1982

Trace element nutrition.

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DEPARTMENT OF AGRICULTURE

WESTERN AUSTRALIA

EXPERIMENTAL RESULTS 1982

TRACE ELEMENT NUTRITION

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1. LONG TERM COPPER TRIAL - NEWDEGATE RESEARCH STATION
66 N 14

Block 3 was cropped to Clipper barley in 1981 in accordance with the one crop: three clover pasture. Copper was originally applied to Block 3 in 1969. Within each two hectare plot of Block 3 a small trial of four treatments and two replicates was sown to determine the response to 1981 copper applications.

Basals: Urea 40 kg/ha
Superphosphate 150 kg/ha
Clipper barley 45 kg/ha

Table 1 - Effect of 1981 copper application on grain yield (t ha^{-1}) and copper concentration in the youngest emerged blade (Y.E.B. ppm) of barley on areas which had different rates of copper applied in 1969.

Copper Sulphate Applied in 1969 (kg ha^{-1})	Copper Sulphate (kg ha^{-1}) applied in 1981							
	0		2.75		5.5		8.25	
	Grain Yield	Cu Y.E.B.	Grain Yield	Cu Y.E.B.	Grain Yield	Cu Y.E.B.	Grain Yield	Cu Y.E.B.
0	0.3	0.9	0.7	1.5	0.8	1.8	0.8	1.7
2.75	1.0	2.4	1.1	3.0	1.0	3.1	1.1	3.5
5.50	1.2	3.9	1.3	4.1	1.2	4.1	1.2	4.4
8.25	1.2	4.7	1.2	5.2	1.3	5.5	1.2	5.2
11.00	1.2	4.7	1.2	5.0	1.2	4.8	1.2	5.2
11.00 + 0.5 per annum	1.2	6.2	1.2	6.2	1.1	6.5	1.3	6.5

Y.E.B.'s sampled at 6 - 7 leaf stage

Table 1 illustrates:

(i) A grain yield response to 1981 applied copper on the 1969 plot.

(ii) The highest rate of Cu (8.25) on the nil Cu plot was insufficient to raise grain yields to the same level as where 2.75 kg ha^{-1} $CuSO_4$ was applied in 1969. This is reflected in the critical Cu concentrations found in the Y.E.B.'s. The values obtained in the nil plot ranged from deficient (0.9 ppm for no applied Cu) to low (1.7 ppm for 8.25 kg ha^{-1} $CuSO^4$); whereas the value obtained for the 2.75 kg ha^{-1} $CuSO_4$ level applied in 1969 was adequate, (2.4 ppm).

(iii) 2.75 kg ha^{-1} $CuSO_4$ applied in 1969 was still sufficient for maximum grain yields in 1981.

The low availability of copper drilled with the crop can be explained by limited contact between wheat roots capable of absorbing copper and the discrete grains of fertiliser copper in a band containing only a small proportion of the roots.

The 1982 grain yield results are uninterpretive due to missing plots and three harvesting times, and are therefore not shown. The tissue analyses for this year are as yet unavailable.

2. RATES OF COPPER AND METHODS OF APPLICATION ON NEW LAND

82 ME 43 / 2247 EX

Aims:

(i) To determine how much extra copper is required to overcome the first year problem of poor copper availability.

(ii) To compare the response of wheat to the commercial wet mix and the D of A mix.

(iii) To compare foliar applied $CuSO_4$, Cu-chelate and drilled $CuSO_4$ and Cu - OSP mixes.

Location: M. Sedgewick - Mt Walker

Soil: Virgin Yellow brown gravelly sandy loam

Sown: May 24, 1982

Basals: Urea T.D. 52 kg ha^{-1}
Gamenya 44 kg ha^{-1}

Table 2 - Grain yield (t ha^{-1}) of wheat with varying Cu treatments.

TR	Rate of $CuSO_4 . 5H_2O$ (kg ha^{-1})				Yield (t ha^{-1})	% Maximum
	Drilled	Soil Spray	No. Cultivants	Foliar Spray		
1.	6.6	-	-	-	1.74	82
2.	9.9	-	-	-	1.76	84
3.	13.2	-	-	-	1.72	81
4.	6.6	-	-	0.41 (1)	2.08	98
5.	6.6	-	-	0.82 (1)	2.05	96
6.	6.6	-	-	1.65 (1)	2.13	100
7.	-	-	-	-	0.46	21
8.	6.6	-	-	-	1.88	88
9.	13.2	-	-	-	1.96	92
10.	-	-	-	0.82 (1)	1.97	92
11.	-	-	-	1.65 (1)	1.98	93
12.	-	-	-	0.14 (2)	1.67	79
13.	-	-	-	0.42 (2)	1.98	93
14.	-	-	- (3)		0.33	16
15.	-	6.6	1 (3)		1.49	70
16.	-	6.6	2 (3)		1.88	88
17.	-	6.6	4 (3)		1.86	87

TR 1 - 6 : Sown with Super - Cu, Zn, Mo No. 1 247 kg ha^{-1}
7 - 17: Sown with Super (245) + ZnO (2) + MoO_3 (0.18)

(1) As Cu $SO_4.5H_2O$ (25.4% Cu)

(2) As chelated copper (14% Cu) with rates (250 at 750 g) given as equivalent rates of $CuSO_4.5H_2O$.

(3) All these plots were cultivated 4 times, the last being the seed operation.

Analyses for Cu uptakes and concentrations in Y.E.B. are unavailable at this time.

Results indicate:

(1) The site was severely copper deficient. Where no copper was supplied grain yield was restricted to about 20% (400 kg ha^{-1}) of the best treatments (2 t ha^{-1}).

(2) Wheat sown with only super - Cu, Zn, Mo, No. 1 yielded 80% of the highest yielding treatment. Drilling additional $CuSO_4$ with the No. 1 mix did not improve grain yields.

(3) The highest yielding treatment was the No. 1 mix with a subsequent foliar spray of 1.65 kg $CuSO_4$ ha^{-1} (2.1% $CuSO_4$ solution sprayed at 80 L ha^{-1}). Lower rates of foliar applied copper (down to 0.4 kg $CuSO_4$ ha^{-1}) did not result in very much lower yields.

(4) Foliar applications of copper alone, without copper in the drilled fertilizer, did not achieve the same grain yields as both drilled and subsequent foliar applications of copper.

(5) Copper sprayed onto the soil prior to sowing was made more effective by cultivating prior to seeding.

(6) The high rate of chelated copper was equivalent in grain yield to $CuSO_4$ as a foliar spray.

3. WHEAT RESPONSE TO ZINC RATES
81 MO 8 / 4035 EX

Aim: To measure the response of wheat to zinc applied with super and zinc sprayed on the soil immediately before seeding on this site which produced zinc deficient plants in 1980.

Soil: Grey clay loam, calcareous sub-soil
Surface pH 8.8

Location: G. Crane - Gabalong

Basals:

1981 - Urea 50 kg ha^{-1} T.D.
Plain super 100 kg ha^{-1}
Miling wheat 47 kg ha^{-1}

1982 - DAP 73 kg ha^{-1} T.D.
Gamenya Wheat 48 kg ha^{-1}

Table 3 The effect of zinc fertilisers on grain yields (t ha^{-1}) and Zn concentrations in Y.E.B. (ppm) in 1981 and 1982.

Treatment 1981	Grain (t ha^{-1}) 1981	Zn Y.E.B. (ppm) 1981	Grain (t ha^{-1}) 1982
1. Nil Zn	1.48	14	1.26
2. Nil Zn	1.51	-	1.21
3. Nil Zn	1.52	-	1.23
4. Nil Zn	1.48	-	1.28
5. ZnO 1 kg ha^{-1}	1.71	15	1.35
6. ZnO 2 kg ha^{-1}	1.75	15	1.32
7. ZnO 4 kg ha^{-1}	1.79	15	1.52
8. ZnO 6 kg ha^{-1}	1.86	16	1.36
9. $ZnSO_4$ (3.5 kg ha^{-1})	1.72	15	1.28
10. $ZnSO_4$ (7.0 kg ha^{-1})	1.81	14	1.44

TRS 9 - 10 sprayed immediately before seeding

Y.E.B. sampled stage 7 - 8 : second node formed.

Chemical analyses of Zn concentrations in the Y.E.B.'s in 1982 are unavailable at this time.

4. ZINC, SULPHUR, COPPER RESIDUAL WITH HIGH ANALYSIS NP FERTILISER FOR WHEAT
78 LG 27 / 2247 EX

Aim: To measure any decline in effectivneess of Cu, Zn, S on this soil type using DAP fertiliser.

Location: G. Cugley - S.W. Newdegate

Soil: Yellow brown sandy loam

Table 4 - Grain yields (t ha^{-1}) for wheat at S.W. Newdegate (78 LG 27).

No.	BASAL P-N	1978 TR	1982 TR	1982 Grain t ha^{-1}
1		Cu + Zn	Zn	2.20
2	S Residual	Cu + Zn + S	Zn	0.99
3	All DAP	Cu + Zn	Zn + S	0.97
4		Cu + Zn	Zn	1.79
5		Cu + S	S	2.04
6		Cu + S + Zn	S	2.07
7	Zn Residual	Cu + S	S + Zn	2.17
8	All DAP	Cu + S	S	1.20
9		Cu + S	S	2.15
10		Cu + S	S	1.29
11		Zn + S	Zn + S	1.72
12	Cu Residual	Zn + S + Cu	Zn + S	1.13
13	All DAP	Zn + S	Zn + S + Cu	2.16
14		Zn + S	Zn + S	2.22
15		Zn + S	Zn + S	2.19
16	DAP	-	-	2.33
17	+ T.E.	Cu	-	1.46
18		Cu + Zn	-	1.54
19	Super/Agran	-	-	2.31
20	+ T.E.	Cu	-	2.28
21		Cu + Zn	-	1.48

Chemical analyses of the Y.E.B.'s are unavailable at this time.

The trial commenced in 1978, with 1982 being the second crop on this soil type. The trial allows for future applications of Cu, Zn and S, and will need to be carried out before any statements can be made about the residual effectiveness of Cu, Zn and S; on this soil type using high analysis NP fertiliser (D.A.P.). This fertiliser is used in this trial (and others) as chemical analysis has shown that Cu, Zn and S are in much lower concentration as a contaminate than in Super. The contaminate component of a fertiliser is thought to be an important factor in determining the residual effectiveness of Copper, Zinc and Sulphur.

5. MANGANESE RESIDUAL ON LUPINS
78 Ba 26 / 3074 EX

Aim: To measure the residual effect of manganese sulphate application for sweet lupins at this site.

Location: Badgingarra Research Station

Soil: Deep grey sand

Table 5 - Lupin Yields (t ha^{-1}) Harvested November 23, 1982.

$MnSo_4$ kg ha^{-1}	Year Applied 1978	1982
NIL	1220	-
15	2061	2166
30	2195	2014
60	1982	-

Results illustrate:

(i) Grain response to manganese up to 15 kg ha^{-1} drilled $MnSO_4$.

(ii) Manganese applied at 15 and 30 kg ha^{-1} $MnSO_4$ in 1978 yield as much grain as equivalent amounts applied in 1982.

(iii) 15 kg ha^{-1} $MnSO_4$ applied in 1978 was still sufficient for maximum grain yields in 1982.

Table 6 - Manganese concentration (ppm) in whole tops of lupins at early flowering.

$MnSO_4$ kg ha^{-1}	Year Applied 1978	1982
NIL	34	-
15	80	81
30	140	112
60	120	-

Results illustrate:

(i) The Nil plot which has a low grain yield also has a marginal manganese concentration.

(ii) The manganese concentrations are adequate in the lupins having received $MnSO_4$ in 1978 or 1982.

(iii) The manganese concentrations in the lupins fertilised in 1978 are similar to those fertilised in 1982 in the respective $MnSO_4$ rates of 15 and 30 kg ha^{-1}.

6. <u>MANGANESE ON WHEAT</u>
82 No 8 / 1509 EX

Aim: To determine the response of a wheat crop to manganese and nitrogen fertilizers on a manganese deficient site.

Location: C. Wilkes - Konnongorring

Soil: Brown gravelly sand

Sown: June 10, 1982

Table 7 Wheat yields (t ha^{-1}) harvested November 29, 1982.

	Treatment	Grain (t ha^{-1})
1.	Super (170)	0.34
2.	Super (170) + $MnSO_4$ (15)	0.43
3.	Super (170) + $MnSO_4$ (30)	0.79
4.	Super (170) + S/A (167)	0.81
5.	Super (170) + S/A (167) + $MnSO_4$ (15)	0.99
6.	Super (170) + S/A (167) + $MnSO_4$ (30)	1.05
7.	AGRAS No. 1 (200)	0.60
8.	AGRAS No. 1 + $MnSO_4$ (15)	1.09
9.	AGRAS No. 1 + $MnSO_4$ (30)	1.09
10.	Super (170) + Urea T.D. (76)	0.38
11.	Super (170) + Urea T.D. (76) + $MnSO_4$ (15)	0.82
12.	Super (170) + Urea T.D. (76) + $MnSO_4$ (30)	0.68
13.	Super (170) + Urea T.D. (76) + $MnSO_4$ (4) Sprayed	0.54

- Rates of fertilizers in kg ha^{-1}
- Urea T.D. after seeding
- Manganese spray applied August 5, 1982 (Tillering) 4 kg ha^{-1} in 100 L water

Chemical analyses for Mn concentrations are unavailable at this time.

Results indicates:

(i) A grain yield response to manganese and nitrogen

(ii) The manganese spray was a failure.

Table 8 Economic comparison of treatments - compiled by T. Sweeney, Northam D.O.

Treatment	Grain Yield ($t\ ha^{-1}$)	Gross Return ($\$\ ha^{-1}$)	Treatment Cost ($\$\ ha^{-1}$)	Net Return ($\$\ ha^{-1}$)	Ranking	Net Return as % Treatment 1
1.	0.34	40.44	17.00	23.44	11	100
2.	0.43	51.52	22.31	29.41	9	125
3.	0.79	92.16	27.62	64.54	5	275
4.	0.81	96.72	37.00	59.72	6	252
5.	0.99	119.16	42.31	76.85	4	324
6.	1.05	125.88	47.62	78.26	3	334
7.	0.60	72.00	40.20	31.80	8	136
8.	1.09	130.56	45.51	85.05	1	363
9.	1.09	130.56	50.82	79.74	2	339
10.	0.38	45.00	42.14	2.86	13	12
11.	0.82	99.00	47.45	51.55	7	220
12.	0.68	81.00	52.76	28.24	10	120
13.	0.54	65.16	50.64	14.52	12	62

Assumptions: $/tonne

(1) Wheat 120
(2) Super 100
$MnSO_4$ 16.70 for 50 kg
Sulphate of Ammonia 120
Agras 1 201
Urea 265
$MnSO_4$ spray $3.50/ha
(3) Treatments 10, 11 and 12 have $5 added to their cost for application expenses. Treatment 13 has $10 added to its cost (two extra passes).

Results Indicate:

(i) The highest yielding treatments are also the most economic, being the Agras and Manganese sulphate treatments. Along with Treatment 6 (Super, S/A, $MnSO_4$) they were the only treamtments to exceed 1 t ha^{-1}.

Conclusions:

(i) On a severely manganese deficient site the best fertiliser is agras No. 1 and manganese sulphate at rates of 200 kg/ha and 15 kg/ha respectively. This is on straight economic basis, as a visual assessment showed agras at the same rate and manganese sulphate at 30 kg/ha to be the superior treatment. Sulphate of Ammonia and manganese sulphate at 167 and 30 kg/ha looked better than the same fertilisers at 167 and 15 kg/ha.

(ii) With costs bordering on $50/ha for fertilisers a farmer may be reticent to take notice of these recommendations. Neveretheless the need for both manganese and nitrogen on this site was clearly established.

(iii) These results also support the addition of solid manganese fertiliser at the start of the season being more reliable than sprayed manganese sulphate later.

7. MANGANESE ON WHEAT, BARLEY, OATS, AND LUPINS

82 Br 4 / 1509 EX

Aim: To determine the response of varieties of wheat, barley, oats, and lupins to the application of manganese.

Location: G. Millar - Boyup Brook

Soil: Brown gravelly sand

Sown: June 25, 1982

Basals: Muriate of potash T.D. at 100 kg ha^{-1}
Superphosphate drilled at 300 kg ha^{-1}
Agran 34 T.D. at 120 kg ha^{-1} on cereals July 26, 1982

Cereals 50 kg ha^{-1}
Lupins 90 kg ha^{-1}, gum slurry inoculated

Manganese Treatment:
Cereals 15 kg $MnSO_4$ ha^{-1}
Lupins 30 kg $MnSO_4$ ha^{-1}

Table 9 Wheat, barley, oats and lupins grain yield (t ha^{-1}) response to manganese

Crop	Variety	-Mn	+Mn
Wheat	Egret	3.06	2.97
	Lance	3.01	2.95
Oats	West	2.43	2.57
	Moore	2.48	2.76
	Swan	2.42	2.55
	Hill	2.69	2.65
	Stout	2.20	2.22
Barley	Clipper	2.18	2.02
	Stirling	2.29	2.22
	Forrest	2.41	2.62
Lupins	Yandee	1.30	1.35
	Kiev	1.03	0.85

Chemical analyses for manganese concentrations are unavailable at this time.

8. MANGANESE, ZINC, MAGNESIUM, AND LIME ON WHEAT VARIETIES

82 Je 21 / 2247 EX

Aim: To determine the response of wheat varieties to Mn, Zn, and Mg at this site where low levels were found in plant samples in 1981.

Location: M. Smith - Needilup

Soil: Grey Gritty Sand

Basals: Super 200 kg ha^{-1}
Urea T.D. 50 kg ha^{-1}
Wheat 50 kg ha^{-1}

Table 10 Wheat grain yields (t ha^{-1}) harvested December 3, 1982

	Treatment	Grain Yield (t ha^{-1}) Gamenya	Egret
1.	-	1.20	1.09
2.	ZnO (1)	1.17	1.13
3.	ZnO (2)	1.16	1.15
4.	Lime (1)	1.21	1.20
5.	Lime (1) + $MnSO_4$ (15)	0.90	1.09
6.	Lime (1) + ZnO (1)	1.12	1.13
7.	Lime (1) + $MnSO_4$ (15) + ZnO (1)	1.03	0.94
8.	ZnO (1) + $MnSO_4$ (15) + $MgSO_4$ (100)	1.09	1.17
9.	Lime (1) + ZnO (1) + $MnSO_4$ (15) $MgSO_4$ (100)	1.08	0.90

ZnO, $MnSO_4$, and $MgSO_4$ in kg ha^{-1}
Lime in t ha^{-1}
Rep. I omitted - sparse and weedy

Chemical analyses for Zn, Mn and Mg are unavailable at this time.

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9. FOLIAR APPLICATION OF MOLYBDENUM TO WHEAT

82 Me 74 / 1213 EX

Aim: To determine the response of wheat to varying rates of foliar applied molybdenum and varying times of application.

Soil: Wodtil yellow brown sand

Location: K. Jones - Belka

Basals: Super - Cu - Zn A 225 kg ha^{-1}
Agran 34 100 kg ha^{-1}
Wheat 50 kg ha^{-1}

Table 11- The effect of amount, method, and time of molybdenum application on wheat grain yield (t ha^{-1}) harvested December 7, 1982

Method	Amount Mo					Wheat Yield
Nil	-					0.93
Drilled	150 g Mo ha^{-1} as MoO_3					1.02 (10%)
Sprayed	g Mo ha^{-1} as Na_2MoO_4:					
	15	30	60	120	240	
Stage 4	-	-	0.98	0.98	1.01	0.99 (6%)
Stage 6	0.94	0.90	0.93	0.97	0.97	0.94 (1%)
Stage 9	0.87	0.87	0.89	0.87	0.85	0.87 (-6%)

Stage 4 : Leaf sheaths beginning to lengthen
Stage 6 : First node of stem visible
Stage 9 : Ligule of last leaf just visible

Results Illustrate:

(i) Wheat grain yield responds to both drilled and foliar applications of Mo.

(ii) There is little difference in grain yield to varying rates of foliar applied Mo at any wheat growth stage with 15 g Mo ha^{-1} as equally effective as higher rates.

(iii) Drilled Mo achieved the best wheat yield increase. Foliar application at stage 4 provided a larger grain yield response than at stage 6 or 9, and was near the response to drilled Mo. The smaller responses at stage 6 and 9 may have been due to a yield loss through knockdown by the spraying unit's tyres. Good recovery could be made after early knockdown (stage 4) but would be more severe at later stages of wheat maturity.

Table 12 Mo Concentration (ppm) in Y.E.B.

Treatment	Mo Y.E.B. (ppm) Stage 2	Stage 10
Nil Mo	0.06	0.06
Drilled Mo (150)	0.35	0.18
Sprayed Stage 4:		
Mo (60)	-	0.19
Mo (120)	-	0.37
Mo (240)	-	0.82

Stage 2 : Tillering begins
Stage 4 : Leaf sheaths beginning to lengthen
Stage 10 : in boot

Results Indicate:

(1) The concentration of Mo in the Y.E.B. of Nil Mo wheat is deficient at 0.06 ppm.

Table 13 A comparison of foliar applied sodium molybdenum and molytrac on wheat grain yield (t ha^{-1})

g Mo ha^{-1}	Wheat Yield (t ha^{-1}) Sodium Molybdate	Molytrac
15	0.94	-
30	0.90	-
60	0.93	0.90
120	0.97	0.91
240	0.97	0.93

Sprayed stage 6 : First node of stem visible

Results indicate:

(i) No difference in wheat grain yields to varying forms or rates of Mo.

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10. FOLIAR APPLICATION OF MOLYBDENUM TO WHEAT
82 TS 41 / 1213 EX

Aim: As 82 ME 74

Soil:

Location: P. Innis - East Perenjori

Basals: As 82 ME 74

Table 14 The effect of amount, method, and time of molybdenum application on wheat grain yield (kg ha^{-1}) harvested November 19, 1982

Method	Amount Mo					Wheat Yield	
Nil	-					153	
Drilled	150 g Mo ha^{-1} as MoO_3					177	(16%)
Sprayed	g Mo ha^{-1} as Na_2MoO_4:						
	15	30	60	120	240		
Pre-emergent	-	-	146	146	128	140	(-8%)
Stage 4	-	-	207	159	156	174	(14%)
Stage 6	159	146	149	156	167	155	(1%)
Stage 9	146	172	164	146	164	158	(4%)

Low yields due to drought stress.

Results Indicate:

(i), (ii) and (iii) as 82 ME 74

(iv) Pre-emergent application of Mo is onto the soil. Grain yield indicates this was totally unavailable to the growing wheat plants, implying little or no movement of Mo down the soil profile.

Table 15 Mo Concentration (ppm) in Y.E.B.

Treatment	Mo Y.E.B. (ppm)
Nil Mo	0.04
Drilled Mo (150)	0.37

Sampled stage 2 : Tillering begins

Analyses of sampling at Stage 9 indicated contamination, probably due to spray drift. Therefore results not tabled.

Results indicate:

(i) The concentration of the Mo in the Y.E.B. of Nil Mo wheat is deficient at 0.04 ppm.

11. MOLYBDENUM AND AMMONIUM SULPHATE (S/A) ON WHEAT

81 No 40 / 1213 EX

Aim: To determine the response of wheat to molybdenum at different rates of S/A at this site (81 No 40) where low Mo levels were found in wheat samples.

Basals: Super 150 kg ha^{-1}
Wheat 50 kg ha^{-1}

Location: A.R. Uppill and Co. - Tammin

Soil: Hard setting yellow sandy loam

Table 16- The effect of molybdenum and rates of sulphate of ammonia on wheat grain yield (kg ha^{-1}) harvested November 11, 1982.

No.	1981 Tr	1982 Tr	Grain Yield kg ha^{-1}
1	Nil Mo or S/A	-	833
2	Mo (180)	-	881
3	Mo (360)	-	917
4	Nil Mo: S/A (120)	Mo (180)	905
5	Mo (180); S/A (120)	-	810
6	Mo (360); S/A (120)	-	798
7	Nil Mo; S/A (210)	-	821
8	Mo (180); S/A (240)	-	810
9	Mo (360); S/A (240)	-	881

Mo as g MoO_3 ha^{-1}
S/A kg ha^{-1}

Results illustrate:

(i) Response to molybdenum to at least 180 g MoO_3 ha^{-1}.

(ii) Application of S/A in 1981 reduces grain yield in 1982 due to a pH effect on decreasing the plant available molybdenum.

(iii) At the 1981 S/A rate of 120 kg ha^{-1}, the application of 180 or 360 g MoO_3 ha^{-1} in 1981 is not as effective in grain yield as the application of 180 g of MoO_3 ha^{-1} in 1982.

Table 17 Mo Concentration (ppm) in Y.E.B.

Treatments No.	1981	1982	Mo Y.E.B. (ppm) Time 1	Time 2
1.	Nil Mo ; Nil S/A	-	0.05	0.03
2.	Mo (180) ; Nil S/A	-	0.11	0.09
3.	Mo (360) ; Nil S/A	-	0.23	0.20
4.	Nil Mo ; S/A (120)	Mo (180)	0.22	0.13
5.	Mo (180) ; S/A (120)	-	0.13	0.08
6.	Mo (360) ; S/A (120)	-	0.18	0.11
7.	Nil Mo ; S/A (240)	-	0.04	0.02
8.	Mo (180) ; S/A (240)	-	0.09	0.07
9.	Mo (360) ; S/A (240)	-	0.13	0.12

Time 1 : 6 leaf
Time 2 : Flowering

Results Illustrate:

(i) A slight decrease in Mo concentration in Y.E.B. with wheat plant maturity.

(ii) The effect of S/A on decreasing Mo in Y.E.B.

(iii) The higher concentration of Mo in the Y.E.B. with presently applied Mo (TR 4) than previously applied Mo (TR 5 and 6).

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12. MOLYBDENUM RESIDUAL ON WHEAT
82 No 7

Aim: To measure the rate of decline in effectiveness of fertilizer molybdenum at this site.

Basals: Super 150 kg ha^{-1}
Agran 34 100 kg ha^{-1}
Wheat 50 kg ha^{-1}

Location: "Nalkain" - B. Jones
Cowcowing Bin

Soil: Yellow brown sandy loam

Table 18- The effects of Molybdenum and lime on wheat grain yield (t ha^{-1}) harvested November 26, 1982.

Treatment	Grain Yield
Nil Mo; Nil L	1.08
Mo ; Nil L	1.26
Nil Mo; L	1.02
Mo ; L	1.18

Lime : 1 t ha^{-1}
Mo : 180 g MoO_3 ha^{-1}

Results Illustrate:

(i) An increase by wheat in grain yield to the application of Mo, both with and without lime.

(ii) The application of lime has no net effect on wheat grain yield.

Table 19 Mo Concentration (ppm) in Y.E.B.

Treatment	Mo Y.E.B. (ppm) Time 1	Time 2	Time 3
Nil Mo ; Nil L	0.09	0.06	0.06
Mo ; Nil L	0.37	0.32	0.45
Nil Mo ; L	0.07	0.08	0.07
Mo ; L	0.55	0.66	0.68

Time 1 : 5 leaf
Time 2 : Boot
Time 3 : Flowering

Results Illustrate:

(i) Increase in Mo concentration in Y.E.B. upon additional of lime to Mo fertilized plots.

(ii) No effect of lime on Mo concentration in Y.E.B. on Nil Mo plots.

This trial, like several other trials that have recently been set up, require several more years work to understand and specify the effects which lead to the decline in the residual effectiveness of molybdenum.