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68/C/26 Nitrogen Fixation by Lucerne - Lucerne and Grass

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68/c/26.1

N FIXATION - LUCERNE AND GRASS

(EBN and WEBO)

Nitrogen fixation by lucerne - Rothamsted (R) Pastures and Woburn (W) Stackyard B, 1968, the first year.

Design: 4 blocks of 4 plots split into 4 for minerals and nitrogen with certain high order interactions confounded with blocks.

Area of each sub-plot: 0.0011. Area harvested: 0.0006.

Treatments: All combinations of:-

- Whole plots: 1. Seed: Lucerne uninoculated (O), lucerne with ineffective inoculum (I), lucerne with effective inoculum (E), Italian ryegrass (G).
- Sub-plots: 2. Minerals: Unmanured (U), 0.6 cwt P₂O₅, 1.2 cwt K₂O as compound fertiliser (0:14:28), plus 4 tons of ground chalk (3 tons on Stackyard B (W)) (M).
3. Nitrogen as 'Nitro-Chalk': None (NO), 30 (N1), 60 (N2), 90 (N3) lb N in the seedbed and after each cut except the last.

Basal applications (Pastures (R) only): Weedkiller: Paraquat at 0.75 lb ion in 37 gals.

Cultivations, etc.:-

Pastures (R): Weedkiller applied: 3 Oct, 1967. Ploughed: 29 Oct. PK, ground chalk and seedbed 'Nitro-Chalk' applied: 28 Mar, 1968. Seed drilled, lucerne at 12 lb, ryegrass at 30 lb: 1 Apr. Cut 3 times: 18 July, 26 Aug, 16 Oct. 'Nitro-Chalk' applied after first 2 cuts. Varieties: Lucerne - Du Puits, ryegrass - S22.

Stackyard B (W): Subsoiled: 27 Sept, 1967. Ploughed: 11 Oct. PK, ground chalk and seedbed 'Nitro-Chalk' applied: 26 Mar, 1968. Seed drilled, lucerne at 12 lb, ryegrass at 30 lb: 27 Mar. Seed re-drilled at same rates because of poor establishment of first drilling: 26 Apr. Cut 3 times: 23 July, 30 Aug, 24 Oct. 'Nitro-Chalk' applied after first 2 cuts. Varieties: Lucerne - Du Puits, ryegrass - S22.

- NOTES: (1) Soil samples were taken before sowing to determine pH and for counts of *Rhizobium leguminosarum*.
- (2) On Stackyard Series B (W) there was flooding of the experiment at the end of April and beginning of May, and also in September.

68/c/26.2

Standard errors per plot. Dry matter:

Rothamsted (Pastures) (R):

1st cut:	Whole plot:	2.34	or	11.0%	(6 d.f.)
	sub plot:	1.88	or	8.9%	(24 d.f.)
2nd cut:	Whole plot:	1.31	or	6.4%	(6 d.f.)
	Sub plot:	1.92	or	9.3%	(24 d.f.)
3rd cut:	Whole plot:	1.43	or	11.8%	(6 d.f.)
	Sub plot:	1.13	or	9.3%	(24 d.f.)
Total of 3 cuts:	Whole plot:	4.09	or	7.6%	(6 d.f.)
	Sub plot:	3.63	or	6.7%	(24 d.f.)

Woburn (Stackyard B) (W):

1st cut:	Whole plot:	2.92	or	15.7%	(6 d.f.)
	Sub plot:	3.04	or	16.4%	(24 d.f.)
2nd cut:	Whole plot:	1.03	or	8.4%	(6 d.f.)
	Sub plot:	2.33	or	18.9%	(24 d.f.)
3rd cut:	Whole plot:	0.90	or	10.2%	(6 d.f.)
	Sub plot:	0.94	or	10.6%	(24 d.f.)
Total of 3 cuts:	Whole plot:	3.11	or	7.8%	(6 d.f.)
	Sub plot:	4.97	or	12.5%	(24 d.f.)

68/c/26.3

SUMMARY OF RESULTS

DRY MATTER

	O	I	E	G	Mean
PASTURES (R)					
1ST CUT					
Mean (± 1.17)	16.7	17.6	21.5	28.7	21.1
		(1) and (2)			(± 0.33)
U	16.7	16.7	18.9	29.3	20.4
M	16.7	18.4	24.2	28.0	21.9
		(3) and (4)			(± 0.47)
NO	9.2	11.2	19.3	16.5	14.0
N1	14.9	15.1	20.8	26.9	19.4
N2	20.1	20.5	22.6	32.8	24.0
N3	22.6	23.5	23.6	38.5	27.1

Mean D.M. %: 20.3

- (1) (± 1.26) (3) (± 1.42) For use in horizontal and diagonal comparisons only
 (2) (± 0.67) (4) (± 0.94) For use in vertical and interaction comparisons only

68/c/26.4

	DRY MATTER				
	O	I	E	G	Mean
	PASTURES (R)				
	2ND CUT				
Mean (± 0.66)	18.9	18.1	22.5	23.2	20.7
	(1) and (2)				(± 0.34)
U	17.9	17.2	21.1	23.8	20.0
M	19.9	19.1	24.0	22.5	21.4
	(3) and (4)				(± 0.48)
N0	10.5	9.2	19.8	9.4	12.2
N1	17.9	15.2	22.6	21.4	19.3
N2	22.3	22.7	24.8	28.0	24.4
N3	24.8	25.3	22.8	33.9	26.7

Mean D.M. %: 16.9

- (1) (± 0.81) (3) (± 1.06) For use in horizontal and diagonal comparisons only
 (2) (± 0.68) (4) (± 0.96) For use in vertical and interaction comparisons only

68/c/26.5

DRY MATTER					
	O	I	E	G	Mean
PASTURES (R)					
3RD CUT					
Mean (± 0.72)	10.3	9.5	11.9	16.8	12.1
	(1) and (2)				(± 0.20)
U	9.4	9.0	10.9	16.9	11.6
M	11.3	9.9	12.9	16.7	12.7
	(3) and (4)				(± 0.28)
NO	6.7	5.3	10.4	7.6	7.5
N1	10.1	8.1	11.5	17.0	11.7
N2	11.2	11.3	13.0	20.7	14.1
N3	13.3	13.2	12.8	21.9	15.3

Mean D.M. %: 15.5

- (1) (± 0.77) (3) (± 0.87) For use in horizontal and diagonal comparisons only
 (2) (± 0.40) (4) (± 0.57) For use in vertical and interaction comparisons only

68/c/26.6

	DRY MATTER				
	O	I	E	G	Mean
	PASTURES (R)				
	TOTAL OF 3 CUTS				
Mean (± 2.04)	45.9	45.2	56.0	68.7	53.9
	(1) and (2)				(± 0.64)
U	44.0	42.9	50.8	70.1	52.0
M	47.9	47.4	61.1	67.2	55.9
	(3) and (4)				(± 0.91)
NO	26.5	25.7	49.4	33.4	33.8
N1	43.0	38.4	54.9	65.3	50.4
N2	53.6	54.5	60.4	81.6	62.5
N3	60.7	62.0	59.1	94.3	69.0

Mean D.M. %: 17.6

- (1) (± 2.24) (3) (± 2.58) For use in horizontal and diagonal comparisons only
 (2) (± 1.28) (4) (± 1.81) For use in vertical and interaction comparisons only

68/c/26.7

DRY MATTER					
	O	I	E	G	Mean
STACKYARD B (W)					
1ST CUT					
Mean (± 1.46)	14.2	13.2	18.8	28.1	18.6
	(1) and (2)				(± 0.54)
U	14.1	11.7	16.0	29.3	17.8
M	14.3	14.7	21.5	27.0	19.4
	(3) and (4)				(± 0.76)
N0	7.9	7.6	14.5	8.8	9.7
N1	14.0	13.6	19.7	20.5	17.0
N2	16.0	13.8	20.3	32.9	20.8
N3	18.8	17.7	20.5	50.3	26.8

Mean D.M. %: 20.4

- (1) (± 1.65) (3) (± 1.97) For use in horizontal and diagonal comparisons only
 (2) (± 1.08) (4) (± 1.52) For use in vertical and interaction comparisons only

68/c/26.8

	DRY MATTER				
	O	I	E	G	Mean
	STACKYARD B (W)				
	2ND CUT				
Mean (± 0.51)	11.2	11.5	13.5	13.0	12.3
	(1) and (2)				(± 0.41)
U	10.3	10.6	12.7	12.4	11.5
M	12.2	12.4	14.4	13.6	13.1
	(3) and (4)				(± 0.58)
NO	5.4	6.0	9.6	2.3	5.8
N1	11.4	10.9	13.9	11.2	11.9
N1	11.9	13.0	15.6	18.4	14.7
N3	16.2	16.0	15.0	20.1	16.8

Mean D.M. %: 16.2

- (1) (± 0.78) (3) (± 1.13) For use in horizontal and diagonal comparisons only
- (2) (± 0.82) (4) (± 1.16) For use in vertical and interaction comparisons only

68/C/26.9

	DRY MATTER				Mean
	O	I	E	G	
	STACKYARD B (W)				
	3RD CUT				
Mean (± 0.45)	6.7	6.5	7.4	14.6	8.8
	(1) and (2)				(± 0.17)
U	6.9	6.4	7.5	14.9	8.9
M	6.5	6.7	7.3	14.3	8.7
	(3) and (4)				(± 0.23)
N0	3.0	3.8	6.2	2.5	3.9
N1	6.0	6.7	7.6	14.2	8.6
N2	8.4	7.7	8.2	19.1	10.8
N3	9.5	8.0	7.6	22.7	11.9

Mean D.M. %: 17.2

(1) (± 0.51) (3) (± 0.61) For use in horizontal and diagonal comparisons only

(2) (± 0.33) (4) (± 0.47) For use in vertical and interaction comparisons only