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Impact of AMF on Summer Crops (Cotton)

Trial ID: **BD1901b** **Location:** **Mullaley** **Trial Year:** **2019**
Investigator: **Branko Duric**

Canola provides a number of benefits in our farming system. It provides an early sown crop option and a disease break crop for a range of cereals and pulses including being a non-host of the root lesion nematode *Pratylenchus thornei*.

One of the challenges is that canola is also a non-host of arbuscular mycorrhiza fungi (AMF). AMF are obligate symbionts and require the presence of a plant host for reproduction. AMF provide nutrients such as P and Zn to the plant, the plant hosts the AMF and provides carbohydrates.

AMF are important for crop production in winter crops such as linseed and faba beans and a range of key summer crops including cotton, sorghum, mung bean, maize and sunflower. The absence, or low levels, of AMF can cause reduced growth and yield in these crops, often described as long fallow disorder.

In addition, the deep-rooted habit of canola often dries out the soil profile in the year of production. In the northern region, this means a longer fallow is often required after the canola phase to replenish soil moisture profiles. The combination of a non-host crop followed by an extended fallow can mean very low levels of AMF are present.

In regions such as the Liverpool Plains where canola production is more reliable, crop productions issues are often evident when a summer crop is grown following a canola phase. This trial was conducted to evaluate the impact of a range of management options to limit the impact of low AMF following canola and to assess the performance on sorghum. Separate reports examine the impact on cotton and mung bean.

Trial Comments:
This was a very complex trial design that was implemented at a site near Mullaley NSW. The site had a stratified phosphorous profile with 15 mg P/kg at 0-10 cm but only 2-4 kg P/ha at depths from 10-30 cm, 30-60 cm and 60-90 cm (low subsoil P). Soil PBI levels ranged from 173-204 with BSES phosphorous ranging from 114-135 mg/kg. The site had previously shown long fallow disorder symptoms in summer crops following canola.

In year 1 (winter 2019) plots of wheat, canola or fallow were established to produce varied densities of AMF (arbuscular mycorrhizal fungi). Testing prior to the start of the trial showed AMFa at 6.7 kDNA/g soil and AMFb at 4.5 kDNA/g. (NB only AMF a and AMF b were screened).

In year 2 (autumn 2020) soil testing for nutrient status was conducted and management practices imposed over the initial crop treatments:

- Nitrogen was applied to wheat plots at 95 kg N/ha and canola at 235 kg N/ha to balance the N status compared to fallow plots
- MAP 100 kg/ha was applied at either shallow (~2 cm) or deep (~20 cm) placement
- Barley was sown in March 2020 as a cover crop to build AMF densities and sprayed out ~7 weeks later.
- Combination of deep MAP and barley cover crop
- All plots received deep ripping to 20 cm irrespective of MAP application to ensure consistency across the trial

In November 2020 cotton was sown with additional treatments of Endofuse (AMF product) applied at 10 mL/ha alone as either a seed treatment or liquid in furrow or in combination following a deep MAP application in autumn 2020.

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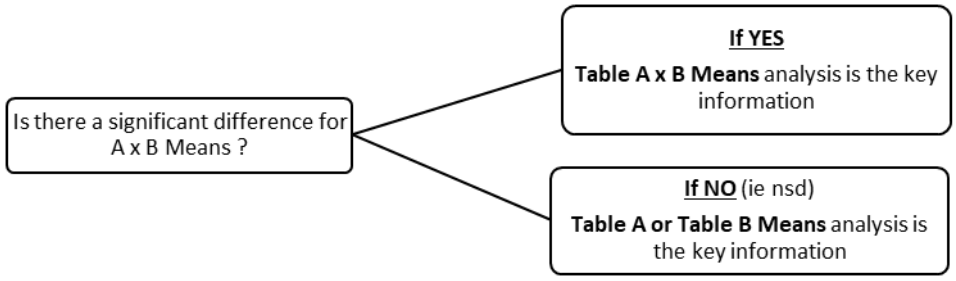
Trial ID: BD1901b **Location:** Mullaley **Trial Year:** 2019

Objectives:	To evaluate the impact of management practices on AMF To evaluate the impact of AMF on cotton performance To screen management options for use in low AMF situations		
Crop 2019:	**Fallow**	**Wheat**	**Canola**
Variety:	-	Suntop	43Y92CL
Planting Date:	-	10/05/2019 (DAP1)	10/05/2019
Row Spacing:	-	32cm	32cm
Planting Rate	-	50 kg/ha	2.5 kg/ha
Harvest Date:	-	1/11/2019 (DAH1)	1/11/2019
Harvest Details:	Small Plot harvester - harvest size 2m x 12m		
Crop 2020:	Barley		
Variety:	Commander		
Planting Date:	12/03/2020		
Row Spacing:	32cm		
Planting Rate	80kg/ha		
Harvest Date:	Sprayed out: 28/04/2020 (47 days after planting (DAH2)		
Crop 2020/2021:	Cotton		
Variety:	Sicot 714 B3F		
Planting Date:	27/11/2020 (DAP2)		
Row Spacing:	1 m		
Planting Rate	12 kg/ha		
Trial Design:	Split plot design – 3 x 8 treatments with 4 replicates		
Plot Size:	4 m x 12 m		
Keywords:	Canola, wheat, barley, cotton, arbuscular mycorrhiza, AMF		

Trial designed and analysed as Split Plot

	In Simple Terms
Table of A Means:	Mean of 'Crop' performance with **ALL** 'Management' treatments
Table of B Means:	Mean of 'Management' performance with **ALL** 'Crop' treatments
Table of A x B Means:	'Crop' performance with **EACH** 'Management' treatment

How to interpret?



Impact of AMF on Summer Crops (Cotton)

Trial ID: BD1901b **Location:** Mullaley **Trial Year:** 2019

Table 1: AMF in Fallow Phase

Situation		Fallow		Fallow #		Fallow			
Assessment Date		4/02/2020		8/05/2020		14/10/2020			
Evaluation Interval		95 DAH1		10 DAH2		169 DAH2			
Description		AMFa	AMFb	AMFa	AMFb	AMFa	AMFb	AMFd	AMFa2
Assessment Unit		kDNA/g	kDNAg	kDNA/g	kDNAg	kDNA/g	kDNA/g	kDNA/g	kDNA/g
ARM Action Code		AL	AL			AS	AL	AA	
TABLE OF A MEANS (Crop)									
1	Fallow	3.5b	4.5b	7.4b	7.8b	5.6b	4.5b	0.0-	0.1-
2	Wheat	51.8a	114a	32.3a	89.0a	28.0a	52.4a	0.0-	0.0-
3	Canola	5.0b	4.5b	6.2b	8.4b	3.3c	5.4b	0.0-	0.0-
TABLE OF B MEANS (Management)									
1	Untreated			6.0b	9.2b	5.6b	10.7-	0.1-	0.1-
3	Shallow MAP			.	.				
4	Barley cover crop			21.7a	36.4a	15.8a	12.0-	0.0-	0.0-
7	Endofuse liquid-in-furrow			.	.				
TABLE OF A x B MEANS (Crop x Management)									
1a	Fallow, Untreated			2.6e	2.2-	3.4b	4.4-	0.1-	0.2-
1b	Wheat, Untreated			14.7bc	52.0-	11.9b	45.2-	0.1-	0.0-
1c	Canola, Untreated			5.1de	5.3-	3.1b	5.4-	0.0-	0.0-
4a	Fallow, Barley cover crop			18.3b	23.4-	8.3b	4.6-	0.0-	0.0-
4b	Wheat, Barley cover crop			69.6a	152.1-	50.8a	60.6-	0.0-	0.0-
4c	Canola, Barley cover crop			7.6cd	13.0-	3.5b	5.5-	0.0-	0.0-

Only AMFa and AMFb analysed at 8/05/2020. No AMFe or AMFc2 was detected in soil analysis in fallow on 14/10/2020

Table 2: AMF in Cotton Phase

Crop		Cotton Sicot 714 B3F						
Assessment Date		4/02/2021						
Evaluation Interval		69 DAP2						
Description		AMF in soil samples				AMF in roots		
Assessment Type		AMFa	AMFb	AMFd	AMFa2	AMFa	AMFb	AMFa2
Assessment Unit		kDNA/g	kDNA/g	kDNA/g	kDNA/g	kDNA/g	kDNA/g	kDNA/g
TABLE OF A MEANS (Crop)								
1	Fallow	24.3-	6.9b	0.4a	3.2-	1.2-	0.8-	0.2-
2	Wheat	43.4-	32.3a	0.7a	0.0-	0.5-	0.6-	0.0-
3	Canola	29.7-	7.9b	0.0b	0.0-	1.7-	0.4-	0.0-
TABLE OF B MEANS (Management)								
1	Untreated	26.9-	16.1-	0.5-	1.1-	1.1-	1.3a	0.2-
3	Shallow MAP	26.9-	13.4-	0.6-	0.0-	2.0-	0.7ab	0.0-
4	Barley cover crop	39.7-	20.1-	0.0-	2.4-	0.9-	0.3b	0.0-
7	Endofuse liquid-in-furrow	36.3-	13.3-	0.5-	0.9-	0.6-	0.1b	0.1-
TABLE OF A x B MEANS (Crop x Management)								
1a	Fallow, Untreated	17.6-	4.0-	0.0-	3.3-	1.5-	1.7-	0.7-
1b	Wheat, Untreated	30.9-	30.7-	1.4-	0.0-	0.5-	1.7-	0.0-
1c	Canola, Untreated	32.0-	13.5-	0.0-	0.0-	1.3-	0.4-	0.0-
3a	Fallow, Shallow MAP	17.1-	4.9-	1.2-	0.0-	2.0-	0.9-	0.0-
3b	Wheat, Shallow MAP	35.5-	29.9-	0.6-	0.0-	0.2-	0.5-	0.0-
3c	Canola, Shallow MAP	28.2-	5.4-	0.0-	0.0-	3.7-	0.8-	0.0-
4a	Fallow, Barley cover crop	24.7-	10.7-	0.0-	7.0-	1.2-	0.7-	0.0-
4b	Wheat, Barley cover crop	69.3-	39.6-	0.0-	0.1-	0.6-	0.1-	0.0-
4c	Canola, Barley cover crop	25.2-	10.0-	0.0-	0.0-	0.7-	0.1-	0.0-
7a	Fallow, Endofuse liquid-in-furrow	37.6-	8.0-	0.5-	2.6-	0.1-	0.1-	0.0-
7b	Wheat, Endofuse liquid-in-furrow	37.9-	29.0-	0.9-	0.0-	0.6-	0.2-	0.0-
7c	Canola, Endofuse liquid-in-furrow	33.5-	2.9-	0.0-	0.0-	1.2-	0.2-	0.2-

No AMFe or AMFc2 detected in soil, No AMFd, AMFe or AMFc2 in root samples

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

Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

Impact of AMF on Summer Crops (Cotton)

Trial ID: BD1901b **Location:** Mullaley **Trial Year:** 2019

Table 3: EMF38 and Cotton Crop Measurements

Situation		Fallow	Cotton Sicot 714 B3F				
Assessment Date		1/10/2020	11/1/2021	4/2/2021	4/2/2021	9/02/2021	28/4/2021
Assessment Type		EM38 to 1.5m	EMERGENCE	HEIGHT	DRY MATTER	NDVI	BOLL COUNT
Assessment Unit		mS/m	/m²	cm	kg/ha	Ratio	/1m row
Treatment-Evaluation Interval		156 DAH2	45 DAP2	69 DAP2	69 DAP2	74 DAP2	152 DAP2
ARM Action Codes							
TABLE OF A MEANS (Crop)							
1	Fallow	165a	7.2-	35.8-	589-	589-	48-
2	Wheat	159a	7.3-	37.5-	683-	683-	52-
3	Canola	146b	7.3-	36.0-	597-	597-	44-
TABLE OF B MEANS (Management)							
1	Untreated	158-	7.4-	35.7-	536-	536-	41-
2	Deep MAP	157-	7.2-	36.8-	732-	732-	51-
3	Shallow MAP	158-	7.3-	36.4-	604-	604-	49-
4	Barley cover crop	155-	7.4-	37.3-	653-	653-	44-
5	Deep MAP + barley cover crop	155-	7.3-	38.2-	678-	678-	51-
6	Endofuse seed treatment	157-	7.1-	34.8-	596-	596-	51-
7	Endofuse liquid-in-furrow	158-	7.2-	35.8-	581-	581-	49-
8	Deep MAP, Endofuse seed trt	156-	7.3-	36.6-	604-	604-	48-
TABLE OF A x B MEANS (Crop x Management)							
1a	Fallow, Untreated	165-	7.4-	34.7-	456-	456-	46-
1b	Wheat, Untreated	164-	7.4-	36.9-	551-	551-	41-
1c	Canola, Untreated	145-	7.4-	35.5-	601-	601-	37-
2a	Fallow, Deep MAP	164-	7.1-	36.8-	650-	650-	50-
2b	Wheat, Deep MAP	159-	7.2-	37.0-	766-	766-	54-
2c	Canola, Deep MAP	148-	7.3-	36.7-	780-	780-	49-
3a	Fallow, Shallow MAP	167-	7.1-	35.3-	562-	562-	38-
3b	Wheat, Shallow MAP	163-	7.3-	37.2-	688-	688-	64-
3c	Canola, Shallow MAP	144-	7.6-	36.7-	562-	562-	46-
4a	Fallow, Barley Cover crop	164-	7.3-	37.3-	702-	702-	46-
4b	Wheat, Barley cover crop	156-	7.1-	38.7-	684-	684-	46-
4c	Canola, Barley cover crop	146-	7.8-	35.9-	574-	574-	39-
5a	Fallow, Deep MAP + barley cover crop	162-	7.5-	39.4-	778-	778-	56-
5b	Wheat, Deep MAP + barley cover crop	157-	7.4-	39.7-	788-	788-	52-
5c	Canola, Deep MAP + barley cover crop	145-	6.9-	35.6-	468-	468-	44-
6a	Fallow, Endofuse seed treatment	166-	6.9-	34.4-	566-	566-	55-
6b	Wheat, Endofuse seed treatment	160-	7.6-	36.1-	684-	684-	55-
6c	Canola, Endofuse seed treatment	147-	6.9-	34.0-	539-	539-	43-
7a	Fallow, Endofuse liquid-in-furrow	165-	7.1-	34.0-	559-	559-	38-
7b	Wheat, Endofuse liquid-in-furrow	160-	7.1-	37.7-	646-	646-	59-
7c	Canola, Endofuse liquid-in-furrow	150-	7.4-	35.7-	539-	539-	51-
8a	Fallow, Deep MAP, Endofuse seed Trt	166-	7.5-	34.8-	439-	439-	54-
8b	Wheat, Deep MAP, Endofuse seed Trt	156-	7.2-	36.8-	662-	662-	42-
8c	Canola, Deep MAP, Endofuse seed Trt	146-	7.3-	38.1-	710-	710-	48-

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

Mean comparisons performed only when AOV Treatment P (F) is significant at mean comparison OSL.

Impact of AMF on Summer Crops (Cotton)

Trial ID: **BD1901b** **Location:** **Mullaley** **Trial Year:** **2019**

This trial was started in winter 2019 near Mullaley in northern NSW with plots planted to wheat, canola or left fallow to establish varied populations of AMF (Arbuscular mycorrhizal fungi). Testing of background AMF prior to planting found AMFa at ~7 kDNA/g soil and AMFb at ~5 kDNA/g soil (only AMFa and AMFb were screened).

The 2019 winter was very dry with only 67 mm of rain recorded from May until November. In autumn 2020, five 'management' practices were imposed. These practices were combinations of shallow MAP (100 kg/ha), deep MAP (at 20 cm depth) or planting a barley cover crop. NB all plots were ripped to 20 cm depth irrespective of fertiliser placement. At the same time nitrogen was applied to wheat (95 kg N/ha) and canola (235 kg N/ha) plots to balance the amount extracted in crop growth in 2019 compared to the fallow. The barley cover crop was sprayed out ~7 weeks later.

An EM38 survey ~ 2 weeks prior to the initial cotton planting showed significantly lower conductance/ soil water following canola compared to wheat or fallow. However, there was no significant difference in soil water between the management practices imposed in 2020 (including the barley cover crop).

Treatments of Endofuse (commercial AMF inoculum) as a seed treatment or in-furrow spray were applied at cotton planting in October 2020. Cotton establishment was very poor. The cotton seedlings were sprayed out in early November then replanted to variety Sicot 714B 3F at the end of November. Endofuse treatments were reapplied. There were no significant affects from any treatment on emergence in the second cotton planting.

Sampling in February 2020 at 95 DAH1 (95 days after harvest 1) found AMFa counts following wheat were ~10 times larger than after either canola or fallow. AMFb counts following wheat were ~25 times larger. The levels of AMFa and AMFb following canola or fallow were similar to the site assessment prior to trial initiation. Under more ideal conditions for crop growth, AMF differences between these cropping options may have been greater. Testing did not detect any AMFa2, AMFc2 or AMFe with only trace levels of AMFd.

AMF assessment in May 2020 at 3 DAH2 (3 days after spray out of barley) found significantly higher AMFa and AMFb where barley had been grown but the counts were generally only ~3-4 times the level in the canola and fallow plots.

Intensive sampling for AMF was conducted at 69 DAP2. Soil samples (0-30cm) and cotton root samples were collected and sent for Predicta B analysis.

Detection of AMFa in the soil was generally higher than in October, but with no significant treatment differences. Plots following the barley cover crop had significantly higher AMFb levels than after canola or fallow. AMFd levels were still very low but with significantly higher levels following wheat or fallow in 2019. No AMFd was detected in the soil where canola had been grown in 2019.

Predicta B analysis of cotton root samples detected very little AMF presence. Both AMFa and AMFb were found but at lower levels than in adjacent sorghum and mungbean trials.

Crop NDVI, dry matter and plant height were assessed in early February 2021 with no significant differences between treatments.

A severe frosting event was experienced across the trial in early April. Plants were heavily desiccated and the majority of bolls failed to open. No harvest was attempted. A boll count was conducted in late April in an attempt to capture some production date but with no significant differences apparent.

Unfortunately, planned microscope analysis of root AMF for determination of the actual AMF species colonising the cotton roots did not get completed at USC.

This was an extremely complex trial and very challenging to manage, interpret and analyse. Disappointingly, despite securing a low AMF, low phosphorous site which had previously shown classic long fallow disorder symptoms after canola, in this situation the impact of a range of AMF levels on cotton production was negligible. A key outcome was observing the difference in AMF group buildup between sorghum, mung beans and cotton in both soil and root assays. Further basic research into the actual AMF species that are important for each summer crop is needed before similar applied research work is considered.

Impact of AMF on Summer Crops (Cotton)

Trial ID: **BD1901b** **Location:** **Mullaley** **Trial Year:** **2019**

Assessment Type
EM38 = Soil conductivity
NDVI = Normalized difference vegetation index
Assessment Unit
mS/m = Millisiemens per metre
ARM Action Codes
AS = Automatic square root transformation of X+0.5
AL = Automatic log transformation of X+1
AA = Automatic arcsine square root % transformation

DAP2 = Days after Planting 2 (cotton)
DAH1 = Days after Harvest 1 (establishment crops)
DAH2 = Days after Harvest 2 (barley cover crop harvest)

COMPLETE SPLIT-PLOT AOV
AMFa in Soil
14/10/2020
0-30cm kDNA/g 169 DAH2 AS

Source	DF	Sum of Squares	Mean Square	F	Prob(F)	LSD (.05)
Total	23	107.971054				
R	3	9.338652	3.112884	2.026	0.1808	
A	2	53.280961	26.640481	54.442	0.0001	1.9 - 4.4
ERROR A	6	2.936027	0.489338			
B	1	14.990479	14.990479	9.755	0.0123	1.1
AB	2	13.595323	6.797661	4.424	0.0459	2.0
ERROR B	9	13.829612	1.536624			

COMPLETE SPLIT-PLOT AOV
AMFb in Soil
14/10/2020
0-30cm kDNA/g 169 DAH2 AL

Source	DF	Sum of Squares	Mean Square	F	Prob(F)	LSD (.05)
Total	23	5.459037				
R	3	0.078654	0.026218	2.439	0.1314	
A	2	4.864314	2.432157	37.616	0.0004	2.4 - 16.1
ERROR A	6	0.387942	0.064657			
B	1	0.012923	0.012923	1.202	0.3014	0.1
AB	2	0.018448	0.009224	0.858	0.4560	0.2
ERROR B	9	0.096756	0.010751			

COMPLETE SPLIT-PLOT AOV
AMFd in Soil
14/10/2020
0-30cm kDNA/g 169 DAH2 AA

Source	DF	Sum of Squares	Mean Square	F	Prob(F)	LSD (.05)
Total	23	108.685289				
R	3	34.732987	11.577662	2.934	0.0918	
A	2	0.648904	0.324452	0.066	0.9372	0.1 - 99999.1
ERROR A	6	29.672605	4.945434			
B	1	5.375936	5.375936	1.362	0.2731	1.8
AB	2	2.740825	1.370412	0.347	0.7157	3.2
ERROR B	9	35.514032	3.946004			

Impact of AMF on Summer Crops (Cotton)

Trial ID: BD1901b **Location:** Mullaley **Trial Year:** 2019

COMPLETE SPLIT-PLOT AOV
AMFa2 in Soil
14/10/2020
0-30cm kDNA/g 169 DAH2

Source	DF	Sum of Squares	Mean Square	F	Prob(F)	LSD (.05)
Total	23	0.557912				
R	3	0.072771	0.024257	1.000	0.4363	
A	2	0.048514	0.024257	1.000	0.4219	0.1
ERROR A	6	0.145542	0.024257			
B	1	0.024257	0.024257	1.000	0.3434	0.1
AB	2	0.048514	0.024257	1.000	0.4053	0.2
ERROR B	9	0.218313	0.024257			

COMPLETE SPLIT-PLOT AOV
AMFa in Soil
4/02/2021
0-30cm kDNA/g 69 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	31984.902698				
R	3	463.352406	154.450802	0.202	0.8940	
A	2	3112.706554	1556.353277	3.294	0.1083	13.3
ERROR A	6	2835.250963	472.541827			
B	3	1554.589056	518.196352	0.678	0.5730	23.2
AB	6	3390.577013	565.096169	0.740	0.6224	40.1
ERROR B	27	20628.426706	764.015804			

COMPLETE SPLIT-PLOT AOV
AMFb in soil
4/02/2021
0-30cm kDNA/g 69 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	9774.641298				
R	3	214.023140	71.341047	1.234	0.3168	
A	2	6608.464654	3304.232327	27.560	0.0009	6.7
ERROR A	6	719.354029	119.892338			
B	3	366.859623	122.286541	2.115	0.1218	6.4
AB	6	304.571246	50.761874	0.878	0.5242	11.0
ERROR B	27	1561.368606	57.828467			

COMPLETE SPLIT-PLOT AOV
AMFd in soil
4/02/2021
0-30cm kDNA/g 69 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	39.355792				
R	3	1.845142	0.615047	0.726	0.5451	
A	2	4.325454	2.162727	5.226	0.0485	0.4
ERROR A	6	2.483146	0.413858			
B	3	2.530175	0.843392	0.996	0.4096	0.8
AB	6	5.313063	0.885510	1.046	0.4183	1.3
ERROR B	27	22.858813	0.846623			

Impact of AMF on Summer Crops (Cotton)

Trial ID: BD1901b **Location:** Mullaley **Trial Year:** 2019

COMPLETE SPLIT-PLOT AOV
AMFa2 in soil
4/02/2021
0-30cm kDNA/g 69 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	905.565048				
R	3	126.188556	42.062852	3.624	0.0256	
A	2	110.778579	55.389290	1.304	0.3385	4.0
ERROR A	6	254.776138	42.462690			
B	3	34.943656	11.647885	1.004	0.4063	2.9
AB	6	65.517738	10.919623	0.941	0.4825	4.9
ERROR B	27	313.360381	11.605940			

COMPLETE SPLIT-PLOT AOV
AMFa in roots
4/02/2021
kDNA/g 69 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	148.566522				
R	3	11.198198	3.732733	1.408	0.2620	
A	2	12.522776	6.261388	1.621	0.2737	1.2
ERROR A	6	23.181979	3.863663			
B	3	12.238315	4.079438	1.539	0.2272	1.4
AB	6	17.849997	2.975000	1.122	0.3759	2.4
ERROR B	27	71.575257	2.650935			

COMPLETE SPLIT-PLOT AOV
AMFb in roots
4/02/2021
kDNA/g 69 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	41.107060				
R	3	2.006521	0.668840	0.875	0.4664	
A	2	1.676159	0.838079	1.408	0.3153	0.5
ERROR A	6	3.571523	0.595254			
B	3	9.115572	3.038524	3.973	0.0182	0.7
AB	6	4.089946	0.681658	0.891	0.5150	1.3
ERROR B	27	20.647340	0.764716			

COMPLETE SPLIT-PLOT AOV
AMFa2 in roots
4/02/2021
kDNA/g 69 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	9.002436				
R	3	0.858866	0.286289	1.479	0.2424	
A	2	0.294257	0.147128	1.000	0.4219	0.2
ERROR A	6	0.882770	0.147128			
B	3	0.487772	0.162591	0.840	0.4838	0.4
AB	6	1.253864	0.208977	1.080	0.3990	0.6
ERROR B	27	5.224908	0.193515			

Impact of AMF on Summer Crops (Cotton)

Trial ID: BD1901b **Location:** Mullaley **Trial Year:** 2019

COMPLETE SPLIT-PLOT AOV
EM38 to 1.5
1/10/2020
mS/m 156 DAH2

Source	DF	Sum of Squares	Mean Square	F	Prob(F)	LSD (.05)
Total	95	10121.394238				
R	3	1256.136869	418.712290	32.046	0.0001	
A	2	5706.743655	2853.371827	8.930	0.0159	11
ERROR A	6	1917.168732	319.528122			
B	7	154.214435	22.030634	1.686	0.1286	3
AB	14	263.970167	18.855012	1.443	0.1604	5
ERROR B	63	823.160380	13.066038			

COMPLETE SPLIT-PLOT AOV
EMERGENCE
11/01/2021
Plants/m² 45 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob(F)	LSD (.05)
Total	95	18.733724				
R	3	0.132161	0.044054	0.254	0.8580	
A	2	0.079427	0.039714	0.074	0.9295	0.4
ERROR A	6	3.217448	0.536241			
B	7	0.634766	0.090681	0.523	0.8136	0.3
AB	14	3.753906	0.268136	1.548	0.1205	0.6
ERROR B	63	10.916016	0.173270			

COMPLETE SPLIT-PLOT AOV
HEIGHT
4/02/2021
cm /Plant 69 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	1151.979063				
R	3	36.398646	12.132882	1.055	0.3748	
A	2	52.523125	26.261563	0.960	0.4346	3.2
ERROR A	6	164.053542	27.342257			
B	7	92.693229	13.241890	1.151	0.3436	2.8
AB	14	81.570208	5.826443	0.506	0.9208	4.8
ERROR B	63	724.740313	11.503814			

COMPLETE SPLIT-PLOT AOV
DRY MATTER
4/02/2021
kg/ha 69 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	92	4263778.951563				
R	3	366716.186424	122238.728808	3.439	0.0223	
A	2	175766.525278	87883.262639	0.681	0.5413	220
ERROR A	6	774256.779444	129042.796574			
B	7	319567.019618	45652.431374	1.284	0.2735	154
AB	14	494840.159167	35345.725655	0.994	0.4704	267
ERROR B	60	2132632.281632	35543.871361			

Impact of AMF on Summer Crops (Cotton)

Trial ID: **BD1901b** **Location:** **Mullaley** **Trial Year:** **2019**

COMPLETE SPLIT-PLOT AOV
NDVI
9/02/2021
Ratio 74 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	0.647500				
R	3	0.016822	0.005607	0.957	0.4185	
A	2	0.049274	0.024637	1.438	0.3089	0.08
ERROR A	6	0.102816	0.017136			
B	7	0.025317	0.003617	0.617	0.7395	0.06
AB	14	0.084231	0.006016	1.027	0.4393	0.11
ERROR B	63	0.369040	0.005858			

COMPLETE SPLIT-PLOT AOV
BOLL COUNT
28/04/2021
/1m Row 152 DAP2

Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	95	16869.958333				
R	3	1445.458333	481.819444	4.099	0.0101	
A	2	800.583333	400.291667	0.758	0.5088	14
ERROR A	6	3168.916667	528.152778			
B	7	1154.458333	164.922619	1.403	0.2199	9
AB	14	2895.916667	206.851190	1.760	0.0656	15
ERROR B	63	7404.625000	117.533730			

Impact of AMF on Summer Crops (Cotton)

Trial ID: BD1901b **Location:** Mullaley **Trial Year:** 2019

Monthly Rainfall:

Closest Weather Station:	Silo weather data
Distance:	0.5 km

Date	Monthly Total	Unit	Comments
10/05/2019	-		Wheat and canola planted
31/05/2019	34.6	mm	
30/06/2019	2.9	mm	
31/07/2019	13.8	mm	
31/08/2019	2.4	mm	
30/09/2019	4.6	mm	
31/10/2019	9.4	mm	
1/11/2019	-		Wheat and canola harvested
30/11/2019	27	mm	
31/12/2019	0	mm	
31/01/2020	51.4	mm	
4/02/2020	-		AMF in soil assessment 1
29/02/2020	124.6	mm	
12/03/2020	-		Barley cover crop planted
31/03/2020	95.7	mm	
28/04/2020	-		Barley cover crop sprayed out
30/04/2020	69.9	mm	
8/05/2020	-		AMF in soil assessment 2
31/05/2020	34.7	mm	
30/06/2020	28	mm	
31/07/2020	27.9	mm	
31/08/2020	26.1	mm	
30/09/2020	25	mm	
1/10/2020	-		EM38 assessment
14/10/2020	-		AMF in soil assessment 3
31/10/2020	83.9	mm	
27/11/2020			Cotton planted
30/11/2020	4.4	mm	
31/12/2020	164.3	mm	
11/01/2020	-		Cotton emergence assessment
31/01/2021	26.8	mm	
4/02/2021	-		Cotton height and dry matter assessment AMF in soil assessment 4 AMF in roots assessment
9/02/2021	-		Cotton NDVI assessment
28/02/2021	65.8	mm	
31/03/2021	117.1	mm	
28/04/2021	-		Cotton boll count assessment

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