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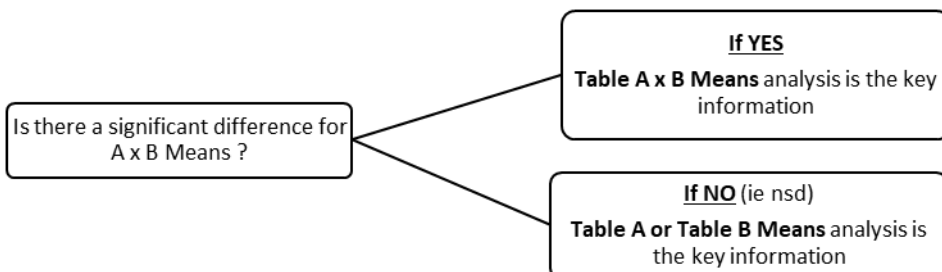
Chickpea Desiccation Timing

Trial ID: BD1908	Location: Mullaley	Trial Year: 2019
Investigator:	Branko Duric	

Objective:	To evaluate the impact of desiccation timing on chickpea yield and grain quality		
Crop:	Chickpea cv. PBA Seamer		
Planting Date:	18/06/2019		
Planting Equipment:	Tyne Planter		
Planting Rate:	60 kg/ha		
Row Spacing:	30cm		
Application Code:	A (Timing 1)	B (Timing 2)	C (Timing 3)
Application Date:	9/11/2019	14/11/2019	21/11/2019
Crop Stage at Application:	70% of pods physiologically mature	80% of pods physiologically mature	90% of pods physiologically mature
Harvest Date:	19/11/2019 (10 days after application)	21/11/2019 (7 days after application)	28/11/2019 (7 days after application)
Keywords:	Chickpea, desiccation		

Trial designed and analysed as a Strip Plot

	In Simple Terms
Table of A Means:	Mean of 'Timing' performance with ALL 'Desiccant' treatments
Table of B Means:	Mean of 'Desiccant' performance with ALL 'Timing' treatments
Table of A x B Means:	'Timing' performance with EACH 'Desiccant' treatment



Key analyses highlighted in grey

Chickpea Desiccation Timing

Trial ID: **BD1908**Location: **Mullaley**Trial Year: **2019**

NB: Assessment of crop discolouration, leaf drop and stem snapping was conducted for each application shortly prior to harvest.

Crop Name Crop Variety Assessment Date Assessment Type Assessment Unit				Chickpea PBA Seamer Timing 1: 19/11/2019, Timing 2: 21/11/2019, Timing 3: 28/11/2019			
				DISCOLOUR %	LEAF DROP %	STEM SNAP %	YIELD t/ha
Trt No.	Treatment	Product Rate	Appln. Code				
TABLE OF A MEANS (Timing)							
1	Timing 1 (70% maturity)		A	90-	50c	100-	2.52-
2	Timing 2 (80% maturity)		B	91-	60b	100-	2.47-
3	Timing 3 (90% maturity)		C	91-	85a	100-	2.19-
TABLE OF B MEANS (Desiccant)							
1	Untreated	-		84d	59b	100-	2.34-
2	Crucial	1600ml/ha		88bcd	65ab	100-	2.43-
3	Crucial	1000ml/ha		94ab	70a	100-	2.49-
	Ally	5g/ha					
4	Crucial	1000ml/ha		93abc	64ab	100-	2.41-
	Sharpen	34g/ha					
	Hasten	1% v/v					
5	Crucial	1000ml/ha		99a	71a	100-	2.36-
	Sharpen	9g/ha					
	Ally	5g/ha					
	Hasten	1% v/v					
6	Gramoxone	800ml/ha		87cd	61b	100-	2.31-
TABLE OF A x B MEANS (Timing x Desiccant)							
1a	Untreated	-	A	83-	38-	100-	2.56-
2a	Crucial	1600ml/ha	A	86-	53-	100-	2.54-
3a	Crucial	1000ml/ha	A	96-	55-	100-	2.67-
	Ally	5g/ha					
4a	Crucial	1000ml/ha	A	93-	55-	100-	2.52-
	Sharpen	34g/ha					
	Hasten	1% v/v					
5a	Crucial	1000ml/ha	A	99-	50-	100-	2.44-
	Sharpen	9g/ha					
	Ally	5g/ha					
	Hasten	1% v/v					
6a	Gramoxone	800ml/ha	A	86-	50-	100-	2.37-
1b	Untreated	-	B	80-	55-	100-	2.48-
2b	Crucial	1600ml/ha	B	91-	60-	100-	2.45-
3b	Crucial	1000ml/ha	B	93-	68-	100-	2.62-
	Ally	5g/ha					
4b	Crucial	1000ml/ha	B	94-	53-	100-	2.53-
	Sharpen	34g/ha					
	Hasten	1% v/v					
5b	Crucial	1000ml/ha	B	100-	70-	100-	2.36-
	Sharpen	9g/ha					
	Ally	5g/ha					
	Hasten	1% v/v					
6b	Gramoxone	800ml/ha	B	89-	55-	100-	2.38-
1c	Untreated	-	C	89-	84-	100-	1.97-
2c	Crucial	1600ml/ha	C	88-	83-	100-	2.31-
3c	Crucial	1000ml/ha	C	93-	86-	100-	2.19-
	Ally	5g/ha					
4c	Crucial	1000ml/ha	C	93-	85-	100-	2.17-
	Sharpen	34g/ha					
	Hasten	1% v/v					
5c	Crucial	1000ml/ha	C	98-	93-	100-	2.29-
	Sharpen	9g/ha					
	Ally	5g/ha					
	Hasten	1% v/v					
6c	Gramoxone	800ml/ha	C	85-	78-	100-	2.19-

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

Chickpea Desiccation Timing

Trial ID: BD1908

Location: Mullaley

Trial Year: 2019

Crop Name Crop Variety Description Assessment Type Assessment Unit				Chickpea PBA Seamer				
				PROTEIN %	MOISTURE %	Mature Grain COUNT %	Green Grain COUNT %	Yellow Grain COUNT %
Trt No.	Treatment	Product Rate	Appln. Code					
TABLE OF A MEANS (Timing)								
1	Timing 1 (70% maturity)		A	25.7-	7.9b	98-	0.0b	0.0-
2	Timing 2 (80% maturity)		B	25.5-	7.7b	98-	0.1a	0.0-
3	Timing 3 (90% maturity)		C	25.3-	8.2a	98-	0.0b	0.0-
TABLE OF B MEANS (Desiccant)								
1	Untreated	-		25.5-	8.0-	98-	0.0-	0.0-
2	Crucial	1600ml/ha		25.6-	7.8-	98-	0.0-	0.0-
3	Crucial	1000ml/ha		25.3-	8.0-	98-	0.0-	0.0-
	Ally	5g/ha						
4	Crucial	1000ml/ha		25.5-	7.9-	98-	0.0-	0.0-
	Sharpen	34g/ha						
	Hasten	1% v/v						
5	Crucial	1000ml/ha		25.5-	7.9-	98-	0.0-	0.0-
	Sharpen	9g/ha						
	Ally	5g/ha						
	Hasten	1% v/v						
6	Gramoxone	800ml/ha		25.6-	7.7-	98-	0.0-	0.0-
TABLE OF A x B MEANS (Timing x Desiccant)								
1a	Untreated	-	A	25.6-	8.0-	98-	0.0-	0.1-
2a	Crucial	1600ml/ha	A	25.6-	7.8-	98-	0.0-	0.0-
3a	Crucial	1000ml/ha	A	25.7-	7.8-	98-	0.0-	0.0-
	Ally	5g/ha						
4a	Crucial	1000ml/ha	A	26.1-	7.7-	98-	0.0-	0.0-
	Sharpen	34g/ha						
	Hasten	1% v/v						
5a	Crucial	1000ml/ha	A	25.0-	8.3-	98-	0.0-	0.0-
	Sharpen	9g/ha						
	Ally	5g/ha						
	Hasten	1% v/v						
6a	Gramoxone	800ml/ha	A	26.1-	7.5-	98-	0.0-	0.0-
1b	Untreated	-	B	25.5-	7.9-	98-	0.1-	0.0-
2b	Crucial	1600ml/ha	B	25.7-	7.6-	98-	0.1-	0.0-
3b	Crucial	1000ml/ha	B	25.2-	7.8-	98-	0.0-	0.0-
	Ally	5g/ha						
4b	Crucial	1000ml/ha	B	25.3-	7.7-	98-	0.0-	0.0-
	Sharpen	34g/ha						
	Hasten	1% v/v						
5b	Crucial	1000ml/ha	B	25.6-	7.5-	97-	0.1-	0.0-
	Sharpen	9g/ha						
	Ally	5g/ha						
	Hasten	1% v/v						
6b	Gramoxone	800ml/ha	B	25.6-	7.6-	98-	0.1-	0.0-
1c	Untreated	-	C	25.4-	8.3-	98-	0.0-	0.0-
2c	Crucial	1600ml/ha	C	25.6-	8.2-	99-	0.0-	0.0-
3c	Crucial	1000ml/ha	C	25.0-	8.4-	98-	0.0-	0.0-
	Ally	5g/ha						
4c	Crucial	1000ml/ha	C	25.1-	8.4-	98-	0.0-	0.0-
	Sharpen	34g/ha						
	Hasten	1% v/v						
5c	Crucial	1000ml/ha	C	25.9-	8.0-	98-	0.0-	0.0-
	Sharpen	9g/ha						
	Ally	5g/ha						
	Hasten	1% v/v						
6c	Gramoxone	800ml/ha	C	25.2-	8.2-	98-	0.0-	0.0-

Chickpea Desiccation Timing

Trial ID: BD1908

Location: Mullaley

Trial Year: 2019

Crop Name Crop Variety Description Assessment Type Assessment Unit				Chickpea PBA Seamer			
				Damaged COUNT %	Shriveled COUNT %	Whole Pods COUNT %	Germination COUNT %
Trt No.	Treatment	Product Rate	Appln. Code				
TABLE OF A MEANS (Timing)							
1	Timing 1 (70% maturity)		A	1.2-	0.3a	0.3-	40b
2	Timing 2 (80% maturity)		B	1.6-	0.3ab	0.3-	54a
3	Timing 3 (90% maturity)		C	1.7-	0.2b	0.1-	32c
TABLE OF B MEANS (Desiccant)							
1	Untreated			1.5-	0.2-	0.4-	51a
2	Crucial	1600ml/ha		1.3-	0.2-	0.3-	40bc
3	Crucial Ally	1000ml/ha 5g/ha		1.5-	0.3-	0.2-	44b
4	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v		1.5-	0.4-	0.2-	36c
5	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v		1.9-	0.2-	0.1-	38c
6	Gramoxone	800ml/ha		1.6-	0.2-	0.2-	41bc
TABLE OF A x B MEANS (Timing x Desiccant)							
1a	Untreated	-	A	1.1-	0.3-	0.7-	44cde
2a	Crucial	1600ml/ha	A	1.2-	0.3-	0.4-	33fg
3a	Crucial Ally	1000ml/ha 5g/ha	A	1.4-	0.3-	0.3-	35efg
4a	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v	A	1.0-	0.5-	0.2-	39def
5a	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v	A	1.5-	0.3-	0.2-	47cd
6a	Gramoxone	800ml/ha	A	1.2-	0.4-	0.1-	41c-f
1b	Untreated	-	B	1.5-	0.1-	0.4-	60ab
2b	Crucial	1600ml/ha	B	1.5-	0.3-	0.4-	50c
3b	Crucial Ally	1000ml/ha 5g/ha	B	1.3-	0.4-	0.2-	60a
4b	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v	B	1.5-	0.4-	0.2-	46cd
5b	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v	B	2.3-	0.3-	0.2-	43c-f
6b	Gramoxone	800ml/ha	B	1.8-	0.1-	0.2-	65a
1c	Untreated	-	C	1.8-	0.3-	0.2-	50bc
2c	Crucial	1600ml/ha	C	1.2-	0.1-	0.1-	39def
3c	Crucial Ally	1000ml/ha 5g/ha	C	1.7-	0.1-	0.1-	38def
4c	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v	C	2.0-	0.2-	0.2-	23h
5c	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v	C	1.8-	0.0-	0.0-	25gh
6c	Gramoxone	800ml/ha	C	1.7-	0.2-	0.2-	17h

Chickpea Desiccation Timing

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COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer DISCOLOUR %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	5765.277778				
R	3	473.611111	157.870370	2.532	0.0690	
A	2	4.861111	2.430556	0.037	0.9640	6
ERROR A	6	395.138889	65.856481			
B	5	1790.277778	358.055556	5.742	0.0004	7
AB	10	295.138889	29.513889	0.473	0.8985	11
ERROR B	45	2806.250000	62.361111			

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer LEAF DROP %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	23298.611111				
R	3	345.833333	115.277778	1.086	0.3646	
A	2	15202.777778	7601.388889	77.085	0.0001	7
ERROR A	6	591.666667	98.611111			
B	5	1344.444444	268.888889	2.534	0.0419	8
AB	10	1038.888889	103.888889	0.979	0.4747	15
ERROR B	45	4775.000000	106.111111			

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer STEM SNAP %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	0.000000				
R	3	0.000000	0.000000	0.000	1.0000	
A	2	0.000000	0.000000	0.000	1.0000	0
ERROR A	6	0.000000	0.000000			
B	5	0.000000	0.000000	0.000	1.0000	0
AB	10	0.000000	0.000000	0.000	0.0000	0
ERROR B	45	0.000000	0.000000			

No analysis all 100%

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer YIELD t/ha TY1						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	24.448767				
R	3	15.930221	5.310074	63.385	0.0001	
A	2	1.536410	0.768205	1.827	0.2401	0.46
ERROR A	6	2.523051	0.420508			
B	5	0.270659	0.054132	0.646	0.6658	0.24
AB	10	0.418548	0.041855	0.500	0.8812	0.41
ERROR B	45	3.769878	0.083775			

Chickpea Desiccation Timing

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COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer PROTEIN %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	27.109861				
R	3	6.038194	2.012731	7.676	0.0003	
A	2	1.471111	0.735556	2.715	0.1447	0.4
ERROR A	6	1.625556	0.270926			
B	5	0.965694	0.193139	0.737	0.5999	0.4
AB	10	5.210556	0.521056	1.987	0.0576	0.7
ERROR B	45	11.798750	0.262194			

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer MOISTURE %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	16.366528				
R	3	3.979306	1.326435	11.891	0.0001	
A	2	3.583611	1.791806	8.092	0.0198	0.3
ERROR A	6	1.328611	0.221435			
B	5	0.775694	0.155139	1.391	0.2458	0.3
AB	10	1.679722	0.167972	1.506	0.1688	0.5
ERROR B	45	5.019583	0.111546			

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer Mature Grain COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	48.711178				
R	3	20.228078	6.742693	16.994	0.0001	
A	2	1.533619	0.766810	1.472	0.3019	1
ERROR A	6	3.125514	0.520919			
B	5	1.882011	0.376402	0.949	0.4592	1
AB	10	4.086847	0.408685	1.030	0.4345	1
ERROR B	45	17.855108	0.396780			

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer Green Grain COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	0.464444				
R	3	0.013333	0.004444	0.656	0.5836	
A	2	0.071111	0.035556	8.000	0.0203	0.0
ERROR A	6	0.026667	0.004444			
B	5	0.016111	0.003222	0.475	0.7926	0.1
AB	10	0.032222	0.003222	0.475	0.8971	0.1
ERROR B	45	0.305000	0.006778			

Chickpea Desiccation Timing

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Trial Year: 2019

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer Yellow Grain COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	0.157778				
R	3	0.006667	0.002222	1.000	0.4016	
A	2	0.004444	0.002222	1.000	0.4219	0.0
ERROR A	6	0.013333	0.002222			
B	5	0.011111	0.002222	1.000	0.4287	0.0
AB	10	0.022222	0.002222	1.000	0.4579	0.1
ERROR B	45	0.100000	0.002222			

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer Damaged Grain COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	39.822088				
R	3	15.832138	5.277379	19.076	0.0001	
A	2	3.106158	1.553079	2.624	0.1518	0.5
ERROR A	6	3.551708	0.591951			
B	5	2.476146	0.495229	1.790	0.1342	0.4
AB	10	2.406608	0.240661	0.870	0.5671	0.8
ERROR B	45	12.449329	0.276652			

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer Shrivelled Grain COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	3.092832				
R	3	0.100426	0.033475	0.792	0.5049	
A	2	0.319053	0.159526	8.786	0.0165	0.1
ERROR A	6	0.108936	0.018156			
B	5	0.216007	0.043201	1.022	0.4163	0.2
AB	10	0.445597	0.044560	1.054	0.4165	0.3
ERROR B	45	1.902813	0.042285			

COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer Whole Pods COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	5.479111				
R	3	0.246922	0.082307	1.169	0.3320	
A	2	0.476669	0.238335	3.632	0.0925	0.2
ERROR A	6	0.393686	0.065614			
B	5	0.618428	0.123686	1.757	0.1412	0.2
AB	10	0.575864	0.057586	0.818	0.6130	0.4
ERROR B	45	3.167542	0.070390			

Chickpea Desiccation Timing

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COMPLETE SPLIT-PLOT AOV Chickpea cv. PBA Seamer Germination COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	71	14898.000000				
R	3	1223.666667	407.888889	8.550	0.0001	
A	2	5889.333333	2944.666667	43.661	0.0003	6
ERROR A	6	404.666667	67.444444			
B	5	1705.166667	341.033333	7.149	0.0001	6
AB	10	3528.500000	352.850000	7.397	0.0001	10
ERROR B	45	2146.666667	47.703704			

Assessment Type

DISCOLOUR = Phytotoxicity - % discoloration

LEAF DROP = Estimate of % of leaves dropped from plant

STEM SNAP = Measurement of stem dry down as indicator of harvest readiness. 10 plants/plot were twisted and evaluated. Recorded the % of plants where all stems had snapped in 2 twists.

Conclusions:

This trial was designed to determine the impact of desiccant application timing. Desiccants were applied to chickpeas cv. PBA Seamer, grown in a pivot irrigation block, at ~70 %, ~80 % and ~90 % grain maturity. Harvest was conducted 10 days after timing 1 and 7 days after timings 2 and 3. At each harvest, visual ratings of crop discoloration and leaf drop were conducted and a physical measure of stem dry down (stem snapping) was performed. Grain quality was evaluated within 24 hours of each harvest.

Differences between treatments for crop discoloration and leaf drop were relatively minor. All treatments except Crucial alone and Gramoxone significantly increased % crop discoloration compared to the Untreated. Only Crucial + Ally and Crucial + Sharpen + Ally significantly increased % leaf drop compared to the Untreated. There was no difference between treatments for impact on stem dry down (stem snapping) with the Untreated and all treatments recording 100% at all 3 harvests.

There was no significant impact from desiccant treatments on yield or grain quality. Grain from application timing 3 had significantly increased % grain moisture due to a 19mm rain event between application and harvest. Visual grain grading did not show any significant impact from desiccant treatment.

Seed germination levels were very poor with Untreated seed only averaging ~50% (range of 44-60%). There was no consistent impact from desiccant treatments at application timings 1 and 2. However all desiccant treatments significantly reduced % germination compared to the Untreated at application timing 3. The results suggest an impact from the rain event that occurred after application 3.

In this situation, application of desiccant treatments at ~70% grain maturity had little or no impact on yield, grain quality or visual grain assessment. The results suggest that rain events between desiccation application and harvest may reduce seed germination. This result should be tested with additional work as it could have a major bearing on seed retention and possibly chemical residues.

Crop Description	
Crop:	Chickpea
Variety:	PBA Seamer
Planting Date:	18/06/2019
Planting Equipment:	Tyne
Row Spacing:	30cm
Harvested Width, Unit:	1.6m
Harvested Length, Unit:	11.7m

Chickpea Desiccation Timing

Trial ID: BD1908

Location: Mullaley

Trial Year: 2019

Application Description			
	A	B	C
Application Date:	9/11/2019	14/11/2019	21/11/2019
Application Start Time:	8:30 AM	9:00 AM	10:00 AM
Application Stop Time:	10:30 AM	11:00 AM	12:00 PM
Application Method:	SPRAY		
Application Timing:	PRE-HARVEST		
Application Placement:	FOLIAR		
Air Temperature, Unit:	14 C	20 C	24 C
% Relative Humidity:	44	26	48
Wind Velocity, Unit:	3.9 m/s	3.2 m/s	0.5 m/s
Wind Direction:	SW	W	SW
Dew Presence (Y/N):	No		
% Cloud Cover:	20	40	40

Crop Stage at Each Application			
	A	B	C
Crop:	Chickpea		
Stage Scale Used:	Grain maturity		
Stage Majority, %:	70 %	80 %	90 %
Stage Minimum, %:	50 %	60 %	70 %
Stage Maximum, %:	80 %	90 %	100 %

Application Equipment			
	A	B	C
Application Equipment:	Polaris		
Equipment Type:	BOOM		
Operation Pressure, Unit:	300 kPa		
Nozzle Type:	AIXR		
Nozzle Size:	110015		
Nozzle Spacing, Unit:	50 cm		
Boom Length, Unit:	4 m		
Boom Height, Unit:	50 cm above top of chickpeas		
Ground Speed, Unit:	7.2 km/h		
Spray Volume, Unit:	100 L/ha		