ROTHAMSTED RESEARCH

Yields of the Field Experiments 1977

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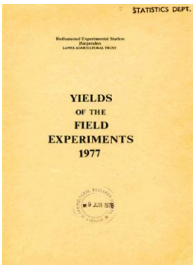

77/R/G/1 and 77/W/G/1 Aqueous Ammonia and Nitrification Inhibitors - Grass

Rothamsted Research

Rothamsted Research (1978) *77/R/G/1 and 77/W/G/1 Aqueous Ammonia and Nitrification Inhibitors - Grass ;* Yields Of The Field Experiments 1977, pp 398 - 409 **- DOI: https://doi.org/10.23637/ERADOC-1-29**

77/R/G/1 and 77/W/G/1

GRASS

AQUEOUS AMMONIA AND NITRIFICATION INHIBITORS

Object: To study the effects of adding a range of nitrification inhibitors to liquid fertilisers on the yield and nitrogen uptake of grass cut for silage - Rothamsted (R) Bones Close and Woburn (W) Stackyard II.

Sponsors: J. Ashworth, G.G. Briggs, A. Penny.

Design: Bones Close (R): 2 randomised blocks of 25 plots.
Stackyard II (W): 2 randomised blocks of 24 plots.

Whole plot dimensions: 2.44 x 9.14.

Treatments: All combinations of:-

1. NI FORM — Nitrification inhibitors added to aqueous ammonia applied at 375 kg N, as a single application, injection tines spaced 30 cm apart:

NITRAPYR	Nitrapyrin ('N-Serve')
SOD TRI	Sodium trithiocarbonate

2. NI RATE — Rates of nitrification inhibitors (kg)

	Nitrapyrin	Sodium trithiocarbonate
1	1	10
2	2	20
3	3	30

3. NI TIME — Times of applying aqueous ammonia and nitrification inhibitors:

AUTUMN
SPRING

plus thirteen extra treatments (R) or twelve extra treatments (W)
EXTRA

Aqueous ammonia applied at 375 kg N, as a single application, tines spaced 30 cm apart except where stated:

AQ/A	Alone, in autumn
AQ/S	Alone, in spring
AQ/A+	Alone, in autumn, tines spaced 60 cm apart
AQ/S+	Alone, in spring, tines spaced 60 cm apart
AQ+SH/A	With sodium hydroxide, nitrification modifier, in autumn ((R) only)
AQ+TM/A	With trimethylamine, nitrification modifier in autumn ((R) only)

Aqueous urea/ammonium nitrate, applied at 375 kg N, as a single application, tines spaced 30 cm apart:

UA/S	Alone in spring
UA+ST3/S	With sodium trithiocarbonate, 30 kg, in spring

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	Nitrification inhibitor alone, tines spaced 30 cm apart:
-ST3/S	Sodium trithiocarbonate, 30 kg in spring
	'Nitro-Chalk', dressing divided between cuts (kg N, total):
0	0
NC 250	250
NC 375	375 (duplicated at (W) only)
NC 500	500

Basal applications:
Bones Close (R): Manures: (0:14:28) at 1000 kg.
Stackyard II (W): Manures: (0:14:28) at 1000 kg. Chalk at 2.8 t.

Cultivations, etc.:-
Bones Close (R): NI TIME AUTUMN applied: 25 Nov, 1976. PK applied: 9 Dec. NI TIME SPRING applied: 7 Mar, 1977. 'Nitro-Chalk' applied: 10 Mar, 27 May, 28 July. Cut three times: 24 May, 18 July, 7 Nov. Previous crops: Grass since 1952.
Stackyard II (W): Chalk applied: 3 Sept, 1976. NI TIME AUTUMN applied: 22 Nov. PK applied: 18 Jan, 1977. NI TIME SPRING applied: 8 Mar. 'Nitro-Chalk' applied: 11 Mar, 9 June, 26 July. Cut three times: 30 May, 20 July, 27 Sept. Previous crops: Ley 1975 and 1976.

NOTES: (1) Grass samples were taken for N determinations.
(2) N in the injected soil profile was measured during the season and ammonia evaporation measured.

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77/R/G/1 BONES CLOSE (R)

1ST CUT (24/5/77) DRY MATTER TONNES/HECTARE

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

NI RATE	1	2	3	MEAN
NI FORM				
NITRAPYR	5.92	5.90	5.68	5.84
SOD TRI	5.87	5.56	5.96	5.80
MEAN	5.90	5.73	5.82	5.82

NI TIME	AUTUMN	SPRING	MEAN
NI FORM			
NITRAPYR	6.08	5.59	5.84
SOD TRI	5.90	5.69	5.80
MEAN	5.99	5.64	5.82

NI TIME	AUTUMN	SPRING	MEAN
NI RATE			
1	6.18	5.62	5.90
2	5.67	5.80	5.73
3	6.13	5.51	5.82
MEAN	5.99	5.64	5.82

NI RATE	1		2		3	
NI TIME	AUTUMN	SPRING	AUTUMN	SPRING	AUTUMN	SPRING
NI FORM						
NITRAPYR	6.12	5.73	5.97	5.83	6.15	5.22
SOD TRI	6.23	5.50	5.36	5.77	6.12	5.80

EXTRA	
AQ/A	6.37
AQ/S	5.53
AQ/A+	5.70
AQ/S+	5.11
AQ+SH/A	6.15
AQ+TM/A	5.74
UA/S	5.14
UA+ST3/S	6.18
-ST3/S	3.12
0	3.20
NC 250	5.47
NC 375	5.99
NC 500	5.92
MEAN	5.35

GRAND MEAN 5.58

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

TABLE	EXTRA	NI FORM	NI RATE	NI TIME
SED	0.247	0.101	0.124	0.101

TABLE	NI FORM NI RATE	NI FORM NI TIME	NI RATE NI TIME	NI FORM NI RATE NI TIME
SED	0.175	0.143	0.175	0.247

https://doi.org/10.23637/ERADOC-1-29

77/R/G/1 BONES CLOSE (R)

2ND CUT (18/7/77) DRY MATTER TONNES/HECTARE

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

NI RATE	1	2	3	MEAN
NI FORM				
NITRAPYR	4.48	4.25	4.29	4.34
SOD TRI	4.28	4.17	4.22	4.22
MEAN	4.38	4.21	4.25	4.28

NI TIME	AUTUMN	SPRING	MEAN
NI FORM			
NITRAPYR	4.22	4.46	4.34
SOD TRI	3.99	4.46	4.22
MEAN	4.11	4.46	4.28

NI TIME	AUTUMN	SPRING	MEAN
NI RATE			
1	4.23	4.53	4.38
2	3.97	4.45	4.21
3	4.11	4.40	4.25
MEAN	4.11	4.46	4.28

NI RATE	1		2		3	
NI TIME	AUTUMN	SPRING	AUTUMN	SPRING	AUTUMN	SPRING
NI FORM						
NITRAPYR	4.27	4.70	4.06	4.45	4.34	4.24
SOD TRI	4.20	4.36	3.89	4.45	3.88	4.56

EXTRA	
AQ/A	4.01
AQ/S	4.23
AQ/A+	4.19
AQ/S+	4.34
AQ+SH/A	3.99
AQ+TM/A	4.32
UA/S	4.36
UA+ST3/S	4.58
-ST3/S	2.33
0	2.15
NC 250	4.59
NC 375	4.52
NC 500	4.35
MEAN	4.00

GRAND MEAN 4.13

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

TABLE	EXTRA	NI FORM	NI RATE	NI TIME
SED	0.318	0.130	0.159	0.130

TABLE	NI FORM NI RATE	NI FORM NI TIME	NI RATE NI TIME	NI FORM NI RATE NI TIME
SED	0.225	0.184	0.225	0.318

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77/R/G/1 BONES CLOSE (R)

3RD CUT (7/11/77) DRY MATTER TONNES/HECTARE

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

NI RATE	1	2	3	MEAN
NI FORM				
NITRAPYR	1.47	1.42	1.48	1.45
SOD TRI	1.40	1.37	1.46	1.41
MEAN	1.43	1.39	1.47	1.43

NI TIME	AUTUMN	SPRING	MEAN
NI FORM			
NITRAPYR	1.40	1.51	1.45
SOD TRI	1.45	1.37	1.41
MEAN	1.43	1.44	1.43

NI TIME	AUTUMN	SPRING	MEAN
NI RATE			
1	1.39	1.48	1.43
2	1.36	1.43	1.39
3	1.53	1.41	1.47
MEAN	1.43	1.44	1.43

NI RATE	1		2		3	
NI TIME	AUTUMN	SPRING	AUTUMN	SPRING	AUTUMN	SPRING
NI FORM						
NITRAPYR	1.34	1.59	1.30	1.53	1.57	1.40
SOD TRI	1.44	1.36	1.42	1.32	1.49	1.43

EXTRA	
AQ/A	1.80
AQ/S	1.32
AQ/A+	1.42
AQ/S+	1.31
AQ+SH/A	1.56
AQ+TM/A	1.48
UA/S	1.43
UA+ST3/S	1.29
-ST3/S	0.57
0	0.59
NC 250	2.04
NC 375	1.84
NC 500	1.67
MEAN	1.41

GRAND MEAN 1.42

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

TABLE	EXTRA	NI FORM	NI RATE	NI TIME
SED	0.222	0.090	0.111	0.090

TABLE	NI FORM NI RATE	NI FORM NI TIME	NI RATE NI TIME	NI FORM NI RATE NI TIME
SED	0.157	0.128	0.157	0.222

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77/R/G/1 BONES CLOSE (R)

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

NI RATE	1	2	3	MEAN
NI FORM				
NITRAPYR	11.87	11.57	11.45	11.63
SOD TRI	11.54	11.10	11.64	11.43
MEAN	11.71	11.34	11.55	11.53

NI TIME	AUTUMN	SPRING	MEAN
NI FORM			
NITRAPYR	11.70	11.56	11.63
SOD TRI	11.34	11.52	11.43
MEAN	11.52	11.54	11.53

NI TIME	AUTUMN	SPRING	MEAN
NI RATE			
1	11.80	11.62	11.71
2	11.00	11.67	11.34
3	11.77	11.32	11.55
MEAN	11.52	11.54	11.53

NI RATE	1		2		3	
NI TIME	AUTUMN	SPRING	AUTUMN	SPRING	AUTUMN	SPRING
NI FORM						
NITRAPYR	11.73	12.02	11.33	11.81	12.05	10.85
SOD TRI	11.87	11.22	10.67	11.54	11.49	11.79

EXTRA	
AQ/A	12.19
AQ/S	11.07
AQ/A+	11.31
AQ/S+	10.75
AQ+SH/A	11.70
AQ+TM/A	11.55
UA/S	10.93
UA+ST3/S	12.04
-ST3/S	6.02
0	5.95
NC 250	12.10
NC 375	12.35
NC 500	11.94
MEAN	10.76

GRAND MEAN 11.13

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

TABLE	EXTRA	NI FORM	NI RATE	NI TIME
SED	0.514	0.210	0.257	0.210

TABLE	NI FORM NI RATE	NI FORM NI TIME	NI RATE NI TIME	NI FORM NI RATE NI TIME
SED	0.364	0.297	0.364	0.514

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77/R/G/1 BONES CLOSE (R)

1ST CUT (24/5/77) DRY MATTER TONNES/HECTARE

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

STRATUM	DF	SE	CV%
BLOCK.WP	24	0.247	4.4

1ST CUT MEAN DM% 17.1

1ST CUT PLOT AREA HARVESTED 0.00085

2ND CUT (18/7/77) DRY MATTER TONNES/HECTARE

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

STRATUM	DF	SE	CV%
BLOCK.WP	24	0.318	7.7

2ND CUT MEAN DM% 23.4

2ND CUT PLOT AREA HARVESTED 0.00104

3RD CUT (7/11/77) DRY MATTER TONNES/HECTARE

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

STRATUM	DF	SE	CV%
BLOCK.WP	24	0.222	15.6

3RD CUT MEAN DM% 20.0

3RD CUT PLOT AREA HARVESTED 0.00104

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

STRATUM	DF	SE	CV%
BLOCK.WP	24	0.514	4.6

TOTAL OF 3 CUTS MEAN DM% 20.2

https://doi.org/10.23637/ERADOC-1-29

77/W/G/1 STACKYARD II (W)

1ST CUT (30/5/77) DRY MATTER TONNES/HECTARE

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

NI RATE	1	2	3	MEAN
NI FORM				
NITRAPYR	4.53	5.07	4.50	4.70
SOD TRI	4.27	4.59	4.39	4.42
MEAN	4.40	4.83	4.45	4.56

NI TIME	AUTUMN	SPRING	MEAN
NI FORM			
NITRAPYR	5.88	3.52	4.70
SOD TRI	5.40	3.44	4.42
MEAN	5.64	3.48	4.56

NI TIME	AUTUMN	SPRING	MEAN
NI RATE			
1	5.21	3.59	4.40
2	6.16	3.50	4.83
3	5.55	3.35	4.45
MEAN	5.64	3.48	4.56

NI RATE	1		2		3	
NI TIME	AUTUMN	SPRING	AUTUMN	SPRING	AUTUMN	SPRING
NI FORM						
NITRAPYR	5.62	3.43	6.46	3.68	5.56	3.45
SOD TRI	4.79	3.74	5.87	3.32	5.53	3.25

EXTRA	
AQ/A	5.84
AQ/S	4.60
AQ/A+	5.14
AQ/S+	2.68
UA/S	5.43
UA+ST3/S	4.82
-ST3/S	0.83
0	0.82
NC 250	3.49
NC 375	5.05
NC 500	4.57
MEAN	4.03

GRAND MEAN 4.29

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

TABLE	EXTRA	NI FORM	NI RATE	NI TIME
SED	0.496	0.203	0.248	0.203

TABLE	NI FORM NI RATE	NI FORM NI TIME	NI RATE NI TIME	NI FORM NI RATE NI TIME
SED	0.351	0.286	0.351	0.496

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77/W/G/1 STACKYARD II (W)

2ND CUT (20/7/77) DRY MATTER TONNES/HECTARE

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

NI RATE	1	2	3	MEAN
NI FORM				
NITRAPYR	1.22	1.06	0.91	1.06
SOD TRI	1.30	1.15	1.40	1.28
MEAN	1.26	1.10	1.16	1.17

NI TIME	AUTUMN	SPRING	MEAN
NI FORM			
NITRAPYR	1.02	1.10	1.06
SOD TRI	1.23	1.33	1.28
MEAN	1.13	1.22	1.17

NI TIME	AUTUMN	SPRING	MEAN
NI RATE			
1	1.29	1.22	1.26
2	1.09	1.12	1.10
3	1.00	1.31	1.16
MEAN	1.13	1.22	1.17

NI RATE	1		2		3	
NI TIME	AUTUMN	SPRING	AUTUMN	SPRING	AUTUMN	SPRING
NI FORM						
NITRAPYR	1.19	1.24	1.06	1.05	0.81	1.02
SOD TRI	1.40	1.19	1.12	1.18	1.18	1.61

EXTRA	
AQ/A	1.24
AQ/S	1.13
AQ/A+	1.11
AQ/S+	1.37
UA/S	1.38
UA+ST3/S	1.63
-ST3/S	0.12
0	0.16
NC 250	1.48
NC 375	1.92
NC 500	1.80
MEAN	1.27

GRAND MEAN 1.22

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

TABLE	EXTRA	NI FORM	NI RATE	NI TIME
SED	0.221	0.090	0.111	0.090

TABLE	NI FORM NI RATE	NI FORM NI TIME	NI RATE NI TIME	NI FORM NI RATE NI TIME
SED	0.156	0.128	0.156	0.221

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77/W/G/1 STACKYARD II (W)

3RD CUT (27/9/77) DRY MATTER TONNES/HECTARE

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

NI RATE	1	2	3	MEAN
NI FORM				
NITRAPYR	1.44	1.35	1.58	1.46
SOD TRI	1.34	1.36	1.35	1.35
MEAN	1.39	1.35	1.46	1.40

NI TIME	AUTUMN	SPRING	MEAN
NI FORM			
NITRAPYR	1.81	1.10	1.46
SOD TRI	1.79	0.90	1.35
MEAN	1.80	1.00	1.40

NI TIME	AUTUMN	SPRING	MEAN
NI RATE			
1	1.94	0.85	1.39
2	1.75	0.95	1.35
3	1.71	1.21	1.46
MEAN	1.80	1.00	1.40

NI RATE	1		2		3	
NI TIME	AUTUMN	SPRING	AUTUMN	SPRING	AUTUMN	SPRING
NI FORM						
NITRAPYR	1.92	0.97	1.68	1.01	1.82	1.33
SOD TRI	1.95	0.73	1.82	0.89	1.60	1.09

EXTRA	
AQ/A	1.72
AQ/S	1.17
AQ/A+	1.25
AQ/S+	1.44
UA/S	1.43
UA+ST3/S	1.60
-ST3/S	0.04
0	0.07
NC 250	3.12
NC 375	3.55
NC 500	3.65
MEAN	1.88

GRAND MEAN 1.64

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

TABLE	EXTRA	NI FORM	NI RATE	NI TIME
SED	0.310	0.126	0.155	0.126

TABLE	NI FORM NI RATE	NI FORM NI TIME	NI RATE NI TIME	NI FORM NI RATE NI TIME
SED	0.219	0.179	0.219	0.310

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77/W/G/1 STACKYARD II (W)

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

NI RATE	1	2	3	MEAN
NI FORM				
NITRAPYR	7.19	7.47	7.00	7.22
SOD TRI	6.90	7.10	7.14	7.05
MEAN	7.04	7.29	7.07	7.13

NI TIME	AUTUMN	SPRING	MEAN
NI FORM			
NITRAPYR	8.71	5.73	7.22
SOD TRI	8.42	5.67	7.05
MEAN	8.56	5.70	7.13

NI TIME	AUTUMN	SPRING	MEAN
NI RATE			
1	8.44	5.65	7.04
2	9.00	5.57	7.29
3	8.26	5.88	7.07
MEAN	8.56	5.70	7.13

NI RATE	1		2		3	
NI TIME	AUTUMN	SPRING	AUTUMN	SPRING	AUTUMN	SPRING
NI FORM						
NITRAPYR	8.73	5.64	9.20	5.75	8.19	5.80
SOD TRI	8.15	5.66	8.80	5.39	8.32	5.96

EXTRA	
AQ/A	8.80
AQ/S	6.90
AQ/A+	7.50
AQ/S+	5.49
UA/S	8.25
UA+ST3/S	8.06
-ST3/S	0.99
0	1.05
NC 250	8.08
NC 375	10.52
NC 500	10.02
MEAN	7.18

GRAND MEAN 7.16

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

TABLE	EXTRA	NI FORM	NI RATE	NI TIME
SED	0.640	0.261	0.320	0.261

TABLE	NI FORM NI RATE	NI FORM NI TIME	NI RATE NI TIME	NI FORM NI RATE NI TIME
SED	0.452	0.369	0.452	0.640

https://doi.org/10.23637/ERADOC-1-29

77/W/G/1 STACKYARD II (W)

1ST CUT (30/5/77) DRY MATTER TONNES/HECTARE

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

STRATUM	DF	SE	CV%
BLOCK.WP	24	0.496	11.6

1ST CUT MEAN DM% 24.6

1ST CUT PLOT AREA HARVESTED 0.00085

2ND CUT (20/7/77) DRY MATTER TONNES/HECTARE

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

STRATUM	DF	SE	CV%
BLOCK.WP	24	0.221	18.1

2ND CUT MEAN DM% 32.0

2ND CUT PLOT AREA HARVESTED 0.00104

3RD CUT (27/9/77) DRY MATTER TONNES/HECTARE

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

STRATUM	DF	SE	CV%
BLOCK.WP	24	0.310	18.8

3RD CUT MEAN DM% 24.3

3RD CUT PLOT AREA HARVESTED 0.00104

TOTAL OF 3 CUTS DRY MATTER TONNES/HECTARE

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

STRATUM	DF	SE	CV%
BLOCK.WP	24	0.640	8.9

TOTAL OF 3 CUTS MEAN DM% 27.0

https://doi.org/10.23637/ERADOC-1-29