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76/R/WW/7 Rates and Times of N and K - W. Wheat

Rothamsted Research

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76/R/WW/7

WINTER WHEAT

RATES AND TIMES OF N AND K

Object: To study the effects of a range of rates and times of applying nitrogen and potassium on nutrient uptake and yield of winter wheat - Gt. Knott III.

Sponsors: O. Talibudeen, A. Penny, M. Page.

Design: Single replicate of 4 x 4 x 2 x 3 fully randomised plus 3 randomised blocks of 8 plots.

Whole plot dimensions: 2.67 x 4.57.

Treatments: All combinations of:-

1. N METHOD Rates, forms and times of applying nitrogen (kg N):

	'Nitro-Chalk' at G.S.2 (9 Apr)		Urea spray at G.S.6 (11-13 May)		Urea spray at G.S.11 (28-30 June)
120 0 30	120	+	0	+	30
120 0 60	120	+	0	+	60
120 0 90	120	+	0	+	90
120 30 0	120	+	30	+	0
120 30 30	120	+	30	+	30
120 30 60	120	+	30	+	60
120 30 90	120	+	30	+	90
120 60 0	120	+	60	+	0
120 60 30	120	+	60	+	30
120 60 60	120	+	60	+	60
120 60 90	120	+	60	+	90
120 90 0	120	+	90	+	0
120 90 30	120	+	90	+	30
120 90 60	120	+	90	+	60
120 90 90	120	+	90	+	90

2. N CONC Concentration of nitrogen in urea spray:-

2.5	2.5%
5.0	5.0%

3. K CONC Concentration of potassium in urea spray, K:N atom ratio:

0	None
5	5%
10	10%

EXTRA plus nine extra treatments given 'Nitro-Chalk' only, in spring at Growth Stage 2 (kg N) (9 Apr):

0	None
30	30
60	60
90	90
120 (duplicated)	120
150	150
180	180
240	240
300	300

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NOTE: Urea sprays were applied in 600 l to provide 30 kg N at N CONC 5.0 and in 1200 l to provide N CONC 2.5. The larger rates of urea were obtained by proportionate increases in volume.

Basal applications: Manures: (0:20:20) at 310 kg, combine drilled.

Weedkillers: Paraquat at 0.42 kg ion in 220 l. Ioxynil at 0.53 kg with mecoprop at 1.6 kg (both as the potassium salt) in 220 l in spring.

Fungicides: Tridemorph at 0.53 kg in 280 l. Benomyl at 0.28 kg with mancozeb plus maneb ('Kascade' at 2.2 kg) in 280 l. Insecticide: Pirimicarb at 0.14 kg in 280 l.

Seed: Cappelle, sown at 200 kg.

Cultivations, etc.:- Heavy spring-tine cultivated: 24 Sept, 1975. Paraquat applied: 6 Oct. Ploughed and rotary harrowed: 13 Oct. Seed sown: 14 Oct. Spring weedkiller applied: 22 Apr, 1976. Tridemorph applied: 29 Apr, 11 May. Benomyl with 'Kascade' applied, pirimicarb applied: 21 June. Combine harvested: 22 July. Previous crops: Barley 1974, winter oats 1975.

GRAIN TONNES/HECTARE

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

N CONC	2.5	5.0	MEAN
N METHOD			
120 0 30	4.90	4.76	4.83
120 0 60	4.70	4.73	4.71
120 0 90	4.88	4.66	4.77
120 30 0	4.88	4.77	4.83
120 30 30	5.09	4.98	5.03
120 30 60	4.86	5.06	4.96
120 30 90	4.86	4.91	4.88
120 60 0	5.11	5.15	5.13
120 60 30	5.13	5.02	5.07
120 60 60	5.28	4.74	5.01
120 60 90	5.07	5.09	5.08
120 90 0	5.24	5.15	5.19
120 90 30	5.00	4.96	4.98
120 90 60	5.20	5.01	5.11
120 90 90	4.87	5.13	5.00
MEAN	5.00	4.94	4.97

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GRAIN TONNES/HECTARE

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

K CONC	0	5	10	MEAN
N METHOD				
120 0 30	4.53	4.79	5.10	4.83
120 0 60	4.53	4.75	4.86	4.71
120 0 90	4.86	4.87	4.53	4.77
120 30 0	4.88	4.91	4.69	4.83
120 30 30	5.14	5.12	4.84	5.03
120 30 60	5.05	5.04	4.78	4.96
120 30 90	4.86	4.93	4.81	4.88
120 60 0	5.26	5.11	5.01	5.13
120 60 30	4.90	5.03	5.24	5.07
120 60 60	5.09	5.09	4.85	5.01
120 60 90	5.13	4.96	5.15	5.08
120 90 0	5.48	4.88	5.22	5.19
120 90 30	4.65	5.25	5.03	4.98
120 90 60	4.94	5.36	5.01	5.11
120 90 90	5.15	4.86	4.97	5.00

MEAN 4.97 5.00 4.94 4.97

K CONC	0	5	10	MEAN
N CONC				
2.5	5.02	5.03	4.96	5.00
5.0	4.92	4.98	4.92	4.94

MEAN 4.97 5.00 4.94 4.97

EXTRA	0	30	60	90	120	150	180	240	300	MEAN
	3.25	3.45	4.30	4.47	4.89	5.22	4.79	5.29	5.06	4.56

GRAND MEAN 4.87

TABLE	N METHOD	N CONC	K CONC	EXTRA
SED	0.152	0.056	0.068	0.215 MIN REP 0.187 MAX-MIN
TABLE	N METHOD N CONC	N METHOD K CONC	N CONC K CONC	
SED	0.215	0.263	0.096	

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

STRATUM	DF	SE	CV%
BLOCK.WP	47	0.264	5.4

EXTRA
MAX-MIN 120 V ANY OF REMAINDER
MIN REP ANY OF REMAINDER

GRAIN MEAN DM% 82.5

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STRAW TONNES/HECTARE

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

N CONC	2.5	5.0	MEAN
N METHOD			
120 0 30	5.99	5.92	5.95
120 0 60	5.48	5.62	5.55
120 0 90	6.09	5.85	5.97
120 30 0	5.56	6.04	5.80
120 30 30	6.08	6.07	6.08
120 30 60	5.98	6.05	6.01
120 30 90	5.88	5.75	5.82
120 60 0	6.07	6.31	6.19
120 60 30	6.01	6.12	6.07
120 60 60	6.07	5.82	5.95
120 60 90	6.36	6.35	6.35
120 90 0	6.52	6.19	6.35
120 90 30	6.20	5.96	6.08
120 90 60	6.23	5.74	5.99
120 90 90	6.10	5.96	6.03

MEAN 6.04 5.98 6.01

K CONC	0	5	10	MEAN
N METHOD				
120 0 30	5.51	6.14	6.21	5.95
120 0 60	5.30	5.84	5.51	5.55
120 0 90	6.00	6.58	5.33	5.97
120 30 0	5.91	5.78	5.71	5.80
120 30 30	6.04	6.24	5.96	6.08
120 30 60	6.12	5.99	5.93	6.01
120 30 90	5.87	5.52	6.06	5.82
120 60 0	6.49	6.12	5.96	6.19
120 60 30	6.24	5.99	5.98	6.07
120 60 60	6.16	5.85	5.83	5.95
120 60 90	6.54	6.24	6.27	6.35
120 90 0	6.30	6.14	6.62	6.35
120 90 30	5.58	6.35	6.31	6.08
120 90 60	5.72	5.98	6.26	5.99
120 90 90	6.19	5.64	6.27	6.03

MEAN 6.00 6.03 6.01 6.01

K CONC	0	5	10	MEAN
N CONC				
2.5	5.95	6.09	6.09	6.04
5.0	6.05	5.97	5.94	5.98

MEAN 6.00 6.03 6.01 6.01

EXTRA	0	30	60	90	120	150	180	240	300	MEAN
	4.05	4.50	4.89	5.40	5.99	5.92	6.40	6.21	6.99	5.63

GRAND MEAN 5.92

STRAW MEAN DM% 89.6

PLOT AREA HARVESTED 0.00073