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NORTHARVEST

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Volume 14, Issue 2 2008 Research & Resource Guide

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Slow Age-Related Bone Loss



On the Cover

LARIAT PINTO: Two new pinto varieties were released this year by the North Dakota Agricultural Experiment Station -- Lariat and Stampede. Both have an upright architecture as shown by the photo of Lariat on the cover. This upright trait allows for good air flow in the rows which helps thwart diseases like white mold, says NDSU bean breeder, Juan Orsorno. The feature also provides the potential for direct combining.

The Northarvest Bean Grower is published five times a year by the Northarvest Bean Growers Association, 50072 E. Lake Seven Road, Frazee, MN 56544, Phone: (218) 334-6351, Website: www. northarvestbean.org, Email: nhbean@loretel.net.

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Contact Alan at (701) 543-3773
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Bean Organizations

Company Name	Address	Phone/Fax
United States Dry Bean Council (Headquarters)	Grapeview, WA 98546	Ph: 360-277-0112 / Fax: 360-233-0621
United States Dry Bean Council (Gov't Affairs Office)	Washington, DC 20036	Ph: 202-466-4500 / Fax: 202-466-5777
California Bean Shippers Association (CBSA)	Sacramento, CA 95814	Ph: 916-441-2514
California Dry Bean Advisory Board (CDBAB)	Dinuba, CA 93618	Ph: 559-591-4866
Colorado Dry Bean Administrative Committee (CDBAC)	Buena Vista, CO 81211	Ph: 719-395-5757
Idaho Bean Commission (IBC)	Boise, ID 83720-0015	Ph: 208-334-3520
Michigan Bean Commission (MBC)	St. Johns, MI 48879	Ph: 989-224-1361
Michigan Bean Shippers Association (MBSA)	East Lansing, MI 48823	Ph: 517-336-0226
Minnesota Dry Bean Research & Promotion Council	Frazee, MN 56544-8963	Ph: 218-334-6351
Nebraska Dry Bean Commission (NeDBC)	Scottsbluff, NE 69361	Ph: 308-632-1258
New York State Bean Shippers Assn. (NYSBSA)	Seneca Castle, NY 14547	Ph: 585-526-5427
North Central Bean Dealers Assn. (NCBDA)	Thompson, ND 58278-0391	Ph: 701-261-4157
North Dakota Dry Edible Been Seed Growers Assn.	Fargo, ND 58105	Ph: 701-231-8067
Northarvest Bean Growers Assn. (NHBGA)	Frazee, MN 56544-8963	Ph: 218-334-6351
North Dakota Dry Bean council	Frazee, MN 56533-8963	Ph: 218-334-6351
Rocky Mountian Bean Dealers Assn. (RMBDA)	Elizabeth, CO 80107-1285	Ph: 303-646-8883
Washington Bean Dealers Assn. (WaBDA)	Quincy, WA 98848	Ph: 509-787-1544
Western Bean Dealers Assn. (WBDA)	Hansen, ID 83334	Ph: 208-423-4900

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Company Name	Address	Ph/Fax/Web/Email	Beans
ADM Edible Bean Specialties, Inc	P.O. Box 149, 22nd St. N. Olivia, MN 55277	Ph: 320-523-1637 / Fax: 320-523-5683	Navy
ADM Edible Bean Specialties, Inc.	P.O. Box 255, 557 Industrial Drive St. Thomas, ND 58276	Ph: 701-257-6721 / Fax: 701-257-6577	Pinto, Navy
ADM Edible Bean Specialties, Inc.	P.O. Box 124, Hwy 7 W Appleton, MN 56208	Ph: 320-289-2430 / Fax: 320-289-2008	Navy
ADM Edible Bean Specialties, Inc	16255 Hwy. 13 Barney, ND 58008	Ph: 701-439-2266 / Fax: 701-439-2723	Black, Pinto, Navy
ADM Edible Bean Specialties, Inc.	P.O. Box 249, 1804 Front Street Casselton, ND 58012	Ph: 701-347-5321 / Fax: 701-347-5552	Black, Pinto, Navy
ADM Edible Bean Specialties, Inc.	9451 Hwy. 18 P.O. Box 676 Cavalier, ND 58220	Ph: 701-265-8385 / Fax: 701-265-4804	Pinto, Navy
ADM Edible Bean Specialties, Inc.	P.O. Box 98, 108 MN Ave W Galesburg, ND 58035	Ph: 701-488-2214 / Fax: 701-488-2538	Pinto, Navy
ADM Edible Bean Specialties, Inc.	77 East 3rd Street, P.O. Box 25 Grafton, ND 58237	Ph: 701-352-1030 / Fax: 701-352-3430	Pinto
ADM Edible Bean Specialties, Inc.	P.O. Box 437 Northwood, ND 58267	Ph: 701-587-5900 / Fax: 701-587-5927	Pinto, Navy
Alvarado Bean Co.	P.O. Box 961, 120 1st Ave. E. Alvarado, MN 56710	Ph: 218-965-4668 / Fax: 218-965-4916 albean@wiktel.com	Pinto, Cranberry, Great Northern, Navy, Pink
B T R Farmers Co-op	6001 60th Ave NE Leeds, ND 58346	Ph: 701-466-2281 / Fax: 701-466-2022 Web: btrfarmerscoop.com Email: btr@gondtc.com	Pinto

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Barlow Grain & Stock Exchange	260 Elevator Road, Carrington, ND 58421	Ph: 701-984-2617 / Fax: 701-984-2616	Pinto
Bird Island Bean Co. LLC	P.O. Box 249 Bird Island, MN 55310	Ph: 320-365-3070 / Fax: 320-365-3811	Navy
Bollingberg Seeds	5353 Highway 15 Cathay, ND 58422	Ph: 701-984-2486 / Fax: 701-984-2485	Pinto
Bremen Elevator Company	310 Railway Right-of-way Bremen, ND 58356	Ph: 701-947-5966 / Fax: 701-947-5967	Pinto
Buchholz Enterprises, Inc.	801 Birch Ave Wyndmere, ND 58081	Ph: 888-439-2831 abuchholz@rrt.net	All Classes
C & F Foods/ Turtle River Bean Co.	P.O. Box 55, Highway 33 Manvel, ND 58256	Ph: 701-696-2040 / Fax: 701-696-2042	Black, Pinto
C & F Foods	301 Oak Street Oslo, MN 56744	Ph: 218-695-2201 / Fax: 218-695-3006	Black, Pinto
Cando Farmers Grain & Oil	Box 456 101 9th Street Cando, ND 58324	Ph: 701-968-4466 / Fax: 701-968-4447	Pinto
Cavalier Bean Co.	P.O. Box 297, 308 Industrial Park Cavalier, ND 58220	Ph: 701-265-8495 / Fax: 701-265-8576	Pinto
Central Valley Bean Cooperative	401 Broadway P.O. Box 162 Buxton, ND 58218	Ph: 701-847-2622 / Fax: 701-847-2623 Web: www.centralvalleybean.com gary@centralvalleybean.com	Pinto
Chippewa Valley Bean Co., Inc.	N2960 730th St Menomonie, WI 54751	Ph: 715-664-8342 / Fax: 715-664-8344 cbrown@cvbean.com	Dark Red Kidney, Light Red Kidney
Colgate Commodities	HC 2, Box 17 Colgate, ND 58046	Ph: 701-945-2580 / Fax: 701-945-2634 nelsondm@polarcomm.com	Black, Pinto, Great Northern, Light Red Kidney, Navy, Pink
Diversified Bean LLC	38026 330th Ave SW Climax, MN 56523	Ph: 218-857-3341 / Fax: 218-857-3390	Black, Pinto, Great Northern, Navy, Pink, Small Red
Earthwise Processors LLC	4111 30th Ave S Moorhead, MN 56560	Ph: 218-287-5510 / Fax: 218-287-5499	Black, Pinto, Navy





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Engstrom Bean & Seed	6131 57th Ave NE, Leeds, ND 58346	Ph: 701-466-2398 / Fax: 701-466-2076	Black, Pinto
Falkirk Farmers Elevator Co.	101 Main St. Washburn, ND 58577	Ph: 701-462-8572 / Fax: 701-462-8574	Pinto
Farmers Elevator Co. of Honeyford	2472 30th St. NE Gilby, ND 58235-9711	Ph: 701-869-2466 / Fax: 701-869-2456	Pinto, Navy
Fessenden Coop Assn.	P.O. Box 126 900 Railway St Fessenden, ND 58438	Ph: 701-547-3354 / Fax: 701-547-3574 Web: www.fess coop.com gsmith@fesscoop.com	Pinto
Forest River Bean Co., Inc.	P.O. Box 68, #1 Side Rd Forest River, ND 58233	Ph: 701-248-3261 / Fax: 701-248-3766	Black, Pinto, Dark Red Kidney, Light Red Kidney, Pink, Small Red
Fugleberg Seed & Bean Co.	RR 1 Box 49 Portland, ND 58274	Ph: 701-786-4159	Pinto, Black
Grafton Farmers Co-op Grain Co.	129 E 6th Street Grafton, ND 58237	Ph: 701-352-0461 / Fax: 701-352-0280	Pinto
Grand Forks Bean Co.	2120 N. Washington St PO Box 5357 Grand Forks, ND 58206-5357	Ph: 701-775-3984 / Fax: 701-775-3985	Pinto
Green Valley Bean	58473 St., Hwy 34 Park Rapids, MN 56470	Ph: 218-573-3400 / Fax: 218-573-3434	Dark Red Kidney, Light Red Kidney, Pink, White Kidney
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Idaho Seed Bean Co.	PO Box 1072 Twin Falls, ID 83303-1072	Ph: 208-734-5221 / Fax: 208-733-1984 isbco@filertel.com	Pinto
JM Grain Inc.	12 N Railroad Street, PO Box 248 Garrison, ND 58540-0248	Ph: 701-463-7261 / Fax: 612-435-4868	Pinto
Johnstown Bean Co.	PO Box 5 Gilby, ND 58235	Ph: 701-869-2680 / Fax: 701-869-2692 jbc@polarcomm.com	Black, Pinto
Joliette Ag Systems Inc	15866 Highway 5 Pembina, ND 58271	PH: 701-454-6226 / Fax: 701-454-6244 jwarner@polarcomm.com	Black, Pinto
Kelley Bean Company	2407 Circle Drive PO Box 2488 Scottsbluff, NE 69363	Ph: 308-635-6438 / Fax: 308-635-7345 Web: www.kelleybean.com jswanson@kelleybean.com	Pinto, Dark Red Kidney, Great Northern, Light Red Kidney, Navy, Pink, Small Red
Kelley Bean Company	PO Box 99 703 Division Ave South Cavalier, ND 58220	Ph: 701-265-8328 / Fax: 701-265-8533	Black, Pinto, Dark Red Kidney, Light Red Kidney, Navy, Pink
Kelley Bean Company	480 Hwy 18 NE Mayville, ND 58257-9001	Ph: 701-786-2997 / Fax: 701-786-4214 asvanstu@kelleybean.com	Pinto, Navy, Great Northern
Kelley Bean Company	650 2nd Street NE, P.O. Box 253 Perham, MN 56573	Ph: 218-346-2360 / Fax: 218-346-2369	Dark Red Kidney, Light Red Kidney
Kelley Bean Company	1328 Dakota Ave, Hatton, ND 58240	Ph: 701-543-3000 / Fax: 701-543-4195	Black, Pinto, Navy
Kelley Bean Company	524 S 7th St, PO Box 290 Oakes, ND 58474	Ph: 701-742-3219 Fax: 701-742-3520	Black, Pinto, Dark Red Kidney, Light Red Kidney, Navy

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Kirkeide's Northland Bean Co.	4520 12th St NE Fessenden, ND 58438	Ph: 701-547-3466 / Fax: 701-547-3539	Black, Pinto, Navy
Klindworth Seed & Bean Co.	2139 Highway 30 Fessenden, ND 58438-9441	Ph: 701-547-3742 / Fax: 701-547-2592	Pinto
Larimore Bean Co. Inc.	PO Box 607 Larimore, ND 58251	Ph: 701-343-6363 / Fax: 701-343-2842 lbc@polarcomm.com	Black, Pinto
Larson Grain Co.	100 2nd Ave Englevale, ND 58033	Ph: 701-683-5246 / Fax: 701-683-4233	Black, Pinto, Dark Red Kidney, Navy
Lee Bean & Seed Inc.	P.O. Box 37, 3 mile So. Hwy 9 Borup, MN 56519	Ph: 218-494-3330 / Fax: 218-494-3333	Black, Pinto, Navy
Manvel Bean Co.	2875 18th St NE, Manvel, ND 58265	Ph: 701-696-2271 / Fax: 701-696-8266	Pinto
Mayport Farmer's Co-op	Edible Bean Division, PO Box 338 Portland, ND 58274	Ph: 701-786-4062 / Fax: 701-786-4098	Black, Pinto, Navy
Michigan Crop Improvement Assn.	PO Box 21008 Lansing, MI 48909	Ph: 517-332-3546 palmerj@michcrop.com	Kidney, Black, Small Red
Miller Elevator Company/Trinidad Benham	Box 844 Valley City, ND 58072	Ph: 701-984-2499 / Fax: 701-984-2499	Pinto
North Star Bean	4082 22nd Avenue NE Larimore, ND 58251	Ph: 701-397-5261 / Fax: 701-397-5783	Navy, Black, Pinto
Northwood Bean Co. Inc.	301 Potato Road Northwood, ND 58267	Ph: 701-587-5206 / Fax: 701-587-5650 nbc@polarcomm.com	Black, Pinto

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O'Brien Seed, Inc	PO Box 505, 321 2nd Ave SE Mayville, ND 58257	Ph: 701-788-9118 / Fax: 701-788-9119	Black, Pinto, Pink, Small Red
Parent Seed Farms Ltd	PO Box 49 Neche, ND 58265	Ph: 204-737-3003 dennisl@parentseed.com	Black, Navy, Pinto, Chickpeas, Kidney, Pink, Small Red
Preator Bean Company	PO Box 234, Burlington, WY 82411	Ph: 307-762-3310	
Red River Bean of Oslo	PO Box 227, 105 Oak Street Oslo, MN 56744	Ph: 218-695-3040 / Fax: 218-695-3040	Black, Pinto
SK Food International	4749 Amber Valley Parkway Suite #1 Fargo, ND 58104	Ph: 701-356-4106 / Fax: 701-356-4102 Web: www.skfood.com skfood@skfood.com	Black, Pinto, Cranberry, Kidney, Great Northern, Navy, Pink, Small Red
Specialty Export Productions	PO Box 485 Fairview, MT 59221	Ph: 406-752-5401 / Fax: 406-742-5404 johnw@midrivers.com	Pinto
SRS Commodities	411 2nd Avenue NE, PO Box 386 Mayville, ND 58257	Ph: 701-786-3402 / Fax: 701-786-3374	Black, Pinto
St. Hilaire Seed Co.	PO Box 85 , Hwy 32 S St Hilaire, MN 56754	Ph: 218-964-5407 Fax: 218-964-5415	Black, Pinto, Navy
Stony Ridge Foods, Inc.	715 Atlantic Avenue Benson, MN 56215	Ph: 320-842-3401 Fax: 320-842-3403 dhughes@stonyridgefoods.com	Black, Dark Red Kidney, Light Red Kidney, Navy

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Company Name	Address	Ph/Fax/Web/Email	Beans
Syngenta Rogers	PO Box 4188 Boise, ID 83711-4188	www.rogersadvantage.com	Black, Kidney, Great Northern, Navy, Pink, Small Red
The Bean Mill	42631 450th Ave Perham, MN 56573	Ph: 218-346-2151	Dark Red Kidney, Light Red Kidney, Pink
Thompsons USA Limited	PO Box 374, 41703 Highway 2 SW E Grand Forks, MN 56721	Ph: 218-773-8834 / Fax: 218-773-9809	Black, Pinto, Kidney, Navy, Pink, Small Red
TMT Bean & Seed Farm	3718 67 Ave SE, Cleveland, ND 58424	Ph: 701-763-6544 / Fax: 701-763-6545	Pinto, Navy
Tronson Grain Co.	115 W 1st St, Doyon, ND 58327-2807	Ph: 701-398-3512 / Fax: 701-398-3609	Pinto
Valley Bean Assn.	301 Oak Street, PO Box 250 Oslo, MN 56744	Ph: 218-695-2201 / Fax: 218-695-3006	Black, Pinto, Pink, Small Red
Walhalla Bean Co.	PO Box 67, 1920 Hwy. 32 N. Walhalla, ND 58282	Ph: 701-549-3721 / Fax: 701-549-3725 wbc@utma.com	Black, Pinto, Small Red, Navy
Walhalla Bean Company	7400 55th Street South Grand Forks, ND 58201	Ph: 701-775-3317 / Fax: 701-775-3289 wbcm@gfwireless.com	Black, Pinto, Small Red, Navy
Walton Ag Services	106 First Avenue Englevale, ND 58033	Ph: 701-683-5743 / Fax: 701-683-5957 waltonag@drtel.net	Black, Pinto, Dark Red Kidney, Small Red
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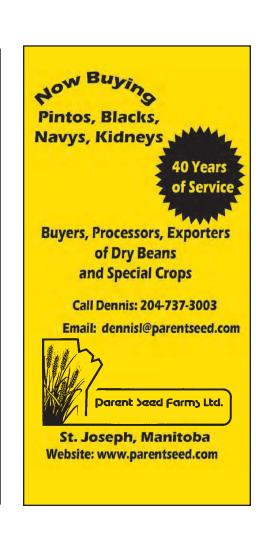
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 - Perham, MN Office: 218.346.2360 Mitch Cell: 218.639.2548
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2008 Northarvest Resource Directory

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Dry Bean Breeding Program Research Report 2007

Prepared by: Juan M. Osorno and Gonzalo Rojas-Cifuentes. Project Leader: Dr. Juan Manuel Osorno; Research Associate: Dr Gonzalo A. Rojas-Cifuentes; Research Specialist: Albert J. Vander Wal

Objectives: The objective of the dry bean breeding program at North Dakota State University is to develop high yielding, high quality bean genotypes adapted to the Northern Great Plains. This involves many characteristics of dry beans and different disciplines of research (e.g. genetics, pathology, physiology, nutrition etc.). The main priority is to improve pinto, navy, and black market classes, but also great northern, kidney, red and pink market classes are important part of our breeding program. Crosses involve adapted cultivars grown in the Northern Plains, breeding lines developed at NDSU, and germplasm possessing desirable traits from other breeding programs. Unadapted germplasm lines from other sources are evaluated for desirable traits and introgressed into adapted material. Each year, the breeding program evaluates material from around the world as possible sources of resistance to white mold, rust, root rot, anthracnose, virus, and bacterial blights, among others.

2007 Season: After several years of climatic constraints in our region, the 2007 growing season can be considered as normal in terms of environmental conditions, with no extreme adverse conditions. This allowed obtaining excellent yields not only for dry beans, but also for most of the crops grown in the region. Likewise, NDSU dry bean field trials showed excellent performance for most genotypes and allowed to gather a lot of genetic and agronomic information. In previous years, at least one location was always lost due to extreme weather (flood, drought, frost, among others). In 2007, all our locations and trials were harvested, which reflects the favorable conditions during the season.

Locations and Trials: During 2007 growing season 56 experiments and earlygeneration breeding material were planted at 6 locations in North Dakota, and at 2 locations in Minnesota. Total area in all these trials was around 36 acres (~9,000 plots). Additionally, several other variety trials were planted at the ND Research and Extension Centers (REC) across the state. By petition of the bean growers from Dickey County, we added two variety trials at the Oakes REC. We hope to keep doing more trials at this location in the future.



The new pinto variety, Lariat, released this year, has an upright architecture, allowing for good air movement between rows, and the potential for direct combining.

North Dakota Locations and Trials: Carrington (REC)

- Pinto Advanced Yield Trial (32 lines)
- Navy Advanced Yield Trial (10 lines)
- Black Advanced Yield Trial (10 lines)
- Great Northern & Red Advanced Yield Trial (10 lines)
- Black Preliminary Yield Trial 1 (169 lines)
- Black Preliminary Yield Trial 2 (100 lines)
- F₃ plant rows Pinto, Great Northern, Red, Navy and Black (624 rows)
- F₃ 06 plant rows Navy and Black (174 rows)
- F₄ Plant Rows Pinto and Great Northern (273 rows)
- F₆ Plant Rows Great Northern, Navy, and Black (1170 rows)

Johnstown (Jim Karley)

- Pinto Advanced Yield Trial (32 lines)
- Navy Advanced Yield Trial (10 lines)
- Black Advanced Yield Trial (10 lines)
- Great Northern & Red Advanced Yield Trial (10 lines)
- Midwest Regional Performance Nursery (23 lines)

Forest River (Brian Shanilec)

- Pinto Variety Trial (22 lines)
- Navy Variety Trial (19 lines)

Hatton (2 sites: Glen & Tim Skjoiton and Mark Sletten)

- Pinto Variety Trial (29 lines)
- Navy Variety Trial (21 lines)
- Miscellaneous Variety Yield Trial (16

lines)

- Pinto Advanced Yield Trial (32 lines)
- Navy Advanced Yield Trial (10 lines)
- Black Advanced Yield Trial (10 lines)
- Great Northern & Red Advanced Yield Trial (10 lines)
- Pinto Preliminary Yield Trial (196 lines)
- Great Northern Preliminary Yield Trial (121 lines)
- Red Preliminary Yield Trial (64 lines)
- Navy Preliminary Yield Trial (36 lines)
- Black Preliminary Yield Trial 1 (169 lines)
- Black Preliminary Yield Trial 2 (100 lines)
- F₃ plant rows Pintos, Great Northern, Red, Navy and Black (624 rows)
- F₃ 06 plant rows Navy and Black (174 rows)
- F₄ Plant Rows Pinto and Great Northern (273 rows)
- F₆ Plant Rows Great Northern, Navy, and Black (1170 rows)

Prosper (REC)

- Pinto Variety Trial (18 lines)
- Navy Variety Trial (16 lines)
- · Miscellaneous Variety Trial (10 lines)
- Pinto Advanced Yield Trial (32 lines)
- Navy Advanced Yield Trial (10 lines)
- Black Advanced Yield Trial (10 lines)
- Great Northern & Red Advanced Yield Trial (10 lines)
- Pinto Preliminary Yield Trial (196 lines)
- Great Northern Preliminary Yield Trial (121 lines)
- Red Preliminary Yield Trial (64 lines)
- Navy Preliminary Yield Trial (36 lines)
- USDA (Phil Miklas) Yield Trial (42 lines)

Oakes (REC)

- Pinto Variety Trial (4 lines)
- Navy & Black Variety Trial (5 lines)

Minnesota Locations and Trials: Park Rapids (Mike Beelner)

- Miscellaneous Variety Trial (28 lines)
- Kidney Advanced Yield Trial (32 lines)

Perham (Mark Dombeck)

- Miscellaneous Variety Trial (20 lines)
- Kidney Advanced Yield Trial (32 lines)
- Puerto Rico Root Rot Trial (6 lines)

Disease Testing: During 2007, 32 lines from the Pinto Advanced Yield Trial were sent to USDA-Beltsville for rust screening. A set of 20 lines were sent to USDA-Prosser for evaluation to BCMV. Five germplasm lines from Puerto Rico were also evaluated for root rot in the field. Natural pressure of common bacterial blight at Prosper allowed the identification of lines with some level of tolerance or resistance. In the same way, natural pressure of white mold at Hatton also permitted to observe differences

among lines, particularly within the Pinto Variety Trial.

Winter Nurseries: In January, 2100 lines were planted at Puerto Rico for selection. Approximately 25% was discarded due to poor performance and disease and the rest was brought back and planted at Hatton for more visual selection. More recently, another set of 1118 lines were planted during last December at Puerto Rico again,

including early-generation material of pintos, great northerns, navys, reds, pinks, and blacks. Seed increases of new pinto lines for release (Lariat and Stampede) were made at New Zealand, allowing gaining one year in the seed production process of these two lines.

Crossing block: The first crossing block from the new dry bean breeder was made, including crosses among several advanced

breeding lines, commercial varieties and germplasm with traits of interest. Production of F_1 seed was low due to technical problems in the greenhouse. In spite of this, a total of $34\,F_1$ crosses are being grown in the greenhouse and are expected to be planted on the next season in the field.

Training & Education: Students are an important component of the project, which allows a relation of mutual benefit since they help in the routine activities and at the same time, they learn about the management and genetic principles involved in a breeding program. This is of key significance in order to guarantee the future generation of plant breeders. In 2007, two summer internships (one from North Dakota and one from Puerto Rico) were part of the project, as well as students from other NDSU departments whom helped in the daily activities of the project.

Results

- A total of 3,648 test plots of advanced and preliminary yield trials were harvested. In advanced yield trials, 32 pinto, 14 navy, 10 black, and 10 great northern and red bean lines were tested
- For the variety trials, 532 test plots were harvested including pinto, navy, and miscellaneous trials.
- More than 2,000 single plant selections from breeding trials were made and harvested from F₃ and F₄ plant rows.
- A total of 357 row selections from breeding trials were made and bulk-harvested from F₆ plant rows.
- After extensive testing in several trials in and out of North Dakota, two new pinto lines (Lariat and Stampede) are being released.

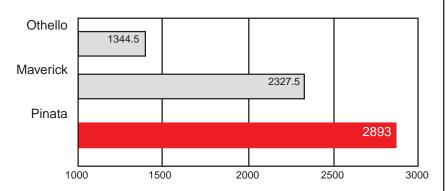
Further Steps

- Several advanced experimental lines will be increased and screened for diseases at NDSU greenhouse facilities. Besides yield and agronomic performance, breeding for disease resistance will continue to be one of the main priorities in the program.
- Selection of early and advanced experimental lines will permit to reduce the size
 of the field trials to something more manageable given the personnel and resources
 available.
- The navy line was already presented and approved by the release committee. It has been named "Avalanche" and seed increase will start this year.
- A new Masters student will start doing research on yield losses in direct combining and its relationship with plant architecture.

Pinata: A High Yield, Early Maturity Vine Pinto

SEE FOR YOURSELF!

RED RIVER VALLEY PINTO TRIALS



Red Rive	r Valley Pin	to Yield Trials					
Variety	Maturity	Location 1	Location 2	Average	Mold	Rust	Blights
Pinata	89	2982	2804	2893	s*	t*	mt*
Maverick	103	2136	2519	2327.5	S	t	S
Othello	105	1262	1427	1344.5	S	S	S
* ^ -1:		Antonomia makiman alai			411-1		- 4 - I

*Adjusted for moisture; t=tolerant, mt-moderately tolerant, s-susceptible, ms=moderately susceptible. Pinata is under Plant Variety Protection.



Idaho Seed Bean Co.

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Utilization of Cracked & Broken Bean Flour in Omega-3 Fortified Extruded Snacks

Investigators: Mehmet Tulbek and Brian Sorenson, Northern Crops Institute at North Dakota State University Fargo, ND and Clifford Hall, Department of Cereal and Food Sciences North Dakota State University Fargo, ND

Extrusion is a unique process which helps utilize edible beans by inactivating enzymes, antinutritional factors and enhancing taste attributes. Due to the diversity and changes in the U.S. agriculture, food companies are looking for alternative and feasible ingredients for snack food manufacturing. Edible beans are good source of protein and fiber and can be successfully utilized in developing health based extruded snacks fortified with cold milled flaxseed, which is a major source omega-3 fatty acids. In this project we focused on utilizing broken and cracked beans in snack food manufacturing.



Fitzmill

The objectives of this project were i) to develop a milling process for cracked and broken edible beans and also whole beans; ii) to assess the shelf life properties of cracked and broken bean flour; iii) to develop a method for producing extruded snack products from omega-3 fortified dry bean flour.

Navy and pinto beans were milled with Fitzmill Model DAS-06 (Fitzpatrick Company, Elmhurst IL) (Picture 1). Mill speed was conducted at 2400, 3600 and 7200 RPM and screw speed was arranged as 15 RPM. Screen size was used as 0.0109. Particle size distribution and detailed data was given in Table 1-3. Results indicated similar results in terms of milling quality. As the mill speed increased particle size decreased. Cracked and broken beans had the lowest particle size compared to navy and pinto beans.

Navy, pinto and cracked mixed bean flours did not show significant differences in terms of shelf life stability. However bean flour quality significantly improved with cooking application. Hydrothermal treatment prior to milling significantly improved cracked bean flour quality. Gas chromatography tests indicated higher levels of hexanal aldehyde during 8-week storage in non treated bean flour samples, compared to cooked flours. Storage stability was related to hydrothermal treatment which is possibly



Wenger TX-52 Twin Screw Extruder

Table 1. Milling conditions and particle size analysis of navy beans

Milling Parameters	1	II	III
Navy Bean Moisture Content	16.2%	16.2%	16.2%
Rotor Speed	2400 RPM	3600 RPM	7200 RPM
Screen	0.109	0.109	0.109
Initial Product Temperature	19.5°C	19.5°C	19.6°C
Feed Screw Rate	15 RPM	15 RPM	15 RPM
Final Product Temperature	26.2°C	27.3°C	31.2°C
Amperage	9 amps	10 amps	12 amps
Particle Size Analysis			
Over 60 mesh	65%	59%	31%
Through 60 mesh	35%	41%	69%

Table 2. Milling conditions and particle size analysis of pinto beans

Table 2: Willing con	Table 2. Willing Conditions and particle size analysis of pinto beans				
Milling Parameters	1	II	III		
Pinto Bean Moisture Content	17.1%	17.1%	17.1%		
Rotor Speed	2400 RPM	3600 RPM	7200 RPM		
Screen	0.109	0.109	0.109		
Initial Product Temperature	19.8°C	19.8°C	19.8°C		
Feed Screw Rate	15 RPM	15 RPM	15 RPM		
Final Product Temperature	25.2°C	26.4°C	29.7°C		
Amperage	8 amps	9 amps	11 amps		
Particle Size Analysis					
Over 60 mesh	61%	54%	36%		
Through 60 mesh	39%	46%	64%		

Table 3. Milling conditions and particle size analysis of cracked beans

I	II	III
17.9%	17.9%	17.9%
2400 RPM	3600 RPM	7200 RPM
0.109	0.109	0.109
21.2°C	21.2°C	21.2°C
15 RPM	15 RPM	15 RPM
23.1°C	24.3°C	27.1°C
6 amps	7 amps	9 amps
53%	38%	28%
47%	62%	72%
	2400 RPM 0.109 21.2°C 15 RPM 23.1°C 6 amps	17.9% 17.9% 2400 RPM 3600 RPM 0.109 0.109 21.2°C 21.2°C 15 RPM 15 RPM 23.1°C 24.3°C 6 amps 7 amps

related to the enzyme activity of bean flours.

Extrusion was conducted according to standard corn curl processing method of Wenger (Picture 2). Screw speed and water absorption levels were adjusted at 350 RPM and 0.328 kg/min respectively. Bean samples milled at 7200 RPM were utilized in extruded snack process.

Specific mechanical energy values decreased as the cold milled flaxseed addition increased during extrusion as observed in the previous study. Snack quality analyses indicated that water activity scores increased with navy and cracked bean flour, whereas no change was observed with pinto bean flour. Milled flaxseed addition significantly (P<0.05) increased the oil content of the samples. In terms of 20% milled flaxseed fortified extruded snacks, navy bean and cracked mixed bean flour samples had higher oil content (6.8 and 6.2% respectively) compared to pinto bean flour (5.6%). Alpha linolenic acid was found to be the major fatty acid (51-53%) followed by linoleic acid (20-22%) in the oil fraction. Shelf life stability of extruded bean snacks was evaluated by headspace volatile analysis. Gas chromatography was conducted and secondary metabolites of lipid oxidation were analyzed. Propanal the primary aldehyde of alpha-linolenic acid was detected in all extruded bean snack samples at 4-month storage. As the milled flaxseed addition increased, propanal content increased. Due to the high temperature and shear during extrusion, cracked bean flour had results similar to navy and pinto beans in terms of product quality. In conclusion cracked and broken beans could be introduced as an alternative ingredient with high temperature high shear food process applications. The results of this project will be further discussed and presented during the Pulse Quality and Utilization Short Course which will be organized by Northern Crops Institute on August 5-7, 2008 at Fargo, ND.

Resistance Against Fusarium Root Rot of Dry Bean

Investigators: Rubella Goswami, Carl Bradley, and Jack Rasmussen, Department of Plant Pathology, North Dakota State University. Dr. Bradley is now at the University of Illinois

Objectives: The objective of this research is to assist the development of dry bean germplasm and resistance to Fusarium root rot for the Northarvest production area by a) screening germplasm for root rot resistance, and (b) conducting experiments to determine the genetics of resistance to Fusarium root rot in Vax 3.

Progress: In previous work supported by Northarvest, we developed an inoculation technique, termed the "layered inoculum" method, as a greenhouse and laboratory tool to effectively evaluate dry bean reaction to Fusarium root rot. This method was used to assess eleven dry bean cultivars, representing different market classes, for their level of resistance to Fusarium root rot in field (Fargo, ND and Park Rapids and Perham, MN) and greenhouse trials. As expected, dark red kidneys (cultivars Montcalm and Red Hawk) were among the most susceptible. By comparison, Vax 3 had good resistance suggesting that this variety may be a good source of genetic resistance to Fusarium root rot. For purposes of elucidating the genetics of resistance, crosses were made between Vax 3 (resistant parent) and the dark red kidney variety Red Hawk by the breeding group. Red Hawk is highly susceptible to this disease, despite many other desirable agronomic characteristics (yield, quality, and so forth). F, progeny were tested by us and found to be disease resistant. This implicates but does not by itself prove that resistance may be genetically dominant. [This would be good for the breeding program because resistance conditioned by dominant gene(s) is easier to work with]. Proof of genetic dominance requires analysis of F2 and F2 populations, which would segregate for susceptibility and resistance. Those populations have been developed and screened in the laboratory and green house. Progeny have been forwarded to the F₆ generation and the recombinant inbred lines are currently being evaluated for resistance to identify potential parents for the breeding program. These populations will subsequently be used for molecular analysis to try to identify markers that can be linked to root rot resistance and used for marker assisted selection of breeding lines.

In other experiments, we investigated the ability of *Fusarium graminearum*, previously known to cause head blight of wheat and barley, to cause root rot in dry bean cultivars. We used greenhouse experiments to determine the reaction of dry bean genotypes from six dif-

ferent market classes to *F. graminearum*. 'VAX 3,' 'Eclipse,' and 'T-39' were found to be more resistant to this pathogen as well when compared to 'Rojo Chiquito,' 'Red Hawk,' 'Montcalm' and other genotypes, including two pinto beans. These results suggest that dry bean genotypes with susceptibility to *F. solani* may have susceptibility to *F. graminearum* and those with resistance to one pathogen may have resistance to the other, at least under greenhouse conditions. We emphasize that the importance of *F. graminearum* as a root rot pathogen of dry bean in commercial fields was not investigated in these experiments and needs to be a topic for future research.



Figure 1. A-D Greenhouse evaluations: (A) Susceptible root rot reaction of 'Rojo Chiquoto' to *E solani f sp. phaseoli*. (B), Susceptible reaction of 'Rojo Chiquoto' to *E graminearum*. (C) Resistant type reaction of T-39 to *E solani f sp. phaseoli* (D) Resistant type reaction of T-39 to *E graminearum*.

Effect of Soybean Cyst Nematode on Growth of Dry Bean

periments.

Results: The field experi-

ment with the pinto bean GTS

900 showed a significant effect

of SCN on growth of the plants.

All measurements of plant

growth were significantly less

in the SCN infested soil treat-

ments compared to the non-

infested soil. There were no

significant differences between

cm3 of soil treatments. Also, the

the 5,000 and 10,000 eggs/100

number of cysts and eggs pro-

duced was significantly higher

in the SCN infested soils com-

pared to the control. There was

some SCN reproduction on our

controls due to possible con-

tamination from the adjacent

infested soil. This is the first

Investigators: Berlin D. Nelson and Susilo Poromarto, Dept. Plant Pathology, NDSU

Objective: Determine the effect of soybean cyst nematode on growth of four classes of dry bean.

Introduction: In 2007 we established two research plots in Richland Co., North Dakota, to test the effect of soybean cyst nematode (SCN) on growth of dry bean. These experiments were established by growing dry beans in SCN infested soil in large plastic pots that were placed in the field so plants could grow under natural conditions. Soil was collected from an infested site, pasteurized to kill the SCN eggs and then placed in the plastic pots. Eggs were obtained from infested soil and were added to the soil in pots at three rates: 0 (control), 5,000 and 10,000 eggs/100 cm³ of soil. Seed was then planted and pots were buried in the soil on an infested SCN field site. There were six replications of

the treatments. In one experieach pot was determined.

We also established greenhouse experiments to determine the effect of SCN on dry bean growth using the same bean varieties as in the field experiments. Plants were grown in a sandy soil in 10 liter pots at five levels of SCN infestation: 0, 1,000, 5,000, 10,000 and 20,000

ment we tested the pinto bean variety GTS 900 and in the other the kidney bean variety Chinook. These two dry bean types were placed in different fields. Plants were grown to maturity and plant height, pod number and weight, number of seeds in a pod, total number of seeds, weight of seeds, and total dry weight of plant was recorded. Also, the total number of cysts and eggs produced in the soil of

> field evidence that soybean cyst the controls, but significant-120 Control ■5,000 eggs/100 cc ■10,000 eggs/100 cc *Columns with the same letter are not significantly different 100 80 60 40 20

nematode can reduce the

growth of dry bean and re-

produce on dry bean in the

field. Some of the field data

All the kidney beans at

the other research site grew

oped normally. Plants were

is shown in Figures 1-3.

poorly and never devel-

stunted and malformed.

There were no significant

ments of growth between

based on our observations

of SCN reproduction on the

plant that the controls were

contaminated by SCN and

the nematode reproduced

on the control plants. Cysts

and eggs were produced on

differences in measure-

treatments. We suspect

bean variety GTS900 in a 2007 field experiment with three egg densities.

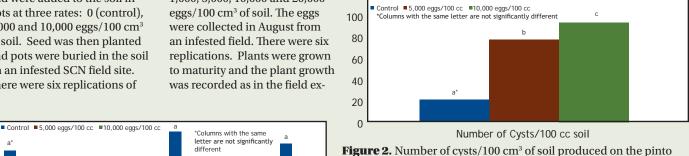


Figure 1. Effect of soybean cyst nematode on the pinto bean variety GTS900 in a field experiment in 2007.

Number of Pods Weight of Pods (g) Number of Seeds Weight of Seeds (g)

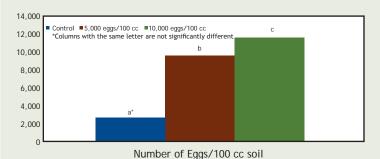


Figure 3. Number of eggs/100 cm³ of soil produced on the pinto bean variety GTS900 in a 2007 field experiment with three egg densities.

Figure 4. Pinto bean GTS900 growing in soil infested with soybean cyst nematode (SCN). Plant in middle is the control growing in soil without SCN. The plants on the right and left are growing in soil with 10,000 and 5,000 eggs/100 cm³ of soil, respectively. Notice the more robust plant growth of the control.

80

70

60

50 40

30 20 10

ly greater numbers of cysts and eggs were produced in the 5,000 and 10,000 egg treatments compared to the control. There were significantly greater cysts and eggs produced at the 10,000 egg compared to the 5,000 egg density.

The first greenhouse experiments were inconclusive since there was poor infection of the roots. We discovered that our hatching rate for the eggs was poor, apparently due to the population reverting to diapause (dormant state) during August when the eggs were collected from infested soil. We created a new population of SCN in the greenhouse and all the greenhouse experiments were repeated using eggs from this new population. The experiments are currently in progress and will run until plant maturity.

Future work will continue to refine our greenhouse testing so we know which egg densities are appropriate for testing the effects of SCN on the other 6 bean varieties that we proposed to use: Pinto bean Rally, Navy bean Vista and Navigator, Black Bean T-33 and Condor and Kidney Bean Red Hawk. Furthermore, in 2008 we will expand our field testing using methods similar to those employed in 2007.

Conclusion: This is the first report showing SCN can adversely effect the growth of dry bean plants and can reproduce on roots of dry bean in the field. This indicates SCN is a potential threat to dry bean production. Continued research is needed to determine the egg densities associated with yield loss.

Enhancement of Molecular Marker and Molecular Biology Capabilities for Dry Bean Pathology

Investigators: Rubella Goswami and Jack Rasmussen, Department of Plant Pathology, North Dakota State Univeristy

Molecular biology holds tremendous promise in providing the necessary tools for enhancing agricultural research. In addition its role in advancing breeding programs, these tools have been found to be instrumental in monitoring and diagnosing plant pathogens that affect crop production.

Objective: The purpose of this proposal was to request commodity money to purchase molecular biology laboratory equipment. This equipment would be used to conduct research on dry bean diseases in our region, including cooperation and collaboration with the dry bean breeding program.

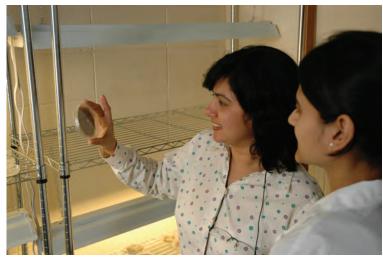
Progress: The funds provided by the grower community along with support from NDSU have resulted in the initiation of a well equipped dry bean pathology laboratory in university. The equipment now available to members of the dry bean research team including pathologists and breeders comprise of a gradient PCR machine, gel electrophoresis units, DNA quantification apparatus, a mini centrifuge and other supplies. These are currently being used for direct pathogen identification from diseased tissue samples, study of pathogen variation and plant DNA analysis. Pictures showing members of the dry bean and pulse pathology group working with some of these equipments are at right.



Gel electrophoresis for visualizing dry bean DNA



PCR for diagnosis of dry bean diseases



Rubella Goswami, the new dry bean pathologist at NDSU, examines a petri plate containing a Fusarium root rot pathogen.

2006 Dry Bean Grower Survey of Pest Problems and Pesticide Use in Minnesota and North Dakota

Investigators: J. Knodel, J. Luecke, P. Beauzay, D. Franzen, H. Kandel, S. Markell, J. Osorno and R. Zollinger, NDSU Extension Service, North Dakota State University, Fargo, ND 58105

This dry bean grower survey is the 19th (2006) annual survey

of varieties grown, pest problems, pesticide use and grower practices of the Northarvest Bean Growers Association, and association of dry edible bean growers in Minnesota and North Dakota. Results of previous surveys dated 1987-2000, 2002, and 2004-2005 have been published. No surveys were conducted in 1993 and 2001.

The survey forms were developed by research and Extension faculty at North Dakota State University and the directors of the Northarvest Bean Growers

Association. The survey was mailed to all Northarvest bean growers. All participants in the survey were anonymous. In some years, such as 2003, the survey was completed by dry bean producers who attended the Northarvest Bean Day in

Table 5. Dry bean varieties grown in 2006 by respondents

		Acres Planted ¹						
Variety	Class ²	MN	%	ND	%	Northarvest	%	
Maverick	Р	937	4.6	42,934	49.3	43,971	40.7	
Buster	Р	979	4.8	6,965	7.9	7,944	7.4	
GTS 900	Р	0	0	2,733	3.1	2,733	2.5	
Remington	Р	100	0.5	250	0.3	350	0.3	
Гораz	Р	0	0	3,782	4.3	3,782	3.5	
Pintoba	Р	390	1.9	170	0.2	560	0.5	
Vinchester	Р	0	0	725	0.8	725	0.7	
Other pinto	Р	135	0.7	5,345	6.1	5,480	5.0	
otal Pinto	Р	2,541	12.4	62,904	72.2	65,445	60.8	
Ensign	N	1,081	5.3	2,778	3.2	3,859	3.6	
lavigator	N	972	4.8	3,521	4.0	4,493	4.2	
lorstar	N	1,190	5.8	3,577	4.1	4,767	4.4	
'ista	N	2,474	12.1	483	0.6	2,957	2.7	
ally	N	0	0	0	0	0	0	
Arthur	N	0	0	0	0	0	0	
Mayflower	N	190	0.9	0	0	190	0.2	
Cirrus	N	294	1.4	350	0.4	644	0.6	
9903	N	0	0	60	0.1	60	0.1	
Other navy	N	641	3.1	3,797	4.4	4,438	4.1	
Nontcalm	K	3,949	19.3	133	0.2	4,082	3.8	
Red Hawk	K	3,940	19.3	0	0	3,940	3.7	
Other Kidney	K	1,335	6.5	0	0	1,335	1.2	
otal Kidney	K	9,224	45.1	133	0.2	9,357	8.7	
-39	В	280	1.4	2,238	2.6	2,518	2.3	
aguar	В	54	0.3	310	0.4	364	0.3	
)nyx	В	0	0	0	0	0	0	
clipse	В	110	0.5	2,839	3.3	2,949	2.7	
ther Black	В	288	1.4	476	0.5	764	0.7	
otal Black	В	732	3.6	5,863	6.7	6,595	6.1	
ny Pink	PK	467	2.3	2,429	2.8	2,896	2.7	
Other Class		637	3.1	1,279	1.5	1,916	1.8	

¹Respondents' acres only

²P = pinto; N = navy; K = kidney; B = black; PK = pink

Fargo during the winter.

Throughout this report, trade names of chemicals often are presented as an aid to clearer communication. Mention of the trade names does not constitute endorsement or recommendation by North Dakota State

University or Northarvest Bean Growers Association.

The complete survey can be found on the Northarvest Bean Growers web site at <u>www.</u> <u>northarvestbean.org</u>. Click on More Headline News.

Table 1. Number of Northarvest dry bean growers responding, total acres and acres planted by respondents in 2006

Growers	# of respondents	Respondent's Acres	Total Acres *	Acres Surveyed (% of total)
MN	69	20,443	145,000	14.1
ND	168	87,174	670,000	13.0
Northarvest	237	107,617	815,000	13.2

^{*} Total of dry bean acres planted for area.

Table 2. Dry bean acres irrigated, harvested and damaged by hail, frost and water in 2006.

	% of respondents' acres			
	Minnesota	North Dakota	Northarvest	
Irrigated	18.9	4.4	7.1	
Harvested	93.8	97.5	96.8	
Hail damaged	6.9	7.3	7.2	
Frost damaged	7.2	4.6	5.1	
Water damaged	6.9	4.3	4.8	

Table 3. Sources of dry edible bean seed used for planting by respondents in 2006.

	% of respondents' acres				
Seed Source	Minnesota	North Dakota	Northarvest		
Bin run	0	10.3	8.3		
Canada	0	0	0		
Northarvest	11.8	31.9	28.1		
Western	87.5	55.1	61.2		

Table 4. Market classes of dry bean grown by respondents in 2006

	% of respondents' acres				
Market class	Minnesota	North Dakota	Northarvest		
Black	3.6	6.7	6.1		
Kidney	45.2	0.1	8.7		
Navy	33.4	16.7	19.9		
Pink	2.3	2.8	2.7		
Pinto	12.4	72.2	60.8		
Other	3.1	1.5	1.8		

Dry BeanTolerance to KIH-485

Investigators: Zollinger, Richard K. and Jerry L. Ries.

Richard K. and Jerry L. Ries. An experiment was conducted near Thompson, ND, to evaluate crop response and weed efficacy to herbicide applications applied PRE to four dry edible bean types. 'Montcalm' kidney bean, 'Maverick' pinto bean, 'T-39' black bean, and 'Ensign' navy bean were planted perpendicular to each plot length on May 25, 2007. PRE treatments were applied on May 25 at 10:40 with 52 F air, 51 F soil at a four inch depth, 46% relative humidity, 100% cloud cover, 3 to 5 mph E wind, dry soil surface, and moist subsoil. Soil characteristics were 16.3% sand, 57.9% silt, 25.8% clay, 4.5% OM, and pH 7.9. POST treatments were applied on June 25 at 9:55 am with 73 F air, 74 F soil surface, 77% relative humidity, 100% cloud cover, 10 to 15 mph SE wind, dry soil surface, wet subsoil, excellent crop vigor, and no dew present to V2 to V3 bean types. Weed species present in plots with PRE applications were: 1 to 4 inch (5 to 15/ft2) yellow foxtail; and 1 to 6 inch (5 to 15/ft²) kochia. Weed species present in POST only applications were: 2 to 6 inch (5 to 20/ft2) yellow foxtail; 2 to 10 inch (5 to 20/ft2) kochia: 1 to 4 inch (5 to 20/ft2) redroot pigweed, and 1 to 4 inch (5 to 20/ft²) common lambsquarters. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a bicycle-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles with a backpack-type plot sprayer for POST treatments. The experiment had randomized complete block

per treatment.

On June 25, all dry bean types were 2 to 3 trifoliates. All dry bean types had burning and speckling on unifoliate and first trifoliate, which cause is unknown but could be from excess water or hail. Newer leaves were unaffected. Plants were chlorotic and with holes. The grower sprayed the micro-rate containing Reflex which could have drifted and caused speckling. There was stand loss and injury in some plots from standing water.

In Permit plots on July 2 (7 dat), there was no bean injury. Permit had no activity on foxtail, common lambsquarters, or kochia. Redroot pigweed was stunted and yellow. All treatments except Permit applied POST had 0% control of common lambsquarters and 99% of redroot pigweed at PRE/14/28 DAT ratings. Yield was not taken due to excess standing water throughout study.

Injury comments: Low KIH-485 rates showed visual signs of stunting and chlorosis and high rates showed visual signs of stunting, chlorosis, and slight stand loss.

The x rate for soil type was 2.1 oz/A. Dry bean safety to KIH-485 was greater at early evaluations and injury increased over time indicating root uptake. Injury increased as rate increased, although Spartan treatments showed no injury. KIH-485 completely controlled kochia even at the lowest rate indicating lower rates could be used which may provide greater dry bean tolerance. (Dept. of Plant Sciences, North Dakota State University, Fargo).

Data tables from this research are available online at www.northarvestbean.org. Clickon More Headline News.

design with three replicates

Dry Edible Bean Herbicide Programs

Investigators: Zollinger, Richard K. and Jerry L. Ries, Dept. of Plant Sciences, North Dakota State University, Fargo.

An experiment was conducted near Thompson, ND, to evaluate crop response and weed efficacy to herbicide programs in dry beans. 'Montcalm' kidney

bean, 'Maverick' pinto bean, 'T-39' black bean, and 'Ensign' navy bean were planted perpendicular to each plot length on May 25, 2007. PRE treatments were applied on May 25 at 10:30 with 52 F air, 51 F soil at a four inch depth, 45% relative humidity, 100% cloud cover, 3 to

5 mph E wind, dry soil surface, and moist subsoil. Soil characteristics were 16.3% sand, 57.9% silt, 25.8% clay, 4.5% OM, and pH 7.9. POST treatments were applied on June 25 at 9:45 am with 73 F air, 74 F soil surface, 77% relative humidity, 100% cloud cover, 10 to 15 mph SE

wind, dry soil surface, wet subsoil, excellent crop vigor, and no dew present to V2 to V3 dry edible bean types. Weed species present in plots with PRE applications were: 1 to 5 inch (1/ $\rm ft^2$) yellow foxtail; 1 to 6 inch (5 to $10/\rm ft^2$) kochia (in treatment 3 only); 1 to 5 inch ($1/\rm yd^2$) kochia





Pinto, navy, kidney, and black beans planted perpendicular to the plots. Untreated plot on the left, and untreated and treated dry bean types on the right.

Dry Edible Bean Desiccation, 2007

Investigators: Zollinger, Richard K. and Jerry L. Ries, Dept. of Plant Sciences, North Dakota State University, Fargo.

An experiment was conducted near Hatton, ND to evaluate dry edible bean desiccation treatments. 'Ensign' navy bean was planted on June 11, 2007. The study was maintained weed free throughout the growing season from two applications of Rezult Copack at 1.6pt/A and hand weeding. Desiccation treatments were applied on September 4 at 11:40 am, with 73 F air, 76 F soil surface, 43% relative humidity, 75% clouds, 3 to 8 mph S wind, dry soil surface, damp subsoil, and no dew present to naturally senescent dry bean. Dry bean senescence at application was quantified in the following manner: 85% green pods, 14% vellow pods, 1% leather pods, and 40 to 60% leaf drop. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-



Untreated

type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-tan nozzles. The experiment had a randomized complete block design with three replicates per treatment.

Treatments were applied before dry bean senescence to create treatment separation. All treatments increased dry



Valor + MSO at 7 DAT

bean desiccation. Valor and Gramoxone Inteon generally increased the rate of desiccation when compared to Aim treatments. Some Aim treatments were comparable to Valor and Gramoxone, but tended to take longer to reach similar activity. Previous research, as well as in 2007, has shown that Valor plus

a methylated seed oil increased desiccation when compared to other treatments. Gramoxone Inteon has also shown to be an effective dry bean desiccant the last two years, probably due to favorable conditions of sunlight and moderate temperatures after application. Organosilicones, Syl-Tac and Dyne-Amic, did not increase control. Dyne-Amic in 2006 showed excellent control, although the rate used was higher than used conventioanlly. In-Place generally did not enhance desiccation. Aim is labeled at 1 to 2.0 oz/A with an NIS, MSO, or COC. Gramoxone Inteon is labeled at 1.2 to 2.0 pt/A with an nonionic surfactant. Valor is expected to be registered in 2008 at 1.5 oz/A with an MSO.

Data tables from this research are available online at www.northarvestbean.org. Click on More Headline News.

(in treatment 4 only); and 1 to 3 inch (10 to 25/yd2) redroot pigweed. Weed species present in POST only applications were: 2 to 8 inch (5 to 20/ft2) yellow foxtail; 2 to 10 inch (10 to 20/ft2) kochia; 2 to 7 inch (10 to 30/ft2) redroot pigweed; and 1 to 4 inch (1 to 3/yd²) common lambsquarters. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a bicycle-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles for PRE treatments and 8.5 gpa at 40 psi through 11001 Turbo TeeJet flat-fan nozzles with a backpack-type plot sprayer for POST treatments. The experiment had randomized complete block design with three replicates per treatment.

Soil-applied Reflex was safe to dry bean and improved weed control. The NDSU Dry Bean Micro-rate applied POST did control common lambsquarters and kochia because of the large weed size at application. Weeds should be no larger than 2 inches tall. Yield was not taken due to excess standing water throughout study and hail.

Data tables from this research are available online at www.northarvestbean.org. Click on More Headline News.

Weed Control in Dry Bean

Investigators: Zollinger, Richard K. and Jerry L. Ries, Dept. of Plant Sciences, North Dakota State University, Fargo.

An experiment was conducted near Thompson, ND, to evaluate crop response and weed efficacy to herbicide treatments applied PPI and PRE to four dry bean types. PPI treatments were applied on May 25 at 9:00 with 52 F air, 51 F soil at a four inch depth, 42% relative humidity, 100% cloud cover, 3 to 5 mph E wind, dry soil surface, and moist subsoil and immediately double incorporated with a field cultivator operating at a 2 to 2.5 inch depth, followed by the planting of 'Montcalm' kidney bean,' Maverick' pinto bean, 'T-39' black bean, and 'Ensign' navy bean perpendicular to each plot length. PRE treatments were applied on May 25 at 10:15 am with 52 F air, 51 F soil surface, 42% relative humidity, 100% cloud cover, 3 to 5 mph E wind, dry soil surface, and moist subsoil. Soil characteristics were 16.3% sand, 57.9% silt, 25.8% clay, 4.5% OM, and pH 7.9. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a bicyle-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet flat-fan nozzles for PPI and PRE treatments. The experiment had randomized complete block design with three replicates per treatment.

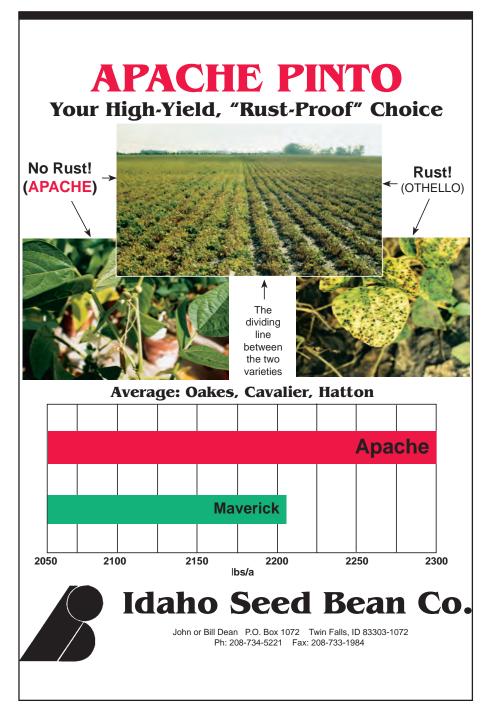
PPI treatments were safe to dry bean and controlled weeds. Lower rates of KIH-485 were safe to dry beans and controlled weeds. Injury type was stunting.

Data tables from this research are available online at www.northarvestbean.org. Click on More Headline News.





The four bean types with untreated checks on each side shown on the left. The four bean types weed free on the right.



Antioxidant Activity in Dry Beans: Potential for Pinto Beans to Slow Age-related Bone Loss

Investigator: Jay Cao, Ph.D., Principal Investigator (PI)

Objectives of the study:

To determine whether antioxidant factors in dry pinto beans slow age-related bone loss in an animal model.

Hypothesis: We hypothesized that antioxidant factors in pinto beans can slow agerelated bone loss in mice by inhibiting osteoclast activity and, thus, can be useful in preventing osteoporosis.

Research Methodology:

We proposed to determine the long-term (up to 6 mos.) effects of the consumption of pinto bean hull extracts on bone structure and bone cell activities in older mice (12-mo-old). To accomplish the goal, 12-moold male C57BL/6J mice were fed either a control diet or a diet containing bean hull extracts for up to six months. Animals from each group will be euthanized at 3 and 6 month for tissue collection. Antioxidant capacity of the diets, pinto beans, and pinto bean extract will be determined. Bone structure will be evaluated with micro-computed tomography (µCT) and quantitative histomorphometry of distal end of femur and lumbar vertebrae

2 and 3 (cancellous bone volume, osteoblast and osteoclast surface, mineral apposition rate, bone formation). Primary osteoblasts from bone marrow will be cultured to access in vitro bone formation (alkaline phosphatase, colony formation, mineralization nodules). Gene expression of RANKL, OPG, cbfa-1, c-fos, collagen _1 (I), osteopontin, osteocalcin, alkaline phosphatase, and M-CSF (quantitative real-time PCR) will be measured by real-time PCR. Cell proliferation and apoptosis will be measured. Liver will be analyzed for total glutathione (reduced glutathione + oxidized glutathione). Thioredoxin and thioredoxin reductase will also be determined.

Work conducted and results obtained in 2007:

Since 12-mo-old mice are not available from any commercial vendors and the aged mice from the National Institute of Aging (NIA) are only available to those researchers who have grants with the agency. We purchased the oldest mice wherever possible and raised them in house. These mice are now 12-mo-old and feeding trial was started January 16, 2008.

We have performed bean hull extraction from commercially available pinto beans. We separated bean hulls from beans manually. About 1.5 kg of dry bean hulls was obtained from 18 kg of pinto beans (the yield is about 8%). Then, based on a published paper (J Nutr Sci Vitaminol, 50: 380-383, 2004), we prepared water extracts from pinto bean hulls. About 75 g of extract were prepared (the yield is about 5%. We performed the oxygen radical absorbance capacity (ORAC) assay to assess antioxidant capacity of whole bean extracts (WBE) and pinto bean hull extracts (BHE). We found that ORAC values were much higher in BHE than in WBE (77 vs 17 µmol/g as expressed as Trolox equivalent). These ORAC values are comparable to those in published reports.

In an effort to mimic a hu-

man diet, the experimental design was slightly modified. We now have three groups: Control, 0.04% bean hull extract supplemented group, and 0.08% bean hull extract supplemented group. According to extraction results, 0.08% bean hull extract would be equivalent to about 20% pinto bean in the diet. Using extracts we prepared, all experimental diets (20 kg/group) have been made in house.

Benefit of Research to
Bean Growers: With osteoporosis being a major health
concern affecting nearly 50
million Americans, the findings
from this study will provide new
information about the usefulness of pinto bean hull extract
in maintaining bone health and
preventing age-related bone
loss. A positive effect could
mean good news for many
Americans, but for bean producers in particular.



10% Zinc 9.5% Nitrogen 4% Sulfur

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The research projects reviewed in this report were funded by the Northarvest Bean Growers Association.

Northarvest Bean Growers

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2007 Dry Bean Performance Testing Results

Following are dry bean performance testing results completed in 2007 along with variety descriptions, compiled by Hans Kandel, Extension Agronomist, Department of Plant Sciences, North Dakota State University. The report can also be found in NSDU Extension Bulletin A-654 "North Dakota Dry Vean Performance Testing 2007" available at county extension offices. Results can also be found online at www.ag.nsdu.nodak.edu/pubs/plantsci/rowcrops/A654.pdf.

Test trials are supported in

party by fees collected from entrants of private varieties. We acknowledge the support for Juan Osornos' breeding project by the Northarvest Bean Growers Association, North Dakota Dry Bean Council, and Minnesota Dry Bean Research and Promotion Council with checkoff funds.

Reference Points

Mean refers to the average number for a particular trait or characteristic evaluated in the trial. Coefficient of variability (C.V.%) is a relative measure of the amount of variation or consistancey recorded for a particular trait, expressed as a percentage of the mean. Generally, trials with low C.V. rates are more reliable for making hybrid choices than trials with higher C.V. rates. Trials with C.V. rates below 15-20% are generally considered to be reliable for comparing yield.

Least significant difference (LSD 5%) - use this to accurately determine if one variety is bet-

ter than another for a given trait. This is a statistical way to indicate if a trait such as yield differes when comparing two hybrids. If two hybrids differ by more than the indicated LSD 5% value for a given trait, they would most likely differ again when grown under similar conditions. If two varieties differ by less than the LSD for a particular trait, then there is no statistical difference.

Presentation of data for the entries tested does not imply approval or endorsement by the

Dry Edible beans, area planted, acres harvested	, yield and total production for North Dakota and the United States for 2006-07 acres and
production by class for North Dakota and the U.	S. ,

	Acres Pla	Acres Planted		vested Yield Per Acre		Acre	Production	
	2006	2007	2006	2007	2006	2007	2006	2007
Class	1,00	0s	1,00	0s	Pound	ds	1,000 (Cwt.
North Dakota								
Navy	120.0	96.0	113.0	89.0	1,400	1,810	1,585	1,611
Great Northern	7.5	8.0	6.5	7.7	1,080	1,470	70	113
Pinto	453.0	502.0	435.0	487.0	1,150	1,560	4,988	7,606
Dark Red Kidney	2.0	1.5	1.9	1.4	1,630	1,790	31	25
Pink	20.0	13.0	19.4	12.5	1,430	1,870	277	234
Small Red	6.0	5.5	5.7	5.3	1,190	1,400	68	74
Black	46.0	45.0	44.0	43.5	1,180	1,460	520	635
Chickpeas, all (garbanzo)	13.0	17.0	12.2	16.8	910	1,470	111	247
- Small	7.5	4.5	7.0	404	690	1,390	48	61
- Large	5.5	12.	5.2	12.4	1,210	1,500	63	186
Other	2.5	2.0	2.3	1.8	1,300	1,610	30	29
Total	670.0	690.0	640.0	665.0	1,200	1,590	7,680	10,574
United States								
Navy	280.7	221.8	263.9	211.1	1,649	1,786	4,353	3,771
Great Northern	69.7	59.0	59.3	56.5	2,007	2,080	1,190	1,175
Pinto	690.9	694.5	652.6	673.1	1,474	1,730	9,618	11,642
Dark Red Kidney	48.8	40.2	46.4	39.1	1,774	1,678	823	656
Pink	45.3	30.8	43.4	29.9	1,684	1,930	731	577
Small Red	35.5	30.6	34.4	29.7	1,887	1,818	649	540
Black	167.4	175.7	159.3	171.6	1,670	1,583	2,661	2,717
Chickpeas, all (garbanzo)	136.8	125.5	132.9	123.5	1,158	1,245	1,539	1,537
- Small	17.4	10.5	16.3	10.2	914	1,196	149	122
- Large	119.4	115.0	116.6	113.3	1,192	1,249	1,390	1,415
Other	154.78	147.4	145.4	143.1	1,845	1,831	2,683	2,620
Total	1,629.8	1,525.5	1,537.6	1,477.6	1,577	1,708	24,247	25,235

authors or agencies conducting the test. Compare relative performance of a variety over many years and locations. Consult with an agronomist or your seed dealer for more specific variety information.

Acknowledgements

- Juan Osorno, Dry bean breeder, Plant Sciences Department, North Dakota State University, Fargo, ND
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• Bryan Hanson, Agronomist,
Langdon Research Extension
Center, North Dakota State
University, Langdon, ND

Pinto bean var	riety trial, For	est River, N.	D. (Walsh Coun	ty), 2007.
Mantaka	No. to coldens	Plant	100 Seed	Seed
Variety	Maturity	Height	Wt.	Yield
	(days)	(cm)	(grams)	(lb/ac)
Buster	102	59	44.1	2,710
Windbreaker	103	62	44.7	2,650
Othello	104	57	42.2	2,590
Durango	104	60	40.8	2,480
Stampede	105	74	45.2	2,430
Lariat	108	72	47.4	2,420
Sonora	105	63	36.3	2,380
Floyd ¹	105	52	33.0	2,180
Baja	104	56	38.1	2,150
Maverick	105	59	42.3	2,080
Topaz R	96	51	41.8	2,050
GTS-900	109	60	46.5	1,510
Trial Mean	105	62	41.9	2,320
C.V. %	1	6	4.6	12.4
LSD 0.05	2	5	2.7	400
¹ Pink				

Navy bean va	riety trial, For	est River, N.I	D. (Walsh Count	y), 2007.
Variety	Maturity	Plant Height	100 Seed Wt	Seed Yield
	(days)	(cm)	(grams)	(lb/ac)
01054	107	68	22.8	2,733
T9905	107	65	24.9	2,675
T10101	109	59	20.8	2,603
Ensign	105	62	25.7	2,578
Cirrus	106	57	21.9	2,393
Navigator	106	69	21.2	2,388
Mayflower	109	72	21.2	2,350
Norstar	106	64	22.8	2,190
T9903	107	61	27.5	2,140
T2003	109	57	22.2	2,115
Vista	110	69	23.2	2,028
Seahawk	110	58	26.8	1,865
GTS-549	109	60	17.5	1,448
Trial Mean	108	64	22.8	2,236
C.V. %	1	6	14.3	17.5
LSD 0.05	1	5	4.6	557

Pinto bean varie	ty trial, Hatto	n, N.D. (Tra	ill County), 200	07
Variety	Maturity	Plant Height	100 Seed Wt.	Seed Yield
Buster	(days)	(cm) 58	(grams) 43.2	(lb/ac) 2,970
Shoshone	106	52	40.8	2,960
Maverick	106	58	43.1	2,950
Durango	107	58	41.8	2,910
Windbreaker	102	60	40.0	2,880
GTS-900	108	63	45.0	2,760
Sonora	105	56	36.2	2,710
Lariat	112	67	48.6	2,530
Stampede	105	66	46.9	2,510
Kimberly	108	56	39.8	2,500
Othello	102	49	38.7	2,380
Baja	103	53	30.5	2,050
Topaz R	96	47	39.7	2,040
Trial Mean	106	59	40.8	2640
C.V. %	2	10	11.0	14.2
LSD 0.05	2	8	6.3	530

Navy bean variety trial, Hatton, N.D. (Traill County), 2007						
Variety	Maturity	Plant Height	100 Seed Wt.	Seed Yield		
	(days)	(cm)	(grams)	(lb/ac)		
T9905	109	68	23.7	3,240		
01054	111	66	20.7	3,210		
Ensign	108	64	23.5	3,120		
T2003	118	53	22.4	2,960		
ROG 331	113	55	20.2	2,950		
T10101	110	62	19.5	2,940		
Navigator	107	67	21.8	2,820		
Mayflower	108	62	21.4	2,800		
T9903	116	53	25.2	2,750		
Norstar	108	55	21.7	2,730		
Cirrus	107	56	21.4	2,730		
Vista	115	64	20.3	2,720		
GTS-544	113	64	24.5	2,630		
Seahawk	119	54	24.6	2,550		
Trial Mean	112	62	22.2	2,820		
C.V. %	2	9	5.3	7.1		
LSD 0.05	5	8	1.6	280		

- Blaine Schatz, Director and agronomist, Carrington Research Extension Center, North Dakota State University, Carrington, ND
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- Mark Halvorson, Agronomist, North Central Research Extension Center, North Dakota State University, Minot, ND
- Neil Riveland, Agronomist, Williston Research Extension Center, North Dakota State University, Williston, ND
- Walt Albus, Agronomist, Oakes Irrigation Research Site, North Dakota State University, Oakes, ND
- Brian and Rod Shanilec, Forest River, ND
- Tim and Glen Skjoiton, Hatton, ND
 - Mark Sleeten, Hatton, ND
 - Jim Karley, Johnstown, ND
- Mike Beelner, Park Rapids, MN
 - Mark Dombeck, Perham, MN

Miscellaneous dry edible bean variety trial, Hatton, N.D. (Traill County), 2007							
Variety	Market Class	Maturity	Plant Height	100 Seed Wt.	Seed Yield		
		(days)	(cm)	(grams)	(lb/ac)		
Jaguar	Black	118	68	22.6	3,140		
Condor	Black	120	66	24.3	3,120		
T-39	Black	117	54	23.5	3,120		
Hime	Otebo	110	65	34.2	3,100		
Loreto	Black	120	68	23.0	2,970		
Matterhorn	Great Northern	102	58	37.0	2,920		
Bandit	Black	119	67	22.6	2,730		
Hungerford	Great Northern	109	53	46.6	2,670		
Merlot	Small Red	107	64	39.7	2,630		
Floyd	Pink	111	51	38.7	2,630		
CDC Jet	Black	109	60	26.0	2,400		
Sawtooth	Great Northern	123	61	46.3	1,760		
Trial Mean		113	61	31.8	2,790		
C.V. %		2	10	6.8	9.9		
LSD 0.05		3	8	3.1	390		





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Pinto, navy and black bean variety trial, Oakes, N.D. (Dickey County), 2007									
Variety	Market Class	Maturity	100 Seed Wt.	Seed Yield					
	(days)	(days)	(grams)	(lb/ac)					
Othello	Pinto	107	39.5	2,940					
GTS-900	Pinto	107	42.5	2,440					
Buster	Pinto	101	40.4	2,440					
Maverick	Pinto	103	40.9	2,380					
Trial Mean		105	40.8	2,550					
C.V. %		1	4.5	9.6					
LSD 0.05		2	NS	390					
Vista	Navy	119	21.3	2,620					
Seahawk	Navy	113	26.3	2,580					
T-39	Black	119	22.1	2,300					
Eclipse	Black	119	22.2	2,000					
Norstar	Navy	104	19.7	1,930					
Trial Mean		115	22.3	2,290					
C.V. %		3	3.3	32.4					
LSD 0.05		5	1.1	NS					

Variety	Maturity	Plant Height	100 Seed Wt.	Seed Yield
	(days)	(cm)	(grams)	(lb/ac)
GTS-900	117	57	36.9	2,850
Sonora	121	56	32.2	2,710
Stampede	117	60	38.3	2,670
Buster	116	51	35.2	2,540
Maverick	116	55	35.0	2,460
Lariat	118	62	37.3	2,440
Durango	121	47	34.2	2,440
Othello	122	54	35.8	2,400
Baja	123	56	34.2	2,100
Topaz R	108	45	36.8	1,550
Trial Mean	118	55	35.3	2,500
C.V. %	1	9	7.9	8.5
LSD 0.05	1	7	3.9	300

riety trial, Pr	osper, N.D. (C	ass County), 2	007.
Maturity	Plant Height	100 Seed Wt.	Seed Yield
(days)	(cm)	(grams)	(lb/ac)
117	61	20.3	2,773
117	56	19.7	2,693
117	58	22.0	2,430
117	58	18.9	2,368
121	56	19.4	1,775
121	56	18.7	1,630
116	45	17.1	1,343
120	55	18.9	1,183
118	56	19.1	2,082
1	8	6.0	20.6
2	6	1.6	612
	Maturity (days) 117 117 117 117 121 121 116 120 118 1	Maturity Plant Height (days) (cm) 117 61 117 56 117 58 117 58 121 56 121 56 116 45 120 55 118 56 1 8	Height (days) Wt. (cm) (grams) 117 61 20.3 117 56 19.7 117 58 22.0 117 58 18.9 121 56 19.4 121 56 18.7 116 45 17.1 120 55 18.9 118 56 19.1 1 8 6.0

County), 2007											
Variety	Market Class	Maturity	Plant Height	100 Seed Wt.	Seed Yield						
		(days)	(cm)	(grams)	(lb/ac)						
Merlot	Sm. Red	120	56	38.1	2,450						
Condor	Black	120	53	21.5	2,360						
Loreto	Black	122	54	21.1	2,360						
Jaguar	Black	116	48	19.2	2,190						
Eclipse	Black	117	51	19.6	2,090						
T-39	Black	120	54	21.8	2,000						
CDC Jet	Black	119	47	21.3	2,000						
Matterhorn	G. North.	114	52	32.7	1,880						
Floyd	Pink	120	48	37.6	1,800						
Trial Mean		118	51	25.0	2,140						
C.V. %		1	12	12.8	13.1						
LSD 0.05		1	NS	4.6	400						



Miscellaneous dry edible bean variety trial, Perham, Minn. (Otter Tail County), 2007.										
Variety	Market Class	Maturity	Plant Height	100 Seed Wt.	Seed Yield					
		(days)	(cm)	(grams)	(lb/ac)					
01054	Navy	101	61	22.3	2,505					
Loreto	Black	104	62	23.5	2,433					
T-39	Black	102	62	21.8	2,375					
Baja	Pinto	97	54	38.5	2,270					
Vista	Navy	100	63	21.4	2,130					
Sonora	Pinto	98	63	32.2	2,035					
GTS-549	Navy	101	55	23.5	2,023					
Durango	Pinto	99	53	38.9	1,955					
Foxfire	LR Kidney	100	56	52.4	1,808					
Chinook 2000	LR Kidney	104	54	54.5	1,735					
Celrk	LR Kidney	96	46	53.7	1,490					
Redhawk	DR Kidney	99	57	50.6	1,413					
Montcalm	DR Kidney	98	59	49.1	1,133					
Trial Mean		100	59	38.0	1,943					
C.V. %		2	7	12.2	18.7					
LSD 0.05		3	6	6.6	514					

	Miscellaneous dry edible bean variety trial, Park Rapids, Minn. (Hubbard County), 2007.										
Variety	Market Class	Mat. (days)	Plant Ht (cm)	100 Sd Wt. (gm)	Seed Yield						
Sonora	Pinto	93	65	35.9	3,030						
01054	Navy	98	64	19.9	2,990						
Durango	Pinto	98	58	42.6	2,920						
Loreto	Black	103	64	21.7	2,730						
Vista	Navy	103	66	19.9	2,720						
T-39	Black	103	61	20.7	2,610						
GTS-544	Navy	100	62	22.1	2,570						
Baja	Pinto	93	57	41.3	2,560						
CDC Jet	Black	98	62	21.8	2,400						
Montcalm	DR Kidney	98	60	52.0	2,260						
Redhawk	DR Kidney	96	61	50.9	2,070						
Foxfire	LR Kidney	93	52	52.6	2,000						
Chinook 2000	LR Kidney	106	63	49.1	1,950						
Capri	Cranberry	90	52	51.8	1,710						
Celrk	LR Kidney	88	45	64.8	1,430						
Trial Mean			58	40.3	2,260						
C.V. %			4	6.4	10.5						
LSD 0.05			3	3.6	330						

						Seed	Yield
Variety	Market Class	Maturity	Seeds per Pound	100 Seed Wt.	Test Weight	2007	3-yr Avg.
		(days)		(grams)	(lb/bu)	(lb/	'ac)
Buster	Pinto	95.8	1,050	43.3	58.8	2,934	1,913
Eclipse	Black	94.5	2,393	19.1	63.1	2,972	1,930
GTS 900	Pinto	107.0	1,238	36.7	60.2	2,490	1,831
Hime	Otebo	96.8	1,457	31.2	64.5	2,960	
Jaguar	Black	96.0	2,466	18.4	63.2	2,802	
Lariat*	Pinto	103.0	1,005	45.3	60.3	3,424	
Matterhorn	G. Northern	98.0	1,144	39.7	59.3	3,030	
Maverick	Pinto	96.3	1,215	37.4	59.4	3,017	1,873
Mayflower	Navy	97.0	2,330	19.5	64.0	2,914	
Merlot	Small Red	96.5	1,216	37.3	62.7	3,0.76	
Norstar	Navy	97.3	2,549	17.8	64.9	1,975	1,535
Othello	Pinto	88.5	1,048	43.4	62.1	3,063	2,126
Seahawk	Navy	104.0	2,180	20.8	64.8	2,614	1,656
Sedona	Pink	92.5	1,154	39.4	59.7	2,804	
Stampede*	Pinto	95.3	1,086	41.8	59.2	2,922	
T-39	Black	98.3	2,165	21.0	63.5	2,856	1,958
Topaz R	Pinto	91.0	1,064	42.7	58.8	2,521	1,725
Vista	Navy	99.0	2,455	18.5	64.1	2,890	1,665
Trial Mean		96.9	31.6	1638	61.9	2,907	
C.V.%		3.9	3.1	3.2	1.3	8.5	
LSD 0.05		5.3	1.4	73	1.1	348	

	ean trial (irrigated)			per Pound			Seed	d Yield
Variety	Market Class	Maturity -	2007	3-yr Avg.	— 100 Seed Wt.	– Test Weight	2007	3-yr Avg.
		(days)		, ,	(grams)	(lb/bu)	(Ib	o/ac)
Buster	Pinto	92.3	1,031	1,069	44.0	61.5	3,149	3,061
Eclipse	Black	94.8	1,878	2,151	24.2	63.5	3,177	2,849
GTS 900	Pinto	95.8	1,078	1,147	42.2	61.0	2,815	2,977
Hime	Otebo	93.3	1,432		31.8	64.7	2,866	
Jaguar	Black	96.5	2,107		21.5	64.1	2,773	
Lariat*	Pinto	94.3	985		46.1	61.7	3,931	
Matterhorn	G. Northern	89.0	1,151		39.5	59.9	3,201	
Maverick	Pinto	88.5	1,104	1,159	41.2	60.9	3,317	2,994
Mayflower	Navy	93.8	2,073		21.9	63.8	2,822	
Merlot	Small Red	98.5	1,111		40.9	63.4	3,207	
Norstar	Navy	93.5	2,287	2,425	19.9	65.2	2,450	2,339
Othello	Pinto	89.8	1,097	1,125	41.4	63.1	3,072	2,886
Seahawk	Navy	99.3	1,893	2,092	24.0	65.1	2,996	2,685
Sedona	Pink	91.3	1,029		44.1	60.8	3,144	
Stampede*	Pinto	92.3	1,078		42.2	61.0	3,067	
T-39	Black	98.3	1,998	2,249	22.7	63.2	2,610	2,535
Topaz R	Pinto	84.5	1,328	1,249	36.7	59.6	2,613	2,364
Vista	Navy	96.8	2,204	2,379	20.6	64.2	2,677	2,688
Trial Mean		93.3	1,506		33.4	62.6	2,982	
C.V.%		2.4	10.1		9.1	1.7	11.0	
LSD 0.05		3.2	214		4.3	1.5	465	

Planting Date: 06/04/07; Harvest Date: 09/28/07; Previous Crop: Spring Wheat. *Lariat previously tested as ND020069. Stampede previously tested as ND020351.



Dry edible b	Ory edible bean trial, Langdon, N.D. (Cavalier County), 2007.										
						Seed Yield					
Variety	Market Class	100 Seed Wt.	Plant Height	2005	2006	2007	2-yr Avg.	3-yr Avg.			
		(grams)	(cm)			(lb/ac)					
Buster	Pinto	39.6	55	2,741	3,758	3,895	3,827	3,465			
GTS 900	Pinto	37.6	63	2,145	3,610	3,643	3,627	3,133			
Lariat	Pinto	46.0	65		4,250	3,933	4,092				
Maverick	Pinto	40.0	56	2,691	3,706	3,843	3,774	3,413			
Othello	Pinto	38.8	58	2,391	3,698	3,200	3,449	3,096			
Stampede	Pinto	41.2	60		4,190	3,846	4,018				
Topaz R.	Pinto	38.8	58		3,210	3,113	3,162				
Mayflower	Navy	20.0	55			3,298					
Norstar	Navy	20.4	58		3,103	3,384	3,244				
Seahawk	Navy	24.0	53	1,970	3,343	3,696	3,520	3,003			
Vista	Navy	19.2	62	2,598	3,817	3,531	3,674	3,315			
Eclipse	Black	21.6	49	2,379	3,610	3,428	3,519	3,139			
Jaguar	Black	19.6	59			3,429					
T-39	Black	22.4	56	2,159	3,094	3,174	3,134	2,809			
Merlot	Small Red	36.0	69			3,527					
Sedona	Pink	40.4	70			3,275					
Matterhorn	Great Northern	39.2	55			4,012					
Trial Mean			59	2,144	3,530	3,558					
C.V.%			7	17.7	10.5	9.1					
LSD 0.05			6	627	613	535					

Planting Date: June 1; Harvest Date: September 28.

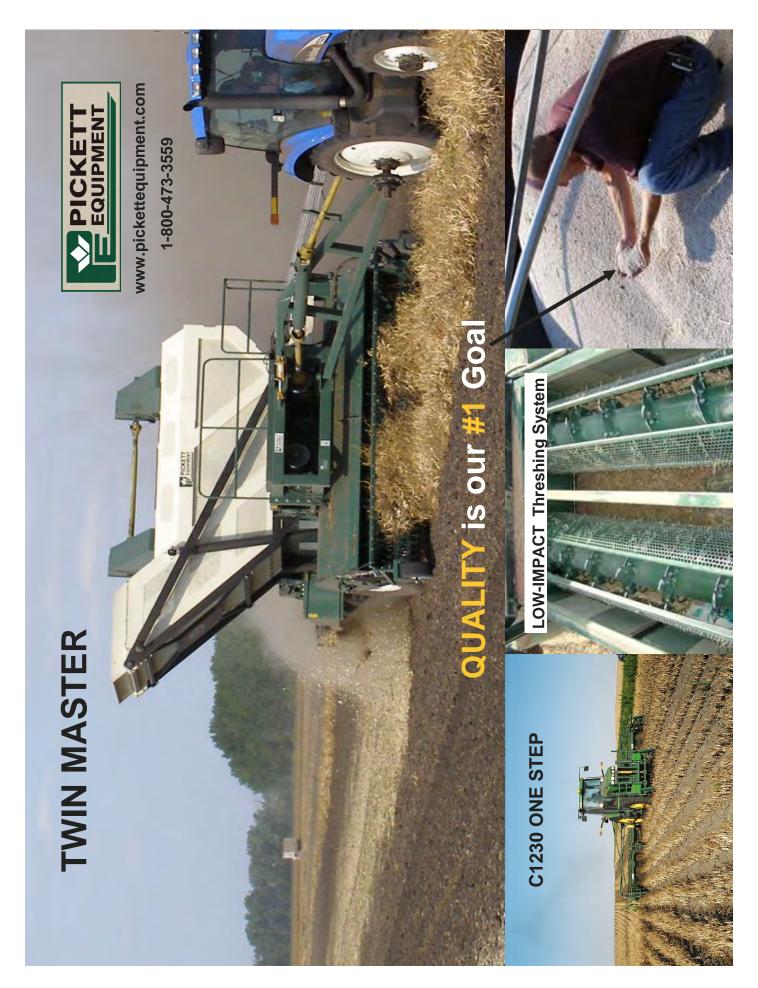
Variety Market Class 100 Seed Wt. (grams) Days to Mature (days) 2005 2006 Buster Pinto 48.4 101.0 2,023 3,322 GTS 900 Pinto 50.8 106.7 2,217 3,018 Lariat Pinto 52.4 106.3 Maverick Pinto 46.8 101.7 2,019 2,523	(lb/ac) 3,752 3 3,305 3 3,561	3-yr. Avg. 3-yr. Avg. 3,537 3,032 2,847
(grams) (days) Buster Pinto 48.4 101.0 2,023 3,322 GTS 900 Pinto 50.8 106.7 2,217 3,018 Lariat Pinto 52.4 106.3	(lb/ac) 3,752 3 3,305 3 3,561	3,537 3,032 3,161 2,847
Buster Pinto 48.4 101.0 2,023 3,322 GTS 900 Pinto 50.8 106.7 2,217 3,018 Lariat Pinto 52.4 106.3	3,752 3 3,305 3 3,561	3,161 2,847
GTS 900 Pinto 50.8 106.7 2,217 3,018 Lariat Pinto 52.4 106.3	3,305 3 3,561	3,161 2,847
Lariat Pinto 52.4 106.3	3,561	
Maverick Pinto 46.8 101.7 2,019 2,523	3,373	
		2,948 2,638
Othello Pinto 43.2 100.3 2,162 2,678	2,839 2	2,759 2,560
Stampede Pinto 48.0 101.0	3,418	
Topaz R Pinto 46.4 99.0 2,510	2,737 2	2,624
Mayflower Navy 23.6 107.0	3,012	
Norstar Navy 20.8 102.3 1,859 2,007	2,895 2	2,451 2,254
Seahawk Navy 26.4 107.3 1,651 3,182	2,760 2	2,971 2,531
Vista Navy 23.2 108.3 2,526 3,226	2,982 3	3,104 2,911
Eclipse Black 24.4 103.7 2,448 2,786	3,316 3	3,051 2,850
T-39 Black 25.2 107.0 2,103 2,850	2,888 2	2,869 2,614
Jaguar Black 24.8 105.7	2,940	
Sedona Pink 48.0 102.7	2,918	
Trial Mean 104.1 1,986 2,697	3,120	
C.V.% 2.2 9.6 16.9	5.9	
LSD 0.05 3.8 321 767	308	

Planting Date: May 30; Harvest Date: September 27.

										Seed Yield		
Variety	Market Class	Maturity ¹	Plant Height	Lodge ²	Disease ³	1,000 Seed Wt.	Test Weight	2005	2006	2007	2-yr. Avg.	3-yr. Avg.
			(cm)	(0-9)	(0-9)	(grams)	(lb/bu)			(lb/ac)		
Eclipse	Black	М	66	0.0	1.3	196.8	61.4	2,168	2,404	1,882	2,143	2,151
Jaguar	Black		66	0.0	1.8	181.5	62.1			1,600		
T-39	Black	M	64	4.8	1.5	188.4	61.5	2,198	2,204	1,747	1,975	2,050
Merlot	Red		76	5.5	1.3	342.5	61.6			1,989		
Mayflower	Navy	ML	76	0.8	1.5	175.8	61.3			1,864		
Vista	Navy	ML	79	2.5	1.0	175.4	62.6	1,954	2,262	1,813	2,037	2,010
Norstar	Navy	ME	69	3.3	1.3	172.1	63.6		1,734	1,511	1,623	
Seahawk	Navy	ML	69	4.8	1.8	207.2	62.3		1,968	1,505	1,737	
Topaz	Pinto	Е	74	4.3	2.0	360.6	56.4	1,211	2,141	1,880	2,011	1,744
Othello	Pinto	Е	79	4.0	1.5	354.7	59.8	1,827	229	2,367	1,298	1,474
Maverick	Pinto	ME	74	5.3	2.3	370.6	58.6	1,854	2,481	1,711	2,096	2,015
Buster	Pinto	ME	79	4.0	2.5	390.0	58.2	1,955	2,463	2,165	2,314	2,194
GTS 900	Pinto	L	86	5.5	1.0	361.3	59.1	1,506	2,270	1,261	1,765	1,679
Sedona	Pink		74	6.0	2.8	318.7	58.1			1,304		
Matterhorn	G. Northern		76	3.8	2.3	351.5	57.4			1,543		
Trial Mean			74	3.4	1.7	286.4	60.1			1,720		
C.V. %			10	40.1	49.1	7.1	0.9			17.8		
LSD 0.05			10	1.9	NS	28.7	0.8			433		

¹Maturity: E=early, ME=medium early, M=medium, ML=medium late, L=late. ²Lodging score based on scale 0-9 (0=upright, 9=flat). ³Disease score based on scale 0-9 (0=no disease, 9=high disease incidence).

Dry edible b	Dry edible bean trial (dryland) Williston Research Extension Center, Williston, N.D. (Williams County), 2007.											
									Seed	Yield		
Variety	Market Class	Days to Flower (fr plntg)	Flower Duration (days)	Plant Height (cm)	1,000 Seed Wt. (grams)	Seeds/ Pound	Test Weight (lb/bu)	2005 (lb/ac)	2006 (lb/ac)	2007 (lb/ac)	3-yr. Avg. (Ib/ac)	
Buster	Pinto	46	18	51	279	1,630	55.1	675	262	365	434	
GTS 900	Pinto	48	19	58	242	1,878	47.8	601	178	146	308	
Maverick	Pinto	47	15	43	234	1,940	53.3	581	278	273	377	
Othello	Pinto	45	17	46	189	2,404	60.3	651	510	413	525	
Topaz R	Pinto	45	16	51	279	1,630	55.1	675	262	365	434	
Mayflower	Navy	49	17	53	114	3,980	51.5			166		
Norstar	Navy	47	16	48	127	3,566	62.6	454	344	394	397	
Seahawk	Navy	47	16	56	138	3,284	52.1	912	323	143	459	
Vista	Navy	48	16	51	118	3,861	53.3	879	284	133	432	
Eclipse	Black	48	12	48	150	3,030	57.8		205	245		
Jaguar	Black	47	11	41	162	2,806	52.7			218		
T-39	Black	48	12	46	159	2,859	61.9	875	440	321	545	
Matterhorn	G. Northern	45	16	38	231	1,970	54.9			509		
Merlot	Small Red	48	11	43	237	1,915	59.7			394		
Sedona	Pink	48	15	53	224	2,021	49.0			116		
Trial Mean		47	15	19	48	2,605	55.0	748	319	288		
C.V.%		2	12	10	10	3	1.7	10	17	28		
LSD 0.05		2	3	3	8	195	2.1	214	84	114		
Planting Date	e: May 29 into t	illed durum	stubble. Har	vest Date:	September 1	9.						



Class and Cultivar	Origin		Plant Type ²	Common		BCMV				
		Mat ¹		Blight	Halo	Туре	NY15	Fusarium Root Rot	White Mold	Rust ³
PINTO										
AC Pintoba	Ag. Can.	ML	UV	S	Т	-	-	-	Α	MS-S
Apache	Idaho Seed Bean	M	V	S	T	-	-	-	S	R
Arapaho	CSU	M	V	S	T	R	R	-	S	S
BiII-Z	CSU	M	V	S	Т	R	R	-	S	MR
Buckskin	Rogers	ME	V	-	-	R	R	-	S	S
Burke	USDA-Prosser	М	V	S	T	R	R	-	S	R
Buster	Seminis	ME	UV	S	Т	R	R	-	S	R
Chase	U. Neb.	L	V	MR	R	S	S	-	Т	R
Fargo	Rogers	E	V	S	Т	-	-	-	S	MS-S
Focus	Seminis	M	UV	S	-	-	-	-	А	R
Frontier	NDSU	L	UV	S	Т	R	R	-	Α	R
GTS 900	GenTec	L	UV	S	Т	-	-	-	А	S
Grand Mesa	CSU	L	UV	S	S	R	R	-	Α	R
Hatton	NDSU	Е	V	S	Т	R	R	_	S	S-MS
Kodiak	MSU	M	USV	-	T	R	R	_	A	R
Lariat	NDSU	M	UV	S	-	R	R	-	A	MR
Maverick	NDSU	ME	V	S	Т	S	S	_	A	R
Montrose	CSU	E	V	-	T	R	R	-	S	R
Othello	USDA-Prosser	E	V	S	T	R	R	_	S	S
Pinata	Idaho Seed Bean	VE	V	-	-	R	R	-	A	-
	GenTec	L	UV	-	-	K	-	-	A	R
Rally		ME	UV		T	-				
Remington	Rogers			S		-	-	-	A	R
Sierra	MSU	ML	UV	S	S	S	S	-	A	R
Stampede	NDSU	ME	UV	S	-	R	R	-	A	MR
Topaz	Rogers	E	V	S	Т	R	R	-	S	S-MS
UI-320	U. Idaho	ME	V	S	-	R	R	-	S	R
Winchester	Rogers	ME	UV	VS	-	-	-	-	А	R
NAVY				-						
Agri-1	Agri-Sales	M	В	S	Т	R	R	-	Α	R
Arthur	NDSU	ME	USV	S	T	R	R	Α	R	-
Avanti	Seminis	M	USV	-	-	R	R	-	-	R-MS
CDC Whitecap	U. Sask	M	USV	S	-	-	-	-	S	R
Cirrus	Hyland	ME	USV	-	-	-	-	-	S	-
Compass	Ag. Can.	Е	В	S	-	-	-	-	-	-
Envoy	GenTec	M	В	-	-	R	R	-	S	R
Ensign	Roger	M	USV	-	-	R	R	-	-	R
Huron	MSU	M	USV	-	-	R	R	-	T	R
Laser	U. Ontario	VL*	UV	S	Т	R	R	-	T	-
Mackinac	MSU	M	USV	S	T	R	R	-	Т	R
Mayflower	MSU	ML	USV	-	Т	R	R	T	Т	R
McHale	Seminis	ME	В	S	Т	R	R	-	-	R
Navigator	Rogers	M	USV	-	-	R	R	-	Т	R
Norstar	NDSU	ME	USV	S	T	R	R	-	Т	R

Variety descrip	otions									
				Blig	ght	ВС	MV			
Class and Cultivar	Origin	Mat ¹	Plant Type ²	Common	Halo	Туре	NY15	Fusarium Root Rot	White Mold	Rust ³
Premiere	Ag. Can.	M	UV	S	-	R	R	-	-	R
Regent	Ag. Can.	ME	UV	S	-	R	R	_	-	R
ROG 331	Rogers	M	UV	S	-	R	R	-	А	R
ROG 372	Rogers	M	UV	S	_	R	R	_	A	R
Sailor	Rogers	ME	USV	-	_	R	-	-	-	-
Schooner	Rogers	ML	USV	-	_	R	R	_	S	R
SeaHawk	MSU	ML	USV	S	-	R	R	_	T	S
Skipper	Ag. Can	E	В	S	_	-	-	_	-	-
Stingray	W.G. Thompson	ML	UV	S	-	R	R	_	Т	R
AC Trident	Ag. Can	ML	UV	S	_	R	R	_	T	R
Vista	Ag. Can	ML	USV	-	-	R	R	_	T	R
Voyager	Rogers	ME	V	-	-	R	R	_	S	S-MS
CRANBERRY	Nogera	W.E	•				- K			o mo
Capri	MSU/ARS	M	В	S	-	R	-	S	S	MR
Cran-09	GenTec	M	В	-	-	R	R	S	S	R
Hooter	Seminis	M	В	VS	S	R	R	MR	S	R
Mich. Imp.	MSU	L	V	-	-	-	-	-	S	R
Taylor Hort.	Unknown	E	В	_	_	-	-	S	S	R
UI-50	U. Idaho	M	В	-	-	R	R	-	-	-
UI-686	U. Idaho	M	V	-	-	R	R	_	-	R
SMALL RED										
AC Earlired	Ag. Can.	E	V	S	-	-	-	-	S	S
AC Scarlet	Ag. Can.	ME	USV	S	S	_	-	S	S	S
Cajun	Rogers	E	UV	-	-	-	-	-	-	MR
Carman	Idaho Seed	E	V	-	-	R	-	-	S	-
Garnet	Rogers	M	V	-	-	R	R	-	S	S
Merlot	MSU	ME	USV	S	S	R	R	T	S	R
NW63	USDA	ML	V	S	Т	R	R	Т	S	S
Ryder	Rogers	M	USV	-	-	MR	-	-	-	-
UI-239	U. Idaho	ME	V	-	-	-	-	-	S	S
UI-259	U. Idaho	M	V	-	-	-	-	-	S	S
BLACK										
Black Magic	GenTec	L	USV	S	T	R	R	Т	Т	R
Blackhawk	MSU	L	USV	S	Т	R	R	Т	Т	R
Black Jack	GenTec	ML	USV	-	-	R	R	-	-	R
CDC Expresso	U. Sask.	E	USV	-	-	-	-	-	Т	-
CDC Jet	U. Sask.	ME	USV	R	-	-	-	T	T	R
Condor	MSU	ML	USV	S	S	-	R	R	T	R
Domino	MSU	L	USV	S	T	R	R	T	T	R
Eclipse	NDSU	M	USV	-	-	R	R	Т	Т	R
Jaguar	MSU	М	USV	-	-	R	R	-	T	R
Onyx	Rogers	ME	USV	-	-	R	R	-	T	R
Panther	Rogers	M	USV	-	-	R	R	-	T	R
Phantom	MSU	E	UV	S	R	R	R	R	A	R
		_	0.	J				**		

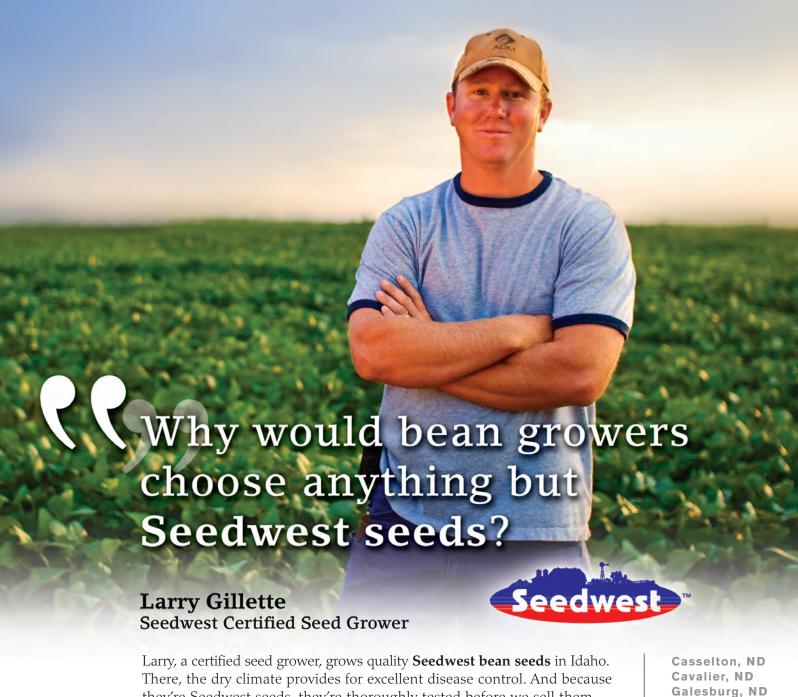
				Blight		ВС	MV			
Class and Cultivar	Origin	Mat ¹	Plant Type ²	Common	Halo	Туре	NY15	Fusarium Root Rot	White Mold	Rust ³
Raven	MSU	ME	-	-	-	R	R	-	S	R
Shadow	Rogers	ME	USV	-	-	R	R	-	T	R
Shiny Crow	CSU	М	V	-	-	R	R	-	S	R
T-39	U. Calif.	М	USV	S	T	R	R	Т	Т	R
UI-911	U. Idaho	M	V	-	-	R	R	-	-	R
PINK										
Alberta Pink	U. Alberta	Е	V	S	-	S	S	-	S	S
Flamingo	Idaho Seed Bean	E	V	-	-	-	-	-	S	S
Floyd	Rogers	ML	V	-	-	-	-	-	S	R
ROG 922	Rogers	М	V	-	-	R	R	-	S	S
Rosalee	U. Sask.	E	V	S	-	-	-	-	S	S
Sedona	MSU/ARS	M	USV	S	-	R	-	R	А	MR
UI-537	U. Idaho	E	V	-	-	R	R	-	S	S
Viva	USDA-Prosser	M	V	-	-	-	-	R	S	S
LIGHT RED KIDNE	Υ									
California Early	U. Calif.	E	В	S	S	R	R	S	S	S
Chinook 2000	MSU	M	В	-	T	R	R	S	-	R
Foxfire	Rogers	ME	В	Т	R	R	R	Т	Т	R
Redkanner	Cornell U.	ML	В	S	T	-	-	T	-	-
Sacramento	Agri-Sales	E	В	S	S	S	S	S	S	S
DARK RED KIDNE	Υ									
AC Calmont	Ag. Can.	ML	В	S	S	R	R	S	S	R
Cabernet	Rogers	ML	В	VS	S	R	R	MR	S	R
Drake	Seminis	M	В	S	S	R	R	S	Т	R
Isles	MSU	M	В	S	Т	R	R	Т	Т	R
Montcalm	MSU	ML	В	TV	TV	R	R	S	Т	R
Nichols	U. Calif.	L	В	VS	S	R	R	MR	S	R
Redhawk	MSU	M	В	S	Т	R	R	-	T	R
ROG 802	Rogers	ME	В	S	T	R	R	T	Т	MR
WHITE KIDNEY										
Beluga	MSU	M	В	S	Т	R	R	S	S	R
Lassen	Agri-Sales	E	В	S	S	R	R	S	S	R
GREAT NORTHERI										
Matterhorn	MSU	ME	USV	S	Т	R	R	-	А	R
Beryl	Rogers	M	V	S	S	-	-	-	S	-
UI 59	U. Idaho	E	V	S	R	R	R	-	S	S
UI 465	U. Idaho	M	V	S	-	R	R	T	S	R
US 1140	USDA-Prosser	E	V	S	R	R	-	-	S	S
		ME	USV	T	T	R	R		A	

^{*}Cultivar has a tendency to express a green stem trait that may lead to quality problems.

¹RM=Relative Maturity; E=Early; ME=Medium Early; M=Medium; ML=Medium Lake; L=Late.

²V=Vine; B=Bush; UV=Upright Vine; USV=Upright Short Vine.

³Disease reactions based upon field observations in North Dakota. A=Avoidance; S=Susceptible; T=Tolerant; R=Resistant; MS=Moderately Susceptible; MR=Moderately Resistant.



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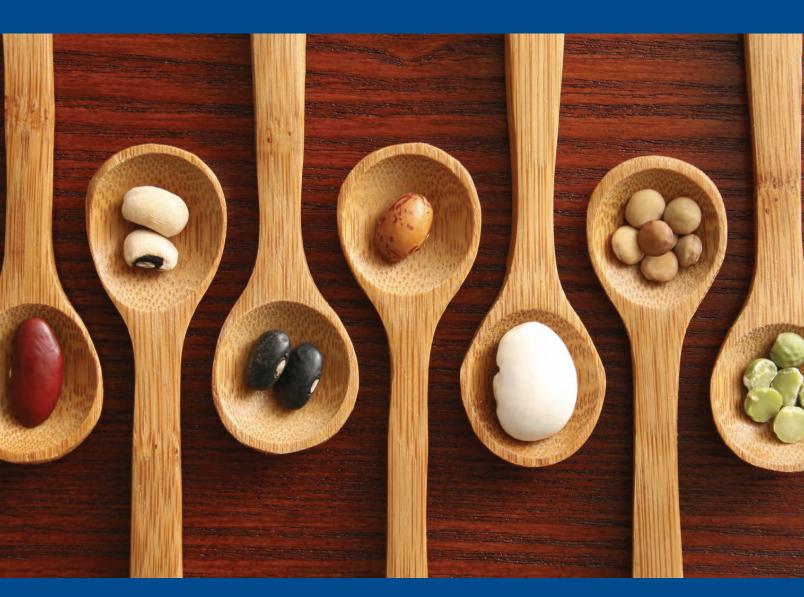


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Variety Trial Results and 2007 Research Update Inside: Review the results from the 2007 Dry Bean Variety Trials beginning on page 27. Also, read about the results of research funded by Northarvest in the 2007 Northarvest Dry Bean Research Update beginning on page 15.