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Chickpea Desiccation Timing

Trial ID: **BD1911** Location: **Breeza** Trial Year: **2019**
Investigator: **Branko Duric**

Objective:	To evaluate the impact of desiccation timing on chickpea yield and grain quality	
Crop:	Chickpea cv. Almaz	
Planting Date:	20/06/2019	
Planting Equipment:	Tyne Planter	
Planting Rate:	70 kg/ha	
Application Code:	A (Timing 1)	B (Timing 2)
Application Date:	29/10/2019	6/11/2019
Crop Stage at Application:	70% of pods physiologically mature	90% of pods physiologically mature
Harvest Date:	8/11/2019 (10 days after application)	12/11/2019 (6 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

Is there a significant difference for A x B Means ?

If YES

Table A x B Means analysis is the key information

If NO (ie nsd)

Table A or Table B Means analysis is the key information

Key analyses highlighted in grey

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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 Timing 1 Timing 2 Assessment Type Assessment Unit ARM Action Codes				Chickpea Almaz					
				8/11/2019 12/11/2019 DISCOLOUR %	8/11/2019 12/11/2019 LEAF DROP %	8/11/2019 12/11/2019 STEM SNAP %	8/11/2019 12/11/2019 YIELD t/ha	PROTEIN %	MOISTURE %
Trt No.	Treatment	Product Rate	Appln. Code						
TABLE OF A MEANS (Timing)									
1	Timing 1 (70% maturity)		A	79b	39-	48b	0.15a	26.4b	8.1a
2	Timing 2 (90% maturity)		B	85a	45-	63a	0.11b	26.8a	6.4b
TABLE OF B MEANS (Desiccant)									
1	Untreated	-		81-	41-	51-	0.12-	26.3b	7.5ab
2	Crucial	1600ml/ha		82-	40-	61-	0.14-	27.0a	7.0c
3	Crucial Ally	1000ml/ha 5g/ha		78-	41-	59-	0.13-	26.3b	7.7a
4	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v		84-	41-	53-	0.12-	26.6ab	7.1bc
5	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v		83-	44-	53-	0.13-	26.5b	7.2bc
6	Gramoxone	800ml/ha		83-	44-	56-	0.13-	27.0a	6.9c
TABLE OF A x B MEANS (Timing x Desiccant)									
1a	Untreated	-	A	76-	35-	45-	0.13-	26.3bcd	8.5a
2a	Crucial	1600ml/ha	A	76-	35-	53-	0.16-	26.7abc	7.9ab
3a	Crucial Ally	1600ml/ha 5g/ha	A	76-	40-	50-	0.15-	26.8abc	7.8ab
4a	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v	A	80-	35-	48-	0.13-	26.2cd	8.3ab
5a	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v	A	81-	45-	43-	0.17-	25.9d	8.2ab
6a	Gramoxone	800ml/ha	A	81-	45-	50-	0.16-	26.8abc	8.0ab
1b	Untreated	-	B	86-	48-	58-	0.11-	26.3bcd	6.6c
2b	Crucial	1600ml/ha	B	88-	45-	70-	0.12-	27.2a	6.2cd
3b	Crucial Ally	1000ml/ha 5g/ha	B	80-	43-	68-	0.10-	25.9d	7.6b
4b	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v	B	88-	48-	58-	0.10-	27.0ab	5.9cd
5b	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v	B	85-	43-	63-	0.10-	27.1ab	6.2cd
6b	Gramoxone	800ml/ha	B	84-	43-	63-	0.10-	27.3a	5.8d

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

Chickpea Desiccation Timing

Trial ID: BD1911

Location: Breeza

Trial Year: 2019

Crop Name Crop Variety Description Assessment Type Assessment Unit ARM Action Codes				Chickpea Almaz				
				Mature Grain COUNT %	Damaged Grain COUNT %	Shrivelled Grain COUNT %	Whole Pods COUNT %	Germination COUNT %
Trt No.	Treatment	Product Rate	Appln. Code					
TABLE OF A MEANS (Timing)								
1	Timing 1 (70% maturity)		A	93-	5.6b	0.4a	1.2-	30a
2	Timing 2 (90% maturity)		B	92-	6.8a	0.0b	1.0-	22b
TABLE OF B MEANS (Desiccant)								
1	Untreated	-		92bc	6.2-	0.1-	1.7-	19d
2	Crucial	1600ml/ha		91c	7.1-	0.4-	1.4-	18d
3	Crucial Ally	1000ml/ha 5g/ha		93ab	6.4-	0.2-	0.6-	41a
4	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v		93a	5.6-	0.1-	0.9-	22cd
5	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v		93ab	6.0-	0.2-	0.9-	25c
6	Gramoxone	800ml/ha		93ab	6.0-	0.2-	0.9-	30b
TABLE OF A x B MEANS (Timing x Desiccant)								
1a	Untreated	-	A	92ab	5.1cd	0.1-	2.5-	25d
2a	Crucial	1600ml/ha	A	90c	7.9a	0.9-	1.5-	25de
3a	Crucial Ally	1000ml/ha 5g/ha	A	94ab	5.4bcd	0.4-	0.7-	43a
4a	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v	A	94ab	4.9cd	0.2-	1.2-	27cd
5a	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v	A	94a	4.8d	0.3-	0.9-	34bc
6a	Gramoxone	800ml/ha	A	94ab	5.4bcd	0.5-	0.5-	24de
1b	Untreated	-	B	92bc	7.2ab	0.0-	1.0-	12f
2b	Crucial	1600ml/ha	B	92ab	6.3a-d	0.0-	1.4-	11f
3b	Crucial Ally	1000ml/ha 5g/ha	B	92ab	7.4a	0.0-	0.6-	39ab
4b	Crucial Sharpen Hasten	1000ml/ha 34g/ha 1% v/v	B	93ab	6.2a-d	0.0-	0.6-	16f
5b	Crucial Sharpen Ally Hasten	1000ml/ha 9g/ha 5g/ha 1% v/v	B	92bc	7.3a	0.0-	0.9-	17ef
6b	Gramoxone	800ml/ha	B	92ab	6.6abc	0.0-	1.3-	36ab

NB: There were no yellow or green immature grains in any sample

Chickpea Desiccation Timing

Trial ID: **BD1911**Location: **Breeza**Trial Year: **2019**

COMPLETE SPLIT-PLOT AOV Chickpea cv. Almaz 8/11/2019 & 12/11/2019 DISCOLOUR %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	1774.479167				
R	3	180.729167	60.243056	2.454	0.0825	
A	1	500.520833	500.520833	23.439	0.0168	4
ERROR A	3	64.062500	21.354167			
B	5	158.854167	31.770833	1.294	0.2926	4
AB	5	133.854167	26.770833	1.091	0.3859	7
ERROR B	30	736.458333	24.548611			

COMPLETE SPLIT-PLOT AOV Chickpea cv. Almaz 8/11/2019 & 12/11/2019 LEAF DROP %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	6131.250000				
R	3	39.583333	13.194444	0.088	0.9659	
A	1	352.083333	352.083333	1.610	0.2941	14
ERROR A	3	656.250000	218.750000			
B	5	93.750000	18.750000	0.126	0.9855	10
AB	5	510.416667	102.083333	0.684	0.6393	18
ERROR B	30	4479.166667	149.305556			

COMPLETE SPLIT-PLOT AOV Chickpea cv. Almaz 8/11/2019 & 12/11/2019 STEM SNAP %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	7791.666667				
R	3	475.000000	158.333333	1.281	0.2988	
A	1	2700.000000	2700.000000	69.429	0.0036	6
ERROR A	3	116.666667	38.888889			
B	5	641.666667	128.333333	1.038	0.4135	9
AB	5	150.000000	30.000000	0.243	0.9402	16
ERROR B	30	3708.333333	123.611111			

COMPLETE SPLIT-PLOT AOV Chickpea cv. Almaz 8/11/2019 & 12/11/2019 YIELD t/ha						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	0.043320				
R	3	0.002049	0.000683	1.979	0.1384	
A	1	0.024616	0.024616	65.668	0.0039	0.02
ERROR A	3	0.001125	0.000375			
B	5	0.002454	0.000491	1.422	0.2449	0.02
AB	5	0.002721	0.000544	1.577	0.1968	0.03
ERROR B	30	0.010355	0.000345			

Chickpea Desiccation Timing

Trial ID: BD1911

Location: Breeza

Trial Year: 2019

COMPLETE SPLIT-PLOT AOV						
Chickpea cv. Almaz						
PROTEIN %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	22.888125				
R	3	0.992292	0.330764	0.973	0.4186	
A	1	1.725208	1.725208	31.891	0.0110	0.2
ERROR A	3	0.162292	0.054097			
B	5	4.336875	0.867375	2.550	0.0488	0.5
AB	5	5.468542	1.093708	3.216	0.0192	0.8
ERROR B	30	10.202917	0.340097			

COMPLETE SPLIT-PLOT AOV						
Chickpea cv. Almaz						
MOISTURE %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	57.523125				
R	3	0.440625	0.146875	0.481	0.6980	
A	1	36.575208	36.575208	110.208	0.0018	0.5
ERROR A	3	0.995625	0.331875			
B	5	4.249375	0.849875	2.783	0.0351	0.5
AB	5	6.101042	1.220208	3.996	0.0068	0.8
ERROR B	30	9.161250	0.305375			

COMPLETE SPLIT-PLOT AOV						
Chickpea cv. Almaz						
Mature Grain						
COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	136.903431				
R	3	1.484773	0.494924	0.220	0.8819	
A	1	4.362102	4.362102	2.245	0.2310	1.3
ERROR A	3	5.830273	1.943424			
B	5	28.851969	5.770394	2.562	0.0480	1.3
AB	5	28.809435	5.761887	2.558	0.0483	2.2
ERROR B	30	67.564879	2.252163			

COMPLETE SPLIT-PLOT AOV						
Chickpea cv. Almaz						
Damaged Grain						
COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	107.993898				
R	3	2.566023	0.855341	0.522	0.6702	
A	1	19.139502	19.139502	14.371	0.0322	1.1
ERROR A	3	3.995523	1.331841			
B	5	10.398660	2.079732	1.270	0.3026	1.1
AB	5	22.764160	4.552832	2.780	0.0353	1.8
ERROR B	30	49.130029	1.637668			

Chickpea Desiccation Timing

Trial ID: BD1911

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COMPLETE SPLIT-PLOT AOV						
Chickpea cv. Almaz						
Shrivelled Grain						
COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	5.475400				
R	3	0.076717	0.025572	0.388	0.7623	
A	1	1.920000	1.920000	75.081	0.0032	0.1
ERROR A	3	0.076717	0.025572			
B	5	0.712825	0.142565	2.164	0.0848	0.2
AB	5	0.712825	0.142565	2.164	0.0848	0.4
ERROR B	30	1.976317	0.065877			

COMPLETE SPLIT-PLOT AOV						
Chickpea cv. Almaz						
Whole Pods						
COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	33.669848				
R	3	0.492023	0.164008	0.262	0.8521	
A	1	0.819019	0.819019	2.688	0.1996	0.5
ERROR A	3	0.913990	0.304663			
B	5	6.717960	1.343592	2.148	0.0868	0.7
AB	5	5.957544	1.191509	1.904	0.1231	1.1
ERROR B	30	18.769313	0.625644			

COMPLETE SPLIT-PLOT AOV F						
Chickpea cv. Almaz						
Germination						
COUNT %						
Source	DF	Sum of Squares	Mean Square	F	Prob.(F)	LSD (.05)
Total	47	6112.666667				
R	3	187.500000	62.500000	1.990	0.1367	
A	1	752.083333	752.083333	67.519	0.0038	3
ERROR A	3	33.416667	11.138889			
B	5	3130.916667	626.183333	19.940	0.0001	5
AB	5	1066.666667	213.333333	6.793	0.0002	8
ERROR B	30	942.083333	31.402778			

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.

Chickpea Desiccation Timing

Trial ID: **BD1911**Location: **Breeza**Trial Year: **2019**

Conclusions:

This trial was designed to determine the impact of desiccant application timing. Three application timings were planned: at ~70%, 80% and 90% grain maturity. The crop matured very quickly with desiccants only applied at ~70 % and ~90 % grain maturity. Harvest was conducted 10 days after Timing 1 and 6 days after Timing 2. At each harvest, visual ratings of crop discolouration 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.

There was no significant difference in discolouration, leaf drop or stem snapping between any treatment and the Untreated.

Chickpea grain yield was very low at this site. There was no significant impact from any treatment on yield. There was a small but significant impact on yield between the two harvest timings but this may simply be due to harvest conditions or header setup.

There were no significant differences in protein or grain moisture between the Untreated and any treatment applied at Timing 1. There were small but significant differences in protein and moisture from application at Timing 2. Both Crucial and Gramoxone alone recorded significantly increased grain protein compared to the Untreated (increased by 0.9-1%). Crucial + Ally recorded significantly higher grain moisture than the Untreated with Gramoxone recording significantly lower, both by ~1%. Grain moisture at the second harvest as expected was significantly lower than at the first harvest (6 v 8%).

Visual grading of the grain showed little impact from treatments or timing. Crucial alone at Timing 1 had significantly reduced mature grain and increased damaged grain compared to the Untreated. There were no differences in shrivelled grain between treatments at Timing 1 and no difference in any visual grading category at Timing 2. Shrivelled grain levels were significantly higher from Timing 1 application but at levels less than 1%.

Seed germination was extremely low with no sample reaching 50% germination. There was no indication of any treatment reducing germination compared to the Untreated.

Because of the extended dry conditions and very rapid plant maturation, the data from this trial is considered to be of marginal reliability. In this situation, application of desiccant treatments at ~70% grain maturity had little or no impact on yield, grain quality or visual grain assessment. Although this was an encouraging result, the rapid maturing of the crop meant timing 1 was only ~8 days earlier than currently recommended.

Application Description		
	A	B
Application Date:	29-10-2019	6-11-2019
Application Start Time:	9:00 AM	9:00 AM
Application Stop Time:	11:00 AM	11:00 AM
Application Method:	SPRAY	
Application Timing:	PRE-HARVEST	
Application Placement:	FOLIAR	
Air Temperature, Unit:	23 C	18 C
% Relative Humidity:	39	43
Wind Velocity, Unit:	1 m/s	1.7 m/s
Wind Direction:	SW	W
Dew Presence (Y/N):	No	
% Cloud Cover:	10	0

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

Chickpea Desiccation Timing

Trial ID: **BD1911**Location: **Breeza**Trial Year: **2019**

Application Equipment	
	A
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
Ground Speed, Unit:	7.2 km/h
Spray Volume, Unit:	100 L/ha