Cooperative Extension
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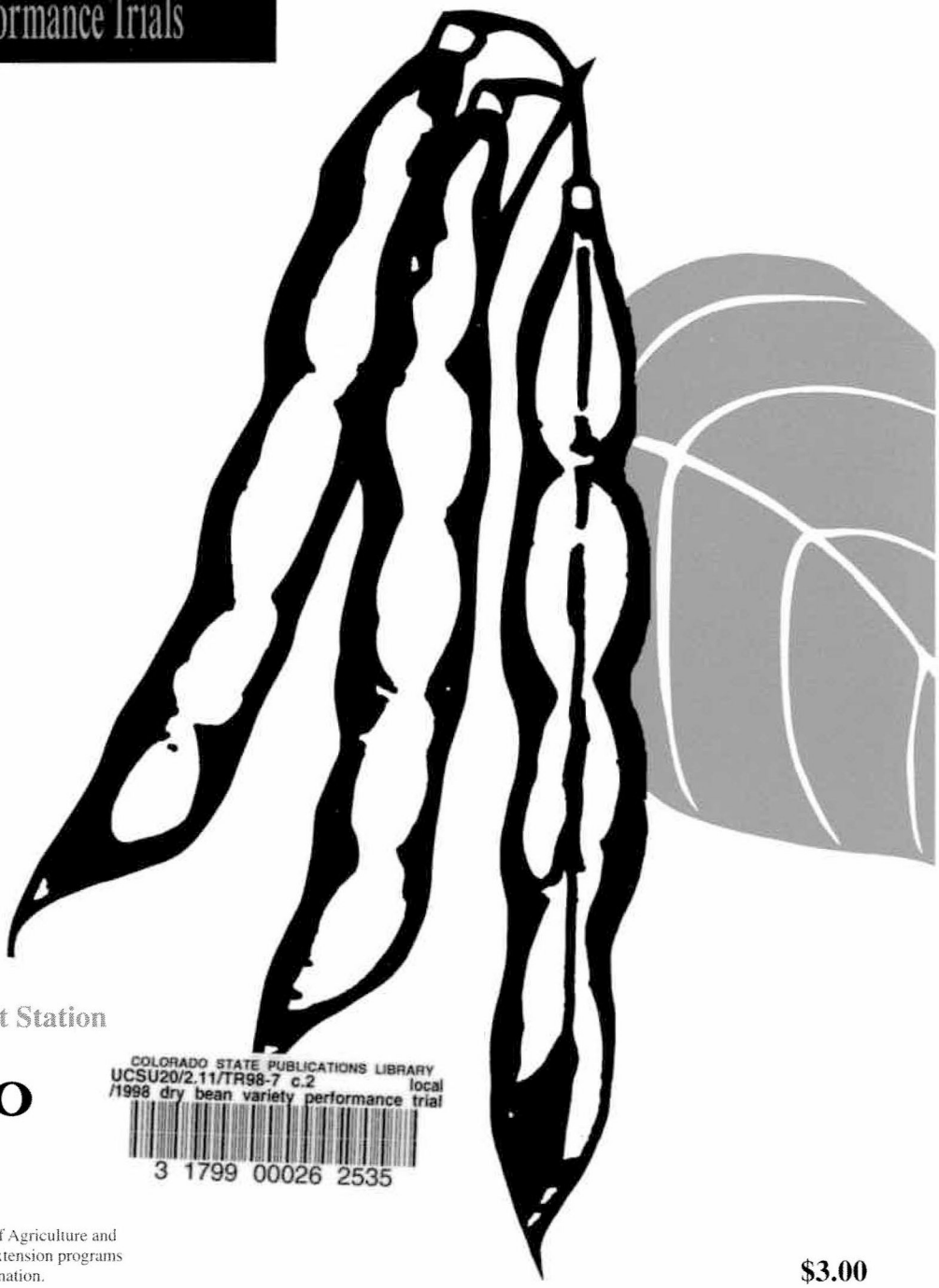
MAKING BETTER DECISIONS

1998 Dry Bean Variety Performance Trials



Agricultural Experiment Station

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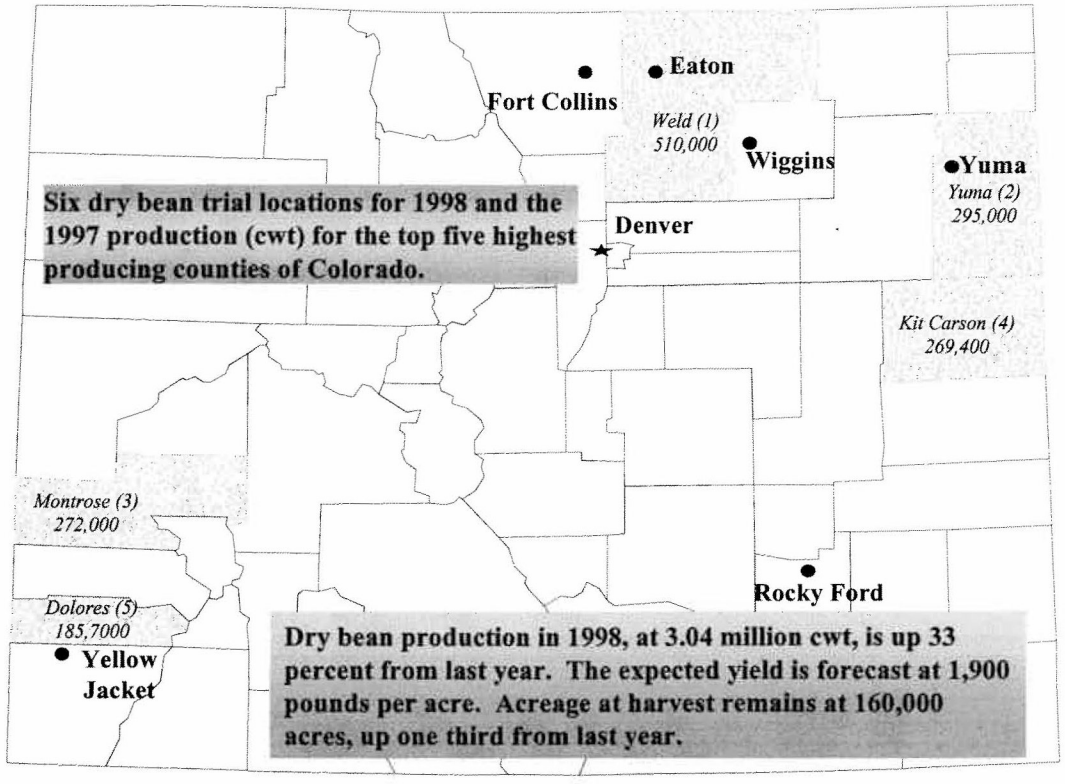

ACKNOWLEDGMENTS

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Technical Report TR 98-7

Agricultural Experiment Station	Department of Soil and Crop Sciences	Cooperative Extension	November 1998

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1998 COLORADO DRY BEAN PERFORMANCE TRIALS

Introduction

Colorado bean producers annually spend over $5 million on pinto bean seed, which means that the bean variety decision is extremely important. Reliable and unbiased performance results from uniform variety trials help Colorado dry bean producers make better variety decisions. With funding from the Colorado Dry Bean Administrative Committee, Colorado State University personnel evaluate dry bean varieties at multiple locations in eastern Colorado.

1997 results showed that CSU's recent rust resistant lines were high yielding. The same lines were entered in the 1998 trials conducted in eastern Colorado at Burlington, Eaton, Rocky Ford, Wiggins and Yuma. Twenty varieties were entered in the trials, including 12 private and eight public varieties or experimental lines. Since 1997, all pinto bean entries are planted at each location. The average performance over locations is more reliable for predicting variety response than the trial-by-trial analysis of previous years. Other market classes were tested at Fort Collins and at the Yuma Irrigated Research Farm. A randomized complete block field design with three replicates was used in all trials. Test plots were planted and harvested by CSU's Crops Testing program. The seeding rate was approximately 87,120 seeds per acre. Plots consisted of four 30-inch rows, and harvest area was approximately 200 sq. ft. All trials were situated in CSU or commercial bean fields. Seed yields, in pounds per acre, were adjusted to 14% moisture content.

1998 Season Summary

The 1998 cropping season was characterized by average seeding dates (15-30 May), hot late summer temperatures, and a long growing season. The long growing season favored later maturing varieties. Hail damage was less common than in previous years. Root rot was a common observance along the Front Range and bacterial leaf diseases were more severe and more widespread in 1998 than in previous years. Leaf rust appeared late in the season and was generally controlled. White mold caused yield reductions in some places.

Table 1. Disease observations for pinto varieties in Colorado's 1998 bean performance trials

	Burlington		Eaton	Wiggins
Variety	% White Mold	Common Blt.	% Yellow Canopy	% Yellow Canopy
5051	16	S	20	5
Apache	19	S-VS	70	10
Bill Z	16	MS-S	10	20
Burke	10	MS-S	20	10
Chase	7	MR-R	30	5
CO45185	29	MS	1	5
CO45188	28	MR	20	5
CO46322	21	MS-S	10	5
CO46329	20	S	20	20
CO46343	25	MS-S	50	10
CO46348	25	MS	60	20
CO49220	34	S	30	10
CO51715	25	MS	20	10
Elizabeth	20	S	70	20
Kodiak	7	S	30	5
ROG 214	7	S	5	20
ROG 261	18	VS	30	20
UI 320	6	S	40	40
USPT 73	2	S	30	5
Vision	20	MR-R	20	5

Note: % White mold intensity (incidence x severity) of 100 plants in 2 reps recorded 9/1/98; Common bacterial blight reaction defined as R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible and VS = very susceptible; % canopy yellowing recorded 8/18/98 as a response to Fusarium yellows and other root rot problems.

There was no evidence of rust infection on susceptible varieties at any CSU Variety Performance location. However, rust resistant varieties like Apache, Burke, Chase and Vision were effective against the local races of rust in commercial fields in eastern and southern Colorado and surrounding states.

Disease observations made by Dr. Howard F. Schwartz, CSU Plant Pathologist.

Pinto bean varietal descriptions:

5051 An experimental line from Asgrow Seed Co.

Apache A vine variety with rust resistance and early maturity from Idaho Seed Bean, susceptible to common bacterial blight.

Arapaho A variety released by Colorado State University in 1993 with semi-upright growth habit. It has some

	field tolerance to white mold but is susceptible to rust.
Bill Z	A variety release by Colorado State University in 1985. It has a vine growth habit with resistance to bean common mosaic virus and moderate tolerance to bacterial brown spot. It is a productive variety when growing conditions are good, similar to Olathe for white mold and rust susceptibility and maturity.
Burke	A medium season variety (USWA-19) released by Washington State in 1996. It has resistance to rust but is susceptible to bacterial diseases.
Cahone	A vine type variety developed for non-irrigated production in the San Juan Basin. It was released in 1981 by Colorado State University.
Chase	A vine variety released by the University of Nebraska. It is resistant to rust and white mold, moderately resistant to bacterial brown spot, but moderately susceptible to Fusarium wilt.
CO16378	An experimental line from Colorado State University.
CO34387	An experimental line from Colorado State University.
CO34596-1	An experimental line from Colorado State University.
CO34843	An experimental line from Colorado State University.
CO45185	An experimental line from Colorado State University with resistance to rust.
CO45188	An experimental line from Colorado State University with resistance to rust.
CO45437	An experimental line from Colorado State University.
CO45580	An experimental line from Colorado State University.
CO46120	An experimental line from Colorado State University.
CO46322	An experimental line from Colorado State University with resistance to rust.
CO46329	An experimental line from Colorado State University with resistance to rust.
CO46341	An experimental line from Colorado State University.
CO46343	An experimental line from Colorado State University with resistance to rust.
CO46348	An experimental line from Colorado State University with resistance to rust.
CO49220	An experimental line from Colorado State University with resistance to rust.
CO51711	An experimental line from Colorado State University.
CO51715	An experimental line (Montrose) from Colorado State University with resistance to rust and excellent seed quality.
Elizabeth	A variety from Fox Bean Co. with rust resistance.
Fisher	A variety released by Colorado State University in 1994 for non-irrigated conditions in the San Juan Basin. It has resistance to Fusarium wilt and similar maturity to Cahone.
Kodiak	A variety from Michigan (P94207) with rust resistance.
Maverick	An upright variety that is resistant to rust, released by North Dakota State University.
Othello	A variety released by the USDA with a semi-upright growth habit. It has very good yielding ability, white mold avoidance due to its small plant size, but is highly susceptible to rust and bacterial diseases.
Remington	A variety from Novartis that has maturity similar to Bill Z and rust resistance.
ROG 179	A variety from Novartis, susceptible to rust, but moderately resistant to some bacterial diseases.
ROG 214	An experimental line from Novartis.
ROG 261	An experimental line from Novartis.

UI 320 A short season variety (93:220) released by the University of Idaho in 1998 with rust resistance.

USPT-73 An experimental line from WSU-ARS.

Vision A full season upright variety with resistance to rust. It was released by Asgrow Seed Co.

Winchester A variety from Novartis.

Table 2. Dry bean trial cultural conditions in 1998

	Eaton	Fort Collins	Rocky Ford	Wiggins	Irrigated Yellow Jacket	Dryland Yellow Jacket	Yuma
Soil Type	Sandy Loam	Clay Loam	Silty Clay Loam	Sandy Loam	Silty Clay Loam	Silty Clay Loam	Sandy Loam
Previous Crop	Corn	Corn	Soybean	Corn	Winter Wheat	Winter Wheat	Potatoes
Fertilization							
N acre^{-1}	50	40		107	50		100
P_2O_5 acre^{-1}	30		50	22	40		
K_2O acre^{-1}	20			20			
Herbicide (fungicide)	Dual Eptam	Frontier Basagran + Pursuit	Treflan	Dual Sonalan Eptam	Dual (Copper)	Dual	Poast (Copper Count N) Basagran
Insecticide	None	Sevin	None	None	None	None	None
Irrigation	Furrow	Furrow	Furrow	Sprinkler	Sprinkler	None	Sprinkler

Table 3. Pinto bean performance at Eaton in 1998[1]

Variety	Yield	Moisture	Seeds
	lb/ac	%	#/lb
CO51715	3083	16.1	1123
CO46322	3034	16.8	1059
CO45188	2967	16.9	1129
CO45185	2930	16.5	1084
Bill Z	2902	14.5	1153
CO46348	2840	14.0	1152
CO46329	2787	14.9	1159
CO49220	2720	15.5	1162
Vision	2661	15.6	1176
CO46343	2655	13.8	1150
ROG 214	2641	13.7	1168
Elizabeth	2617	14.8	1135
ROG 261	2571	13.5	1168
Chase	2559	15.3	1132
5051	2499	15.2	1137
Apache	2494	14.1	1156
Burke	2373	14.0	1133
UI 320	2329	14.7	1138
USPT-73	2284	15.0	1066
Kodiak	2224	14.6	1070
Average	**2658**	**15.0**	**1133**
CV%	8.3		
$LSD_{(0.3)}$	188.6		

[1]Trial conducted on the Rod Weimer farm; seeded on 5/14 and harvested 8/28.

Table 4. Pinto bean performance at Rocky Ford in 1998[1]

Variety	Yield	Moisture	Seeds
	lb/ac	%	#/lb
CO51715	2567	17.5	1129
Vision	2423	21.4	1161
CO49220	2367	17.3	1167
Chase	2328	16.9	1088
USPT-73	2311	15.8	1090
5051	2300	16.7	1120
ROG 261	2283	15.2	1223
ROG 214	2245	16.9	1174
CO46348	2210	14.6	1227
Elizabeth	2179	14.9	1192
CO46329	2123	15.3	1163
CO46343	2121	18.0	1194
CO45185	2066	16.7	1158
Apache	2033	16.9	1169
CO46322	2013	16.1	1139
UI 320	1902	15.8	1138
CO45188	1890	18.4	1156
Kodiak	1842	17.6	1093
Burke	1769	16.1	1140
Bill Z	1699	15.7	1206
Average	**2134**	**16.7**	**1156**
CV%	17.2		
$LSD_{(0.3)}$	314.9		

[1]Trial conducted on the Arkansas Valley Research Center; seeded on 6/5 and harvested 9/10.

Table 5. Pinto bean performance at Wiggins in 1998[1]

Variety	Yield	Moisture	Seeds
	lb/ac	%	#/lb
Chase	2432	11.7	1277
CO51715	2259	11.8	1357
ROG 261	2176	11.8	1335
CO49220	2059	13.5	1365
CO46348	1960	11.8	1330
CO46329	1885	11.3	1404
CO46322	1885	12.8	1245
ROG 214	1851	12.1	1310
CO46343	1808	11.9	1342
Kodiak	1721	10.8	1274
CO45188	1716	12.9	1371
USPT-73	1698	13.3	1315
Vision	1642	14.3	1423
5051	1620	12.1	1328
CO45185	1549	12.3	1304
Bill Z	1501	12.7	1374
Apache	1453	12.4	1312
Burke	1449	13.3	1459
Elizabeth	1336	11.5	1344
UI 320	1235	12.7	1318
Average	**1762**	**12.4**	**1339**
CV%	24.8		
$LSD_{(0.3)}$	374.3		

[1]Trial conducted on the Duane Pope farm; seeded on 5/28 and harvested 9/8.

Table 6. Pinto bean performance at Yuma in 1998[1]

Variety	Yield	Moisture	Seeds
	lb/ac	%	#/lb
CO46348	3490	11.7	1273
CO46329	3255	12.1	1241
CO46343	3227	11.9	1216
Chase	3191	12.1	1290
CO45188	3178	13.0	1249
5051	3123	11.4	1240
CO45185	3042	11.9	1237
Elizabeth	2991	12.0	1234
Vision	2957	12.8	1289
CO51715	2924	11.6	1255
CO49220	2768	12.4	1232
CO46322	2750	12.5	1178
Apache	2685	12.5	1232
Burke	2672	11.3	1220
USPT-73	2577	12.5	1135
Bill Z	2566	11.4	1248
UI 320	2535	12.5	1159
Kodiak	2479	11.3	1158
ROG 261	2442	12.3	1244
ROG 214	2298	11.1	1279
Average	**2857**	**12.0**	**1230**
CV%	20.7		
$LSD_{(0.3)}$	506.6		

[1]Trial conducted on the Irrigation Research Farm; seeded on 6/9 and harvested 9/19.

Table 7. Average pinto bean performance over eastern Colorado sites in 1998

Variety	Yield	Moisture	Seeds
	lb/ac	%	#/lb
CO51715	2708	14.3	1216
Chase	2628	14.0	1197
CO46348	2625	13.1	1246
CO46329	2513	13.4	1242
CO49220	2479	14.7	1232
CO46343	2453	13.9	1226
CO45188	2438	15.3	1226
Vision	2421	16.0	1262
CO46322	2420	14.6	1155
CO45185	2396	14.3	1196
5051	2386	13.9	1206
ROG 261	2368	13.2	1243
Elizabeth	2281	13.3	1226
ROG 214	2259	13.5	1233
USPT-73	2217	14.1	1151
Bill Z	2167	13.6	1245
Apache	2166	14.0	1217
Kodiak	2066	13.6	1149
Burke	2066	13.7	1238
UI 320	2000	13.9	1188
Average	**2353**	**14.0**	**1215**

Table 8. Irrigated pinto bean performance at Yellow Jacket in 1998[1]

Variety	Yield
	lb/ac
Bill Z	2856
RNK 179	2840
CO51711	2772
CO34843	2698
CO46120	2673
CO45580	2658
Apache	2566
Winchester	2554
CO34387	2490
CO46341	2489
Arapaho	2437
Othello	2274
Remington	2233
CO45437	2217
CO34596-1	2107
CO16378	1905
Maverick	1750
Average	**2442**
CV%	10.3
$LSD_{(.05)}$	348

[1]Trial conducted on the Southwestern Colorado Research Center; seeded on 6/10 and harvested 9/24.

Table 9. Dryland pinto bean performance (1) at Yellow Jacket in 1998[1]

Variety	Yield	Maturity[2]
	lb/ac	
Fisher	1000	+ 3-5 days
89721*	929	+ 3-5 days
90436-2-3*	909	+ 3-5 days
90432-2-10*	904	+ 3-5 days
78158*	888	+ 3-5 days
Cahone	880	Sept. 10
89716*	859	+ 7 days
90436-2-2*	853	+ 3-5 days
90432-2-2*	816	+ 3-5 days
89699*	796	same
Average	**883**	
CV%	13.1	
$LSD_{(.05)}$	168	

[1]Trial conducted on the Southwestern Colorado Research Center; seeded on 6/12 and harvested 9/21.
[2]Maturity relative to Cahone.
*Experimental line

Table 10. Dryland pinto bean performance (2) at Yellow Jacket in 1998[1]

Variety	Yield	Maturity[2]
	lb/ac	
Cahone	1314	Sept. 10
90432-2-8*	1186	+3-5 days
Fisher	1039	+3-5 days
28140-8*	1025	+3-5 days
28140-3*	1013	+3-5 days
28141-33*	1004	same
28130-7*	980	+5-7 days
10143-1-2*	915	+5-7 days
10152-2-2*	908	+3-5 days
78153*	894	+5-7 days
Average	**1028**	
CV%	15.6	
$LSD_{(.05)}$	232	

[1]Trial conducted on the Southwestern Colorado Research Center; seeded on 6/12 and harvested 9/21.
[2]Maturity relative to Cahone.
*Experimental line

Black bean and special market class varietal descriptions:

B340 A light red kidney line from Asgrow Seed Co.

CELRK-CPC An experimental light red kidney line from Colusa.

CO45602 An experimental black seeded line from Colorado State University.

CO45664 An experimental black seeded line from Colorado State University.

CO45667 An experimental black seeded line from Colorado State University.

CO45675 An experimental black seeded line from Colorado State University.

CO45677 An experimental black seeded line from Colorado State University.

CO45685 An experimental black seeded line from Colorado State University.

CO45690 An experimental black seeded line from Colorado State University.

CO45693 An experimental black seeded line from Colorado State University.

CO96902 An experimental shiny black seeded line from Colorado State University.

Enola A yellow seeded variety from Red Beard Bean Co., Delta, CO.

GTS-1594 An experimental black seeded line from Gentec Seed Co.

GTS-6394 An experimental black seeded line from Gentec Seed Co.

Matterhorn A great northern variety from Michigan State University.

ROG 372 A navy variety from Novartis.

Sacramento A light red kidney variety from Sacramento Valley Milling.

Shadow A black seeded variety from Novartis (RNK 903).

T 39 A black seeded variety from the University of California. It is resistant to viruses, rust and other diseases.

UI 36 A small red seeded variety from University of Idaho.

UI 259 A small red seeded variety from University of Idaho (formerly 88:539).

UI 425 A great northern variety from University of Idaho.

UI 465 A great northern from University of Idaho (90:465).

UI 911 A black seeded variety from University of Idaho. It has high yields, an upright growth habit, and resistance to BCMV.

Weihing A great northern variety (GN 94-9) from University of Nebraska.

Table 11. Black bean performance at Fort Collins in 1998[1]

Variety	Yield	Seeds
	lb/ac	#/lb
GTS-1594	2476	2476
Shadow	2309	2033
CO45693	2153	2432
CO45602	2065	2389
CO45667	2015	2196
CO45685	1930	2389
CO96902	1902	2522
CO45690	1878	2196
CO45677	1861	2348
UI 911	1858	2724
GTS-6394	1741	2670
Average	**2017**	**2398**
CV%	12.9	
$LSD_{(0.3)}$	225.7	

[1]Trial conducted on the Agricultural Research Development and Education Center; seeded on 6/16 and harvested 10/5.

Table 12. Special market class bean performance at Fort Collins in 1998[1]

Variety	Market Class	Yield	Seeds
		lb/ac	#/lb
ROG 372	Navy	1547	2140
Matterhorn	Great Northern	2295	1349
UI 465	Great Northern	1827	1449
Weihing	Great Northern	1676	1448
CELRK-CPC	Light Red Kidney	1246	861
B340	Light Red Kidney	906	932
Sacramento	Light Red Kidney	803	836
Enola	Yellow	2094	1089
CV%		14.9	
$LSD_{(0.3)}$		202.5	

[1]Trial conducted on the Agricultural Research Development and Education Center; seeded on 6/16 and harvested 10/5.
*Heavy rust and root rot pressure and Fusarium wilt.

Table 13. Black bean performance at Yuma in 1998[1]

Variety	Yield	Moisture	Seeds
	lb/ac	%	#/lb
CO96902	3396	12.9	2033
CO45602	2907	13.9	2181
CO45664	2863	10.0	2256
CO45675	2695	17.8	2276
CO45685	2628	9.0	2061
GTS-1594	2606	18.6	2280
GTS-6394	2574	13.8	2222
CO45693	2451	14.0	2155
CO45667	2442	17.1	2078
CO45690	2351	9.6	2216
Shadow	2028	15.1	2017
CO45677	1945	15.8	2185
T39	1813	18.8	2504
Average	**2515**	**14.3**	**2190**
CV%	18.9		
$LSD_{(0.3)}$	411.6		

[1]Trial conducted on the Irrigation Research Farm; seeded on 6/9 and harvested 9/23.

Table 14. Special market class bean performance at Yuma in 1998[1]

Variety	Market Class	Yield	Moisture	Seeds
		lb/ac	%	#/lb
ROG 372	Navy	1838	12.8	2197
Matterhorn	Great Northern	2592	9.9	1392
Weihing	Great Northern	2584	14.6	1245
UI 425	Great Northern	2359	13.4	1423
UI 465	Great Northern	2010	9.6	1286
UI 259	Small Red	2444	14.2	1492
UI 36	Small Red	2275	16.8	1423
B340	Light Red Kidney	2410	11.3	900
CELRK-CPC	Light Red Kidney	2149	7.9	783
Sacramento	Light Red Kidney	1939	11.7	807
Enola	Yellow	2101	12.5	1162
CV%		23.8		
$LSD_{(0.3)}$		465.1		

[1]Trial conducted on the Irrigation Research Farm; seeded on 6/9 and harvested 9/23.

It's a Keeper! - CO51715 (Montrose)

Summary of Pinto Bean Performance Results Over Years and Locations

Jerry J. Johnson and Mark A. Brick

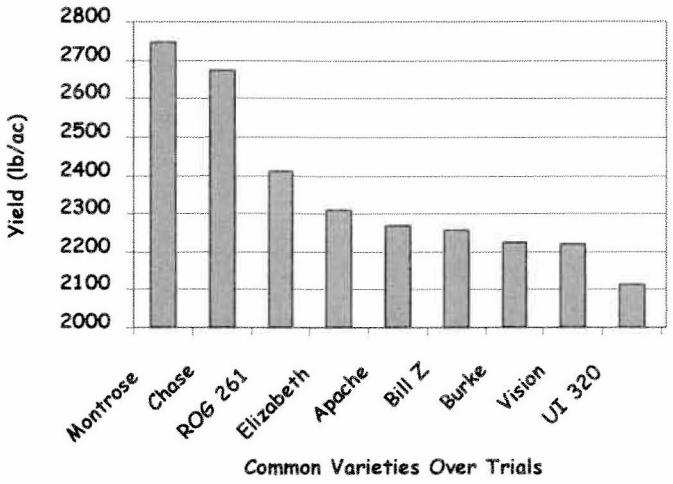
Variety trial results are useful to evaluate performance of entries over environments which vary for disease climate and soil conditions. In 1998, for example, one trial suffered from severe root rot pressure, two were attacked by bacterial leaf pathogens, and white mold caused damage to one trial. In other years trials have been compromised, or lost, to hail, high soil salt content, heavy end-of-season precipitation, planting errors or harvest mistakes. Making sense of trial results was further complicated by different varieties being entered at different trial locations. In 1997, a uniform variety testing system was adopted for all public and private pinto bean varieties. All varieties were entered in three 1997 trials and in five 1998 trials.

An analysis of results from 10 trials over three years (1996-1998) showed Chase to be highest yielding at 2400 lb/ac and four other varieties (Burke, Vision, Bill Z, and Apache) yielded 2050-2160 lb/ac. From 1996-1998, yields of five trials were reduced by rust and bacterial leaf diseases and three common varieties yielded similarly: Chase (2450 lb/ac), Bill Z (2340 lb/ac), and Burke (2330 lb/ac) (figure not shown). The result of analyses including 1996, when CO51715 (to be released as 'Montrose') was not yet in the variety trials, show Chase to be the highest yielding variety. Consequently, the comparison of greatest interest is that of Chase and Montrose based on 1997 and 1998 performances. The summary of complete results for nine varieties obtained from two 1997 locations (Holyoke and Sterling), and four 1998 locations (Eaton, Wiggins, Yuma, and Rocky Ford) are shown in Figure 1. The yield of Montrose also appears to be less variable, due to a lower standard deviation, than Chase over environments, which implies greater yield stability for Montrose. The maturity of Montrose is very similar to that of Chase based on average percent moisture of beans at time of harvest. Seed size of the two varieties is also very similar, Chase (average 1215 seeds/lb) and Montrose (average 1224 seeds/lb).

The color quality of Chase has been a concern in the past and Montrose represents an improvement over Chase for seed color. Using the Hunter colorimeter and based on samples from three 1997-variety trials, Montrose and Chase were compared on the *L*- and *a*-scales. The *L*-value scale ranges from 100 (pure white) to 0 (pure black). Readings with higher *L*-values indicate brighter white seed color. Hunter *a* -scale measures color on the yellow to blue scale. Positive *a* -values indicate yellow color, therefore larger a-values suggest a more yellow hue to the seed background. *L*-values for Chase (53.04) were significantly lower than for Montrose (53.99), suggesting that Montrose seed is whiter than the Chase seed. Hunter *a*-values for Chase (16.14) were significantly higher than the *a*-values for Montrose (15.36), indicating more yellow in the Chase seed color background.

Montrose has multiple sources of rust resistance and has performed well in locations with bacterial leaf diseases and root rot. In addition, Montrose is resistant to bean common mosaic virus strains. Montrose is more susceptible to losses due to white mold than other entries including Chase.

Figure 1. Average Performance Over 6 Trials 1997-1998



Pre-emergence Herbicides for Weed Control in Dry Beans – Trial Results

Scott D. Nissen

In replicated field trials conducted in 1996 and 1997 at the Agricultural Research and Development Center north of Fort Collins, herbicide programs ranging in cost from $8/ac to $41/ac produced equivalent dry bean yields under heavy weed pressure (pigweed, lambsquarters, green foxtail and barnyardgrass). Herbicide treatments, listed in Table 1, are based on banded PRE applications at planting followed by cultivation, or banded PRE applications followed by cultivation and layby herbicide applications, or PRE + POST herbicide combinations, or uniquely POST programs. The cost figures are relative and include application costs and costs for herbicide incorporation or POST tillage operations.

Table 1. PRE based weed control programs for pinto dry beans.

Treatment (type of app.)	*Timing*	*Cost/ac*[1] *$*	*Yield lb/ac*	*Return*[2] *$*
Weedy Check	-	-	260	-
Handweeded Check	-	-	2200	-
Eptam+ Sonalan (broadcast) Cultivation	PPI POST	27	2195	16
Frontier or Dual (band) Cultivation	PRE POST	8	2376	59
Frontier or Dual (band) Cultivation Frontier (broadcast)	PRE POST LAYBY	17	2406	29
Frontier or Dual (band) Pursuit + Basagran (broadcast)	PRE POST	32	2266	14
Frontier or Dual (band) Pursuit + Basagran (broadcast) Frontier (broadcast)	PRE POST LAYBY	41	2238	11
Pursuit + Basagran (broadcast)	POST	28	1606[3]	11

[1]Cost would be slightly higher for Dual, cost of cultivation $3.75/ac, herbicide application costs $5.00, PRE band applications were assumed to be made at planting so no application cost was added.

[2]Returns for dollar invested in weed control are based on an amount of yield from weed control times $23/cwt and divided by the cost of weed control.

[3]Yield reduction occurred because emerged grasses were not controlled.

All herbicide programs provided a significant dollar return compared to the untreated check. The herbicide programs that had the highest return per dollar invested in weed control were Frontier or Dual PRE in a 10-inch band over the row followed by cultivation and Frontier or Dual PRE as a 10-inch band followed by cultivation and a layby application of Frontier. These treatments provide good to excellent weed control, yields equivalent to the handweeded check and $28 to $59 return for each dollar spent on weed control. Pursuit + Basagran was the only treatment where the yield was significantly lower than the handweed control. Emerged grasses were not controlled with this treatment and yield losses resulted from weed competition. The addition of a POST grass herbicide like Poast, Select or Assure II would have solved this problem.

Control of Nightshade. Late emerging nightshades do not cause serious yield losses, but can significantly reduce dry bean quality if nightshade berries stain beans. The tendency toward late emergence and the ability to tolerate shading make nightshade difficult to control.

Every program for nightshade management has some limitation. **Eptam combined with Sonalan** provides excellent early season nightshade control, but does not have the residual activity necessary to control late emerging nightshades. Mechanical incorporation of Eptam and Sonalan consumes time and energy, decreases soil moisture, reduces surface residue, and requires additional operations to firm the seedbed. The best POST option for nightshade control is **Pursuit applied in combination with Basagran.** The addition of Basagran at 1 pt product/ac improves lambsquarters control and reduces the potential for Pursuit injury. Pursuit can also be applied POST-directed as two 1.5 oz product/ac applications spaced 7 to 10 days apart which provides excellent broadleaf weed control and allows Pursuit to be applied without the additional cost of Basagran. However, post application requires additional trips over the field and would not be extremely effective on lambsquarters. If producers have potatoes or sugarbeets in their rotation, Pursuit is not a good choice because these crops are very sensitive to herbicide residues.

Layby applications are relatively new in dry bean production. Layby means the herbicide is applied POST to the crop, but PRE to weeds. Since these herbicides do not have POST activity, fields must be clean before the herbicide is

applied. Layby applications provide the opportunity to extend nightshade control later into the season by delaying applications until the third trifoliolate leaf is fully expanded. **Frontier**, currently the only herbicide labeled for this type of application in dry beans, has good activity on small-seeded, broadleaf weeds and provides good to excellent control of nightshade. However, Frontier applications must be made between the first and third trifoliolate growth stage.

New Bean Herbicide Developments. Two herbicides for use in dry beans were in field trials in 1998. "Motive®" herbicide (active ingredient **imazamox**), from American Cyanamid, is currently being marketed as "Raptor®" in soybeans. Motive is very similar to Pursuit®, but with shorter plant back restrictions for sugarbeets and potatoes. The plant back interval to potatoes will be nine months and 18 months to sugarbeets, thus reducing the interval between herbicide applications and planting of sensitive rotational crops by 50% compared to Pursuit. Motive also has excellent grass activity, meaning that POST applications would not require the addition of a POST grass herbicide. Tank mixes with Basagran will still be needed to reduce the potential for crop injury. The second herbicide examined in 1998 was **pre-harvest applications of Roundup**. A pre-harvest application of Roundup will allow growers a management option for weeds prior to harvest and improve harvest efficiency. Establishment of a tolerance and issuance of 24c Special Local Need label for these products will require three to four years or sometimes longer.

Alkali Soils in Colorado Dry Bean Fields

Jessica G. Davis

The term "alkali" is frequently used to describe soils that are high in salt. But sometimes people use the term to mean high pH, and at other times, it means high sodium. Since people use the word "alkali" to describe a number of different kinds of soil problems, we surveyed Colorado bean fields to determine how big a problem these three different situations are here in Colorado. Dry beans are more sensitive to these problems than many crops so, during the summer of 1998, we sampled 250 dry bean fields scattered throughout Colorado bean growing areas. (See map of Colorado Bean acreage and sample distribution).

Typically, high pH soil doesn't usually look any different from soil with neutral pH. However, high pH reduces the availability of some nutrients (zinc, iron, phosphorus) and symptoms of yellowing of middle to upper leaves (signs of zinc and iron deficiency) or dark green coloring with purpling of the lower leaves and stems (signs of phosphorus deficiency) can be signs of high soil pH. Bean yields can be reduced when soil pH is above 7.8. Visual symptoms are useful indicators of potential high pH, but soil testing is needed for an accurate diagnosis.

Our survey showed that 34% of the Colorado bean fields that we sampled had soil pH levels of 7.8 or higher. Sulfur reduces soil pH but is uneconomical on a field scale. For high pH soils, testing for phosphorus, zinc, and iron is very important in order to determine whether additional fertilizer is required to meet plant needs. Use of fertilizers known to reduce soil pH, like urea or ammonium-based fertilizers, is recommended.

Soil salinity is caused by accumulation of salts that sometimes results in a visible white crust on the soil surface. Plants growing in saline soils may appear droughty. Dry beans start to produce lower yields when the soil salt content goes over 1 mmho/cm. In the bean fields which we sampled, 37% had salt contents above 1 mmho/cm. We would predict at least a 10% yield reduction in about 20% of the sampled fields. (See map showing distribution of saline soils in Colorado Bean Producing Areas).

The only proven treatment for high soil salts is to leach the salts out. In order for this treatment to work, there must be adequate drainage and acceptable irrigation water quality. First of all, drainage must be improved. This can be accomplished with organic soil amendments (crop residue or manure) or physical improvements like drain tiles. After insuring that drainage is adequate, leach the salts out. Proper irrigation management is critical to preventing and managing soil salinity.

Some fields had both high pH and high salts. Fifty-two percent of the fields had at least one of these problems. There are some new products on the market which claim to enhance

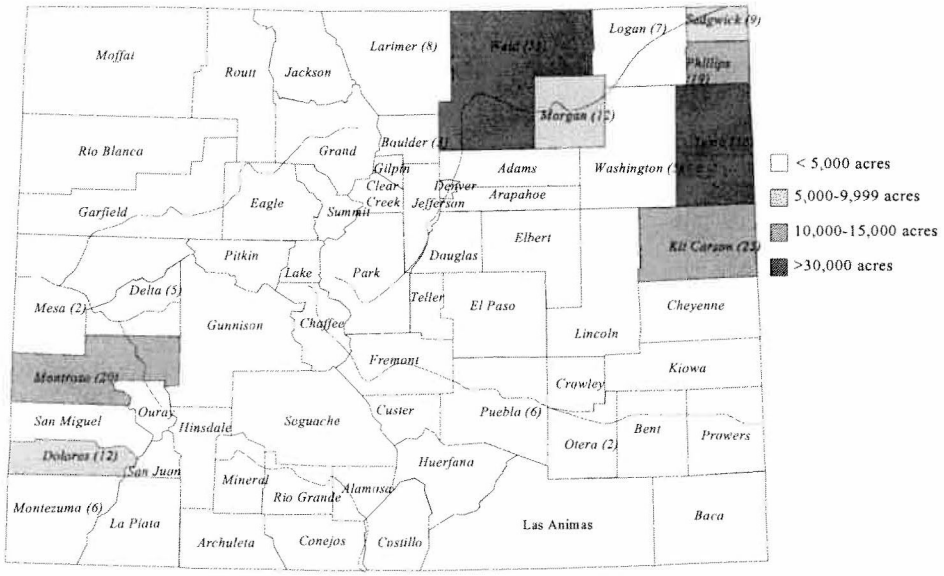
water infiltration into saline soils. Most of these products were developed for sodic soils (soils high in sodium, one particular salt) not for saline soils, in general. Of the 250 fields sampled, not a single one was sodic. Adding calcium sources, such as gypsum or calcium chloride to saline soils only increases the salt content further and aggravates the salinity problem.

If you have an "alkali" problem, before you can fix the problem, you need to determine whether the problem is high pH, high salts, or high sodium. And the best way to diagnose the problem is through soil testing.

This study would not have been possible without the cooperation of the farmers and all of the county extension agents and bean processors who helped Dave Kaasa and Kirk Iversen pull soil samples. The Colorado Dry Bean Administrative Committee funded the sample analysis. Thank you all!

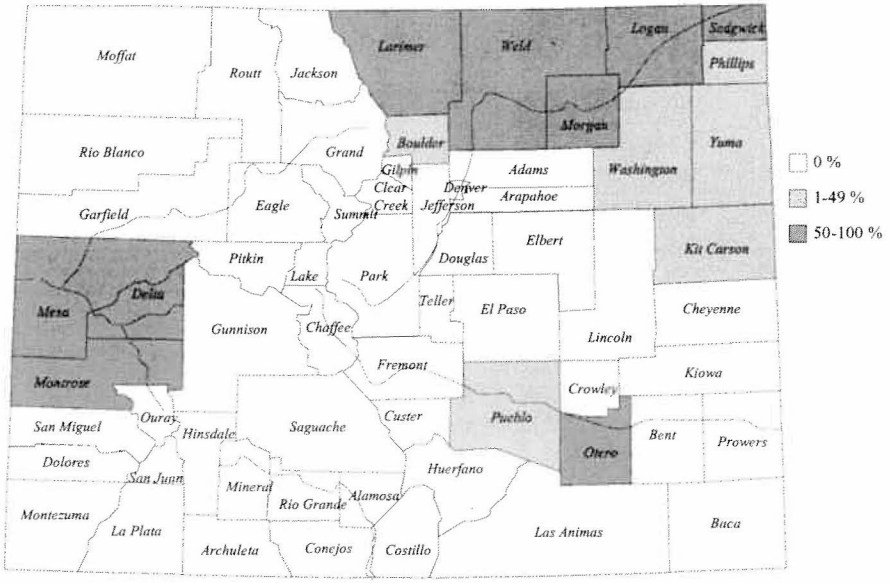
Colorado Bean Acreage and Sample Distribution

(sample number in parentheses)



Distribution of Saline Soils in Colorado Bean Producing Areas

(% fields EC≥1.0)



Entry Forms for 1999 Trials

Entry forms for 1999 trials may be obtained from the Soil and Crop Sciences, Colorado State University, Cynthia Johnson, at C-4 Plant Science Building, Fort Collins, CO 80523; Telephone (970) 491-1914; Fax number (970) 491-2758; or E-mail *cjohnson@agsci.colostate.edu.*

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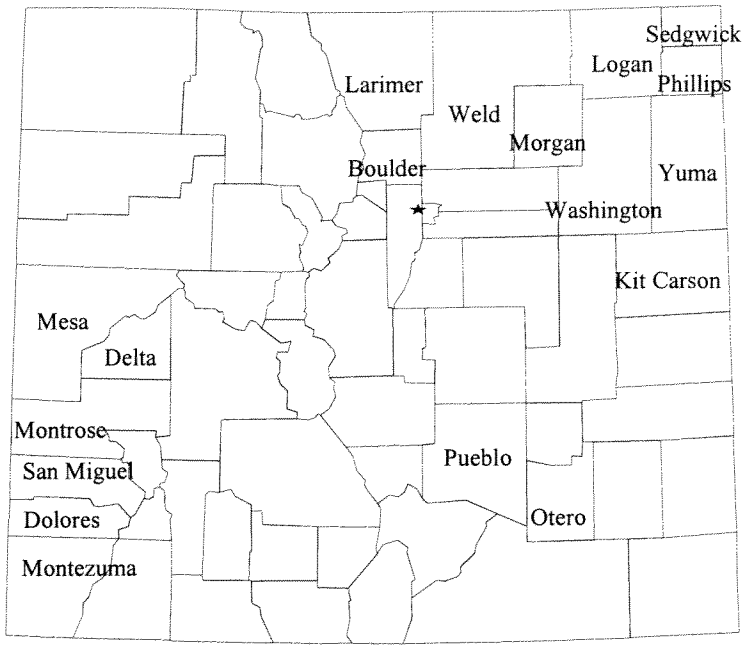
Potential Risk of Bean Diseases in Colorado by Geographical Region

Howard F. Schwartz

Region/County	Rust	Bacterial* Disease	White Mold
Northeast			
Boulder	Low	Low	Moderate
Larimer	Low	Low	Moderate
Weld	Moderate	Moderate	High
Morgan	Moderate	Moderate	Moderate
Washington	High	High	Moderate
Logan	High	Moderate	Moderate
Sedgwick	High	High	High
Phillips	High	High	High
Yuma	High	High	High
Kit Carson	High	High	Moderate
Arkansas Valley			
Pueblo	Low	Low	Low
Otero	Low	Low	Low
Western Slope			
Mesa	Low	Low	Moderate
Delta	Low	Low	Moderate
Montrose	Low	Low	Moderate
San Miguel	Low	Low	Low
Dolores	Low	Low	Low
Montezuma	Low	Low	Low

*Complex of Halo Blight, Brown Spot, &/or Common Bacterial Blight



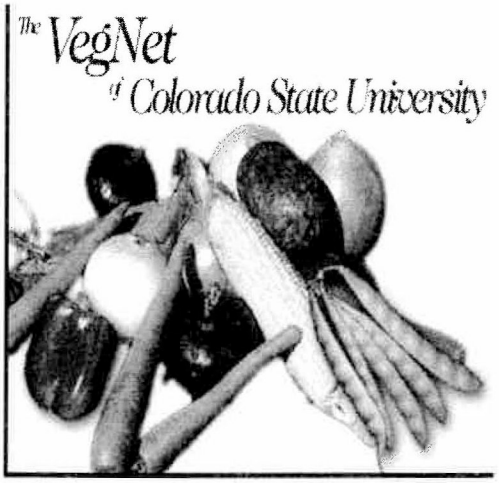
http://www.colostate.edu/Depts/SoilCrop/extension/CropVar/index.html

Crops Testing

Crop Variety Performance, Research, Field Days, Educational Programs, and Technical Information for Colorado Crops:

Winter Wheat	Dry Beans	Corn
Sunflower	Alfalfa	Spring Wheat, Barley, & Oats

http://www.colostate.edu/Orgs/VegNet/



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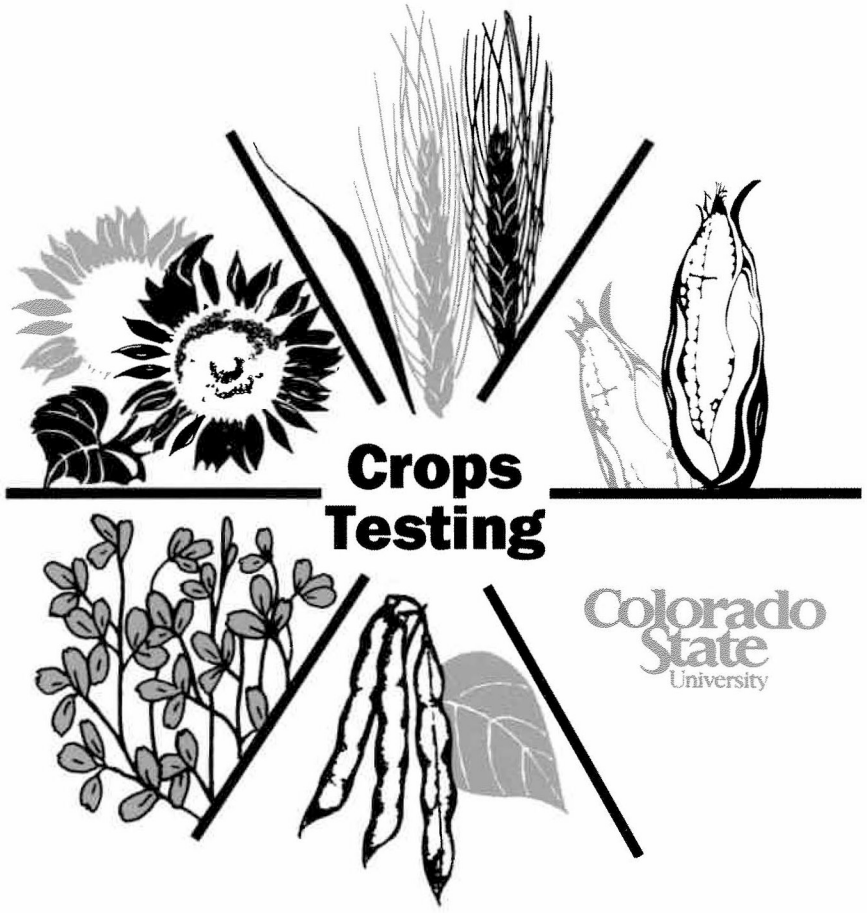

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