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74/R/CS/149 and 74/W/CS/149 Liquid Fertilisers - Potatoes

74/R/CS/149 and 74/W/CS/149 Liquid Fertilisers - Potatoes, Rothamsted Research (1975) Yields Of The Field Experiments 1974, pp 272 - 277 - DOI: <https://doi.org/10.23637/ERADOC-1-119>

74/R/CS/149 and 74/W/CS/149

LIQUID FERTILISERS

Object: To study the effects of a range of rates and methods of applying liquid fertilisers on the quality and yield of potatoes - Rothamsted (R), Geescroft and Woburn (W) Lansome III.

Sponsors: F.V. Widdowson, A. Penny.

The first year, potatoes.

Design: 3 randomised blocks of 24 plots.

Whole plot dimensions: Geescroft (R): 4.27 x 15.2. Lansome III (W): 4.27 x 12.2. Area harvested: Geescroft (R) - 0.00217, Lansome III (W) - 0.00173.

Treatments: All combinations of:-

- | | |
|---|---------|
| 1. Form and method of applying fertiliser: | APPLICN |
| Granules, broadcast over the plough furrow | GB |
| Liquid fertiliser, sprayed onto the plough furrow | LS |
| Liquid fertiliser placed in hands on each side of the seed | LP |
| Liquid fertiliser divided, 2/3 onto the plough furrow, 1/3 placed on each side of the seed | LSP |
| 2. Rate of nitrogen and phosphorus fertiliser (kg N and kg P ₂ O ₅): | NP RATE |
| 188 | N2 P2 |
| 282 | N3 P3 |
| 377 | N4 P4 |
| 3. Ratio of potassium rate to nitrogen and phosphorus rate: | K RATIO |
| N:P ₂ O ₅ :K ₂ O = 1:1:1 | 1.0 |
| N:P ₂ O ₅ :K ₂ O = 1:1:1.5 | 1.5 |

Basal applications:-

Geescroft (R): Weedkillers: Linuron at 1.2 kg plus paraquat at 0.42 kg ion in 450 l. Fungicide and insecticide: Mancozeb at 1.3 kg plus demeton-s-methyl at 0.25 kg in 450 l. Fungicide: Mancozeb at 1.3 kg in 450 l.

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Lansome III (W): Weedkillers: Linuron at 1.2 kg plus paraquat at 0.28 kg ion in 280 l. Fungicide and insecticide: Mancozeb at 1.3 kg plus demeton-s-methyl at 0.25 kg in 450 l. Fungicide: Mancozeb at 1.3 kg in 450 l.

Seed: Geescroft (R) and Lansome III (W): Pentland Crown.

Cultivations, etc.:-

Geescroft (R): Ploughed: 16 Oct, 1973. Spring-tine cultivated, treatments applied: 16 Apr, 1974. Treatments applied, rotary cultivated, potatoes planted: 23 Apr. Weedkiller applied: 17 May. Grubbed: 20 June. Rotary ridged: 22 June. Fungicide with insecticide applied: 11 July. Fungicide applied: 2 Aug. Haulm mechanically destroyed: 16 Sept. Sprayed with undiluted BOV at 220 l: 17 Sept. Lifted: 22 Oct. Previous crops: Barley 1972, fallow 1973.

Lansome III (W): Subsoiled, tines 140 cm apart, 50 cm deep: 12 Nov, 1973. Ploughed: 14 Dec. Spring-tine cultivated: 10 Apr. Plough furrow treatments applied: 18 Apr. Rotary cultivated, potatoes planted, placed treatments applied: 19 Apr. Weedkiller applied: 16 May. Rotary ridged: 12 June. Fungicide with insecticide applied: 18 July. Fungicide applied: 7 Aug. Haulm mechanically destroyed: 16 Sept. Sprayed with undiluted BOV at 170 l: 18 Sept. Lifted: 23 Oct. Previous crops: Barley 1972, beans 1973.

- NOTES: (1) Leaf and haulm samples were taken for N, P, K and Mg analyses.
(2) Lansome III (W): One plot APPLICN - GB, NP RATE - N₄P₄, K RATIO - 1.5 had many fewer plants because of cloddiness of soil. An estimated value was used in the analysis.
(3) Lansome III (W): There was evidence of a fertility trend across the site and yields adjusted for trend are presented.

Standard errors per plot. Total tubers, tonnes/hectare.

Geescroft (R): 4.63 or 7.1% (46 d.f.)
Lansome III (W): 4.50 or 6.4% (44 d.f.)

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TABLES OF MEANS

GEESCROFT (R)

TOTAL TUBERS: TONNES/HECTARE

APPLICN	NP RATE			K RATIO		Mean
	N2 P2	N3 P3	N4 P4	1.0	1.5	
GB	67.6	67.6	69.8	66.6	70.1	68.4
LS	66.3	66.6	62.8	65.0	65.4	65.2
LP	63.1	63.5	58.5	61.0	62.5	61.7
LSP	70.0	66.3	64.0	65.8	67.7	66.8
	NP RATE					
			N2 P2	65.4	68.1	66.7
			N3 P3	65.0	67.1	66.0
			N4 P4	63.5	64.0	63.8
Mean				64.6	66.4	65.5

APPLICN	NP RATE		K RATIO		Mean
	N2 P2	1.5	1.0	1.5	
GB	65.3	70.0	67.7	67.5	66.8
LS	65.7	66.8	63.4	69.8	66.1
LP	61.4	64.9	63.1	63.9	58.4
LSP	69.2	70.8	65.6	67.0	62.7

STANDARD ERRORS OF DIFFERENCES

APPLICN	NP RATE	K RATIO	APPLICN NP RATE	APPLICN K RATIO	NP RATE K RATIO	APPLICN NP RATE K RATIO
	1.54	1.34	1.09	2.67	2.18	1.89
						3.78

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GEESCROFT (R)

PERCENTAGE WARE: 4.44 CM (1.75 INCH) RIDDLE

APPLICN	NP RATE			K RATIO		Mean
	N2 P2	N3 P3	N4 P4	1.0	1.5	
GB	96.6	96.0	95.8	96.1	96.2	96.1
LS	95.6	95.8	94.8	95.3	95.5	95.4
LP	97.1	96.1	97.1	96.4	97.1	96.8
LSP	95.3	95.3	95.9	95.2	95.8	95.5
			NP RATE			
			N2 P2	96.0	96.2	96.1
			N3 P3	95.6	96.0	95.8
			N4 P4	95.6	96.1	95.9
Mean				95.8	96.1	95.9
NP RATE	N2 P2		N3 P3		N4 P4	
K RATIO	1.0	1.5	1.0	1.5	1.0	1.5
APPLICN						
GB	96.8	96.4	96.3	95.7	95.1	96.5
LS	96.0	95.2	95.5	96.1	94.4	95.2
LP	96.9	97.3	95.3	96.9	97.1	97.1
LSP	94.5	96.0	95.3	95.4	95.9	95.8

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LANSOME III (W)

TOTAL TUBERS: TONNES/HECTARE

APPLICN	NP RATE		N4 P4	K RATIO		Mean
	N2 P2	N3 P3		1.0	1.5	
GB	67.4	73.3	76.3	71.9	72.8	72.4
LS	63.4	64.4	75.6	66.2	69.4	67.8
LP	67.2	71.7	74.7	69.5	72.9	71.2
LSP	69.1	73.4	69.4	68.6	72.7	70.6
			NP RATE			
			N2 P2	65.8	67.8	66.8
			N3 P3	68.4	73.0	70.7
			N4 P4	73.0	75.0	74.0
Mean				69.1	71.9	70.5

APPLICN	NP RATE		K RATIO		N4 P4	Mean
	1.0	1.5	1.0	1.5		
GB	67.4	67.4	70.1	76.6	78.3	74.4
LS	61.4	65.4	62.4	66.4	74.9	76.4
LP	67.1	67.4	68.5	74.9	72.9	76.4
LSP	67.1	71.1	72.7	74.0	66.0	72.9

STANDARD ERRORS OF DIFFERENCES

APPLICN	NP RATE	K RATIO	APPLICN NP RATE	APPLICN K RATIO	NP RATE K RATIO	APPLICN NP RATE K RATIO
	1.52	1.33	2.62	2.16	1.85	3.71

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LANSOME III (W)

PERCENTAGE WARE: 4.44 CM (1.75 INCH) RIDDLE

APPLICN	NP RATE			K RATIO		Mean
	N2 P2	N3 P3	N4 P4	1.0	1.5	
GB	93.8	95.9	96.7	95.8	95.1	95.5
LS	93.1	95.2	95.8	94.1	95.3	94.7
LP	96.0	96.3	96.2	95.8	96.6	96.2
LSP	92.8	95.8	96.6	95.2	95.0	95.1
			NP RATE			
			N2 P2	93.8	94.1	93.9
			N3 P3	95.7	95.9	95.8
			N4 P4	96.1	96.5	96.3
Mean				95.2	95.5	95.3
NP RATE	N2 P2		N3 P3		N4 P4	
K RATIO	1.0	1.5	1.0	1.5	1.0	1.5
APPLICN						
GB	94.5	93.1	95.8	96.1	97.0	96.3
LS	91.7	94.5	95.4	94.9	95.2	96.4
LP	96.4	95.7	95.5	97.2	95.4	97.0
LSP	92.5	93.1	96.1	95.4	96.8	96.4