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Impact of *Pratylenchus thornei* and Crown Rot on Barley Varieties - Bullarah 2016

Trial ID: DK1608 Location: Bullarah Trial Year: 2016
Investigator: Denielle Kilby

Planting Date:	14/06/2016	Total soil N:	148 kg N/ha (21/04/2016)
Harvest Date:	13/12/2016	Target Plant Stand:	90/m ²
Low <i>P. thornei</i> (ex-Suntop 2014):	2.1 Pt/g soil (13/04/2016)	Plot Size (Planted):	12 x 2 m (5 rows x 32cm)
High <i>P. thornei</i> (ex-Strzelecki 2014):	9.5 Pt/g soil (13/04/2016)	Plot Size (Harvested):	10 x 2m
PAW Wheat:	~61mm	Cropping History:	Chickpeas 2012
Trial Reliability:	Good	Crown Rot Inoculation:	CR Inoculum applied at planting at 2g/m row

Rep 1 of Trial omitted from reported results due to severe waterlogging and poor crop establishment

Trial designed and analysed as a split plot

	In Simple Terms
Table of A Means:	Mean of 'Nematode Population' performance with ALL 'Crown Rot' treatments and 'Variety' treatments
Table of B Means:	Mean of 'Crown Rot' performance with ALL 'Nematode Population' treatments and 'Variety' treatments
Table of C Means:	Mean of 'Variety' performance with ALL 'Crown Rot' treatments and 'Nematode Population' treatments
Table of A x B Means:	'Nematode Population' performance with EACH 'Crown Rot' treatment
Table of A x C Means:	'Nematode Population' performance with EACH 'Variety' treatment
Table of B x C Means:	'Crown Rot' performance with EACH 'Variety' treatment

How to interpret?

Is there a significant difference for A x B Means
A x C Means or
B x C Means ?

If YES

Table A x B Means, A x C Means or
B x C Means analysis is the key information

If NO (ie nsd)

Table A, Table B or Table C Means analysis is the key information

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Pest Scientific Name		Barley				Pratylenchus thornei Root-lesion Nematode
Pest Name						
Crop Name						
Assessment Date		12/07/2016	15/08/2016	15/10/2016	30/11/2016	21/04/2017
Assessment Type		EMERGENCE	NDVI	NDVI	YIELD	COUNT
Assessment Unit		/m²	RATIO	RATIO	t/ha	/g Soil
Crop Stage Majority		12	30	65		
Plant-Evaluation Interval		28 DP1	62 DP1	123 DP1	169 DP1	311 DP1
CV %					14.2	
ARM Action Codes		T1	ER1		TY2	AL
Trt No.	Treatment					
TABLE OF A MEANS (Nematode Population)						
1	Low	42.1-	0.64-	0.75-	3.5-	1.3b
2	High	47.2-	0.64-	0.73-	3.4-	4.2a
TABLE OF B MEANS (Crown Rot)						
1	- CR	49.0-	0.64-	0.74-	3.5-	2.7-
2	+ CR	40.3-	0.64-	0.74-	3.4-	2.2-
TABLE OF C MEANS (Variety)						
1	Commander	50.5b	0.68ab	0.72ab	3.2b	3.3ab
2	LaTrobe	38.0bc	0.49c	0.66b	3.4b	3.8a
3	Shepherd	68.5a	0.76a	0.78a	3.4b	1.7c
4	Compass	29.0c	0.64b	0.77a	3.9a	1.5c
5	GrangeR	37.2bc	0.63b	0.75a	3.5ab	2.4bc
TABLE OF A x B MEANS (Nematode Population x Crown Rot)						
1	Low	48.1-	0.61-	0.73-	3.6-	1.5-
1	- CR					
2	High	49.8-	0.66-	0.74-	3.5-	4.7-
1	- CR					
1	Low	36.1-	0.66-	0.76-	3.5-	1.1-
2	+ CR					
2	High	44.5-	0.62-	0.71-	3.3-	3.8-
2	+ CR					
TABLE OF A x C MEANS (Nematode Population x Variety)						
1	Low	48.6-	0.67-	0.72-	3.3-	1.8-
1	Commander					
2	High	52.5-	0.70-	0.73-	3.1-	5.7-
1	Commander					
1	Low	37.0-	0.47-	0.67-	3.4-	1.4-
2	LaTrobe					
2	High	39.1-	0.50-	0.64-	3.4-	8.4-
2	LaTrobe					
1	Low	59.5-	0.74-	0.79-	3.5-	0.9-
3	Shepherd					
2	High	77.5-	0.77-	0.78-	3.3-	3.0-
3	Shepherd					
1	Low	33.1-	0.68-	0.81-	4.1-	0.9-
4	Compass					
2	High	25.0-	0.60-	0.74-	3.7-	2.2-
4	Compass					
1	Low	32.4-	0.63-	0.76-	3.5-	1.4-
5	GrangeR					
2	High	41.9-	0.63-	0.74-	3.5-	3.8-
5	GrangeR					

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

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Pest Name		Barley				
Crop Name						
Assessment Date		12/07/2016	15/08/2016	15/10/2016	30/11/2016	21/04/2017
Assessment Type		EMERGENCE	NDVI	NDVI	YIELD	COUNT
Assessment Unit		/m ²	RATIO	RATIO	t/ha	/g Soil
Crop Stage Majority		12	30	65	99	
Plant-Evaluation Interval		28 DP1	62 DP1	123 DP1	169 DP1	311 DP1
ARM Action Codes		T1	ER1		TY2	AL
Trt No.	Treatment					
TABLE OF B x C MEANS (Crown Rot x Variety)						
1	- CR	58.6-	0.72-	0.74-	3.4-	3.5-
1	Commander					
2	+ CR	42.4-	0.64-	0.71-	3.0-	3.1-
1	Commander					
1	- CR	39.5-	0.42-	0.63-	3.3-	5.5-
2	LaTrobe					
2	+ CR	36.6-	0.55-	0.69-	3.6-	2.5-
2	LaTrobe					
1	- CR	73.6-	0.76-	0.79-	3.4-	1.8-
3	Shepherd					
2	+ CR	63.4-	0.75-	0.78-	3.4-	1.7-
3	Shepherd					
1	- CR	32.2-	0.65-	0.78-	4.0-	1.4-
4	Compass					
2	+ CR	25.9-	0.63-	0.77-	3.7-	1.6-
4	Compass					
1	- CR	41.1-	0.62-	0.77-	3.5-	2.7-
5	GrangeR					
2	+ CR	33.2-	0.64-	0.73-	3.4-	2.1-
5	GrangeR					
TABLE OF A x B x C MEANS (Nematode Population x Crown Rot x Variety)						
1	Low	50.5-	0.68-	0.72-	3.4-	1.3-
1	- CR					
1	Commander					
2	High	66.7-	0.76-	0.75-	3.4-	8.0-
1	- CR					
1	Commander					
1	Low	46.6-	0.65-	0.72-	3.2-	2.4-
2	+ CR					
1	Commander					
2	High	38.3-	0.63-	0.70-	2.9-	3.9-
2	+ CR					
1	Commander					
1	Low	40.1-	0.38-	0.61-	3.1-	2.8-
1	- CR					
2	LaTrobe					
2	High	38.8-	0.47-	0.65-	3.4-	10.1-
1	- CR					
2	LaTrobe					
1	Low	33.9-	0.57-	0.73-	3.7-	0.6-
2	+ CR					
2	LaTrobe					
2	High	39.3-	0.53-	0.64-	3.4-	6.9-
2	+ CR					
2	LaTrobe					

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Pest Scientific Name		Barley				Pratylenchus thornei Root-lesion Nematode
Pest Name						
Crop Name						
Assessment Date		12/07/2016	15/08/2016	15/10/2016	30/11/2016	21/04/2017
Assessment Type		EMERGENCE	NDVI	NDVI	YIELD	COUNT
Assessment Unit		/m ²	RATIO	RATIO	t/ha	/g Soil
Crop Stage Majority		12	30	65	99	
Plant-Evaluation Interval		28 DP1	62 DP1	123 DP1	169 DP1	311 DP1
ARM Action Codes		T1	ER1		TY2	AL
Trt No.	Treatment					
1 1 3	Low - CR Shepherd	74.0-	0.77-	0.81-	3.7-	0.9-
2 1 3	High - CR Shepherd	73.2-	0.76-	0.77-	3.1-	3.2-
1 2 3	Low + CR Shepherd	45.1-	0.71-	0.77-	3.3-	0.9-
2 2 3	High + CR Shepherd	81.8-	0.78-	0.79-	3.5-	2.7-
1 1 4	Low - CR Compass	40.4-	0.71-	0.82-	4.4-	1.1-
2 1 4	High - CR Compass	24.0-	0.58-	0.74-	3.6-	1.8-
1 2 4	Low + CR Compass	25.8-	0.64-	0.79-	3.7-	0.8-
2 2 4	High + CR Compass	26.0-	0.61-	0.75-	3.7-	2.8-
1 1 5	Low - CR GrangeR	35.7-	0.52-	0.72-	3.3-	1.8-
2 1 5	High - CR GrangeR	46.6-	0.72-	0.81-	3.8-	4.0-
1 2 5	Low + CR GrangeR	29.2-	0.74-	0.79-	3.7-	1.1-
2 2 5	High + CR GrangeR	37.2-	0.54-	0.67-	3.1-	3.5-

Impact of *Pratylenchus thornei* and Crown Rot on Barley Varieties - Bullarah 2016

Trial ID: DK1608

Location: Bullarah

Trial Year: 2016

Pest Scientific Name		<i>Fusarium pseudograminearum</i>	
Pest Name		Crown Rot	
Crop Name		Barley	
Part Assessed		Stubble	Crown
Assessment Date		5/10/2017	5/10/2017
Assessment Type		CR SEVERITY	PRESENCE
Assessment Unit		Rating	%
Trt No.	Treatment		
TABLE OF A MEANS (Nematode Population)			
1	Low	20b	42.8b
2	High	30a	55.1a
TABLE OF B MEANS (Crown Rot)			
1	- CR	15b	31.1b
2	+ CR	34a	66.9a
TABLE OF C MEANS (Variety)			
1	Commander	28-	54.7-
2	LaTrobe	25-	51.3-
3	Shepherd	20-	46.9-
4	Compass	24-	46.0-
5	GrangeR	25-	46.0-
TABLE OF A x B MEANS (Nematode Population x Crown Rot)			
1	Low	12c	27.5-
1	- CR		
2	High	18c	34.7-
1	- CR		
1	Low	27b	58.1-
2	+ CR		
2	High	41a	75.6-
2	+ CR		
TABLE OF A x C MEANS (Nematode Population x Variety)			
1	Low	21-	45.3-
1	Commander		
2	High	36-	64.0-
1	Commander		
1	Low	19-	43.5-
2	LaTrobe		
2	High	32-	59.2-
2	LaTrobe		
1	Low	19-	48.7-
3	Shepherd		
2	High	21-	45.2-
3	Shepherd		
1	Low	17-	35.3-
4	Compass		
2	High	31-	56.7-
4	Compass		
1	Low	22-	41.3-
5	GrangeR		
2	High	28-	50.7-
5	GrangeR		

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Pest Scientific Name Pest Name Crop Name Part Assessed Assessment Date Assessment Type Assessment Unit		<i>Fusarium pseudograminearum</i> Crown Rot Barley	
		Stubble 5/10/2017 CR SEVERITY Rating	Crown 5/10/2017 PRESENCE %
Trt No.	Treatment		
TABLE OF B x C MEANS (Crown Rot x Variety)			
1 1	- CR Commander	19-	39.3-
2 1	+ CR Commander	38-	70.0-
1 2	- CR LaTrobe	20-	40.7-
2 2	+ CR LaTrobe	30-	62.0-
1 3	- CR Shepherd	10-	24.2-
2 3	+ CR Shepherd	30-	69.7-
1 4	- CR Compass	13-	24.0-
2 4	+ CR Compass	35-	68.0-
1 5	- CR GrangeR	13-	27.3-
2 5	+ CR GrangeR	38-	64.7-
TABLE OF A x B x C MEANS (Nematode Population x Crown Rot x Variety)			
1 1 1	Low - CR Commander	15-	34.7-
2 1 1	High - CR Commander	22-	44.0-
1 2 1	Low + CR Commander	27-	56.0-
2 2 1	High + CR Commander	49-	84.0-
1 1 2	Low - CR LaTrobe	14-	33.7-
2 1 2	High - CR LaTrobe	27-	47.7-
1 2 2	Low + CR LaTrobe	24-	53.3-
2 2 2	High + CR LaTrobe	36-	70.7-

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Trial Year: 2016

Pest Scientific Name		<i>Fusarium pseudograminearum</i>	
Pest Name		Crown Rot	
Crop Name		Barley	
Part Assessed		Stubble	Crown
Assessment Date		5/10/2017	5/10/2017
Assessment Type		CR SEVERITY	PRESENCE
Assessment Unit		Rating	%
Trt No.	Treatment		
1 1 3	Low - CR Shepherd	11-	28.0-
2 1 3	High - CR Shepherd	10-	20.3-
1 2 3	Low + CR Shepherd	27-	69.3-
2 2 3	High + CR Shepherd	33-	70.0-
1 1 4	Low - CR Compass	7-	16.0-
2 1 4	High - CR Compass	20-	32.0-
1 2 4	Low + CR Compass	27-	54.7-
2 2 4	High + CR Compass	43-	81.3-
1 1 5	Low - CR GrangeR	14-	25.3-
2 1 5	High - CR GrangeR	12-	29.3-
1 2 5	Low + CR GrangeR	30-	57.3-
2 2 5	High + CR GrangeR	45-	72.0-

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COMPLETE SPLIT-PLOT AOV						
12/07/2016						
EMERGENCE /m ² 28 DP1 T1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	36683.1				
R	2	5458.4	2729.22	3.38	0.2283	
A	1	386.8	386.81	0.48	0.5604	
ERROR A	2	1615.2	807.59			
B	1	1128	1128.02	2.99	0.0924	
C	4	11356.9	2839.21	7.52	0.0002	16.1
AB	1	169.3	169.28	0.45	0.5072	
AC	4	1107.2	276.79	0.73	0.5751	
BC	4	294.6	73.64	0.2	0.9393	
ABC	4	1583.7	395.92	1.05	0.3956	
ERROR B	36	13583.1	377.31			

COMPLETE SPLIT-PLOT AOV						
15/08/2016						
NDVI RATIO 62 DP1 ER1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	2.22737				
R	2	0.55769	0.27885	2.66	0.2731	
A	1	0.00001	0.00001	0	0.995	
ERROR A	2	0.2095	0.10475			
B	1	0.00053	0.00053	0.03	0.8738	
C	4	0.46627	0.11657	5.63	0.0013	0.1
AB	1	0.03038	0.03038	1.47	0.2335	
AC	4	0.02704	0.00676	0.33	0.8582	
BC	4	0.07121	0.0178	0.86	0.4971	
ABC	4	0.11966	0.02992	1.45	0.2391	
ERROR B	36	0.74507	0.0207			

COMPLETE SPLIT-PLOT AOV						
15/10/2016						
NDVI RATIO 123 DP1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	0.68642				
R	2	0.15238	0.07619	1.64	0.3791	
A	1	0.00588	0.00588	0.13	0.7561	
ERROR A	2	0.09303	0.04651			
B	1	0.00017	0.00017	0.03	0.8723	
C	4	0.1235	0.03087	4.76	0.0035	0.07
AB	1	0.01267	0.01267	1.95	0.1709	
AC	4	0.0082	0.00205	0.32	0.8655	
BC	4	0.01734	0.00434	0.67	0.6185	
ABC	4	0.03952	0.00988	1.52	0.2165	
ERROR B	36	0.23372	0.00649			

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COMPLETE SPLIT-PLOT AOV 30/11/2016 YIELD t/ha 169 DP1 TY2						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	20.8838				
R	2	0.8256	0.41278	0.16	0.8646	
A	1	0.3075	0.30745	0.12	0.7653	
ERROR A	2	5.2727	2.63634			
B	1	0.1288	0.12881	0.53	0.4696	
C	4	2.6611	0.66528	2.76	0.0424	0.4
AB	1	0.0119	0.0119	0.05	0.8255	
AC	4	0.3254	0.08134	0.34	0.851	
BC	4	0.701	0.17525	0.73	0.5796	
ABC	4	1.968	0.49201	2.04	0.1094	
ERROR B	36	8.6819	0.24116			

COMPLETE SPLIT-PLOT AOV <i>Pratylenchus thornei</i> – Root-lesion Nematode 21/04/2017 COUNT /g Soil 311 DP1 AL						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	4.92492				
R	2	0.27182	0.13591	1.83	0.3539	
A	1	1.95232	1.95232	26.23	0.0361	0.3
ERROR A	2	0.14887	0.07443			
B	1	0.0831	0.0831	2.59	0.1159	
C	4	0.72677	0.18169	5.67	0.0012	0.1
AB	1	0.00002	0.00002	0	0.9802	
AC	4	0.22096	0.05524	1.72	0.1659	
BC	4	0.15088	0.03772	1.18	0.3369	
ABC	4	0.21725	0.05431	1.7	0.1723	
ERROR B	36	1.15292	0.03203			

COMPLETE SPLIT-PLOT AOV For <i>Fusarium pseudograminearum</i> - Crown Rot 5/10/2017 CR SEVERITY Rating						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	10612.5				
R	2	164.1	82.03	2.65	0.2737	
A	1	1497	1497	48.42	0.02	6.2
ERROR A	2	61.8	30.92			
B	1	5477.9	5477.88	109.85	0.0000	3.7
C	4	430.8	107.69	2.16	0.0934	
AB	1	290	289.96	5.81	0.0211	6.7
AC	4	344.2	86.04	1.73	0.1658	
BC	4	368.3	92.07	1.85	0.1413	
ABC	4	183.3	45.81	0.92	0.4637	
ERROR B	36	1795.2	49.87			

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COMPLETE SPLIT-PLOT AOV						
<i>Fusarium pseudograminearum</i> – Crown Rot						
5/10/2017						
PRESENCE %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	59	30229				
R	2	31.2	15.6	0.25	0.8022	
A	1	2269.3	2269.3	35.82	0.0268	8.8
ERROR A	2	126.7	63.3			
B	1	19188.8	19188.8	137.39	0.0000	6.2
C	4	718.7	179.7	1.29	0.2935	
AB	1	400.4	400.4	2.87	0.0991	
AC	4	1175.7	293.9	2.1	0.1004	
BC	4	1197.9	299.5	2.14	0.0953	
ABC	4	92	23	0.16	0.9549	
ERROR B	36	5028.1	139.7			

Assessment Type

NDVI = Normalized difference vegetation index

CR SEVERITY = % Basal browning x extent of browning

PRESENCE = % of crowns infected

Crop Stage Majority

12 = 2 leaves unfolded

30 = Beginning of stem elongation: pseudostem & tillers erect, 1st internode elong.

65 = Full flowering: 50% of anthers mature

ARM Action Codes

ER1 = Excluded replicate 1

AL = Automatic log transformation of X+1

T1 = ([C1]/4)/0.32

TY2 = 0.5*[C5]

DP1 = Days after Planting