PROJECT TITLE: Statewide evaluation of chickpea (Garbonzo bean) variety performance (Montana Uniform Chickpea Performance Trial)

EXPERIMENT NO.: #8907

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(This Report Summarizes the Moccasin Testing Site Only)

OBJECTIVES:
To evaluate grain yield potential of chickpea varieties under dryland conditions across Montana.

METHODS:
The 2002 Montana Uniform Chickpea Performance Trial (UCPT) consisted of four desi-type and seven kauli-type chickpea entries, of which one was a "small" kabuli-type. The trial was established at five dryland sites (Bozeman, Conrad, Huntley, Moccasin, and Sidney). A range in seed size and growth habit was observed in the entries (**Table 11**). Due to the wide discrepancy in maturity, the desi-type chickpeas were randomized and seeded separately, but adjacent to, the kabuli-type chickpeas. Both trials were seeded April 30th into tilled fallow conditions (**Table 12**). The desi-type chickpeas were harvested at grain maturity on August 19th. A severe thunderstorm hit the area on August 20th, damaging the remaining (kabuli-type) chickpeas. However, the damage was not complete and the remaining chickpeas were harvested on August 26th. An estimate of hail loss was conducted by collecting all seed (on the ground) in a 2' x 2' sub-plot in kabuli-type plots of the second replication. Other important production methods for Moccasin are summarized in **Table 12**.

RESULTS:
Drought-like conditions persisted into the 2002 cropping year across much of Montana. Below normal growing season precipitation was recorded at all sites at Moccasin, which received only 86% of it's normal growing season precipitation from May 1 through July 31. An outbreak of *Ascochyta* blight was detected on July 15th, and an application of Quadris was applied to suppress the disease until the plots could be harvested. A sever thunderstorm accompanied by hail, hit the site on August 20th, causing at least 50% losses in yield (**Table 13**).

Chickpea Grain Yields: Desi-type chickpea yields at Moccasin averaged 1,960 pounds per acre (32.7 bu/acre; **Table 13**). Although not significant, CDC Desiray had the highest yield (2,071 lbs/acre). The kabuli-type chickpeas were not harvested until after they had been hit by hail. Therefore yields of these chickpeas were much lower than was anticipated (384 lbs/acre) and there appeared to be a close relationship (analysis not shown) to the degree of hail loss. The severity of hail damage, appeared to also be related to maturity, as CDC Chico and CDC Xena, varieties with earlier maturity, had higher losses to hail (**Table 13**).

Flowering: The desi-type chickpeas were much earlier than the kabuli-type chickpeas to reach flowering, with CDC Nika and CDC Desiray being the earliest varieties to flower (**Table 13**). Of the kabuli-types, CDC Chico was the earliest to flower.

Plant Heights: Plant canopy heights for all plots were measured at physiological maturity and grain maturity (desi-types; **Table 13**). It appeared that the kabuli-type chickpeas were taller than the desi-types (no analysis), for the kabuli's averaged 14.4 inches and the desi's averaged 11.5 inches in height. CDC Anna was the tallest desi-type chickpea (12.0"; no analysis), while Sanford and Evans were the tallest kabuli-types (15.6" each).

Kernel Sizes: Chickpea grain samples were evaluated for grain sizes by passing them through 10, 9, 8, and 7 millimeter round sieves. Of the desi-type chickpeas, CDC Nika had the highest percentage of seed sizes greater than 8 mm (**Table 14**). In the larger kabuli-types, the USDA-ARS released Sierra had the largest percentage of beans that wouldn't pass through an 8 mm sieve (95.8%), but was not significantly greater than the other large kabuli's based on an LSD at the 5% level. CDC Chico is a small kabuli-type and appears to have similar sieve classes to the desi-type chickpeas.

UCPT Multi-year (1998-2002) Summary: Desi and small kabuli chickpea grain yields, since 1998, have averaged 1,300 pounds per acre under dryland conditions at Moccasin (**Table 15**). By analysis (which extrapolates yields over missing years), CDC Desiray has been the best grain producer, averaging 1,422 pounds of grain per acre (23.7 bu/acre). However, it has not significantly out produced any of the other desi-/small kabuli-type chickpeas. The large kabuli chickpeas have averaged only 363 pounds per acre (includes the hail damaged yields of 2002). It is unclear at this time what is causing the low kabuli-yields reported at Moccasin. Further research is needed. CDC Xena, had the best 4-year grain average, producing 437 pound per acre.

FUTURE RESEARCH:
Evaluating chickpea varieties for yield performance across Montana will continue.

Table 11. 2002 Montana Statewide Chickpea Trial - Chickpea variety characteristics summary. - Exp. 890002. Central Ag. Research Center, Moccasin, MT. **{File: 890702:Character}**

Variety	Seed Source	Type	Seed Size[1/]	Leaf Structure[2/]	*Ascochyta* Tolerance	Maturity
Myles	CARC	Desi	Very Small	Fern-like	Fair	Early
CDC Anna	CDC - U of Sask.	Desi	Very Small	Fern-like	Fair	Early
CDC Desiray	CDC - U of Sask.	Desi	Very Small	Fern-like	Fair	Early
CDC Nika	CDC - U of Sask.	Desi	Small	Fern-like	Fair	Early
CDC Chico	CDC - U of Sask.	Small Kabuli	Small	Fern-like	Poor	Early
Sanford	USDA-ARS	Kabuli	Large	Unifoliate	Very Poor	Late
CDC Yuma	CDC - U of Sask.	Kabuli	Large	Fern-like	Poor	Late
Evans	USDA-ARS	Kabuli	Large	Unifoliate	Very Poor	Late
Dwelley	CARC	Kabuli	Very Large	Unifoliate	Very Poor	Very Late
CDC Xena	CDC - U of Sask.	Kabuli	Very Large	Unifoliate	Very Poor	Medium
Sierra	USDA-ARS	Kabuli	Very Large	Unifoliate	Very Poor?	Medium

[1/] - Seed Size class ranges (g/1,000 seeds): Very Small: 175 - 250 Small: 250 - 350 Large: 375 - 475 Very Large: 475+

[2/] - "Fern-like" indicates a pinnately compound leaf structure

Table 12. Statewide Chickpea Perforamance Trial - Moccasin trial management summary.
- Exp. 890702. Central Agricultural Research Center, Moccasin, MT. **{File: 890702:Manage}**

Field Summary				
	Environment:	Dryland		
	Tillage History:	Conventional Till	Previous Crop:	Fallow
Trial Management				
	Seeding Date:	4/30	Plot Dimensions:	5-rows x 11" spacing x 16'
	Fertilizer: (lbs/ac)	None		
	Pesticides:(rates)	Quadris (10 oz/acre) - Post Emergence (7/15/02) Hand weeding		
	Harvest Dates:	8/19 & 8/26	Timing: At grain maturity -Using a 5' plot harvestor	
	** - Site received "marble-sized" hail on 8/20			
	Precipitation:	7.18"	- Crop-year (4/30 - 7/31 {Phys. Maturity})	
	Elevation:	4300'		

Table 13. Uniform Chickpea Trial - Chickpea grain yield, growth stage and plant heights summary.
- Exp. 890702. Central Ag. Research Center, Moccasin, MT **{File: 890702:Summary}**

Desi-Types:		Est.				Physiological Maturity			Grain Maturity		
Variety	Yield	Loss[2/]	Flower	Pod Form		--- Dates ---		Height	--- Dates ---		Plant Ht
			--- seeding ---		flower	seeding	pod form	inches	seeding	phys. mat.	inches
	(lbs/acre)	(%)	---------- (days from:) ----------								
CDC Desiray	**2,071** ns	0	59	66	7	86	20	12.0	106	20	11.5
CDC Nika	1,997	0	58	65	7	87	22	13.0	107	20	11.5
CDC Anna	1,940	0	60	67	7	90	23	12.5	110	20	12.0
Myles	1,833	0	60	67	7	87	20	12.0	107	20	11.0
Means (*n*=16)	1,960	0	59	66	7	88	21	12.4	108	20	11.5
LSD (0.05 by t)	339										
C.V.%(s/mean)	10.81										
F-value (3,9 df)	0.9										
Kabuli-Types:[1/]											
Sierra	**615** a	47.8	63	69	6	92	23	14.5			13.9
Sanford	525 a	58.1	66	71	5	93	22	16.0			15.6 a
Dwelley	492 a	58.2	66	71	5	92	21	17.0	Hailed out		15.4 a
Evans	395	62.9	62	68	6	93	25	16.0			15.6 a
CDC Yuma	340	70.5	64	70	6	94	24	15.0			14.0
CDC Xena	227	80.5	62	67	5	89	22	14.0			13.5
CDC Chico	92	96.4	58	66	8	86	20	13.0	111	25	12.5
Means (*n* = 28)	384	67.8	63.0	68.9	5.9	91.3	22.4	15.1	----	----	14.4
LSD (0.05 by t)	155										0.7
C.V.%(s/mean)	27.2										3.5
F-value(6,18 df)	12.1 **										23.3

** - Indicates statistical significance at 0.05 level.

a - Denotes values equal to highest value (in **bold**) based on $LSD_{(0.05)}$.

1/ - Kabuli-type chickpeas yield's severely affected by hail storm on Aug 20, 2002.

2/ - Estimated hail losses in the kabuli-type chickpeas, only.

Table 14. Uniform Chickpea Performance Trial - Moccasin chickpea grain size class summary.
- Exp. 890702. Central Ag. Research Center, Moccasin, MT **{File: 890702:Sizes}**

Desi-Types:	Size Classes					
Variety	Jumbo+	Jumbo	Large	Large+	Medium	Small/Culls[1/]
Screen Size:	>10mm	9mm	8mm	>8mm	7mm	<7mm
			(% greater than)			
Myles	0	0	2.0	2.1	**55.2** [a]	42.7
CDC Anna	0	0.5	8.1	8.6	43.8	47.6
CDC Desiray	0	0	1.0	1.0	26.7	**72.3** [a]
CDC Nika	0	**2.4** [a]	**50.1** [a]	**52.5** [a]	42.6	5.0
Means (*n* = 16)	0	0.7	15.3	16.0	42.1	41.9
LSD (0.05 by t)		0.8	3.9	4.6	7.9	7.1
C.V.% (s / means)		69.4	16.0	17.7	11.8	10.6
F-value (3, 9 df)		19.03 **	363.9 **	296.8 **	22.3 **	156.9 **
Kabuli-Types:						
CDC Chico	1.9	3.9	15.9	21.7	**57.3** [a]	**21.0** [a]
CDC Yuma	15.8	45.2 [a]	33.1 [a]	94.0 [a]	5.3	0.7
Evans	21.9 [a]	41.5 [a]	31.1 [a]	94.5 [a]	4.5	1.0
Sanford	19.0 [a]	38.8	36.7 [a]	94.5 [a]	4.3	1.2
Dwelley	22.0 [a]	44.7 [a]	28.7 [a]	95.4 [a]	3.8	0.8
Sierra	**27.0** [a]	**48.8** [a]	20.0	**95.8** [a]	3.8	0.4
CDC Xena	16.6 [a]	38.0	**38.0** [a]	92.6 [a]	6.3	1.1
Means (*n* = 28)	17.7	37.3	29.1	84.1	12.2	3.7
LSD (0.05 by t)	10.8	9.1	11.8	5.7	4.8	5.1
C.V.% (s / means)	40.8	16.5	27.26	4.60	26.3	90.9
F-value (6, 18 df)	4.84 **	24.35 **	4.39 **	202.4 **	153.8 **	19.99 **

** - Indicates statistical significance at 0.05 level.
[a] - Denotes values equal to highest value (in **bold**) based on $LSD_{(0.05)}$.
[1/] - Kabuli-type chickpeas that pass through a 7mm screen are considered "culls".

Table 15. Uniform Chickpea Performance Trial - Multi-year (1998-2002) grain yield summary at Moccasin. - Exp. 890702. Central Agricultural Research Center, Moccasin, MT **{File: 890702:Multi-year}**

Desi-Type:[1/]	Year				Average		% Comparison	
Variety	1998	1999	2001	2002	Yield[3/]			
	---------- (lbs/acre) ----------						(% of Myles)	
CDC Desiray			1,520	2,071	**1,422**	ns	**101%**	ns
CDC Anna			1,500	1,940	1,346		97%	
Myles	684	(64.5) [2/]	1,417	1,833	1,311		100%	
CDC Nika			1,364	1,997	1,307		94%	
CDC Chico	244		1,368	(92) [2/]	1,113		70%	
Means (n = 15)	464	-------	1,412	1,960	1,300		93%	
LSD (0.05 by t)					NS		NS	
C.V.% (s/mean)					10.05		18.34	
F-value (4,4 df)					2.30	ns	1.68	ns
Kabuli-Type:							(% Dwelley)	
CDC Xena		198	1,149	227	**437**	ns	**200%**	ns
Sanford	96	81	784	525	372		123%	
Evans	91	97	898	395	370		128%	
Dwelley	90	50	677	492	327		100%	
CDC Yuma		113	742	340	310		131%	
Means (n = 20)	92	85	775	438	363		136%	
LSD (0.05 by t)					NS		NS	
C.V.% (s/mean)					36.7		45.42	
F-value (4,10 df)					0.54	ns	1.49	ns

ns - Indicates no statistical significance at 0.05 level.

1/ - CDC Chico, a small kabuli-type, was included with the desi-type chickpeas for multi-year analysis.

2/ - Not included in multi-year grain yield analysis.

3/ - Averages are estimates, which account for missing years' data.