60th Annual Report
National Cooperative Dry Bean Nurseries

2009

Compiled by
Phillip N. Miklas, Coordinator
USDA-ARS

Cooperative Investigation among California, Colorado, Idaho, Maryland, Michigan, Montana, Nebraska, New York, North Dakota, Washington, and Wyoming State Experiment Stations and Agricultural Research Centers as part of the Regional W-1150 Multi-State Project

and

University of Guelph, Canada

and

Agriculture Research Service – USDA

Call for 2010 Cooperative Dry Bean Nursery

Seed Submissions

It is time to request seed submission for 2010 Cooperative Dry Bean Nurseries. I would like to receive **the list of seed submission** no later than **March 19, 2009** and **the seed** must be here no later than **April 2, 2010**. All entries will be planted in replicated test plots across several locations in the United State and Canada. Data will be taken for seed yield, 100-seed weight and several agronomic and marketing characteristics. They will also be included in several disease nurseries including bean rust and ….. Michigan will conduct canning tests.

The seed requirements for each of the three groups are as follows:

1. Small-seeded (Black, Navy, Others): **15 lbs/line**.
2. Medium-seeded (Great Northern, Pink, Pinto, Small Red, Others): **25 lbs/line**.
3. Large-seeded (Cranberry, Kidney, Others): **35 lbs/line**.

As in the past, all lines must be:

- Western grown (West of the Rocky Mountain)
- Pathogen free
- If susceptible to BCMV, an ELSIA test will be required.
- Acceptable commercial quality (no broken, decayed, or off color seed)
- Seed should be untreated

Fees: This fee structure was decided by the W-1150 members at The Annual meeting in Mayaguez, Puerto Rico in 2003

Public institutions: $150/ line submitted
Private institutions: $300/line submitted

NURSERY OPERATIONS

Public institutions that request a nursery will be charged US $150 to defray seed handling expenses including treating, bagging, boxing and shipping costs. Please let me know if your institution is going to submit the seeds and participate in the field trial for 2010 CDBN.

Should you have any questions or concerns about the submission or participant fees please contact me or if you know anyone else who might like to submit seed or plant the nursery please let me know.

Contact and Shipping Information:

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Table 1. List of Contributors and Cooperators - 2009

Name	Location	Seed Submit	Planting seed	No. of Coop.
Shree Singh	Kimberly, ID	yes	yes	1
Mike Moore	Powell. WY Lingle WY		yes yes	2 3
Steve Temple	Davis, CA		yes	4
Bill Dean	Kimberly, ID	yes	yes (1 rep)	
Phil Miklas	Prosser, WA	yes	yes	5
Mark Brick	Ft. Collins, CO	yes	yes	6
John Rayapati	ADM, IL	yes		
Juan M. Osorno	Fargo, ND	yes	yes	7
Jim Schild	Scottsbluff, NB		yes	8
Jim Kelly	Frankenmuth, MI	yes	yes	9
Talo Pastor-Corrales	Beltsville, MD		(1 rep untreated)	
Don Halseth Eric Sansted	Cornell, NY		 yes	 10
Joyce Eckhoff	Montana, MT		yes	11
Peter Pauls	Ontario, Canada	yes	yes	12
James Beaver	Puerto Rico		yes (1 rep)	

Table 2. Data contributors for 2009 Cooperative Dry Bean Nursery

Loc	Last	First	Affiliation	EMAIL	Phone
CADV	Steve	Temple	University of CA – Davis	srtemple@ucdavis.edu	530-752-8216
COFT	Mark	Brick	Colorado State University	Mark.Brick@colostate.edu	970-491-6551
	Barry	Ogg	Colorado State University	Barry.Ogg@Colostate.edu	
MDBE	Marcial	Pastor-Corrales	USDA/ARS	pastorm@ba.ars.usda.gov	301-504-6600
MIFM	Jim	Kelly	Michigan State University	kellyj@msu.edu	517-355-0271 Ext. 1181
MOSI	Joyce	Eckhoff	MSU Eastern Ag Research Center	jeckhoff@sidney.ars.usda.gov	406-433-2208
NDHA	Juan	Osorno	North Dakota State University	Juan.Osorno@ndsu.edu	701-231-8145
NESB	Jim	Schild	University of Nebraska	jschild@unl.edu	308-632-1480
NYFR	Donald	Halseth	Cornell University	deh3@cornell.edu	607-255-5460
	Eric	Sansted	Cornell University	ers23@cornell.edu	
ONGU	Peter	Pauls	University of Guelph	ppauls@uoguelph.ca	519-824-4120 Ext 52460
	Tom	Smith	University of Guelph	tsmith@uoguelph.ca	519-824-4120 Ext 8339
WAOT	Phil	Miklas	USDA-ARS	phil.miklas@ars.usda.gov	509-786-9258
WYPO	Mike	Moore	University of Wyoming	mdmoore@uwyo.edu	307-754-9815
WYLI	Jack	Cecil	University of Wyoming	jtcecil@uwyo.edu	307-532-7127

Table 3. List of 2009 Cooperative Dry Bean Nurseries Entries

	Line	Number	Breeder	Class
1	Lariat	ND020069	Osorno	Pinto
2	Stampede	ND020351	Osorno	Pinto
3	ND307	ND010307	Osorno & TVSC	Pinto
4	Avalanche	ND012103	Osorno & TVSC	Navy
5	Eclipse	ND9902621-2	Osorno	Black
6	Croissant	CO 23704	Brick	Pinto
7	CO 33875		Brick	Pinto
8	Santa Fe	P04205	Kelly	Pinto
9	Zorro	B04554	Kelly	Black
10	Shania	B201240	Rayapati	Black
11	IP08-2		Singh	Pinto
12	OAC Dublin	OAC 05-2	Pauls/Smith	Navy
13	Lightning	OAC 04-2	Pauls/Smith	Navy
14	Sequoia	ISB 620	Dean	Pinto
15	Max	ISB 1131	Dean	Pinto
16	Jackpot	ISB 777	Dean	Pinto
17	ISB 1218		Dean	Pinto
18	Othello		Check	Pinto
19	T39		Check	Black
20	Fuji	G05922	Kelly	Tebo

The 2009 CDBN

The 2009 CDBN comprised 18 test entries and two checks (numbered from 1 to 20)

Agronomic nurseries

There were approximately 1600 seeds supplied to each location sufficient to plant four 4-row replications, 20 to 25 feet long, for each entry. Seed was treated with Maxim XL + Apron XL (MSDS are included with bean shipment) unless nursery operator requested otherwise. Note Idaho Seed Bean received 100 seeds of each entry for observation and UPR (J. Beaver) received 150 seeds for winter nursery observation.

Disease Nurseries

There were 400 seeds (untreated) supplied to Beltsville, MD, for rust screening.

DATA RECORDING

The following were commonly recorded data by the CDBN collaborators. For ease and uniformity of reporting we shall describe and abbreviate each trait:

1. **Early Vigor (EV)**: Scored on a 1 to 9 scale, where 1= excellent and 9= very poor, within the first 3 weeks after emergence.
2. **Days to Flower (DF)**: Actual number of days from planting to when approximately 50% plants in a plot have at least one opened flower.
3. **Days to Maturity (DM)**: Actual number of days from planting to when approximately 50% of plants in a plot have at least one dry pod.
4. **Plant Height (PH)**: Record in cm from the base of the plant (soil surface) to the top node bearing at least one dry pod with seed.
5. **Growth Habit (GH)**: Record during flowering and verified when crop is senescent as type I=determinate erect or upright, II= indeterminate erect, and III= indeterminate prostrate.
6. **Lodging (LG)**: Scored at harvest on a 1 to 9 scale, where 1= 100% plants standing erect, and 9= 100% plants lay flat on the ground.
7. **Pod Clearance (PC)**: Recorded at harvest as percent of pods on plants not touching the ground or in contact with the soil surface.
8. **Biomass Yield (BY)**: Total plant dry weight recorded at 12% moisture and rounded up to the nearest whole number (lb/a).
9. **Seed Yield (SY)**: Recorded in lb/a at 12 % moisture and rounded up to the nearest whole number.
10. **Harvest Index (HI)**: The ratio of SY/BY expressed in % BY at 12% moisture.
11. **Weight of 100 seeds (SW)**: Weight of 100 randomly taken undamaged seed in grams at 12 % moisture.
12. **Appearance Desirability (SD)**: An aggregate value for seed size, shape, color and brilliance for the respective market class recorded by various scales (see footnotes).

For other traits and scoring methods, a footnote is provided with associated details.

Table 4. 2009 CDBN means across locations for major agronomic traits.

	Yield lb/A	SW g 100	HM days	FD 50%	PH cm
Lariat	3013	39.4	101	54	53
Stampede	2808	35.9	99	54	47
ND307	2798	38.8	100	54	48
Santa Fe	2769	40.1	98	54	46
CO 33875	2690	37.9	97	53	49
Othello	2644	36.7	91	49	35
Croissant	2585	36.3	98	54	47
Max	2515	39.6	91	50	38
ISB1218	2431	35.9	99	57	38
IP08-2	2413	32.8	99	54	47
Sequoia	2315	33.3	97	52	46
Jackpot	2286	36.9	93	55	37
Eclipse	2885	19.9	100	56	45
Zorro	2776	20.5	102	57	49
Shania	2713	19.3	104	57	53
T-39	2412	20.0	102	57	45
Lightning	2560	21.0	102	54	44
OAC Dublin	2535	19.5	103	54	43
Avalanche	2435	20.3	101	55	47
Fuji	2161	27.0	101	53	40
Grand mean	2593	30.5	99	54	45

Table 5. 2009 CDBN yield (lbs/A) across locations with planting dates also in the heading.

Entry	WYPO 5/20	WAOT 6/3	ONGU 6/5	NYFR 6/2	NDHA	NESB 6/22	MTSD 4/18	MIFM 6/3	COFC 5/29	CADV	Mean
Lariat	4393	3803	1455	2391	2160	3148	2633	3770	2600	3776	**3013**
Stampede	3604	3097	831	2367	2180	3860	2993	3160	1988	4002	**2808**
ND307	3956	3418	1144	2555	2130	3076	2600	3670	1886	3548	**2798**
Santa Fe	3630	2722	1975	2311	2450	2994	3040	2990	1832	3748	**2769**
CO 33875	4156	3348	1103	1893	1780	2968	2877	3460	1961	3352	**2690**
Othello	4118	3975	1232	2271	1750	3726	2883	2010	1676	2797	**2644**
Croissant	3548	2711	1156	2172	2260	2893	2573	3060	1869	3611	**2585**
Max	3956	4100	1020	1874	1880	2864	3257	1650	1880	2671	**2515**
ISB 1218	2444	4185	572	1758	2090	3251	2367	2300	2135	3212	**2431**
IP08-2	3501	2657	584	1843	1840	2631	2533	3080	1878	3580	**2413**
Sequoia	3324	2763	1289	1769	2180	2431	2373	2910	1493	2616	**2315**
Jackpot	2624	4129	477	1448	1620	2161	2937	2190	1945	3330	**2286**
Eclipse	3661	3956	1170	2534	2410	2867	2720	4060	2027	3442	**2885**
Zorro	3420	3163	1056	2628	2780	2326	2957	3510	2062	3857	**2776**
Shania	3191	3962	1336	2368	2550	1889	2870	3310	1709	3941	**2713**
T39	2329	3641	1824	1998	2280	2199	2423	3120	1724	2582	**2412**
Lightning	3131	3163	2064	2463	1340	2369	2643	3200	1811	3416	**2560**
OAC Dublin	1852	3292	2398	2484	1740	2117	2350	2770	1905	4442	**2535**
Avalanche	2996	3674	686	1967	2180	2490	2757	2950	1637	3011	**2435**
Fuji	2269	3664	1013	2127	2150	2071	2890	2150	1114		**2161**
Mean	3305	3471	1219	2161	2088	2716	2734	2966	1857	3418	2593
CV	12.5	20	25.6	10	10	12.2	8.3	11.1	17.9	11.7	
LSD	585	1116	369	365	310	663	370	540	471	600	

This figure shows adaptation and stability of the lines across test locations based on geometric means (adaptation) and coefficient of variation for Z (stability). The Z statistic from Airton et al. (BIC 48:182-183, 2005) measures adaptation and is correlated with geometric mean (Rayapati and Despain, BIC 49:249-250, 2006). Lariat exhibited the best adaptation and Eclipse the best stability.

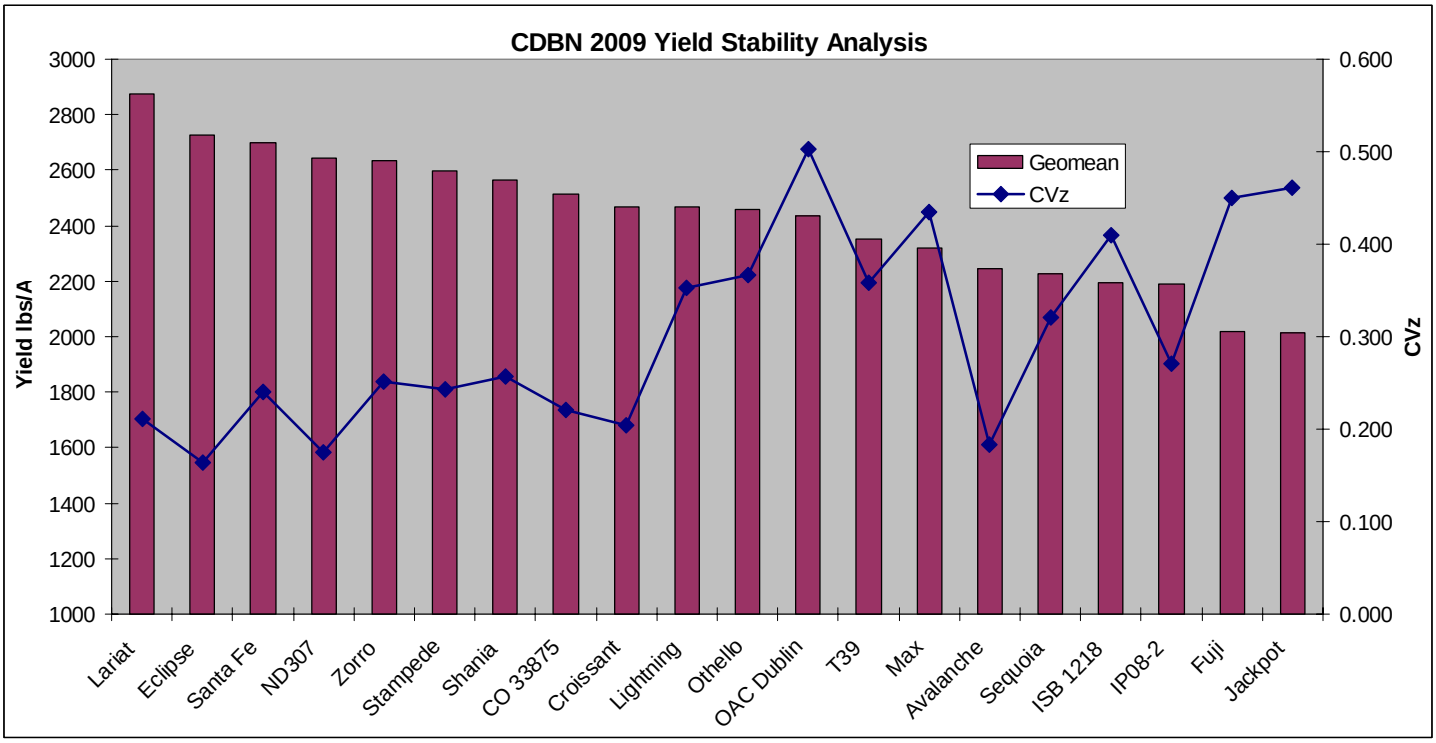

Table 6. 2009 CDBN seed weight (g 100 seeds^{-1}) averaged across locations.

	WA	WY	ON	NY	ND	MI	CO	MT	Mean
Avalanche	24.9	20.6	17.3	15.4	19.3	22.0	20.7	22.6	20.3
CO 33875	45.1	40.8	29.9	28.6	34.8	40.5	45.0	38.5	37.9
Croissant	40.6	36.5	31.7	32.1	34.5	37.9	40.4	37.1	36.3
Eclipse	23.7	19.7	17.3	16.1	19.8	19.2	21.0	22.5	19.9
Fuji	32.5	29.6	20.2	23.4	26.6	29.4	29.6	24.9	27.0
IP08-2	36.9	33.2	26.4	26.9	30.0	37.2	37.2	34.5	32.8
ISB1218	43.5	31.9	29.8	29.1	33.2	39.9	42.3	37.4	35.9
Jackpot	40.8	34.1	28.5	30.2	33.0	42.0	44.1	42.6	36.9
Lariat	45.5	41.9	33.1	29.4	37.4	43.7	44.5	39.6	39.4
Lightning	24.1	21.7	18.8	17.9	21.2	21.5	21.3	21.3	21.0
Max	43.9	45.1	30.5	35.7	36.1	39.7	44.1	41.6	39.6
ND307	42.5	39.7	30.1	34.2	36.5	43.8	40.3	43.1	38.8
OAC Dublin	21.3	18.9	17.6	17.0	19.3	20.8	21.4	19.6	19.5
Othello	39.9	39.4	29.6	33.0	35.0	40.5	40.0	36.4	36.7
Santa Fe	45.0	43.3	34.4	31.0	41.1	40.1	48.5	42.2	40.1
Sequoia	36.5	35.6	29.4	27.8	32.3	32.2	36.0	36.4	33.3
Shania	23.3	19.8	17.5	16.3	19	19.6	19.5	19.8	19.3
Stampede	42.8	37.5	27.6	27.6	34.2	39.0	41.2	37.3	35.9
T-39	22.5	20.2	17.9	15.4	21.3	21.9	19.8	20.8	20.0
Zorro	23.6	22.3	17.9	17.9	19.8	19.8	20.8	21.6	20.5
Mean	34.4	31.6	25.3	25.2	29.2	32.5	33.9	32.0	30.5
LSD 5%	1.8	2.2		2	2.4	2.9	1.9	2.7	
C.V. %	3.2	4.9		6	5.1	4.5	4.0	5.4	

Table 7. 2009 CDBN harvest maturity (days after planting) averaged across locations.

	WA	WY	ON	NY	ND	MI	NE	CO	Mean
Avalanche	96	112	110	88	107	100	94	105	101
CO 33875	94	112	104	81	104	97	86	95	97
Croissant	97	114	108	83	106	96	88	95	98
Eclipse	94	115	109	86	107	97	91	105	100
Fuji	99	115	108	82	105	98	94	105	101
IP08-2	98	114	105	83	104	98	93	98	99
ISB1218	98	115	105	82	108	91	95	100	99
Jackpot	86	108	101	81	100	90	82	95	93
Lariat	97	115	108	87	106	98	95	105	101
Lightning	99	116	110	85	106	99	96	105	102
Max	86	108	96	77	97	91	83	93	91
ND307	95	115	104	87	107	98	93	103	100
OAC Dublin	100	116	113	88	108	100	96	105	103
Othello	85	107	96	76	98	91	84	93	91
Santa Fe	94	108	105	83	106	96	87	103	98
Sequoia	93	107	104	80	105	97	92	103	97
Shania	101	116	114	91	108	100	97	105	104
Stampede	96	112	106	83	105	96	92	105	99
T-39	97	115	115	87	106	99	94	103	102
Zorro	98	116	110	89	108	98	95	103	102
Mean	95	113	106	84	105	96	91	101	99
LSD 5%	5	3	3	3	3	0.9	5		
C.V. %	2	2	2	2	2	0.6	3		

Table 8. 2009 CDBN flowering date and plant height averaged across locations.

	FD	FD	FD	FD	FD	FD	FD		PH	PH	PH	PH
	MI	WY	ON	MT	NY	NE	mean		ND	ON	MI	mean
Avalanche	51.5	68	55	68	48	39	55		46	43	51	47
CO 33875	46.4	68	53	69	46	38	53		55	38	53	49
Croissant	47.8	73	52	68	45	40	54		56	38	48	47
Eclipse	51.4	72	55	69	49	40	56		36	47	51	45
Fuji	47.3	64	53	65	46	41	53		41	34	45	40
IP08-2	49.4	68	51	70	45	41	54		52	36	52	47
ISB1218	49.6	78	58	71	49	39	57		48	33	33	38
Jackpot	45.0	75	55	69	48	39	55		49	28	35	37
Lariat	48.3	69	54	68	48	39	54		65	41	52	53
Lightning	50.5	68	50	67	45	41	54		43	39	50	44
Max	42.6	66	46	65	42	37	50		43	29	42	38
ND307	47.1	68	54	69	48	40	54		53	41	51	48
OAC Dublin	51.0	69	50	70	45	41	54		44	38	46	43
Othello	41.8	64	46	65	44	36	49		44	24	38	35
Santa Fe	46.9	68	53	67	48	39	54		54	37	49	46
Sequoia	46.0	67	50	67	45	39	52		55	31	51	46
Shania	52.2	73	58	69	52	41	57		59	48	53	53
Stampede	46.9	68	55	68	47	39	54		53	39	50	47
T-39	51.9	72	57	70	52	40	57		53	36	45	45
Zorro	52.0	72	56	70	51	40	57		49	47	52	49
Mean	48	70	53	68	47	39	54		50	37	47	45
LSD 5%	2.0	4.4	1.65	2.1	2	2.25			11	6.03	1.7	
C.V. %	2.6	4	2.64	1.9	2	2.86			15	13.74	2.2	

Table 9. 2009 CDBN miscellaneous traits.

	BY	HI	EV	Harvest-ability	Desir-ability	Lodging	Seed Appear	GH		Rust	Rust
	NY	NY	NY	ON	MI	MI	WA	NY		MD	MD
Avalanche	4594	43	7	2.3	4.4	2.0	2	3		4	I
CO 33875	4368	43	4	4.3	4.0	2.0	3	3		5	I
Croissant	4127	53	5	4.5	4.0	2.0	2	3		2	R
Eclipse	5561	45	6	2.8	4.0	1.0	2.5	2		1	R
Fuji	4046	53	6	4.5	4.0	2.9	3	3		8	S
IP08-2	3968	46	7	4.3	4.0	1.5	3	2		7	S
ISB1218	4101	43	4	5.0	2.5	5.0	3	3		2	R
Jackpot	4378	33	4	5.0	3.0	4.0	3	3		8	S
Lariat	4965	48	3	4.0	4.0	2.0	2	3		3	R
Lightning	4841	51	7	2.8	4.5	1.0	2.5	2		3	R
Max	4190	44	4	5.0	3.0	3.0	2.5	3		9	S
ND307	5057	51	4	4.0	4.0	2.4	4	3		2	R
OAC Dublin	4804	52	7	3.3	4.0	2.0	2.5	2		7	S
Othello	4518	50	5	5.0	3.0	3.5	2.5	3		9	S
Santa Fe	4677	49	4	4.5	5.0	2.0	4	2		2	R
Sequoia	3959	45	5	4.3	4.0	1.6	4	3		2	R
Shania	5067	47	6	2.8	4.0	1.0	2	2		1	R
Stampede	4911	48	5	4.0	5.0	1.0	3.5	3		4	I
T-39	4518	44	5	3.8	3.0	3.0	2.5	2		2	R
Zorro	5229	50	7	2.8	4.9	1.0	3	2		5	I
Mean	4594	47	5	3.9	3.9	2.2			Buster	2	R
LSD 5%	582	5	1	0.7	0.5	0.6			Aurora	5	I
C.V. %	8	7	10	15.0	6.8	16.9			UI 114	8	S
			1 to 9	1 to 5	1 to 7	1 to 9	1 to 5			Races 38- 41, 43	
			1=best	1=best	7=best	1=best	1=best				

Individual Reports

Wyoming

Mike Moore, Wyoming Seed Certification Service; Mike Killen, Powell Research and Extension Center, Randy Violet, Powell Research and Extension Center

In 2008, Wyoming ranked eighth nationally in dry bean (Phaseolus vulgaris L.) production, and third in the nation in the production of pinto beans. In the same year, Wyoming growers produced 705,000 hundred-weight of pinto beans on 30,500 harvested acres, averaging 21.3 hundred-weight per acre.

The University of Wyoming Seed Certification Service coordinates the dry bean variety performance evaluation at this location in a continuous and on-going program. In cooperation with the National Cooperative Dry Bean Nursery, a wide range of germplasm is evaluated each year, including promising new lines and newly released varieties, assisting producers in selecting varieties best suited for Wyoming soils and climate. Public and private (proprietary) varieties are tested.

Materials and Methods

The experiment was located at the University of Wyoming Research and Extension Center in Powell, Wyoming. The soil, a Garland clay loam, (fine, mixed, mesic: Typic Haplarid), was prepared by roller harrow and leveled in the spring. Chemical weed control consisted of a preplant incorporated chemical treatment of 2 pints Sonalan and 14 ounces Outlook, which was applied on April 24. The plots received 60 units of N, 50 units of P, and 5 units of Zn April 24. The plots were planted on May 20th in three row plots that were 5.5 feet wide by 20 feet long. IH 185 planter units with cone attachments were used, set on 22-inch row spacing. The experimental design was a randomized block with 4 replications. Cultivation controlled weed escapes during the growing season. Furrow irrigation was applied on May 7th (preplant), July 6th, July 17th, July 24th, August 3rd, August 13th, and August 25st. Visual estimates for days to 50 percent bloom (50 percent of plants at second bloom) and days to maturity (50 percent of the plants with one buckskin pod) were made. Subplots of one row by 10 feet were pulled by hand, and plots were threshed with an Almaco stationary small plot thresher. The seed was then hand screened over a $^{10}/_{64}$ x ¾ inch slotted screen and hand picked to remove dirt clods and seed mixtures. Samples were then weighed for clean seed yield per plot and seeds per pound.

Results and Discussion

Stand establishment was slow and variable due to cold soil temperatures and wet weather at planting. It was followed by the second coolest summer on record, with higher humidity and frequent rain showers further impacting plant development and maturity. September was warm and dry, and conditions during that month essentially saved the crop by allowing most entries to mature prior to a killing frost, although some frost-damaged beans were found in almost all the samples. Yields across entries averaged 3,305 lbs. per acre, and ranged from 1,852 pounds per acre for ‘OAC Dublin’ navy bean to 4,393 pounds per acre for ‘Lariat’ pinto bean.

Acknowledgements

This nursery is possible only with significant assistance from the staff at the Powell Research and Extension Center. The R & E Center staff manages the plots, takes growing season notes, and harvests the plots, and their efforts are greatly appreciated.

Montana

Corresponding cooperator: Joyce Eckhoff
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phone: 406-433-2208
fax: 406-433-7336

CDBN site:
Altitude: 1950 ft
Latitude: 47° 40' N
Longitude: 104° 08'
Soil type: Savage silty clay
Previous crops: 2008 –sugarbeet, 2007 – corn, 2006 – safflower
Residual soil N to 3 ft: 25 lb N/ac
Residual soil P to 6 in: 24 ppm
Applied fertilizer: 50 lb liquid N/ac, 28-0-0 applied in fall, 2008
Chelated zinc applied June 17 and July 10 at a rate of 1 pt/ac
Herbicides: Sonolan at a rate of 3 pt/ac and Eptam at a rate of 3 pt/ac applied May 12 and incorporated immediately
Fungicides: Benlate, 6.8 gm/ac applied August 27

Experimental design: Randomized complete block with three replications
Rows per plot: 3
Row length: 20 feet
Spacing between rows: 2 feet
Planted: May 18

Irrigated (sprinkler) on: May 22, June 4, June 18, July 20, August 28

Precipitation April – August, 2009: 10.45 in
Ave (60 yr) precipitation April – August: 9.41 in
Precipitation September 2008 – August 2009: 15.77 in
Ave (60 yr) precipitation September – August: 13.82 in

Comments:
It was generally a cool summer. Soil moisture was good at planting, but conditions were very dry in May and June. Rain started in early July.

Harvested: September 9
Harvest method: hand pulled, dried, and threshed with a Wintersteiger plot combine
Area harvested: 32 $feet^2$