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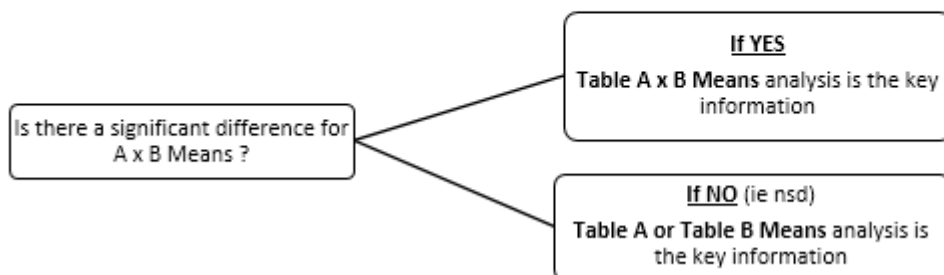
N Management – Timing, Method and Rate

Trial ID: BD1701 Location: Mullaley Trial Year: 2017
Investigator: Branko Duric

Objective:	To evaluate the impact of urea timing, method and rate in Wheat		
Planting Date:	11/05/2017		
Planting Equipment:	Small Plot Tyne Planter		
Row Spacing:	32cm		
Planting Depth:	5cm		
Target Plant Population:	100 Plants /m ²		
Nitrogen Source:	Urea only		
Application Code:	A	B	C
Application Date:	6/01/2017	24/02/2017	11/05/2017 (Planting)
Methods and Rates:	Spread, no incorporation: 50, 100 and 200 kg N/ha		
	Spread with incorporation by narrow point tyne: 100 kg N/ha		
	Banded: 100 kg N/ha		
	Split Application: 50 kg N/ha spread, no incorporation followed by 50 kg N/ha spread at GS30 (25/07/2017)		
Harvest Date:	12/11/2017		
Trial Reliability:	Moderate		
Keywords:	Nitrogen, Wheat, timing, method, rate		

NB: Trial designed and analysed as a Factorial

	In Simple Terms
Table of A Means:	Mean of 'METHOD X RATE' performance with ALL 'TIMING' treatments
Table of B Means:	Mean of 'TIMING' performance with ALL 'METHOD X RATE' treatments
Table of A x B Means:	'METHOD X RATE' performance with EACH 'TIMING' treatment



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Trial ID: BD1701

Location: Mullaley

Trial Year: 2017

Crop Name Crop Variety Assessment Date Assessment Type Assessment Unit Crop Stage Majority Plant-Evaluation Interval ARM Action Codes				Wheat LRPB Lancer				
				2/06/2017 EMERGENCE /m ² 2 Leaf 22 DP1 T1 Tn	25/07/2017 NDVI Ratio 1 st Node 75 DP1 ER3	29/08/2017 NDVI Ratio 110 DP1	27/10/2017 NDVI Ratio 169 DP1 ER2	12/11/2017 YIELD t/ha 185 DP1 T2
Trt No.	Treatment	Nitrogen Rate	Appln. Code					
TABLE OF A MEANS (Method x Rate)								
1	Untreated	-		69-	0.69-	0.81c	0.33d	2.46-
2	Spread	50kg/ha		69-	0.65-	0.84b	0.46c	2.56-
3	Spread	100kg/ha		67-	0.66-	0.84ab	0.51b	2.50-
4	Spread & Incorporated	100kg/ha		73-	0.70-	0.85ab	0.54ab	2.59-
5	Banded	100kg/ha		68-	0.67-	0.85a	0.51b	2.48-
6	Spread	200kg/ha		68-	0.64-	0.85ab	0.57a	2.41-
7	Split Application	100kg/ha		70-	0.67-	0.84ab	0.54ab	2.64-
TABLE OF B MEANS (Timing)								
1	January		A	71-	0.68a	0.84-	0.49-	2.58-
2	February		B	70-	0.69a	0.84-	0.49-	2.49-
3	Planting		C	67-	0.64b	0.84-	0.50-	2.49-
TABLE OF A x B MEANS (Method x Rate x Timing)								
1	Untreated	-	A	73-	0.70abc	0.80-	0.34-	2.45-
1a	Untreated	-	B	70-	0.70abc	0.81-	0.32-	2.43-
1b	Untreated	-	C	64-	0.67a-d	0.81-	0.34-	2.50-
2	Spread	50kg/ha	A	77-	0.65bcd	0.84-	0.44-	2.48-
2a	Spread	50kg/ha	B	68-	0.67a-d	0.83-	0.44-	2.60-
2b	Spread	50kg/ha	C	61-	0.62de	0.83-	0.49-	2.61-
3	Spread	100kg/ha	A	71-	0.68a-d	0.84-	0.50-	2.60-
3a	Spread	100kg/ha	B	64-	0.63cde	0.84-	0.49-	2.42-
3b	Spread	100kg/ha	C	67-	0.65bcd	0.85-	0.53-	2.48-
4	Spread & Incorporated	100kg/ha	A	73-	0.71ab	0.85-	0.50-	2.53-
4a	Spread & Incorporated	100kg/ha	B	70-	0.69a-d	0.85-	0.54-	2.62-
4b	Spread & Incorporated	100kg/ha	C	78-	0.70ab	0.86-	0.56-	2.61-
5	Banded	100kg/ha	A	68-	0.71ab	0.87-	0.51-	2.63-
5a	Banded	100kg/ha	B	68-	0.73a	0.86-	0.53-	2.47-
5b	Banded	100kg/ha	C	66-	0.58ef	0.84-	0.49-	2.34-
6	Spread	200kg/ha	A	70-	0.67a-d	0.86-	0.59-	2.60-
6a	Spread	200kg/ha	B	70-	0.72ab	0.87-	0.58-	2.29-
6b	Spread	200kg/ha	C	64-	0.54f	0.82-	0.56-	2.32-
7	Split Application	100kg/ha	A	64-	0.66a-d	0.83-	0.55-	2.76-
7a	Split Application	100kg/ha	B	78-	0.66a-d	0.85-	0.52-	2.58-
7b	Split application	100kg/ha	C	67-	0.68a-d	0.85-	0.53-	2.57-

Means followed by same letter do not significantly differ (P=.05, LSD)

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Trial ID: BD1701

Location: Mullaleey

Trial Year: 2017

Crop Name Crop Variety Assessment Date Assessment Type Assessment Unit ARM Action Codes				Wheat LRPB Lancer			
				15/12/2017 PROTEIN % ET8	15/12/2017 TEST WEIGHT kg/hL ET10	15/12/2017 SCREENING % AL	15/12/2017 N RECOVERY kg N/ha T3
Trt No.	Treatment	Nitrogen Rate	Appln. Code				
TABLE OF A MEANS (Method x Rate)							
1	Untreated	-		12.4e	81.7a	1.9tbc	53.2b
2	Spread	50kg/ha		13.0d	81.0ab	1.9tbc	58.4a
3	Spread	100kg/ha		13.8ab	80.3bc	2.3tab	60.1a
4	Spread & Incorporated	100kg/ha		13.4c	80.9ab	2.0tbc	60.6a
5	Banded	100kg/ha		13.5bc	80.8ab	2.2tab	58.3a
6	Spread	200kg/ha		14.0a	79.7c	2.6ta	59.0a
7	Split application	100kg/ha		13.4bc	81.1ab	1.8tc	62.0a
TABLE OF B MEANS (Timing)							
1	January		A	13.3-	81.1-	2.0t-	59.8-
2	February		B	13.4-	80.7-	2.1t-	58.1-
3	Planting		C	13.4-	80.6-	2.1t-	58.4-
TABLE OF A x B MEANS (Method x Rate x Timing)							
1	Untreated	-	A	12.3-	82.0-	1.8t-	52.7-
1a	Untreated	-	B	12.4-	81.5-	2.0t-	52.7-
1b	Untreated	-	C	12.4-	81.6-	1.9t-	54.1-
2	Spread	50kg/ha	A	13.1-	81.2-	2.0t-	56.8-
2a	Spread	50kg/ha	B	13.0-	80.9-	1.7t-	59.0-
2b	Spread	50kg/ha	C	13.0-	81.0-	2.0t-	59.3-
3	Spread	100kg/ha	A	13.7-	80.4-	2.3t-	62.2-
3a	Spread	100kg/ha	B	13.7-	79.7-	2.3t-	57.8-
3b	Spread	100kg/ha	C	13.9-	80.7-	2.3t-	60.3-
4	Spread & Incorporated	100kg/ha	A	13.4-	81.0-	2.0t-	59.2-
4a	Spread & Incorporated	100kg/ha	B	13.2-	80.9-	1.9t-	60.7-
4b	Spread & Incorporated	100kg/ha	C	13.6-	80.8-	2.0t-	62.0-
5	Banded	100kg/ha	A	13.2-	81.1-	2.4t-	60.6-
5a	Banded	100kg/ha	B	13.7-	81.3-	2.1t-	59.0-
5b	Banded	100kg/ha	C	13.5-	80.2-	2.2t-	55.2-
6	Spread	200kg/ha	A	14.0-	80.8-	2.2t-	63.7-
6a	Spread	200kg/ha	B	14.1-	79.6-	3.0t-	56.4-
6b	Spread	200kg/ha	C	14.0-	78.7-	2.8t-	56.8-
7	Split Application	100kg/ha	A	13.2-	81.4-	1.5t-	63.7-
7a	Split Application	100kg/ha	B	13.6-	80.8-	2.0t-	61.3-
7b	Split Application	100kg/ha	C	13.6-	81.0-	1.8t-	61.1-

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FACTORIAL/POOLED ERROR AOV Wheat - LRPB Lancer 2/06/2017 EMERGENCE /m² 12 22 DP1 T1 Tn						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	83	6996.459961				
R	3	247.017997	82.339332	0.980	0.4084	
A	6	290.527344	48.421224	0.576	0.7478	7
B	2	226.702009	113.351004	1.349	0.2673	5
AB	12	1189.313616	99.109468	1.179	0.3185	13
ERROR	60	5042.898996	84.048317			

FACTORIAL/POOLED ERROR AOV Wheat - LRPB Lancer 25/07/2017 NDVI Ratio 31 75 DP1 ER3						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	83	0.323561				
R	3	0.002499	0.000833	0.337	0.7989	
A	6	0.033385	0.005564	2.248	0.0505	0.04
B	2	0.045812	0.022906	9.255	0.0003	0.03
AB	12	0.093373	0.007781	3.144	0.0016	0.07
ERROR	60	0.148492	0.002475			

FACTORIAL/POOLED ERROR AOV Wheat - LRPB Lancer 29/08/2017 NDVI Ratio 110 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	83	0.062296				
R	3	0.007800	0.002600	6.006	0.0012	
A	6	0.018750	0.003125	7.219	0.0001	0.02
B	2	0.000966	0.000483	1.116	0.3342	0.01
AB	12	0.008807	0.000734	1.695	0.0905	0.03
ERROR	60	0.025973	0.000433			

FACTORIAL/POOLED ERROR AOV Wheat - LRPB Lancer 27/10/2017 NDVI Ratio 169 DP1 ER2						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	83	0.634465				
R	3	0.007252	0.002417	1.019	0.3906	
A	6	0.462750	0.077125	32.517	0.0001	0.04
B	2	0.001679	0.000840	0.354	0.7033	0.03
AB	12	0.020473	0.001706	0.719	0.7269	0.07
ERROR	60	0.142310	0.002372			

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FACTORIAL/POOLED ERROR AOV Wheat - LRPB Lancer 12/11/2017 YIELD t/ha 185 DP1 T2						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	81	4.532738				
R	3	0.452576	0.150859	2.919	0.0416	
A	6	0.460408	0.076735	1.485	0.1995	0.19
B	2	0.149338	0.074669	1.445	0.2442	0.12
AB	12	0.472828	0.039402	0.762	0.6853	0.32
ERROR	58	2.997587	0.051683			

FACTORIAL/POOLED ERROR AOV Wheat - LRPB Lancer 15/12/2017 PROTEIN % ET8						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	81	34.870622				
R	3	2.551786	0.850595	4.702	0.0053	
A	6	20.492937	3.415489	18.880	0.0001	0.3
B	2	0.392407	0.196204	1.085	0.3448	0.2
AB	12	0.941111	0.078426	0.434	0.9432	0.6
ERROR	58	10.492381	0.180903			

FACTORIAL/POOLED ERROR AOV Wheat - LRPB Lancer 15/12/2017 TEST WEIGHT kg/hL ET10						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	81	122.396336				
R	3	3.414008	1.138003	0.895	0.4494	
A	6	29.792540	4.965423	3.904	0.0024	0.9
B	2	4.771455	2.385728	1.876	0.1624	0.6
AB	12	10.651508	0.887626	0.698	0.7468	1.6
ERROR	58	73.766825	1.271842			

FACTORIAL/POOLED ERROR AOV Wheat - LRPB Lancer 15/12/2017 SCREENING % AL						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	81	0.518905				
R	3	0.071883	0.023961	4.991	0.0038	
A	6	0.122061	0.020343	4.238	0.0013	0.1
B	2	0.004369	0.002184	0.455	0.6367	0.0
AB	12	0.042145	0.003512	0.732	0.7150	0.1
ERROR	58	0.278447	0.004801			

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Trial ID: **BD1701**Location: **Mullaley**Trial Year: **2017**

FACTORIAL/POOLED ERROR AOV Wheat - LRPB Lancer 15/12/2017 N RECOVERY kg/ha T3						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	81	2264.870472				
R	3	90.189525	30.063175	1.325	0.2750	
A	6	570.259055	95.043176	4.189	0.0014	3.9
B	2	48.189983	24.094992	1.062	0.3524	2.5
AB	12	240.300619	20.025052	0.883	0.5688	6.7
ERROR	58	1315.931290	22.688471			

Assessment Type

NDVI = Normalized difference vegetation index

N RECOVERY = Nitrogen recovery in grain

ARM Action Codes

Tn = User-defined transformation formula "n"

ER3 = Excluded replicate 3

ER2 = Excluded replicate 2

ET8 = Excluded treatment 8

ET10 = Excluded treatment 10

AL = Automatic log transformation of X+1

T1 = [c4]/4/0.32

T2 = [c12]/2

T3 = ([13]*1000)*([17]/100)*0.175

DP1 = Days after Planting

Application Description					
	A		B		
Application Date:	6/01/2017	6/01/2017	24/02/2017	24/02/2017	11/05/2017
Application Method:	SPREAD	KNIFEI	SPREAD	KNIFEI	SPREAD
Application Timing:	JANUARY	JANUARY	FEBRUARY	FEBRUARY	AT PLANTING
Application Placement:	TOPDRESS	BANDED	TOPDRESS	BANDED	TOPDRESS

Conclusions:

This trial was conducted near Mullaley to determine the impact of application timing on N movement and location of N at planting, the impact of urea application timing on wheat production and the efficiency of each method.

There were no differences between treatments for emergence.

NDVI assessment in July showed a significantly lower reading where Urea had been applied at planting rather than in January or February. NDVI reading in August and October indicated significantly higher biomass as the rate of urea application increased.

There were no impact on the yield of any applied treatment.

Factorial analysis of grain quality assessments showed a significant increase in % protein as the application rate increased, Screenings were significantly increased (from 1.9 to 2.6%) and test weight significantly decreased, compared to the UTC, by application of 200 units of N. N recovery was significantly increased by all N application rates compared to the control. Timing of urea application had no effect on % protein, test weight, % screenings or N recovery.

The only significant difference from urea application method was for protein, where application by spreading on the surface returned a higher % protein, than urea incorporated or banded.

High levels of crown rot were suspected to have influenced results in this trial. Stubble samples were collected after harvest but results are not currently available (March 2018).