

	N						Mean
	31	63	94	125	157	188	
IRRIGN							
O	5.19	5.73	5.87	5.86	5.40	5.45	5.59
I	5.15	5.86	6.03	5.86	5.73	5.43	5.68
Mean	5.17	5.80	5.95	5.86	5.57	5.44	5.63

STANDARD ERRORS OF DIFFERENCES

	N	IRRIGN*
		N
	0.166	
*Within the same level of IRRIGN only		0.235

STRAW: TONNES/HECTARE

O	6.10	6.27	6.75	6.96	6.78	7.25	6.69
I	6.48	6.80	7.17	7.12	7.03	7.36	6.99
Mean	6.29	6.53	6.96	7.04	6.91	7.30	6.84

Mean D.M. % Grain 87.5
Straw 67.8

73/R/WW/3

WINTER WHEAT

WEEDKILLER, AQUEOUS N AND FUNGICIDE

Object: To study the effects of combined sprays of liquid nitrogen fertiliser, hormone weedkiller and fungicide on foliar scorch and yield of winter wheat - Great Knott III.

Sponsors: S.C.R. Freeman, A. Penny.

Design: 4 randomised blocks of 20 plots.

Whole plot dimensions: 2.13 x 2.74. Area harvested: 0.00038.

Treatments: All combinations of:-

1. Form of nitrogen		FORM
Solid, as 'Nitro-Chalk' 21% N		Solid
Liquid, as urea/ammonium nitrate 26% N		Liquid
2. Rate of nitrogen (kg N)		N
56		56
112		112
3. Weedkiller (dichlorprop/MCPA, kg total a.e.)		WEEDKILLR
None		0.0
2.8		2.8
4. Fungicide (tridemorph, kg)		FUNGICIDE
None		0.00
0.53		0.53

together with EXTRA-certain of the above combinations, all with a wetter ('Nonidet' at 1 part in 1600):-

73/R/WW/3

1. Liquid nitrogen rate (kg N)	LIQUIDNW
56	56
112	112
2. Weedkiller (dichlorprop/MCPA, kg total a.e.)	WEEDKLLR
None	0.0
2.8	2.8

NOTE: Combinations with liquid nitrogen at 56 kg N were all applied in 170 l. All other combinations were applied in 340 l except tridemorph applied alone, in 170 l.

Basal applications: Manures: (0:20:20) at 1300 kg plus magnesium sulphate at 900 kg worked into seedbed. (10:24:24) at 250 kg combine drilled.

Seed: Cappelle, sown at 200 kg.

Cultivations, etc.: - PK and Mg applied: 13 Oct, 1972. Deep-tine cultivated: 16 Oct. Rotary harrowed: 17 Oct. Seed sown: 19 Oct. Treatments applied: 1 May, 1973. Cut by hand: 20 Aug. Previous crops: Barley 1971, beans 1972.

NOTE: Grain samples were taken for determination of N content. Estimates were made of infection by mildew (*Erysiphe graminis*) and *Septoria nodorum* on 10 July.

Standard error per plot.

Grain, tonnes/hectare: 0.670 or 13.2% (57 d.f.)

73/R/W/3

TABLES OF MEANS

GRAIN: TONNES/HECTARE

	N		WEEDKLLR		FUNGICIDE		Mean
	56	112	0.0	2.8	0.00	0.53	
FORM							
Solid	5.56	4.32	5.11	4.78	4.99	4.90	4.94
Liquid	5.52	4.94	5.20	5.26	5.05	5.41	5.23
		N					
		56	5.50	5.58	5.51	5.58	5.54
		112	4.81	4.45	4.53	4.73	4.63
				WEEDKLLR			
				0.0	4.97	5.34	5.15
				2.8	5.07	4.97	5.02
Mean					5.02	5.16	5.09

EXTRA

WEEDKLLR

	0.0	2.8	Mean
LIQUIDW			
56	5.64	5.78	5.71
112	4.49	4.39	4.44
Mean	5.07	5.08	5.08

Grand mean 5.08

73/R/W/3

STANDARD ERRORS OF DIFFERENCES

Excluding EXTRA

All marginal means	0.167
All 2-way tables	0.237

EXTRA

All marginal means	0.335
2-way table	0.474

Mean D.M. % 84.8

73/R/WW/4

WINTER WHEAT

SEPTORIA

Object: To study the effects of different amounts of artificially and naturally infected straw and artificially infected seed on the development of Septoria and its effects on yield - Great Knott I.

Sponsors: J.F. Jenkyn, J. King (MAFF).

Design: 6 x 6 Latin square.

Whole plot dimensions: 4.27 x 9.14. Area harvested: 0.00260.

Treatments: Infection with Septoria	SEPTORIA
None	0
Straws, artificially infected, worked into seedbed (8 cm pieces, thousands per hectare):-	
143	ART1
765	ART2
2470	ART3
Straws, naturally infected, worked into seedbed (8 cm pieces, thousands per hectare):-	
2470	NAT3
Seed artificially infected	SEED

Basal applications: Manures: 310 kg (0:20:20) combine drilled, 380 kg 'Nitro-Chalk' in spring. Weedkiller: MCPA, mecoprop and dicamba ('Tetralex plus' 7.0 l in 220 l).

Seed: Cappelle, dressed with dieldrin, sown at 200 kg.

Cultivations, etc.:- Deep-tine cultivated twice, inoculum applied and power harrowed: 24 Oct, 1972. Seed combine drilled: 25 Oct. N applied: 13 Apr, 1973. Weedkiller applied: 26 Apr. Combine harvested: 22 Aug. Previous crops: Fallow 1971, potatoes 1972.

NOTE: Septoria nodorum was assessed soon after seedling emergence and after ear emergence.

Standard error per plot.

Grain, tonnes/hectare: 0.421 or 6.7% (20 d.f.)

73/R/WW/4

TABLES OF MEANS

GRAIN: TONNES/HECTARE

SEPTORIA

□	ART1	ART2	ART3	NAT3	SEED	Mean
6.10	6.55	6.18	6.35	6.14	6.36	6.28

STANDARD ERROR OF DIFFERENCES

SEPTORIA

0.243

Mean D.M. % 84.7

73/R/WW/8

WINTER WHEAT

PESTICIDES AND PEST PREDATORS

Object: To study the effects of commonly used soil pesticides on predatory arthropods and to determine effects on yield - Road Piece.

Sponsor: C.A. Edwards.

Design: 4 blocks of 6 plots.

Whole plot dimensions: 4.27 x 6.10.

Treatments: Chemicals (kg):-

	CHEMICAL
None	O
Benomyl 4.5	BE
Endrin 3.6	ER
Endosulfan 0.08	ES
Tetradifon 2.2	TE
Phorate 3.6	PH

Treatments were applied on 2 Oct, 1972, tetradifon and phorate as granules, the other three in solution and all harrowed in.

Basal applications: Manures: (0:14:28) at 380 kg combine drilled. 'Nitro-Chalk' at 350 kg. Weedkiller: MCPA, mecoprop and dicamba ('Tetralex Plus' at 7.0 l in 220 l).

Seed: Cappelle, dressed with fungicide only, sown at 200 kg.

Cultivations, etc.:- Ploughed: 21 Sept, 1972. Power harrowed: 2 Oct. Seed sown: 12 Oct. N applied: 18 Apr, 1973. Weedkiller applied: 26 Apr. Combine harvested: 23 Aug. Previous crops: Grass 1971 and 1972.

- NOTES: (1) Soil cores for the estimation of soil fauna were taken on 7 Mar, 9 Apr, 29 May, 13 July and 20 Aug. Numbers of earthworms were estimated on 16 May.
- (2) Yields were not taken because of severe damage by birds.