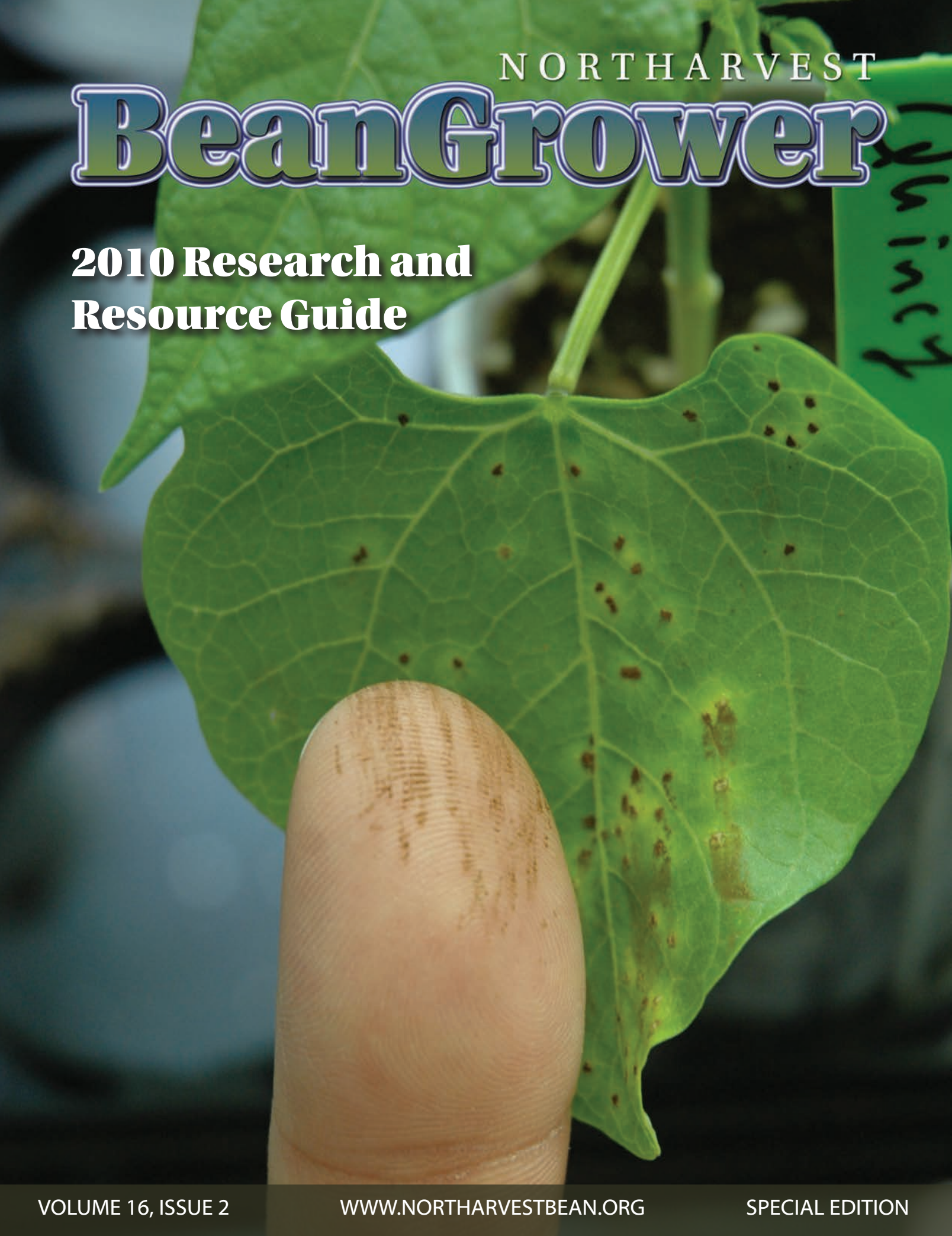

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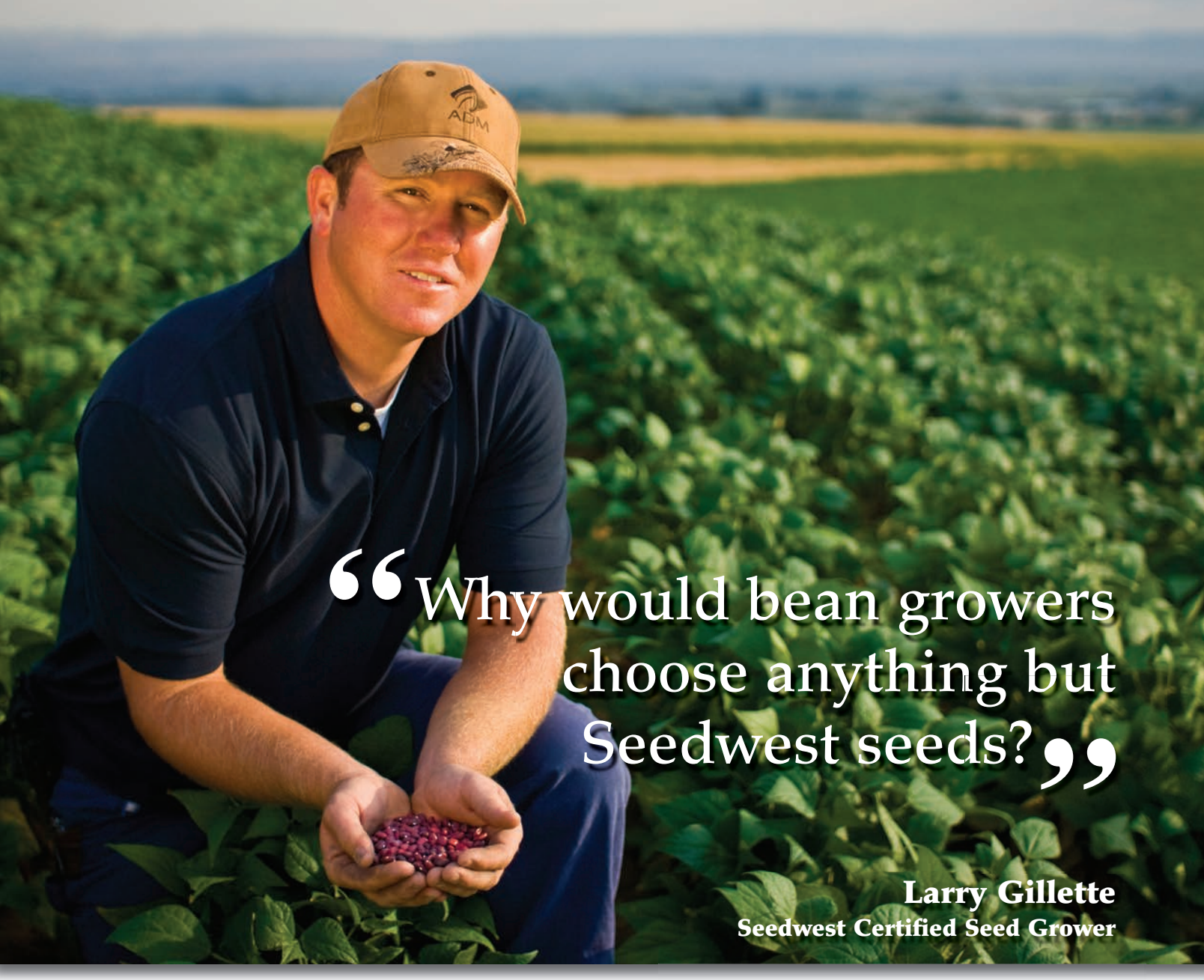
BeanGrower

2010 Research and Resource Guide

VOLUME 16, ISSUE 2 WWW.NORTHARVESTBEAN.ORG SPECIAL EDITION



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Send editorial materials to Don Wick or Mike Hergert, Ag Information Services, Inc., 1407 24th Avenue So., Suite 235, Grand Forks, ND 58201, don@rrfn.com or mike@rrfn.com. Send advertising materials to Marlene Dufault, Prairie Ag Communications, 2607 Wheat Drive, Red Lake Falls, MN 56750, 218-253-4391, mdufault@gvtel.com. Publication of editorial or advertising material in the Northarvest Bean Grower magazine does not imply endorsement by the Northarvest Bean Growers Association. Check agronomic advice with local sources and always read and follow product labels.

VOLUME 16 ISSUE 2

A Focus on Research…

The Northarvest Bean Growers Association has always believed in the value of research. That level of commitment is apparent when you look at our budget. This past year, 31 percent of the Northarvest budget was invested in dry edible bean research.

Why? Thanks to the work of university researchers, we are finding ways to identify and manage disease issues, pest problems and other production concerns. This work enhances our productivity and ultimately, improves the profitability of our industry. In addition, we invest in projects to expand the use of dry beans in the food market. The Northarvest Research Committee meets each spring to assess the various research proposals. Your input is welcome as we prepare for that process.

This edition of *BeanGrower* features an update on the research projects conducted this past year. From variety trials to white mold; from weed control to rust, you'll find practical research results in this issue. The Northarvest region is blessed with some of the industry's very finest dry bean researchers in the country. It is a pleasure working with the research and extension teams at North Dakota State University and the University of Minnesota.

Like you, I'm looking forward to spring.

Brian Love, Research Committee Chair
Northarvest Bean Growers Association

TABLE OF CONTENTS SPECIAL EDITION

2010 RESOURCE DIRECTORY

2010 Northarvest Resource Directory

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2010 Northarvest Resource Directory

Seed Bean Suppliers & Commercial Buyers

COMPANY NAME	ADDRESS	PH / FAX / EMAIL / WEBSITE	BEANS
ADM Edible Bean Specialties, Inc.	P.O. Box 149, 22nd St. N. Olivia, MN 55277	**Ph:** 320-523-1637 **FAX:** 320-523-5683 **Email:** steven.wertish@adm.com	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 **Email:** eugene_krueger@admworld.com	Pinto, Navy
ADM Edible Bean Specialties, Inc.	P.O. Box 124 550 W Christenson Ave Appleton, MN 56208	**Ph:** 320-289-2430 **FAX:** 320-289-2008 **Email:** bob.kieffer@adm.com	Navy
ADM Edible Bean Specialties, Inc.	16255 Hwy. 13 Barney, ND 58008	**Ph:** 701-439-2266 **FAX:** 701-439-2723 **Email:** clayton_day@admworld.com	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 **Email:** harley_blegen@admworld.com	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 **Email:** richard_dinger@admworld.com	Pinto, Navy
ADM Edible Bean Specialties, Inc.	PO 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 **Email:** r_olson@admworld.com	Pinto
ADM Edible Bean Specialties, Inc.	P.O. Box 437 Northwood , ND 58267	**Ph:** 701-587-5900 **FAX:** 701-587-5927 **Email:** ADMNWD@polarcomm.com	Pinto, Navy
Alvarado Bean Co.	P.O. Box 961, 120 1st Ave. E. Alvarado, MN 56710	**Ph:** 218-965-4668 **FAX:** 218-965-4916 **Email:** albean@wiktel.com	Pinto, Cranberry, Great Northern, Navy, Pink

2010 Northarvest Resource Directory

Seed Bean Suppliers & Commercial Buyers

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B T R Farmers Co-op	6001 60th Ave NE Leeds, ND 58346	**Ph:** 701-466-2281 **FAX:** 701-466-2022 **Email:** btr@gondtc.com **Web:** btrfarmerscoop.com	Pinto
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 81591 East Hwy 212 & 400th St Bird Island, MN 55310	**Ph:** 320-365-3070 **FAX:** 320-365-3811 **Email:** larryserbus@hotmail.com **Web:** www.bibcllc.com	Navy
Bollingberg Seeds Co.	5353 Highway 15 Cathay, ND 58422	**Ph:** 701-984-2486 **FAX:** 701-984-2485 **Email:** bsckurt@hotmail.com	Pinto
Bonanza Bean LLC	PO Box 164, 8 Industrial Blvd Morris, MN 56267	**Ph:** 320-585-2326 **FAX:** 320-585-2323 **Email:** cork.fehr@bonanzabean.com	Dark Red Kidney, Light Red Kidney
C and F Foods/ Turtle River Bean Co.	P.O. Box 55, 502 3rd Street Manvel, ND 58256	**Ph:** 701-696-2040 **FAX:** 701-696-2042 **Email:** dkenna@cnf-foods.com **Web:** www.cnffoods.com	Black, Pinto
C and F Foods/Valley Bean Inc.	404 1st Ave E., P.O. Box 250 Oslo, MN 56744	**Ph:** 218-695-2201 **FAX:** 218-695-3006 **Email:** valley@invisimax.com **Web:** www.cnffoods.com	Black, Pinto, Pink, Small Red
Cando Farmers Grain & Oil	Box 456 101 9th Street Cando, ND 58324	**Ph:** 701-968-4446 **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 **Email:** cbc@polarcomm.com	Pinto

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COMPANY NAME	ADDRESS	PH / FAX / EMAIL / WEBSITE	BEANS
Central Valley Bean Cooperative	401 Broadway, P.O. Box 162 Buxton, ND 58218	**Ph:** 701-847-2622 **FAX:** 701-847-2623 **Email:** gary@centralvalleybean.com **Web:** www.centralvalleybean.com	Pinto
Chippewa Valley Bean Co., Inc.	N2960 730th St. Menomonie, WI 54751	**Ph:** 715-664-8342 **FAX:** 715-664-8344 **Email:** 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 **Email:** nelsondm@polarcomm.com	Black, Pinto, Great Northern, Light Red Kidney, Navy, Pink
Diversified Bean Inc	38026 330th Ave SW Climax, MN 56523	**Ph:** 218-946-2575 **FAX:** 218-945-2590 Email: tbalgaard@gmail.com	Dark Red Kidney, Light Red Kidney
Engstrom Bean & Seed	6131 57th Ave NE Leeds, ND 58346	**Ph:** 701-466-2398 **FAX:** 701-466-2076 **Email:** eebas@hotmail.com	Black, Pinto
Falkirk Farmers Elevator Co.	101 Main St. Washburn, ND 58577	**Ph:** 701-462-8572 **FAX:** 701-462-8574 **Email:** ronh@falkirkelevator.com **Web:** www,falkirkelevator.com	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 **Email:** gsmith@fesscoop.com **Web:** www.fesscoop.com	Pinto
Forest River Bean Co., Inc.	P.O. Box 68, 600 Carpenter Ave Forest River, ND 58233	**Ph:** 701-248-3261 **FAX:** 701-248-3766 **Email:** brians@invisimax.com	Black, Pinto, Dark Red Kidney, Light Red Kidney, Pink, Small Red,

2010 Northarvest Resource Directory

Seed Bean Suppliers & Commercial Buyers

COMPANY NAME	ADDRESS	PH / FAX / EMAIL / WEBSITE	BEANS
Grafton Farmers Co-op Grain Company	129 E 6th Street Grafton, ND 58237	**Ph:** 701-352-0461 **FAX:** 701-352-0280	Pinto
Grand Forks Bean Co.	2120 N. Washington Street Grand Forks, ND 58206-5357	**Ph:** 701-775-3984 **FAX:** 701-775-3985 **Email:** gfbeanco@integra.net	Pinto
Green Valley Bean	58473 St., Hwy 34 Park Rapids, MN 56470	**Ph:** 218-573-3400 **FAX:** 218-573-3434 **Email:** mhgvbllc@arvig.net	Dark Red Kidney, Light Red Kidney, Pink, White Kidney
Haberer Foods	41591 180th Street Morris, MN 56267	**Ph:** 320-795-2468 **FAX:** 320-795-2986	Dark Red Kidney, Light Red Kidney
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 **Email:** jbc@polarcomm.com	Black, Pinto
Joliette Ag Systems Inc	15866 Highway 5 Pembina, ND 58271	**Ph:** 701-454-6226 **FAX:** 701-454-6244 **Email:** jwarner@polarcomm.com	Black, Pinto
Kelley Bean Company	P.O. Box 99 703 Division Avenue South Cavalier, ND 58220	**Ph:** 701-265-8328 **FAX:** 701-265-8533 **Email:** tsmith@kelleybean.com **Web:** www.kelleybean.com	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 **Email:** krice@kelleybean.com **Web:** www.kelleybean.com	Black, Pinto, Great Northern, Navy
Kelley Bean Company	650 2nd Street N.E, P.O. Box 253 Perham, MN 56573	**Ph:** 218-346-2360 **FAX:** 218-346-2369 **Email:** dmitchell@kelleybean.com **Web:** www.kelleybean.com	Dark Red Kidney, Light Red Kidney, Pink

2010 Northarvest Resource Directory

Seed Bean Suppliers & Commercial Buyers

COMPANY NAME	ADDRESS	PH / FAX / EMAIL / WEBSITE	BEANS
Kelley Bean Company	1328 Dakota Ave. Hatton , ND 58240	**Ph:** 701-543-3000 **FAX:** 701-543-4195 **Email:** jenger@kelleybean.com **Web:** www.kelleybean.com	Black, Pinto, Navy, Pink
Kelley Bean Company	524 S. 7th St., P.O. Box 290 Oakes, ND 58474	**Ph:** 701-742-3219 **FAX:** 701-742-3520 **Email:** dmaasjo@kelleybean.com **Web:** www.kelleybean.com	Black, Pinto, Dark Red Kidney, Light Red Kidney, Navy
Kirkeide's Northland Bean Co.	4520 12th St. NE Fessenden, ND 58438	**Ph:** 701-547-3466 **FAX:** 701-547-3539 **Email:** knbc@gondtc.com	Black, Pinto, Navy,
Klindworth Seed & Bean Co.	2139 Highway 30 Fessenden, ND 58438-9441	**Ph:** 701-547-3742 **FAX:** 701-547-2592 **Email:** ksb@stellarnet.com	Pinto
Larimore Bean Co. Inc.	P.O Box 607, 111 Elevator Road Larimore, ND 58251	**Ph:** 701-343-6363 **FAX:** 701-343-2842 **Email:** lbc@invisimax.com	Black, Pinto
Larson Grain Co.	100 2nd Ave Englevale, ND 58033	**Ph:** 701-683-5246 **FAX:** 701-683-4233 **Email:** nick.shockman@larsongrain.com **Web:** www.larsongrain.com	Black, Pinto, Dark Red Kidney, Navy
Lee Bean & Seed Inc.	P.O. Box 37, 20152 Hwy 9 N Borup, MN 56519	**Ph:** 218-494-3330 **FAX:** 218-494-3333 **Email:** mharless@feltontel.net **Web:** www.LEESEEDFARM.com	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, P.O. Box 338 Portland, ND 58274	**Ph:** 701-786-4062 **FAX:** 701-786-4098 **Email:** mayportbean@hotmail.com **Web:** www.mayportfarmers.com	Black, Pinto, Navy
Miller Elevator Company/ Trinidad Benham	Box 844 Valley City, ND 58072	**Ph:** 218-845-2013 **FAX:** 701-984-2499	Pinto
North Star Bean, LLC	4082 22nd Ave NE Larimore, ND 58251	**Ph:** 701-397-5261 **FAX:** 701-397-5783 **Email:** sotwbean@polarcomm.com **Web:** www.staroftheWest.com	Black, Pinto, Navy
Northwood Bean Co. Inc.	301 Potato Road Northwood, ND 58267	**Ph:** 701-587-5206 **FAX:** 701-587-5650 **Email:** nbc@polarcomm.com	Black, Pinto
Northwood Equity Elevator	600 Lander Ave., P.O. Box 380 Northwood, ND 58267	**Ph:** 701-587-5291 **FAX:** 701-587-5296	Black, Pinto
O'Brien Seed, Inc.	P.O. Box 505, 945 3rd St. S.E. Mayville, ND 58257	**Ph:** 701-788-9118 **FAX:** 701-788-9119 **Email:** larry@obrienseed.com	Black, Pinto, Pink, Small Red
Red River Bean of Oslo	P.O. Box 227, 105 Oak Street Oslo, MN 56744	**Ph:** 218-695-3040 **FAX:** 218-695-3040 **Email:** redriverbean@invisimax.com	Black, Pinto
SRS Commodities	411 2nd Avenue NE, PO Box 386 Mayville, ND 58257	**Ph:** 701-786-3402 **FAX:** 701-786-3374 **Email:** ricksrs@polarcomm.com	Black, Pinto
St. Hilaire Seed Co.	PO Box 85, 415 Hwy 32 S. St. Hilaire, MN 56754	**Ph:** 218-964-5407 **FAX:** 218-964-5415 **Email:** craig@drybean.com or julie@drybean.com **Web:** www.drybean.com	Black, Pinto, Navy
Star of the North Bean Inc	2489 380th Street Gary, MN 56545	**Ph:** 218-356-8300	Dark Red Kidney, Light Red Kidney
Stony Ridge Foods Inc.	715 Atlantic Avenue Benson, MN 56215	**Ph:** 320-842-3401 **FAX:** 320-842-3403 **Email:** joe-jessica@stonyridgefoods.com **Web:** dhughes@stonridgefoods.com	Black, Dark Red Kidney, Light Red Kidney, Navy

2010 Northarvest Resource Directory

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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 East Grand Forks, MN 56721	**Ph:** 218-773-8834 **FAX:** 218-773-9809 **Email:** jvrolyk@thompsonslimited.com	Black, Pinto, Dark Red Kidney, Light Red Kidney, Navy, Pink
TMT Bean & Seed Farm	3718 67th Ave SE Cleveland, ND 58424	**Ph:** 701-763-6544 **FAX:** 701-763-6545 **Email:** terrytmtfarms@daktel.com	Pinto, Navy
Tronson Grain Co.	115 W. 1st St. Doyon, ND 58327-2807	**Ph:** 701-398-3512 **FAX:** 701-398-3609	Pinto
Walhalla Bean Co.	P.O. Box 67, 1920 Hwy. 32 N. Walhalla, ND 58282	**Ph:** 701-549-3721 **FAX:** 701-549-3725 **Email:** wbc@utma.com **Web:** www.walhallabean.com	Black, Pinto, Navy, Small Red
Walhalla Bean Company - Merrifield	7400 55th Street South Grand Forks, ND 58201	**Ph:** 701-775-3317 **FAX:** 701-775-3289 **Email:** wbcm@gfwireless.com	Black, Pinto, Navy
Walton Ag Services	106 First Avenue Englevale, ND 58033	**Ph:** 701-683-5743 **FAX:** 701-683-5957 **Email:** waltonag@drtel.net	Black, Pinto, Dark Red Kidney, Small Red

Bean Organizations

Company Name	Address	Phone/Fax
United States Dry Bean Council (Headquarters)	PO Box 1026 Pierre, SD 57501	Ph: 605-494-0280
United States Dry Bean Council (Gov't Affairs Office)	1850 M Street NW, Suite 400 Washington, DC 20036	Ph: 202-466-4500
California Bean Shippers Association (CBSA)	1521 I Street Sacramento, CA 95814	Ph: 916-441-2514
California Dry Bean Advisory Board (CDBAB)	531-D, N-Alta Dinuba, CA 93618	Ph: 559-591-4866
Colorado Dry Bean Administrative Committee (CDBAC)	31221 Northwoods Buena Vista, CO 81211	Ph: 303-903-2004
Idaho Bean Commission (IBC)	821 W State Street, Boise, ID 83720-0015	Ph: 208-334-3520
Michigan Bean Commission (MBC)	1031 S. U.S. 27, St. Johns, MI 48879	Ph: 989-224-1361
Michigan Bean Shippers Association (MBSA)	1501 North Shore Drive, Suite A East Lansing, MI 48823	Ph: 517-336-0226
Minnesota Dry Bean Research & Promotion Council	50072 E. Lake Seven Road Frazee, MN 56544-8963	Ph: 218-334-6351
Nebraska Dry Bean Commission (NeDBC)	4502 Avenue, 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)	PO Box 391, Thompson, ND 58278-0391	Ph: 701-261-4157
North Dakota Dry Edible Bean Seed Growers Assn.	PO Box 5607, Fargo, ND 58105	Ph: 701-231-8067
Northarvest Bean Growers Assn. (NHBGA)	50072 E. Lake Seven Road Frazee, MN 56544-8963	Ph: 218-334-6351
North Dakota Dry Bean Council	50072 E. Lake Seven Road Frazee, MN 56533-8963	Ph: 218-334-6351
Rocky Mountain Bean Dealers Assn. (RMBDA)	1178 Huron St., Suite 200 Denver, CO 80234	Ph: 303-646-8883
Washington Bean Dealers Assn. (WaBDA)	PO Box 215, Quincy, WA 98848	Ph: 509-787-1544
Western Bean Dealers Assn. (WBDA)	PO 641, Buhl, ID 83316	Ph: 208-731-1702

North Dakota Certified Bean Seed Growers

For a list of certified bean seed growers in North Dakota, visit **www.nd.gov/seed**, then click on "Field Seed Directory" on the top bar, then click on 2009 Field Bean.

A SUMMARY OF RESEARCH PROJECTS FUNDED BY GROWERS
THROUGH THE NORTHARVEST BEAN GROWERS ASSOCIATION

NORTHARVEST BEAN GROWERS ASSOCIATION

2009 DRY BEAN RESEARCH UPDATE

EVALUATION OF FUNGICIDES EFFICACY AND TIMING FOR MANAGEMENT OF BEAN RUST

Investigators: Samuel G. Markell and Rubella S. Goswami

Research Goal: As most bean growers know, a new race of the bean rust pathogen appeared in North Dakota in 2008. This race is capable of causing disease varieties with the Ur-3 resistance genes, making every variety of beans we tested susceptible and placing the bean growers at risk of a rust epidemic. Since the last major rust epidemics years ago, new fungicides have become available. However, the newer fungicides haven't been evaluated for their ability to manage bean rust. In response, fungicide evaluation trials and fungicide timing trials were established at the Research Extension Centers in Langdon and Carrington and at the NDSU main station in Fargo. Each trial was planted to a variety without the Ur-3 resistance gene, and inoculated with an old race of the pathogen that is not able to cause disease on any bean variety with the Ur-3 resistance gene.

Rust developed early in Langdon, late in Fargo, and poorly in Carrington. As a result, the most useful fungicide results came from Langdon, although yield data was compromised by white mold. All fungicides at Langdon were applied at R5 when rust pustules covered approximately 3% of the leaf tissue in the middle canopy. Results from the fungicide trial in Langdon indicate that all fungicides used were able to manage rust (Table 1). However, differences in the management ability of the fungicides were apparent. In general, triazoles (FRAC 3; including Proline, Tebuzol), strobilurins (FRAC 11; including Headline and Quadris)

MONITORING AND MANAGEMENT OF DRY BEAN DISEASES

Investigators: Rubella S. Goswami and Samuel G. Markell

Research Goal: Diseases can be a major limiting factor in all dry bean production areas. Therefore, monitoring developing disease concerns and assessment of prevalent pathogen populations is an ongoing effort of the dry bean pathology group at North Dakota State University. Two major disease related concerns identified in the bean production areas in the recent past were the appearance of a new race of rust and the increasing incidence of bacterial blight. Therefore, the goals for pathology research over the 2009 growing season were to:

1. Determine the prevalence of diseases and monitor for appearance of new pathogens in North Dakota.
2. Evaluate the spread of bacterial pathogens from infected seeds under controlled conditions.
3. Evaluate the efficacy and timing of fungicides for management of bean rust (refer to article above for research findings from this objective).

RESEARCH FINDINGS FROM OBJECTIVES 1 AND 2:

Disease survey: As in the past couple of years, disease surveys were conducted during the 2009 growing season. Forty-five fields spread over five counties were sampled in late July. Bacterial blight was found to be the most prevalent disease during sampling though white mold came in later and caused significant damage in several fields towards the end of the season. Rust appeared to be limited to the regions where it was detected in 2008 and none of the fields sampled had anthracnose. Among the bacterial diseases, brown spot was found to be more prevalent than halo blight in the state.

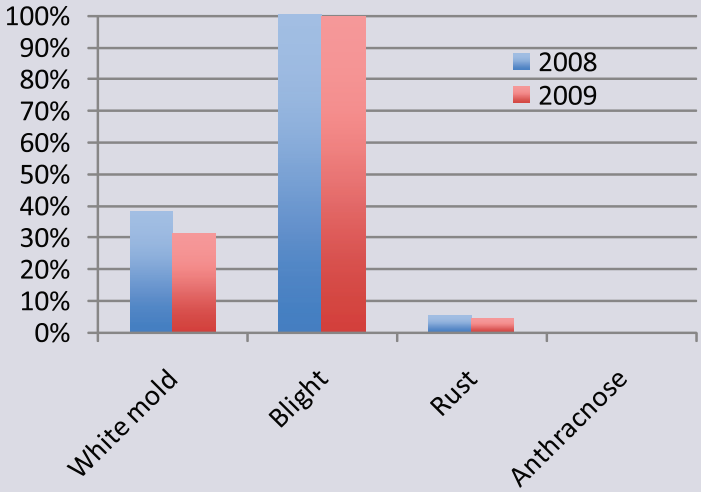


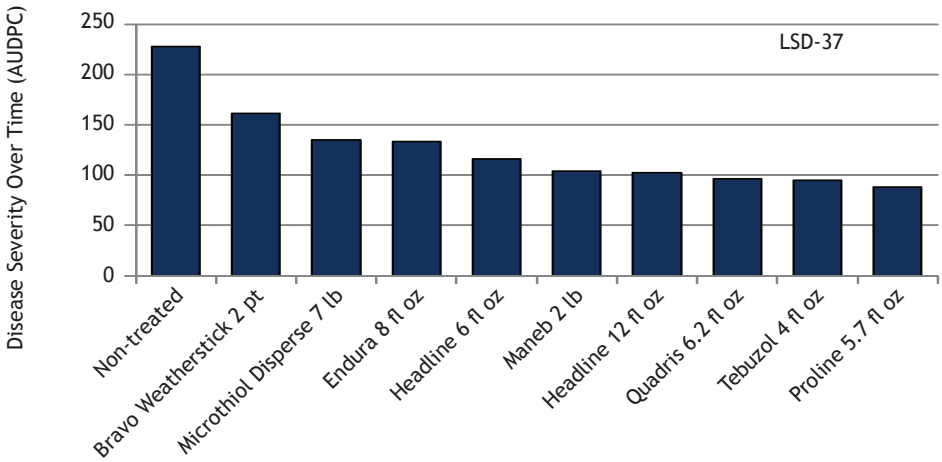
Figure 1: *Graph showing percentage of fields with white mold, bacterial blight, rust and anthracnose, the major foliar diseases of dry beans in North Dakota during the 2008 and 2009 growing seasons.*

and Maneb, tended to manage rust better than some other chemicals evaluated in Langdon. The same triazoles and strobilurins (plus Quash and Picoxystrobin –neither are yet commercially available) managed the rust in Fargo as well (data not shown). Results from the timing trials indicate that the best management of rust occurred when a fungicide was applied at a lower disease severity (1% of leaf area covered with pustules), as opposed to a higher disease severity (6% in our trial was too late to manage rust)(data not shown).

Results of these trials indicate that we have fungicides that can manage rust; but the best management occurs when applications are made soon after rust is observed. Further evaluations need to be done so the most accurate and effective recommendations can be made. Pending funding, these trials will be repeated next year to further elucidate the most effective fungicides and timing strategies to manage this looming threat.

We thank the many people who were involved in this project including Lionel Olson, who co-coordinated the project; personnel at Langdon, Carrington, and Fargo, who established and maintained trials, and the Northarvest Bean Growers Association and chemical companies for financial and technical support.

Fungicide Effect on Rust Severity - Langdon 2009



However, no change in race was detected in the limited number of isolates evaluated.

Bacterial blight: One of the research efforts initiated this year was to evaluate the ability of bacterial pathogens to spread through infected seeds. Greenhouse-based studies were conducted using seeds infected with pathogens causing common bacterial blight, brown spot and halo blight. Infected seeds were planted and grown under controlled conditions until maturity. The development of symptoms in plants emerging from these seeds and their spread was recorded. Pods from these plants were harvested and the seeds tested for the presence of bacterial pathogens. Preliminary results from these experiments suggest that even though plants growing from infected seeds show disease symptoms, the bacteria may not be carried to the seeds borne by these plants.

DRY BEAN IMPROVEMENT FOR THE NORTHERN PLAINS

Investigators: Juan M. Osorno, Program Leader; Research Specialist: Albert J. Vander Wal; Graduate Students: Fernando Eckert, Angela Linares, and Bahadir Sezegen

Project Goal: The objective of the dry bean breeding program at NDSU 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 an 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.

2009 SEASON

The growing season started with a cool spring and ended with a very rainy fall. These conditions were somehow similar to the 2008 growing season. However, the lack of heat units during 2009 was more evident and caused a delayed harvest in most crops in the region. Despite the weather, we managed to have good trials with only one location lost (Prosper) due to flooding with subsequent pod shattering and seed sprouting.

2009 RESEARCH ACTIVITIES

Locations and Trials: During 2009, 68 experiments including early-generation breeding material were planted at five locations in ND, and two locations in MN. Total area in all these trials was around 27 acres accounting for a total of 4731 plots. In addition, several variety trials were planted at the ND Research and Extension Centers (REC) across the state. All the NDSU recent releases (Lariat, Stampede, ND-307, Avalanche, and Eclipse), were also included in the Cooperative Dry Bean Nursery (CDBN) planted at 10 locations across the U.S. and Canada. NDSU varieties were the top yielding across all three market classes (pinto, navy, and black).

Disease Testing: During 2009, screening for resistance to bean rust (including both old and new races) was made at NDSU greenhouse facilities and it is one of the most important components of the program. Additional screening with other diseases is underway and expected to be completed during this year. The purification process of Avalanche for

the *Ur-3* gene has been completed and the first batch of breeder seed was increased in Othello, WA during the summer. Foundation seedstocks will start producing seed of Avalanche from this new batch of breeder seed. Unfortunately, the *Ur-3* gene does not confer resistance to the new race, but it confers resistance to all the other races commonly found in the Northarvest region. Efforts are underway to incorporate additional rust resistance genes into

Continued on Next Page

Table 1. Summary of 2009 trials and locations for the NDSU dry bean breeding program.

Trial*	# of Entries**	Type of Material
Carrington ND		
BAYT	19	Advanced
GNAYT	19	Advanced
NAYT	14	Advanced
PAYT	23	Advanced
RPAYT	21	Advanced
PPYT	49	Preliminary
F7 Plant Rows	88	F7
F4 Plant Rows (pinto)	40	F4
F4 Plant Rows (reds & pinks)	15	F4
F4 Plant Rows (navy)	18	F4
F4 Plant Rows (blacks)	77	F4
Drought - Dryland	33	Germplasm
Drought - Irrigated	33	Germplasm
Direct Combining	9	Variety
Row Spacing	27	Variety
Forest River, ND		
NVT	25	Variety
PVT	34	Variety
Hatton, ND		
MVT	29	Variety
NVT	23	Variety
PVT	39	Variety
Hatton, ND (Nursery)		
BAYT	19	Advanced
GNAYT	19	Advanced
NAYT	14	Advanced
PAYT	23	Advanced
RPAYT	21	Advanced
BPYT	100	Preliminary
GNPYT	49	Preliminary
NPYT	64	Preliminary
PPYT	49	Preliminary
RPYT	29	Preliminary
MRPN	28	Advanced
F2 Spaced Plants (pinto)	66	F2
F2 Spaced Plants (great northern)	13	F3
F2 Spaced Plants (reds & pinks)	43	F4
F2 Spaced Plants (navy)	20	F5
F7 Plant Rows	88	F7
F4 Plant Rows (pinto)	40	F4
F4 Plant Rows (reds & pinks)	15	F4

Trial*	# of Entries**	Type of Material
Hatton, ND (Nursery) Continued		
F4 Plant Rows (navy)	18	F4
F4 Plant Rows (blacks)	77	F4
Direct Combining	9	Variety
Row Spacing	27	Variety
Obs. Rows	10	Advanced & Prelim.
Johnstown, ND		
BAYT	19	Advanced
GNAYT	19	Advanced
NAYT	14	Advanced
PAYT	23	Advanced
RPAYT	21	Advanced
Prosper, ND		
MVT	14	Variety
NVT	17	Variety
PVT	28	Variety
BPYT	100	Preliminary
GNPYT	49	Preliminary
NPYT	64	Preliminary
PPYT	49	Preliminary
RPYT	29	Preliminary
F7 Plant Rows	88	F7
F4 Plant Rows (pinto)	40	F4
F4 Plant Rows (reds & pinks)	15	F4
F4 Plant Rows (navy)	18	F4
F4 Plant Rows (blacks)	77	F4
Park Rapids, MN		
MVT	25	Variety
KAYT	19	Advanced
F2 Spaced Plants	19	F2
Perham, MN		
MVT	24	Variety
KAYT	19	Advanced
ROOT ROT	10	Advanced

* PPYT= Pinto Preliminary Yield Trial; NPYT= Navy Preliminary Yield Trial; BPYT= Black Preliminary Yield Trial; GNPYT= Great Northern Preliminary Yield Trial; RPPYT= Red/Pink Preliminary Yield Trial; PAYT= Pinto Advanced Yield Trial; NAYT= Navy Advanced Yield Trial; BAYT= Black Advanced Yield Trial; GNAYT= Great Northern Advanced Yield Trial; RPAYT= Red/Pink Advanced Yield Trial; KAYT= Kidney Advanced Yield Trial; PVT= Pinto Variety Trial; NVT= Navy Variety Trial; MVT= Miscellaneous Variety Trial; MRPN= Midwest Regional Performance Nursery.
** Total number of entries across all locations = 1053. Total number of plots (including all reps.)= 4731.

Avalanche. During 2008 and 2009, breeding lines and cultivar lines were sent to USDA-Beltsville for rust screening. In the same way, Stampede pinto bean was found to be segregating for the resistance to the new rust race. The *Ur-3* gene, a wide-spectrum resistance gene found in many varieties, is being overcome by the new race. Collaborative work among scientists from NDSU Plant Pathology, USDA-ARS, and the NDSU dry bean breeding program allowed classifying the new race as 20-3. A new race has also been reported in Michigan; however, characterization and comparison of these isolates have shown that the two races are similar, but not identical. At least two genes are able to confer resistance to this new race (*Ur-5* and *Ur-11*). Stampede pinto bean is being screened for *Ur-11* since one of the parental lines of Stampede has three genes of resistance. Homogeneous seed of a new Stampede is expected to be available for 2011. Therefore, several crosses will be made with commercial lines in order to transfer the resistance.

A rot root nursery was established at Perham, as part of a collaborative project with Plant Pathology. High natural pressure of white mold at Johnstown during 2009 allowed the identification of lines with some level of tolerance. Taking advantage of the natural pressure, we evaluate and take records of the presence of the disease in our yield trials and nurseries. White mold will continue to be a priority of the NDSU breeding project. New sources such as the interspecific crosses of *Phaseolus vulgaris* x *Phaseolus coccineus* produced by the Univ. of Idaho (VCW-54 and VCW-55) are being used in crosses. Greenhouse screening for rust and Bean Common Mosaic Virus (BCMV) was also made. In the case of Anthracnose, we remain vigilant of the new race reported in Manitoba, CA. Screening of genotypes is underway to find possible sources of resistance. The *Co-4*^{2} allele confers resistance to the new race named as 105.

Field scouting will continue next year to detect the outbreak, or appearance of new diseases. Additionally, introgression of other resistance genes into commercial varieties is underway. Other research areas include resistance to white mold, bacterial diseases, anthracnose, and root rots (in collaboration with NDSU Plant Pathology), among others. Crosses have been made using sources of resistance to bacterial diseases in an attempt to have resistant cultivars in the future.

Winter Nurseries: In the winter of 2009, a total of 420 early-generation lines were sent to our winter nursery at Puerto Rico. In addition, 208 F1 lines were sent to New Zealand for increase during the winter of 2009. Although more expensive than the Puerto Rico site, New Zealand has many advantages over the Puerto Rico nursery in that disease-free seed is produced, and the seed returned from this site has been of excellent quality and quantity.

Crossing block: Approximately, 600 crosses (~2500 unique hybridizations) in different market classes were made among several advanced breeding lines, commercial varieties and germplasm with traits of interest. For example, SDPI-1, a slow-darkening pinto line from the University of Idaho, was used in the crossing block to introgress genes

that avoid or delay seed discoloration, especially in pintos. Several other crosses with different priorities and objectives were also made.

Training & Education: Students are an important component of the project because it 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. Fernando Eckert (from Brazil) successfully finished his Masters degree in Plant Sciences in December of 2009. His research topic was yield losses due to direct harvest, row spacing, and nitrogen fertilization. The findings of his research were shared with growers during the Bean Day. In 2009, one summer intern, Raphael Colbert (from Haiti) was part of the project. Given his experience in the NDSU dry bean breeding program, he applied for a Ph.D. program in Plant Sciences at NDSU. Raphael has been accepted, however, given the recent catastrophe occurred in his home country, he will not be able to start his graduate program until the end of this semester. Angela Linares (from Puerto Rico) is doing her Ph.D. and working on drought tolerance and water use efficiency of dry beans for the Northarvest region. Finally, Bahadir Sezegen (from Turkey) was working with us for almost a year, but he decided to pursue other interests. Only one of these three students (Bahadir) was being supported with Northarvest funds. For all the others, additional funding was obtained.

2009 MILESTONES

- After the foundation and certified seed increases of the new pinto cultivars Lariat and Stampede, ND-307, and Avalanche, commercial growers were able to plant these improved cultivars on their farms. This will have a direct impact in the economic improvement of the Northarvest region.
- Eclipse black bean continues to be the most popular black bean cultivar grown in the region, having superior yield and agronomic performance in the Northarvest region as well as other production areas in the U.S.
- New and purified versions of Avalanche and Stampede are being developed in order to ensure wider resistance to bean rust and keeping the high yield and quality of these varieties.
- License agreements were made to commercialize ND-307 pinto bean and Avalanche navy bean. These agreements will increase the outreach and impact of these improved cultivars not only in the region, but also in other production areas.
- During 2009, a total of 4,730 test plots of advanced and preliminary yield trials were harvested across seven locations. In advanced yield trials, 23 pinto, 14 navy, 19 black, 19 great northern, and 21 red/pink bean lines were tested. For the variety trials, 532 test plots were harvested including pinto, navy, and miscellaneous (great northern, black, red, pink and kidney) trials, in addition to the variety trials made at most RECs. Information can be found in the A-654 Extension Bulletin. A total of 2,128 individual plant selections were made and harvested from F2 spaced plants. A total of 430 individual plant selections were made and harvested from F6 spaced plants.
- In collaboration with the Northern Crops Institute (NCI), and the ABEN department at NDSU, a new canning facility is being implemented. Equipment set up and standardization of protocols were the main activities during 2009 and we expect to start running canning trials in 2010. Canning trials of pinto, navy and black bean breeding lines are conducted for advanced and some preliminary trials, depending on seed supply.
- The first trial for the screening of genotypes tolerant to drought conditions was established during the 2009 growing season at the Carrington REC. A total of 33 genotypes were tested and will be evaluated in 2010 again.
- Research conducted during the 2008 and 2009 growing seasons on the effects of row spacing and N fertilization on plant architecture and seed losses, allowed to have a better understanding of the cultivar effect and all the factors involved in a direct harvest operation. These findings are being shared with scientists, growers and other stakeholders.
- Fernando Eckert completed his M.S. degree in Plant Sciences in December of 2009. The training and education of new plant breeders is one of the goals of the dry bean breeding program and it will ensure the future generation of scientists that society demands.

ACKNOWLEDGEMENTS

The support from Northarvest Bean Growers Association, NDSU, and the North Dakota Dry Edible Bean Seed Growers Association has been fundamental for the success of the dry bean breeding program at NDSU and the growers of the Northarvest region.

ROW SPACING AND NITROGEN FERTILIZATION EFFECTS ON THE NEW PINTO VARIETIES LARIAT AND STAMPEDE

Investigators: H.J. Kandel, J.M. Osorno, B.L. Johnson, G.A. Rojas-Cifuentes, F.R. Eckert, J. VanderWal, and C. Deplazes,

Research Goal: The NDSU dry bean breeding program released two relatively upright pinto varieties 'Lariat' and 'Stampede' in 2007. These newer varieties have more erect architecture and producers are interested in knowing their response to crop management practices. Previous research conducted at NDSU concluded that new genotypes (such as Lariat and Stampede) need to be tested for their yield potential at specific row spacings.

Nitrogen promotes plant growth, which in turn may stimulate biomass production, disrupting the upright growth characteristics, and in more severe cases, causing stem breakage and lodging. Producers need to know what plant response to expect with row spacings and nitrogen availability with more upright pinto bean varieties such as Lariat and Stampede.

The objective of this study was to evaluate yield performance and yield loss due to direct harvesting of Lariat and Stampede compared with the well known, viny pinto bean variety, Maverick. This study was conducted at four environments in North Dakota: Carrington and Prosper during the 2008 growing season, and Carrington and Hatton in 2009. The research had three row spacings: narrow, medium and wide rows (12, 18, and 30 inch row spacing, respectively). Three Pinto varieties were used: Lariat, Stampede, and Maverick as a control. Two nitrogen availability levels, 50 lb N / acre (based on soil test) and 100 lb N/ acre (based on soil test + fertilizer = 100 lb N) were used.

Characteristics evaluated included plant stand, flowering date, plant height, lodging, lowest pod height, pod distribution, seed yield, harvest loss, and seed weight. This article will only address the yield and yield loss results of this research.

The varieties were planted in 25 foot long research plots at recommended seeding rates. Fertilizer was hand-applied to plots based on the soil tests. Management practices were applied to achieve optimum yield under the 2008 and 2009 environmental conditions. A small plot combine was used to direct harvest the pinto beans. Harvest losses were estimated by tossing a metal hoop behind the combine several times and counting the number of seeds and pods with seeds on the ground within the hoop. Based on the seed weight, the yield loss was calculated and expressed as pounds per acre of seed loss. The yield column in the tables is the actual harvested amount. The yield loss indicates the amount of beans lost due to direct combining. Yield of each of the three pinto varieties appears in Table 1. Lariat was the highest yielding variety and had the lowest

Table 1. Yield and yield loss for three pinto varieties averaged over four N.D. environments 2008-2009.

	Seed Yield (lb/a)		Yield Loss (lb/a)	
Variety	50 lb N per acre	100 lb N per acre	50 lb N per acre	100 lb N per acre
Lariat	1,835	1,817	221	226
Stampede	1,351	1,452	403	359
Maverick	1,170	1,250	401	374

Table 2. Yield loss expressed as percent for three row spacings and four environments.

	Yield Loss (%)			
Row Spacing	Prosper 2008	Carrington 2008	Carrington 2009	Hatton 2009
12 inch	11.0 a	27.6 a	21.5 a	32.8 a
18 inch	10.6 a	22.3 b	20.5 a	19.3 b
30 inch	13.8 a	21.5 b	18.2 a	17.0 b

Yield loss should be compared within the column.
Numbers with a similar letter are not significantly different.

Table 3. Average yield of three pinto varieties at 50 lb per acre available N for three row spacings at four N.D. environments.

	Seed Yield (lb/a)			
Row Spacing	Prosper 2008	Carrington 2008	Carrington 2009	Hatton 2009
12 inch	1,752 b	869 a	2,412 a	1,883 ab
18 inch	2,132 a	1,064 a	2,487 a	2,044 a
30 inch	1,624 b	1,064 a	2,449 a	1,741 b

Yield loss should be compared within the column.
Numbers with a similar letter are not significantly different.

Table 4. Average yield of three pinto varieties at 100 lb per acre available N for three row spacings at four N.D. environments.

	Seed Yield (lb/a)			
Row Spacing	Prosper 2008	Carrington 2008	Carrington 2009	Hatton 2009
12 inch	1,959 a	956 a	2,690 a	1,673 b
18 inch	1,957 a	1,056 a	2,678 a	2,442 a
30 inch	1,734 a	1,120 a	2,374 b	1,562 b

Yield loss should be compared within the column.
Numbers with a similar letter are not significantly different.

amount of yield loss.

The bean loss of Lariat was the lowest at both fertility levels. Lariat is the most upright pinto variety in this trial and the pods were slightly higher on the plant which resulted in less yield loss.

Table 2 provides information on the yield loss expressed as a percent. The yield losses at Carrington in 2008 and Hatton in 2009, for the 12 inch row spacing, were significantly higher than the other row spacings. There is variability between the percentage loss at the different environments. This may be due to differences at the time of harvest as drier pods tend to shatter more.

Table 3 and 4 provide information about the yields at the three row spacings for 50 or 100 lb available N. Carrington in 2009 was the highest yielding environment. Within the 50 lb available N level, the 18 inch row spacing yielded the highest at Prosper in 2008 and at Hatton in 2009. However, at Hatton the yields between the 12 and 18 inch were not significantly different.

Researchers apply fertilizer to Carrington test plots.

For the 100 lb available N level, yields of the 12 and 18 inch row spacings at Carrington 2009 were significantly higher than the 30 inch row spacing. At Hatton in 2009 the 18 inch row spacing was the highest yielding.

CONCLUSIONS

- Yield losses depend on variety, but also on the environmental conditions at harvest.
- Lariat resulted in the highest yield and lowest seed loss when direct combined compared with Stampede and Maverick.
- No significant differences overall between 50 and 100 lb available N per acre.
- Seed yield tended to be highest with 18 inch row spacing, but results were variable across environments.

Acknowledgement: The authors acknowledge the generous support from the Northarvest Bean Growers Association to conduct this research.

IDENTIFICATION OF RESISTANCE IN DRY BEAN TO SOYBEAN CYST NEMATODE

Investigators: Drs. Berlin D. Nelson and Rubella Goswami, Dept. Plant Pathology, NDSU, P.O. Box 5012, Fargo, ND 58105.

Project Goal: Identify resistance to soybean cyst nematode in dry bean germplasm.

In research supported by the Northarvest Bean Growers Association, we demonstrated over a three year field study that soybean cyst nematode (SCN; *Heterodera glycines*) can reduce yields of pinto, navy and kidney bean and reproduce on the roots in the field. Information collected thus far from our research and information published in the scientific journals indicates that SCN is a real threat to dry bean production and could cause substantial damage once the nematode is introduced into dry bean fields. In addition to yield loss, SCN is known to interact with root pathogens such as *Fusarium*, and could increase problems with root rot.

Because resistance to SCN is known in soybean, there is a strong possibility that high levels of resistance also occur in the dry bean germplasm. Our research is focused on finding resistance within the dry bean germplasm and providing the sources of resistance to dry bean breeders so resistance can be incorporated into adapted breeding material. Our strategy was to first test cultivars and plant introductions (PI's) reported to have resistance to nematodes or soilborne diseases and then systematically screen PI/cultivars of the various bean classes to find resistance. We checked the literature for information on dry bean with those characteristics and we also

Continued on Next Page

A NEW DRY BEAN PLOT COMBINE FOR FASTER AND ACCURATE TRIAL DATA

Investigators: Juan M. Osorno, Program Leader; Research Specialist: Albert J. Vander Wal; Graduate Students: Fernando Eckert, Angela Linares, and Bahadir Sezegen

Research Goal: After two years of efforts and conversations with different stakeholders groups and university administration, the NDSU dry bean breeding program was able to pool funds from different sources to invest in a new plot combine. Economic support was obtained from the Northarvest Bean Growers Association, the North Dakota Dry Edible Bean Seed Growers Association, and the North Dakota Agricultural Experiment Station (NDAES). The need for a new combine was evident as our 25-year-old combine was not doing a very good job harvesting the research plots. The old combine spent a lot of time in the shop during harvest time due to multiple failures and even worse, the quality and reliability of the data generated by using this equipment was becoming a serious concern. In addition, money from our emergency funds had to be used to pay for the frequent repairs.

A bid process was implemented for this purchase, in which companies specialized in this type of equipment were asked to provide a quote. After receiving and studying three options, we decided that the Wintersteiger was the best alternative given its price, reliability, reputation, and previous experience building dry bean plot combines for other breeding programs. One of the major benefits of this new combine is the HarvestMaster® computerized weighing system, which allows obtaining the yield, moisture, and test-weight data from each plot. This information is stored in the combine's handheld computer which can be plugged into the office computer at the end of the day. This eliminates the manual handling and processing of thousands of samples. Previously, all samples were brought to campus, placed in a drier for 48 hours, then cleaned of soil and plant

Soybean Cyst Nematode • *From page 25*

contacted all the dry bean breeders and requested suggestions on germplasm to screen. We identified specific cultivars/PI's with characteristics of interest and five breeders sent us additional cultivars to test. These consisted of pinto, navy, black, kidney, great northern and other bean classes. In addition we requested germplasm from the USDA Plant Introduction Station in Pullman, WA, where the *Phaseolus* collection is maintained. Molly Welsh, the director of the *Phaseolus* collection is cooperating with us in this study. Screening is being conducted in the greenhouse using the nematode strain HG type 0. SCN females are counted on the roots after 30 days plant growth and the results are compared to those from the susceptible soybean Lee 74. A female index (FI) is calculated for each dry bean entry. FI's of 10 or less is considered highly resistant while FI's of 11-24 is resistant.

We finished screening 60 cultivars suggested by breeders or those with reported resistance to root pathogens and nematodes, of which 10 had FI's between 10 and 24. These will be screened again to determine if the results are consistent between tests. We are currently screening the core group of the *Phaseolus* collection, (which consists of 419 PI's) plus another 29 PI's with specific characteristics of interest to us. To date we have not identified a cultivar or PI that is highly resistant to SCN. Following these groups we will be screening the pinto types from the USDA *Phaseolus* collection and then the navy and other bean types.

residues, and one-by-one manually weighed to obtain yield and test-weight data. In addition, the new combine will help to better assess the direct harvest capability of the new breeding lines and varieties coming along since the new equipment can be alternatively used for both methods. This combine also includes all of the technological and engineering advances obtained in these last 20 years, including gentler handling of the seeds due to rubberized beater drums, which reduces the percentage of broken/split seeds. In addition, a diesel engine instead of a normal gasoline engine from our old combine, will increase the number of plots harvested per gallon of fuel.

After the Wintersteiger technical department was able to fix some minor problems, do some fine tuning, and find the optimal set up, the new combine was used for the first time during 2009 to harvest all the trials across all locations (with exception of the Hatton nursery, in which a stationary plot thresher is used to guarantee seed genetic purity and avoid mixture among entries). As with any new piece of equipment, it took a while to get adjusted to its routine operation. Once it was optimized, and the resulting data was checked, we were satisfied to see reliable results across most trials, as reflected in the coefficients of variation and the yields expected in some well known cultivars. For the first time in the history of the breeding program, results from all variety trials (Extension Bulletin A-654) were almost ready for publication in mid-November. With the experience gained during this harvest season, we are sure the 2010 harvest (and subsequent years) will keep improving.

Acknowledgement: The NDSU dry bean breeding program wants to acknowledge Northarvest Bean Growers Association, the North Dakota Dry Edible Bean Seed Growers Association, and the North Dakota Agricultural Experiment Station (NDAES) for their outstanding support on the purchase of this equipment. This support is ensuring the leadership of the region as the number one producer of dry beans in the United States.

EXTRUSION PROCESSING OF BEANS TO CREATE FOOD INGREDIENTS AND EXTRUDED PRODUCTS.

Investigators: Clifford Hall III, NDSU Department of Cereal and Food Sciences; Mehmet C. Tulbek and Thunyaporn Jeradechachai, Northern Crops Institute

Summary: The trend in the food industry to produce low glycemic index foods and foods that are gluten free and high in fiber demonstrates a need to incorporate more bean ingredients into food products. Foods with low glycemic indexes are important for people suffering from diabetes. The CDC estimates that 24 million people have diabetes and 57 million have pre-diabetes. Furthermore, it is estimated that the number of diabetics could increase by as much as 40% by the year 2023. Therefore, conducting research now that supports the low glycemic index behavior of bean flours will be one tool in combating diabetes. Furthermore, the Centers for Disease Control estimates that approximately 2 million people suffer from gluten intolerance (i.e. Celiac disease).

Previous work between NDSU and the Northern Crops Institute demonstrated that navy and pinto beans had excellent extrusion properties. Bean flours are ideal because the products made with beans are gluten free and high in fiber. However, limited research has been done to create novel food ingredients and products from beans. Furthermore, data that demonstrates the slow digestibility of the bean ingredients is needed to support beans as a novel food and food ingredient for the health markets, primarily as a low glycemic index-promoting ingredient.

The use of extrusion processing is a viable technology to produce dry bean extruded products (snacks and cereals). In addition to extrusion that puff products, extrusion to create texturized products (i.e. products without major puffing) can also be used. The goal of this project is to develop ingredients from the navy, pino, red and black beans using various extrusion conditions. The project will emphasize how extrusion affects the starch digestibility of the extruded beans. The extrusion conditions that produce the extruded bean product with the lowest glycemic index will be used further to develop ingredients for products such as snack bars and breakfast cereals. The resistant starches in the extruded bean ingredients will provide an indirect measure of digestibility.

All bean types were effectively extruded using a Wenger TX-52 Twin Screw Extruder (Figure 1). Figure 2 shows the various shapes of the beans produced via extrusion. In puffed products conditions were 350 rpm and

Figure 1. Extrusion of navy beans into puffed corn curl type snack product.

Figure 2. Extruded beans of various types. Yellow colored extrudates are from navy beans, red from the red beans, black specks from black beans and light brown from pinto beans.

Figure 3. Extruded beans using the texturing protocol. The extrudates are texturized navy beans. The rpm represents the extrusion screw speed.

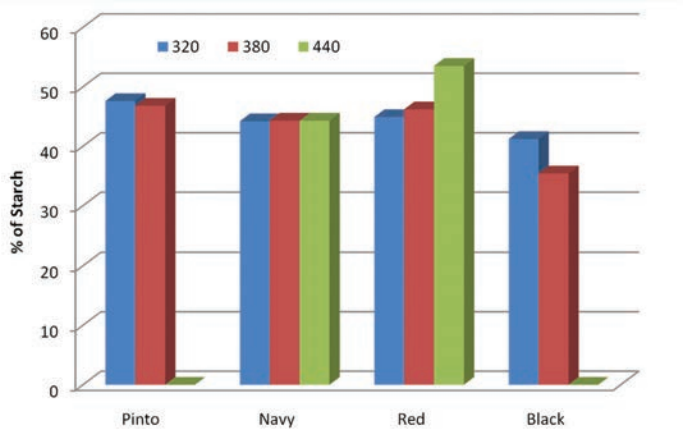


Figure 4. Resistant starch content (% total starch) of various beans extruded at extruder conditions (320, 380, 440 rpm) for texturizing the bean flours.

0.328 kg water/min. The bean extrudates retained color of the respective seed coat (Figure 2). For example, the red bean extrudate had a red color while the black bean had a black hue. The navy bean maintained a yellow color while pinto beans were brown. This indicates that the pigments were retained. Literature data suggests that the pigments have antioxidant activity. Thus, the extruded bean products represented in Figure 2 also are likely to contain antioxidants. Extrusion of the beans at texturizing conditions, i.e. 320, 380, or 420 rpm and 0.117 kg water/min using a screw design for texturizing produced extrudates with less puffing as expected (Figure 3). The texturized products lacked a uniform shape; however, this was not important as these could be milled info flour.

The texturized extrudates were tested for resistant starch using AACC International standard method (AACC Method 32-40). The preliminary results support the increase in resistant starches during the extrusion process. No conclusion can be drawn regarding the effect of processing on resistant starch (Figure 4). In the case of navy bean extrusion condition, the resistant starch was the same regardless of the rpm used during extrusion. However, increasing the extrusion rpm during red bean flour processing resulted in an increase in resistant starch, In contrast, resistant starches decreased in the extrudates made from both pinto and black beans as rpm of the extruder increased. At this time, extrusion does enhance resistant starch content of the beans. The specific pattern of the increase has yet to be determined. Research continues with regards to defining appropriate extrusion conditions for increasing resistant starches. Once complete, the extrudates will be used to develop snack products.

VIDA AS A DRY BEAN DESICCANT

Investigators: Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak.

Research Goals: An experiment was conducted near Thompson, ND, to evaluate Gowan's 'Vida' desiccant. Hyland 'T9905' navy bean was planted on June 6, 2009, and maintained by the cooperator throughout the growing season. Desiccation treatments were applied on September 4 at 9:30 am with 62 F air, 76 F soil surface, 93% relative humidity, 15% cloud cover, 4 to 6 mph S wind, dry soil surface and moist subsoil. Applications were applied earlier than normal due to high levels of white mold and late blight that was occurring in the field. Applications were made at 25 to 75% leaf drop; 0 to 20% vine desiccation; 30 to 50% green pods; 50 to 70% yellow pods; and 0% dry/leather pods. White mold was present on the entire plant including on the seed. The higher the percentages at application were due to plants that were seriously infected by white mold. Crop destruct was done after the last ratings were taken. Treatments were applied to the entire 6.7 by 30 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo TeeJet nozzles for all applications. The experiment had a randomized complete block design with six replicates per treatment.

Vida, active ingredient pyraflufen, is a new desiccant that we used in dry bean desiccation. The higher rate of Vida increased the speed of desiccation compared to the lower rate. At 14 DAT Vida had similar control ratings to Valor. All Vida treatments, the pH was lowered to 5.0 to 5.1 with Tri-Fol. *(Dept of Plant Sciences, North Dakota State University, Fargo)*

Table 1. Gowan Dry Edible Bean Desiccation (Zollinger, Ries, and Kazmierczak).

Treatment	Rate	7 DAT					10 DAT					14 DAT				
		leaf[1]	vine[2]	green[3]	yellow[4]	brown[5]	leaf	vine	green	yellow	brown	leaf	vine	green	yellow	brown
	(product/A)	% control					% control					% control				
Vida+Scoil	4.125fl oz+1% v/v	83	23	4	84	12	93	23	4	66	30	97	28	1	37	62
Vida+Scoil	2.75fl oz+1% v/v	77	17	7	78	17	86	22	3	63	30	92	37	3	49	48
Vida+Roundup WeatherMax+Scoil	2.75fl oz+22fl oz+1% v/v	82	13	10	80	10	90	22	7	64	28	96	33	4	54	45
Valor+Scoil	1.5oz+1% v/v	88	33	5	83	12	95	32	4	56	41	99	47	0	33	67
Untreated		45	6	22	73	5	62	7	13	78	9	68	11	17	52	35
LSD (0.05)		5	4	4	6	4	4	5	4	4	5	3	8	4	8	5

[1]Leaf = % leaf desiccation and leaf drop. [2]Vine = % vine desiccation. [3]Green = % green pods.
[4]Yellow = % yellow pods. [5]Brown = % dry pods.

ROOT ROT RESISTANCE AND DISEASE MANAGEMENT OF DRY BEANS

Investigators: Rubella S. Goswami, Juan Osorno and Samuel Markell

Research Goal: Dry beans are known to be affected by several root-rotting organisms. Among them *Fusarium solani* f sp. *phaseoli* and *Rhizoctonia solani* are considered to be most important in this region. These pathogens survive in cool, wet and heavy soils and can cause major yield losses under favorable conditions. In recent years, disease surveys funded by Northarvest Bean Growers Association have also demonstrated the presence of other *Fusarium* species such as *F. graminearum* in association with roots of dry beans. This prompted screening for resistance within available dry bean germplasm including lines belonging to different market classes. Sources of resistance to *F. solani* f. sp. *phaseoli*, *F. graminearum* and *R. solani* were identified through greenhouse screening in previous studies but these had not been tested in the field. The aim of this project was to primarily assess the ability of a collection of varieties from different market classes to withstand root rot pressure under field conditions.

Figure 1: *The figure shows a partially root rot resistant variety (Vax 3) to the left and a susceptible variety (Red Hawk) in the resistance screening trials in Perham, MN.*

Research Progress and findings: In the first year of this two-year study, results from the field trials have been promising. Eleven lines of dry edible beans namely, Red Hawk, Vax 3, Vista, Norstar, Eclipse, Othello, Maverick, Matterhorn, Rojo Chiquito, T-39 and Montcalm were planted in the breeder's field in Perham with a previous history of root rot. Prior to planting the fungal population present in the soil was evaluated and the target root rot pathogens, *Fusarium solani*, *F. graminearum* and *R. solani* were found to be present. The varieties were planted in four or six row plots and replicated four times and regular agronomic practices were followed during the growing season. Simultaneously, an inoculated trial with the same set of varieties and pathogens was set up in the Fargo research plots to assess the ability of the pathogens to cause disease individually on these cultivars. Severe disease incidence was observed in the trials and was reflected in plant stand (Fig 1). Findings from the trial in the breeder's fields are summarized in Table 1. It is to be noted that towards the end of the season the trials were affected by white mold which could potentially impact yield.

Preliminary results indicate that certain varieties screened in this trial could serve as potential sources of resistance to root rot under natural inoculum pressure,under field conditions. Inoculated trails suggest the presence of differential resistance based on the pathogens tested and interaction between the host and the pathogen. These findings can be confirmed and the interactions observed in the field elucidated after trials have been repeated next year, subject to availability of funding.

The investigators are grateful to Northarvest Bean Growers Association and the State Board of Agricultural Research for financial support.

Table 1: Root rot severity, maturity and yield data collected from first year trial of eleven dry bean cultivars under field conditions.

Genotypes	Root rot severity	Days to maturity	Hundred weight	100 seed weight (g)
Red Hawk	8.4 a	108	21.7	48.2
Vista	7.8 ab	115	27.0	18.3
Norstar	6.9 b	111	23.6	17.8
Eclipse	8.0 a	111	24.9	18.0
Maverick	7.9 ab	108	22.0	30.7
Matterhorn	8.3 a	111	21.6	30.7
T-39	8.2 a	113	27.9	18.9
Montcalm	8.6 a	114	21.9	58.6
Vax 3	7.9 ab	116	37.8	31.6
Rojo Chiquito	7.6 ab	114	25.5	22.1

SHARPEN AS A DRY BEAN DESICCANT

Investigators: Zollinger, Richard K., Jerry L. Ries, and Angela. J. Kazmierczak.

Research Goal: Five dry bean studies were conducted in the fall of 2009, two near Thompson, ND, and three near Portland, ND. At Thompson, Study 1, Sharpen was used at various application rates to evaluate dry bean desiccation. At Thompson, Study 2, Sharpen was applied at one rate with varying adjuvants and application volumes to evaluate dry bean desiccation. At Portland, Study 3, 4, and 5, Sharpen was applied at one rate to 3 dry bean types to screen for Sharpen residue in the harvested seed.

Study 1 and 2: Hyland 'T9905' navy bean was planted on June 6, 2009, and maintained by the cooperator throughout the growing season. Study 1, desiccation treatments were applied on September 4 at 9:40 am with 77, 62 F air, 76 F soil surface, 93% relative humidity, 15% cloud cover, 4 to 6 mph S wind, dry soil surface and moist subsoil. Study 2, desiccation treatments were applied at 10:00 am with the same environmental data.

Studies 1 and 2, the applications were applied earlier than normal due to high levels of white mold and late blight that was occurring in the field. Applications were made at 25 to 75% leaf drop; 0 to 20% vine desiccation; 30 to 50% green pods; 50 to 70% yellow pods; and 0% dry/leather pods. White mold was present on the entire plant including on the seed. The higher the percentages at application were due to plants that were seriously infected by white mold. Crop destruct was done after the last ratings were taken for both studies.

Study 3, 4, 5: At Portland, 'Ensign' navy bean, 'Montcalm' dark red kidney, and 'T-39' black bean were planted on June 10, 2009. The bean types were maintenance sprayed and hand-weeded during the growing season. There was little to no disease pressure at the Portland location. Applications were made at

Continued on Next Page

Table 1. Study 1, Rate response to Sharpen, Thompson (Zollinger, Ries, and Kazmierczak).

		7 DAT					10 DAT					14 DAT				
Treatment[1]	Rate (product/A)	leaf[2]	vine[3]	green[4]	yellow[5]	brown[6]	leaf	vine	green	yellow	brown	leaf	vine	green	yellow	brown
		% control					% control					% control				
Sharpen+Scoil +AMS	0.72fl oz+1% v/ v+17lb/100gal	90	47	5	22	73	94	48	2	51	47	98	72	0	10	90
Sharpen+Scoil +AMS	1fl oz+1% v/ v+17lb/100gal	92	83	5	20	75	96	65	0	42	58	99	90	0	6	94
Sharpen+Scoil +AMS	2fl oz+1% v/ v+17lb/100gal	94	88	8	20	75	97	78	0	25	42	99	98	0	2	98
RUPM+Scoil +AMS	22fl oz+1% v/ v+17lb/100gal	78	48	48	48	33	83	15	13	52	35	87	47	2	36	62
Sharpen+RUPM+ Scoil+AMS	0.72fl oz22fl oz+1% v/v+17lb/100gal	91	45	6	23	72	95	47	0	37	63	99	91	0	14	86
Valor+Scoil	1.5oz+1% v/v	91	48	6	25	68	96	73	1	31	68	99	93	0	9	91
Aim+Scoil +AMS	2.63fl oz+1% v/ v+17lb/100gal	82	38	11	30	58	87	43	5	33	65	98	72	2	16	82
Untreated		48	4	22	68	12	52	6	18	73	11	60	8	10	57	32
LSD (0.05)		3	4	3	6	4	3	4	3	4	12	2	4	1	5	5

[1]RUPM = Roundup PowerMax. [2]Leaf = % leaf desiccation and leaf drop. [3]Vine = % vine desiccation.
[4]Green = % green pods. [5]Yellow = % yellow pods. [6]Brown = % dry pods.

Table 2. Study 2, Volume and adjuvant response to Sharpen, Thompson (Zollinger, Ries, and Kazmierczak).

		7 DAT					10 DAT					14 DAT				
Treatment[1]	Rate (product/A)	leaf[2]	vine[3]	green[4]	yellow[5]	brown[6]	leaf	vine	green	yellow	brown	leaf	vine	green	yellow	brown
		% control					% control					% control				
10 GPA																
Sharpen+R-11 +AMS	1fl oz+0.25% v/ v+17lb/100gal	91	42	5	15	80	93	38	1	49	40	99	65	0	22	73
Sharpen+ Herbimax+AMS	1fl oz+1% v/ v+17lb/100gal	92	45	4	16	80	96	48	1	43	57	99	83	0	15	87
Sharpen+Scoil +AMS	1fl oz+1% v/ v+17lb/100gal	94	47	3	19	78	98	73	0	27	73	99	93	0	10	92
5 GPA																
Sharpen +Scoil+AMS	1fl oz+1% v/ v+17lb/100gal	90	72	4	18	75	95	67	1	33	67	99	83	0	15	87
Untreated		52	4	18	77	5	62	6	13	73	13	68	11	11	63	27
LSD (0.05)		4	5	3	4	3	3	6	3	6	11	2	3	1	4	5

[1]RUPM = Roundup PowerMax. [2]Leaf = % leaf desiccation and leaf drop. [3]Vine = % vine desiccation.
[4]Green = % green pods. [5]Yellow = % yellow pods. [6]Brown = % dry pods.

greater than 80% leaf drop for all bean types. Navy bean applications were applied on Sept 24 at 9:50 am with 73 air, 74 F soil surface, 86% relative humidity, 33% cloud cover, 0 mph wind, dry soil surface and moist subsoil. Navy bean was at 85 to 92 % leaf drop; 45 to 60% vine desiccation; 2 to 5% green pods; 10% yellow pods; and 85% dry/leather pods. Black and Dark Red Kidney bean applications were applied on Sept 17 at 10:30 am with 75 air, 78 F soil surface, 44% relative humidity, 10% cloud cover, 1 to 3 mph SW wind, dry soil surface and moist subsoil. Black bean was at 75 to 99% leaf drop; 35 to 85% vine desiccation; 5 to 10% green pods; 5 to 20% yellow (purple) pods; and 75 to 85% dry/leather pods. Dark Red Kidney bean was at 65 to 85% leaf drop; 25 to 50% vine desiccation; 10% green pods; 10% yellow pods; and 80% dry/leather pods. Seeds from each bean type were collected at 14 DAT from the top, middle, and bottom of each plant. Each plant section of seeds collected were bagged by their plant part and sent for residue samples. Crop destruct was done after the last ratings and seed was harvested.

Treatments for all studies, at all locations, were applied to the entire 6.7 by 30 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo Tee-Jet nozzles for all applications. The experiment had a randomized complete block design with six replicates per treatment.

Sharpen and Valor are PPO inhibitors that work very well at low use rates as a dry bean desiccant. At Thompson, Study 1, Sharpen at three use rates, there are little rate response differences, 0.72 to 2 fl oz. Valor is also an herbicide that works very well as a desiccant that is generally equal to that of Sharpen. Aim also worked well, but takes longer to get adequate desiccation. Study 2 at Thompson, 5 gpa generally desiccated as well as 10 gpa.

At Portland, residue seed samples were not available at the time of this report. Applications were made at normal desiccation timing so residue samples could be harvested, so there is little difference in the ratings of the residue studies. Treatments gave excellent desiccation. *(Dept of Plant Sciences, North Dakota State University, Fargo)*

Table 3. Study 3, Black Bean Desiccation, Portland (Zollinger, Ries, and Kazmierczak).

		5 DAT					10 DAT					14 DAT				
Treatment	Rate	leaf[1]	vine[2]	green[3]	yellow[4]	brown[5]	leaf	vine	green	yellow	brown	leaf	vine	green	yellow	brown
	(product/A)	% control					% control					% control				
Sharpen+Scoil +AMS	1fl oz+1% v/ v+17lb/100gal	98	96	0	0	99	99	99	0	0	99	99	99	0	0	99
Untreated		93	93	0	3	97	95	95	0	0	99	99	95	0	0	99
LSD (0.05)		8	1	NS	1	1	1	1	NS	NS	NS	NS	1	NS	NS	NS

[1]Leaf = % leaf desiccation and leaf drop. [2]Vine = % vine desiccation. [3]Green = % green pods.
[4]Yellow = % yellow pods. [5]Brown = % dry pods.

Table 4. Study 4, Dark Red Kidney Bean Desiccation, Portland (Zollinger, Ries, and Kazmierczak).

		5 DAT					10 DAT					14 DAT				
Treatment	Rate	leaf[1]	vine[2]	green[3]	yellow[4]	brown[5]	leaf	vine	green	yellow	brown	leaf	vine	green	yellow	brown
	(product/A)	% control					% control					% control				
Sharpen+Scoil +AMS	1fl oz+1% v/ v+17lb/100gal	97	48	0	0	99	99	62	0	0	99	99	82	0	0	99
Untreated		85	28	1	1	98	89	37	0	0	99	92	40	0	0	99
LSD (0.05)		6	9	1	3	3	7	9	NS	NS	NS	6	13	NS	NS	NS

[1]Leaf = % leaf desiccation and leaf drop. [2]Vine = % vine desiccation. [3]Green = % green pods.
[4]Yellow = % yellow pods. [5]Brown = % dry pods.

Table 5. Study 5, Navy Bean Desiccation, Portland (Zollinger, Ries, and Kazmierczak).

		5 DAT					10 DAT					14 DAT				
Treatment	Rate	leaf[1]	vine[2]	green[3]	yellow[4]	brown[5]	leaf	vine	green	yellow	brown	leaf	vine	green	yellow	brown
	(product/A)	% control					% control					% control`				
Sharpen+ Scoil+AMS	1fl oz+1% v/ v+17lb/100gal	99	99	0	0	99	99	99	0	0	99	99	99	0	0	99
Untreated		92	78	1	16	83	97	93	0	5	95	99	99	0	0	99
LSD (0.05)		7	7	4	3	7	4	7	NS	NS	NS	NS	NS	NS	NS	NS

[1]Leaf = % leaf desiccation and leaf drop. [2]Vine = % vine desiccation. [3]Green = % green pods.
[4]Yellow = % yellow pods. [5]Brown = % dry pods.

EPTAM AND PERMIT IN DRY BEANS

Investigators: Zollinger, Richard K., Jerry L. Ries, and Angela J. Kazmierczak.

Research Goals: An experiment was conducted near Thompson, ND to evaluate weed control in dry bean with various tank-mix treatments and applications. June 2, 2009, PPI treatments were applied and double incorporated with a field cultivator to a 2 to 3 inch depth. Two rows of 'Ensign' navy bean and 'Lariat' pinto bean were planted in each plot followed by the application of PRE treatments. PPI and PRE treatments were applied at 10:20 and 10:50 am, respectively, with 55 F air, 52 F soil at a four inch depth, 39% relative humidity, 20% clouds, 7 to 10 mph NW wind, dry soil surface, moist subsoil, and no dew present. POST treatments were applied on July 7 at 11:35 am, with 80 F air, 78 F soil surface, 48% relative humidity, 98% clouds, 1 to 3 mph N wind, dry soil surface, moist subsoil, and no dew present. Weed species present at the time of POST applications were: 1 to 4 inch (2/yd2) common lambsquarters and 1 to 3 inch (1 to 3/yd2) redroot pigweed. Treatments were applied to the center 6.7 feet of the 10 by 40 foot plots with a backpack-type plot sprayer delivering 17 gpa at 40 psi through 11002 Turbo nozzles for the PPI and PRE treatments, and 8.5 gpa at 40 psi through 11001 Turbo TeeJet nozzles for POST treatments. The experiment had a randomized complete block design with three replicates per treatment.

All PRE and PPI treatments gave greater than 96% control of common lambsquarters 21 DAT (data not shown). Injury was slight stunting and chlorosis. *(Dept of Plant Sciences, North Dakota State University, Fargo)*

Eptam and Permit in dry beans (Zollinger, Ries, and Kazmierczak).

Treatment	Rate	35 DAT - PPI/PRE				14 DAT - POST				28 DAT - POST				Yield	
		Navy	Pinto	Colq	Rrpw	Navy	Pinto	Colq	Rrpw	Navy	Pinto	Colq	Rrpw	Navy	Pinto
	(product/A)	% injury		% control		% injury		% control		% injury		% control		lb/A	
PPI															
Eptam	4pt	0	4	88	93	0	1	88	96	0	0	65	67	1219	886
Eptam+Sonalan	4pt+1.25pt	0	0	98	95	0	0	98	95	0	0	94	88	1539	1453
Eptam+Sonalan	3.5pt+2pt	0	4	97	97	0	1	97	97	0	0	94	93	1944	1443
Eptam+Prowl H2O	3.5pt+2pt	0	1	94	97	0	1	94	97	0	1	88	83	1337	1257
Eptam+Sonalan+Permit	3.5pt+2pt+0.67pz	0	0	97	98	0	0	97	98	0	0	91	93	1577	1438
Eptam+Permit	4pt+0.67oz	0	1	97	97	0	1	97	97	2	3	87	89	1514	1523
Sonalan+Permit	3pt+0.67oz	0	2	99	99	0	2	99	99	0	1	97	94	1976	1403
PPI/PRE															
Eptam/Permit	4pt/0.67oz	0	0	99	96	0	0	99	96	0	0	96	94	1807	1574
Prowl H_2O+Permit	3.33pt/0.67oz	0	1	96	98	0	1	96	98	0	1	91	96	1698	1295
PPI/EPOST															
Eptam+Sonalan/ Permit+R-11+ 28% N	3.5pt+2pt/0.67oz +0.25% v/v+ 1% v/v	0	1	97	97	0	1	96	95	2	2	93	92	1613	1383
PRE/EPOST															
Permit/Reflex+Scoil	0.67oz/0.75pt+1.5pt	0	1	99	99	0	1	93	92	2	2	88	89	1824	1414
Untreated		0	0	0	0	0	0	0	0	0	0	0	0	667	661
LSD (0.05)		NS	2	8	4	NS	2	8	6	2	3	9	8	577	339

2009 Dry Bean Performance Trials

Hans Kandel NDSU Extension Agronomist and Juan Osorno NDSU Dry Bean Breeder

Information about dry bean variety performance can be accessed on the Web at the site with all variety trial data from all NDSU Research Extension Centers for all crops. The site can be found at **www.ag.ndsu.edu/varietytrials**. The agronomic data presented in this publication are from replicated research plots using experimental designs that enable the use of statistical analysis. The LSD (least significant difference) numbers beneath the columns in tables are derived from the statistical analyses and only apply to the numbers in the column in which they appear. If the difference between two varieties exceeds the LSD value, it means that with 95 percent probability, the higher-yielding variety has a significant yield advantage. If the difference between two varieties is less than the LSD value, then the variety yields are considered similar. The abbreviation NS is used to indicate no significant difference for that trait among any of the varieties. The CV is a measure of variability in the trial. The CV stands for coefficient of variation and is expressed as a percentage. Large CVs mean a large amount of variation that could not be attributed to differences in the varieties. In the tables, the "mean" indicates the average of the observations in the column. Only compare values within the table and look for trends for the desired trait among different experimental sites and years. In the tables, the dry bean varieties are arranged in alphabetical order within market class. Footnotes provide more detailed information about data in the table under which they appear. Characteristics to evaluate for selecting a dry bean variety include marketing class, yield potential in your area, test weight, reaction to problematic diseases and maturity date. When selecting a high-yielding and good-quality variety, use data that summarizes several years and locations.

Choose the variety that, on average, performs the best at multiple locations near your farm during several years.

Trials at Prosper in 2009 were lost due to flooding, shattering and sprouting.

TABLE 1. North Dakota Dry Edible Bean Planted Acreage, 1995-2009

Year	Acreage
1995	600,000
1996	580,000
1997	600,000
1998	750,000
1999	630,000
2000	610,000
2001	440,000
2002	790,000
2003	540,000
2004	560,000
2005	620,000
2006	670,000
2007	690,000
2008	660,000
2009	610,000

Source: ND Agricultural Statistics Service -- USDA.

TABLE 2. North Dakota Dry Edible Bean Production by Commercial Class, 1995 to 2009

Year	Pinto (cwt)	Navy (cwt)
1995	4,704,000	2,086,000
1996	5,138,000	1,929,000
1997	4,480,000	1,878,000
1998	6,800,000	1,770,000
1999	4,860,000	2,555,000
2000	5,294,000	1,620,000
2001	4,050,000	1,327,000
2002	7,184,000	2,340,000
2003	5,864,000	1,164,000
2004	3,573,000	650,000
2005	6,584,000	1,343,000
2006	4,988,000	1,585,000
2007	7,606,000	1,611,000
2008	6,660,000	2,087,000
2009	5,950,000	1,255,000

Source: ND Agricultural Statistics Service -- USDA.

Introduction

Dry edible beans have become a significant crop in eastern and east-central North Dakota during the past decade.

Acreage for the past 15 years is shown in Table 1, with production by classes in Table 2. The 610,000 dry bean acres planted in 2009 reflect a decrease of 50,000 acres compared with 2008.

North Dakota Dry Edible Bean Production

North Dakota -- Dry edible bean production in North Dakota was forecasted at 8.36 million hundredweight (cwt) for 2009, down 16.8 percent from 2008, according to the USDA National Agricultural Statistics Service's North Dakota field office.

The projected statewide average yield for 2009 was 1,480 pounds per harvested acre, 5.7 percent lower than the 2008 yield of 1,570 pounds per acre. In 2009, pintos accounted for about 71 percent and navy beans accounted for 15 percent of total dry bean production in North Dakota.

United States -- Dry edible bean production in the United States was forecasted at 25.2 million cwt for 2009, about 1.5 percent below the 2008 production. Harvested acreage was forecasted at 1.45 million acres. The average U.S. yield was forecasted at 1,737 pounds per acre. Production increased from a year ago for pinto, black, chickpea and the "other" market classes.

2009 Growing Season Weather Summary for North Dakota

The 2009 growing season (the period from April through September) for North Dakota simply can be characterized as "cooler" and "dryer" than normal, compared with the 30-year average from 1971 to 2000. The state average temperature during the 2009 growing season was 57.1 F, which made 2009 the 36th coolest growing season among the past 115 years. Likewise, the state average precipitation during the 2009 growing season was 11.38 inches, which made 2009 the 21st driest growing season among the past 115 years. Table 4 (see page 38) shows the ranking of temperature and precipitation for six selected cities in North Dakota. Table 5 (see page 38) shows the length and the ranking of the growing season based on the number of consecutive days between the last and first day of frost. *(Source: Adnan Akyüz and Barbara A. Mullins, Department of Soil Science)*

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Authors

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Adnan Akyüz and Barbara A. Mullins -- Soil Science Department, NDSU, Fargo, N.D.

2009 Dry Bean Variety Trials

TABLE 3. Dry Edible Beans Acreage and Production

	Acres Planted		Acres Harvested		Yield Per Acre		Production	
	2008	2009	2008	2009	2008	2009	2008	2009
Market Class	1,000s		1,000s		Pounds		1,000 Cwt.	
North Dakota								
Navy	123.0	86.0	118.0	81.0	1,770	1,550	2,087	1,255
Great Northern	6.7	8.0	6.5	7.2	1,690	1,570	110	113
Pinto	446.0	439.0	433.0	405.0	1,540	1,470	6,660	5,950
Dark Red Kidney	1.4	1.5	1.3	1.2	1,540	1,580	20	19
Pink	12.5	11.0	12.4	10.9	1,700	1,380	211	150
Small Red	6.0	2.5	5.9	2.3	1,440	1,520	85	35
Black	53.5	46.0	53.0	43.0	1,380	1,420	731	610
Chickpeas, All (Garbanzo)	9.3	13.2	8.4	11.8	1,420	1,640	119	194
- Small	4.0	9.0	3.3	8.3	1,330	1,600	44	133
- Large	5.3	4.2	5.1	3.5	1,470	1,740	75	61
Other	1.6	2.8	1.5	2.6	1,670	1,380	25	36
Total	660.0	610.0	640.0	565.0	1,570	1,480	10,048	8,362
United States								
Navy	250.6	195.2	242.1	185.8	1,876	1,777	4,542	3,302
Great Northern	76.1	53.9	71.1	47.7	2,248	2,048	1,598	977
Pinto	629.3	689.3	606.9	643.1	1,690	1,695	10,257	10,898
Dark Red Kidney	50.8	50.1	49.3	46.9	2,012	1,887	992	885
Pink	30.6	27.6	30.2	27.0	1,844	1,837	557	496
Small Red	42.3	35.1	41.4	34.3	1,971	2,044	816	701
Black	171.9	187.3	168.9	179.2	1,731	1,673	2,923	2,998
Chickpeas, All (Garbanzo)	83.5	96.0	82.1	93.9	1,362	1,435	1,118	1,347
- Small	11.7	22.5	10.9	21.7	1,183	1,378	129	299
- Large	71.8	73.5	71.2	72.2	1,389	1,452	989	1,048
Other	159.9	200.1	153.2	191.7	1,798	1,863	2,755	3,572
Total	1,495.0	1,534.6	1,445.2	1,449.6	1,768	1,737	25,558	25,176

Source: ND Agricultural Statistics Service -- USDA.

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Presentation of data for the entries tested does not imply approval or endorsement by the authors or agencies conducting the test. North Dakota State University approves the reproduction of any table in this publication only if no portion is deleted, appropriate footnotes are given, the order of the data is not rearranged and NDSU is given credit for conducting these trials.

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2009 Dry Bean Variety Trials

TABLE 4. April-September 2009 Average Temperature and Precipitation Rankings for Selected North Dakota Locations

City	Temperature Ranking	Precipitation Ranking
Bowman	13th Coolest (Since 1915)	24th Driest (Since 1915)
Bismarck	50th Coolest (Since 1874)	24th Wettest (Since 1874)
Fargo	52nd Coolest (Since 1881)	14th Driest (Since 1881)
Minot Research Extension Center	20th Coolest (Since 1905)	22nd Driest (Since 1905)
Cavalier	11th Coolest (Since 1934)	36th Wettest (Since 1927)
Williston Research Extension Center	20th Coolest (Since 1953)	20th Driest (Since 1956)
North Dakota Average	**36th Coolest (Since 1895)**	**21st Driest (Since 1895)**

TABLE 5. Length and the Ranking of the 2009 Growing Season Based on Number of Consecutive Days Between the Last and First Day of Frost.

City	Length of the 2009 Growing Season	Ranking of the 2009 Growing Season
Bowman	112 Days (June 7 - Sep. 28)	16th Shortest (Since 1915)
Bismarck	144 Days (May 16 - Oct. 8)	26th Longest (Since 1875)
Fargo	150 Days (May 10 - Oct. 8)	24th Longest (Since 1881)
Minot Research Extension Center	141 Days (May 19 - Oct. 8)	17th Longest (Since 1905)
Cavalier	114 Days (June 6 - Sep. 29)	17th Shortest (Since 1934)
Williston Research Extension Center	110 Days (June 3 - Sep. 22)	15th Shortest (Since 1894)

2009 Pinto Bean Variety Trial, NDSU

Variety	Days to Flowering	Plant Height	Days to Maturity	100 Seed Weight	Yield
	(DAP)[1]	(inch)	(DAP)[1]	(gram)	(lb/a)
FOREST RIVER (Walsh County)					
Baja	50	19.7	99	34.2	2,440
Buster	52	16.9	101	34.4	2,680
Croissant	54	18.5	107	36.4	2,100
Durango	52	18.1	105	36.0	2,380
GTS-900	56	19.3	105	34.5	2,390
GTS-903	56	18.9	108	32.2	2,480
GTS-904	57	18.9	108	36.7	2,470
GTS-907	53	17.7	103	33.8	2,520
La Paz	57	18.1	101	32.2	2,510
Lariat	55	21.7	103	38.6	2,270
Mariah	54	18.5	100	33.5	2,420
Maverick	53	18.9	102	38.9	2,480
Medicine Hat	52	17.3	99	34.5	2,380
ND-307	54	18.9	108	39.2	2,660
Othello	49	16.1	93	35.8	2,030
Santa Fe	54	20.1	103	38.9	2,720
Sonora	53	18.9	104	31.5	2,400
Stampede	54	18.9	103	35.4	2,290
Windbreaker	54	16.1	102	36.9	2,570
Mean	54	18.5	103	35.5	2,431
CV %	3.0	8.0	2.0	6.9	8.4
LSD 0.05	2	2.0	3	3.4	290

[1]Days after planting.

2009 Pinto Bean Variety Trial, NDSU

Variety	Days to Flowering	Plant Height	Days to Maturity	100 Seed Weight	Yield
	(DAP)[1]	(inch)	(DAP)[1]	(gram)	(lb/a)
HATTON (Traill County)					
Baja	44	20.9	101	33.8	2,280
Buster	45	19.3	103	33.3	2,550
Croissant	50	22.0	106	34.5	2,260
Durango	47	19.7	104	36.6	2,230
GTS-900	50	19.3	105	35.4	2,290
GTS-903	49	22.4	105	32.6	2,450
GTS-904	51	23.2	105	35.7	2,240
GTS-907	47	21.7	103	32.1	2,290
ISB 1218	56	18.9	108	33.2	2,090
Jackpot	51	19.3	100	33.0	1,620
La Paz	55	22.0	107	33.8	2,380
Lariat	49	25.6	106	37.4	2,160
Mariah	49	19.7	103	34.4	2,370
Maverick	46	20.1	104	36.1	2,300
Max	44	16.9	97	36.1	1,880
Medicine Hat	47	22.0	102	34.6	2,660
ND-307	50	20.9	107	36.5	2,130
Othello	44	17.3	98	35.0	1,750
Santa Fe	48	21.3	106	41.1	2,450
Sequoia	47	21.7	105	32.3	2,180
Sonora	49	22.0	105	29.7	2,380
Stampede	50	20.9	105	34.2	2,180
Windbreaker	47	20.1	104	33.4	2,480
Mean	48	20.7	104	34.6	2,243
CV %	3.0	15.0	2.0	5.1	10.0
LSD 0.05	2	4.3	3	2.4	310

[1]Days after planting.

2009 Dry Bean Variety Trials

2009 Navy Bean Variety Trial, NDSU					
Variety	Days to Flowering	Plant Height	Days to Maturity	100 Seed Weight	Yield
	(DAP)[1]	(inch)	(DAP)[1]	(gram)	(lb/a)
FOREST RIVER (Walsh County)					
Avalanche	55	17.7	105	19.9	2,770
Ensign	57	16.9	105	20.2	2,200
GTS-544	58	20.9	105	18.8	2,420
GTS-561	57	18.5	108	19.5	2,350
HMS Medalist	56	20.1	105	17.3	2,820
HY 4181	56	19.3	107	20.4	2,400
Mayflower	57	19.7	107	18.4	2,290
Navigator	57	16.1	108	18.4	2,030
Norstar	54	18.5	104	17.2	2,110
Seahawk	54	17.3	107	19.7	1,950
T9903	55	18.9	104	20.3	2,280
T9905	57	18.9	105	20.1	2,620
Vista	57	19.3	108	17.1	2,020
Mean	56	18.6	106	19.0	2,328
CV %	2.0	10.0	1.0	4.1	20.5
LSD 0.05	2	2.8	2	1.1	NS

[1]Days after planting. [2]Data from one rep missing.

2009 Navy Bean Variety Trial, NDSU					
Variety	Days to Flowering	Plant Height	Days to Maturity	100 Seed Weight	Yield
	(DAP)[1]	(inch)	(DAP)[1]	(gram)	(lb/a)
HATTON (Traill County)					
Avalanche	49	18.1	107	19.3	2,180
Ensign	51	17.3	104	19.2	1,980
GTS-544	53	18.9	106	18.2	1,750
GTS-561	52	17.3	108	18.9	1,800
HMS Medalist	49	18.5	106	17.4	2,320
HY 4181	50	16.9	106	17.6	1,960
Lightning	47	16.9	106	21.2	1,340
Mayflower	53	16.5	109	17.7	1,610
Navigator	55	15.4	109	18.8	1,440
Norstar	49	15.4	105	17.5	1,410
OAC Dublin	49	17.3	108	19.3	1,740
Seahawk	52	15.4	110	21.5	1,690
T9903 [2]	48	17.7	107	19.9	1,402
T9905	52	17.3	105	18.3	1,760
Vista	51	16.5	109	17.5	1,480
Mean	51	17.0	107	18.8	1,696
CV %	5.0	27.0	2.0	5.9	37.3
LSD 0.05	4	NS	3	1.5	NS

[1]Days after planting. [2]Data from one rep missing.

2009 Dry Bean Variety Trials

2009 Miscellaneous Dry Bean Variety Trial, NDSU						
Variety	Market Class	Days to Flowering (DAP)[1]	Plant Height (inch)	Days to Maturity (DAP)[1]	100 Seed Weight (gram)	Yield (lb/a)
HATTON (Traill County)						
CDC Jet	Black	49	22.0	106	19.8	2,770
Eclipse	Black	53	14.2	107	19.8	2,410
Jaguar	Black	49	16.5	106	19.5	2,590
Loreto	Black	48	20.5	107	20.3	2,530
Shania	Black	52	23.2	108	19.0	2,550
T-39	Black	50	20.9	106	21.3	2,280
Zorro	Black	52	19.3	108	19.8	2,780
Gemini	Great Northern	46	15.7	96	30.2	1,980
Matterhorn	Great Northern	47	19.7	104	30.1	2,460
Orion	Great Northern	47	18.9	103	29.3	2,050
Fuji	Otebo	46	16.1	105	26.6	2,150
Hime	Otebo	49	17.7	106	26.1	2,210
Sedona	Pink	50	21.3	106	34.2	2,220
Merlot	Small Red	51	24.8	108	33.4	2,140
Mean		49	19.3	105	25.0	2,366
CV %		4.0	20.0	2.0	6.0	14.9
LSD 0.05		3	NS	4	2.8	NS
PERHAM (Otter Tail County)						
Eclipse	Black	58	18.5	111	20.5	2,470
T-39	Black	57	18.5	114	19.6	2,203
Montcalm	Dark Red Kidney	52	18.9	114	61.3	2,230
Red Rover	Dark Red Kidney	50	21.3	107	56.2	1,677
Redhawk	Dark Red Kidney	50	19.7	107	48.8	1,407
CELRK	Light Red Kidney	51	16.1	106	60.6	800
Chinook 2000	Light Red Kidney	53	19.7	111	51.5	2,197
Clouseau	Light Red Kidney	50	20.1	112	69.6	2,733
Foxfire	Light Red Kidney	50	19.7	111	60.7	2,930
Avalanche	Navy	56	20.9	112	19.7	2,197
GTS-544	Navy	57	19.7	114	20.1	2,363
GTS-561	Navy	56	20.1	110	19.3	2,550
Mayflower	Navy	57	22.0	114	18.7	2,633
Norstar	Navy	53	18.5	111	18.1	2,250
Seahawk	Navy	54	16.9	112	19.6	2,157
Vista	Navy	55	20.5	114	19.3	2,897
Lariat	Pinto	56	21.3	111	36.9	1,990
Stampede	Pinto	55	20.9	107	33.8	1,950
Mean		54	19.6	111	36.4	2,202
CV %		3.0	12.0	1.0	7.0	15.1
LSD 0.05		3	NS	2	4.3	592
PARK RAPIDS (Hubbard County)						
Eclipse	Black	59	16.9	111	17.3	1,730
T-39	Black	59	17.3	114	18.5	1,760
Montcalm	Dark Red Kidney	53	15.7	113	58.1	1,300
Red Rover	Dark Red Kidney	49	19.3	109	55.1	1,150
Redhawk	Dark Red Kidney	49	15.0	109	53.2	1,200

2009 Dry Bean Variety Trials

2009 Miscellaneous Dry Bean Variety Trial, NDSU						
Variety	Market Class	Days to Flowering (DAP)[1]	Plant Height (inch)	Days to Maturity (DAP)[1]	100 Seed Weight (gram)	Yield (lb/a)
PARK RAPIDS (Hubbard County) Continued						
CELRK	Light Red Kidney	50	14.6	106	67.0	1,360
Chinook 2000	Light Red Kidney	50	15.0	111	52.4	1,420
Clouseau	Light Red Kidney	51	19.7	113	69.8	1,890
Foxfire	Light Red Kidney	50	15.4	108	55.8	1,760
Pink Panther	Light Red Kidney	50	17.7	111	66.2	1,930
Avalanche	Navy	55	17.7	111	16.9	1,320
GTS-544	Navy	57	16.5	112	17.1	1,360
GTS-561	Navy	57	16.9	113	19.0	1,610
Mayflower	Navy	58	18.9	114	16.8	1,540
Norstar	Navy	54	15.0	112	17.5	1,450
Seahawk	Navy	56	16.1	112	19.7	1,800
Vista	Navy	57	18.5	114	16.9	1,550
Hime	Otebo	54	15.7	108	22.2	1,080
Lariat	Pinto	54	18.9	109	35.9	1,600
Stampede	Pinto	57	13.8	108	32.6	940
Mean		54	16.7	111	36.4	1,488
CV %		4	9	1	4.6	15
LSD 0.05		3	2.4	2	2.4	330

[1]Days after planting.

2009 Dry Bean Variety Trials

2009 Miscellaneous Dry Bean Variety Trial, Dryland, Carrington

Variety	Market Class	Days to Flower	Days to Maturity	Plant Height	Growth Habit[1]	100 Seed Weight	Seeds/ Pound	Test Weight	Seed Yield 2009	Seed Yield 3-yr Avg.
		(DAP)[2]	(DAP)[2]	(inch)	(1-9)	(gram)	(seeds)	(lb/bu)	(lb/a)	
CDC Jet	Black	62	102	12.3	4.5	19.7	2,310	62.2	2,167	--
Eclipse	Black	63	108	13.6	5.3	19.9	2,277	64.5	2,477	2,369
Jaguar	Black	64	107	11.8	3.8	18.2	2,492	64.6	2,142	2,109
T-39	Black	64	107	13.0	4.0	18.4	2,470	64.1	2,386	2,215
Zorro	Black	64	103	11.7	3.5	19.8	2,295	65.0	2,474	--
Matterhorn	G. Northern	60	108	10.5	2.8	34.1	1,332	60.2	2,694	2,484
Avalanche	Navy	59	103	11.9	4.8	20.5	2,219	66.0	2,292	--
Ensign	Navy	65	108	11.6	4.0	20.4	2,227	65.9	2,582	--
HY 4181	Navy	63	107	14.1	5.8	20.1	2,266	66.3	2,576	--
Mayflower	Navy	61	110	15.4	6.3	18.4	2,471	65.1	2,249	--
Navigator	Navy	62	105	12.6	5.3	18.4	2,475	64.8	2,389	--
Norstar	Navy	60	109	11.2	3.5	18.6	2,447	66.4	1,833	1,802
Octaine	Navy	60	108	9.9	2.0	20.2	2,246	66.7	1,700	--
Seahawk	Navy	62	111	10.9	3.3	21.1	2,147	65.9	2,373	2,074
Skyline	Navy	60	107	10.2	2.5	19.6	2,320	66.6	1,789	--
Vista	Navy	63	110	15.1	6.3	17.7	2,573	65.8	2,722	2,358
Hime	Otebo	60	106	10.4	3.3	28.0	1,625	65.5	2,441	--
Sedona	Pink	61	96	11.8	4.5	34.1	1,331	62.0	2,375	2,198
Buster	Pinto	57	99	10.8	2.3	38.6	1,177	60.5	2,902	2,590
Croissant	Pinto	62	99	12.0	5.0	35.6	1,276	62.6	2,682	--
GTS 900	Pinto	61	107	12.4	3.8	35.5	1,281	62.4	2,604	2,248
La Paz	Pinto	64	106	13.6	5.0	34.5	1,315	63.9	3,048	--
Lariat	Pinto	63	109	13.8	6.0	39.6	1,147	62.3	2,912	2,706
Mariah	Pinto	60	101	11.2	2.8	35.1	1,293	63.3	2,967	--
Maverick	Pinto	59	101	11.2	2.5	39.3	1,159	62.0	2,900	--
Medicine Hat	Pinto	57	97	10.3	3.3	39.4	1,154	60.2	2,827	--
ND-307	Pinto	60	105	13.1	4.8	40.2	1,129	60.5	2,851	2,770
Othello	Pinto	56	96	9.4	1.8	39.1	1,162	62.7	2,469	2,461
Santa Fe	Pinto	59	99	11.5	3.5	41.4	1,097	60.2	2,418	--
Stampede	Pinto	60	102	12.1	4.5	36.5	1,250	61.0	2,750	2,463
Windbreaker	Pinto	58	99	10.3	2.3	38.3	1,186	60.0	2,735	--
Merlot	Small Red	60	103	13.8	5.5	33.4	1,361	64.3	2,625	2,462
Mean		61	104	12.0	4.0	28.6	1,766	63.5	2,511	2,354
CV %		2.6	2.9	10.2	20.6	3.4	3.1	0.7	9.0	--
LSD 0.05		2.2	4.2	1.7	1.2	1.3	77	0.6	322	--

Planted: May 20. Harvested: Sept. 18. Previous crop: spring wheat.
[1]Growth Habit : scale of 1 to 9; 1=a vining plant type, pods low to the ground, short stature; 9=very upright plant structure, pods held off the ground.
[2]Days after planting.

2009 Dry Bean Variety Trials

2009 Dry Bean Variety Trial, Hettinger.

Variety	Market Class	100 Seed Wt.	Test Weight	Seed Yield[1]		
				2008	2009	2-yr Avg.
		(gram)	(lb/bu)	(lb/a)		
Eclipse	Black	18.0	62.4	449	1,343	896
Jaguar	Black	18.0	61.1	377	1,341	859
T-39	Black	17.0	61.8	391	1,334	862
Zorro	Black	19.0	62.8	--	1,413	--
Matterhorn	G. Nor.	30.0	57.3	548	1,459	1,004
Avalanche	Navy	18.0	62.8	447	1,474	960
Ensign	Navy	19.0	62.0	504	1,207	856
Navigator	Navy	--	61.3	428	1,131	780
Norstar	Navy	19.0	62.5	544	1,257	900
Seahawk	Navy	18.0	62.6	453	1,067	760
Vista	Navy	16.0	61.3	544	1,401	972
Sedona	Pink	35.0	56.9	391	803	597
Buster	Pinto	36.0	46.8	515	1,566	1,040
GTS 900	Pinto	31.0	54.1	539	1,636	1,088
La Paz	Pinto	32.0	50.8	628	1,889	1,258
Lariat	Pinto	37.0	52.9	568	1,540	1,054
Maverick	Pinto	35.0	53.5	552	1,808	1,180
ND-307	Pinto	35.0	46.8	--	1,358	--
Othello	Pinto	36.0	45.5	696	1,496	1,096
Stampede	Pinto	37.0	52.0	626	1,745	1,186
Merlot	Sm. Red	29.0	60.0	525	675	600
Mean		26.8	57.0	512	1,378	945
CV %		--	2.1	23	10.6	--
LSD 0.05		--	1.7	165	208	--

Planted: May 27. Harvested: Oct. 18.
Previous crop: 2007 & 2008, spring wheat.
Seeding Rate: 100,000 live seeds/acre (approx. 60 lb/a).
[1]The 2008 trial sustained severe heat and moisture stress.
The 2009 trial sustained moderate hail damage.

2009 Pinto Bean Variety Trial, Irrigated, Oakes.

Variety	Days to PM[1]	100 Seed Wt.	Test Weight	Seed Yield		
				2008	2009	2-yr Avg.
	(DAP)[2]	(gram)	(lb/bu)	(lb/a)		
Baja	96	32.9	61.3	2,071	3,004	2,537
Buster	98	35.8	60.8	3,461	3,432	3,447
Croissant	100	35.7	61.3		2,651	--
Durango	99	34.0	59.3	2,898	2,290	2,594
GTS-900	101	36.0	61.4	3,181	2,894	3,037
La Paz	102	32.7	62.1	2,876	2,926	2,901
Lariat	102	34.4	60.9	3,087	2,258	2,673
Mariah	100	34.0	61.0		2,531	--
Maverick	97	35.3	58.1	2,738	2,773	2,756
Medicine Hat	94	36.8	59.8		3,040	--
Othello	92	37.2	61.5	3,233	2,477	2,855
Santa Fe	98	40.1	59.6		3,018	--
Sonora	101	30.2	61.8	3,041	2,947	2,994
Stampede	99	33.2	59.4	3,079	2,792	2,935
Windbreaker	95	37.6	59.6		3,465	--
Mean	98	35	61	2,966	2,833	2,873
CV %	1.7	3.6	0.8	8.7	9.9	--
LSD 0.05	2	1.8	0.7	362	398	--

Planted: May 22. Harvested: Sept. 4. Previous crop: spring wheat.
[1]Physiological maturity.
[2]Days after planting.

2009 Navy Bean Variety Trial, Irrigated, Oakes.

Variety	Days to PM[1]	100 Seed Wt.	Test Weight	Seed Yield		
				2008	2009	2-yr Avg.
	(DAP)[2]	(gram)	(lb/bu)	(lb/a)		
Avalanche	99	18.8	63.9	2,973	2,263	2,618
Ensign	98	19.8	63.6	3,112	2,373	2,742
HMS Medalist	99	17.0	64.1	--	2,717	--
Mayflower	102	18.6	63.3	--	2,317	--
Navigator	100	18.2	63.6	2,034	2,291	2,162
Norstar	99	17.9	64.9	2,363	1,840	2,101
Seahawk	102	21.6	64.4	1,934	2,568	2,251
Vista	100	17.5	63.5	2,560	2,652	2,606
Mean	100	18.7	63.9	2,496	2,378	2,413
CV %	1.2	3.9	0.6	8.5	8.2	--
LSD 0.05	2	1.1	0.6	320	285	--

Planted: May 22. Harvested: Sept. 4. Previous crop: spring wheat.
[1]Physiological maturity.
[2]Days after planting.

2009 Dry Bean Variety Trials

2009 Miscellaneous Dry Bean Variety Trial, Irrigated, Carrington

Variety	Market Class	Days to Flower	Days to Maturity	Plant Height	Growth Habit[1]	100 Seed Weight	Seeds/ Pound	Test Weight	Seed Yield 2009	Seed Yield 3-yr Avg.
		(DAP)[2]	(DAP)[2]	(inch)	(1-9)	(gram)	(seeds)	(lb/bu)	(lb/a)	
CDC Jet	Black	61	108	15.6	5.8	19.5	2,333	62.3	2,283	--
Eclipse	Black	65	116	16.3	7.5	20.4	2,239	63.5	2,649	2,654
Jaguar	Black	64	115	14.8	6.8	19.1	2,391	63.2	2,124	2,324
T-39	Black	65	118	11.8	2.3	20.6	2,211	63.3	2,716	2,478
Zorro	Black	64	115	16.1	6.5	19.9	2,297	63.4	2,264	--
Matterhorn	G. Northern	60	110	15.1	3.0	33.5	1,359	60.0	2,563	2,769
Avalanche	Navy	62	115	14.0	4.8	20.9	2,173	64.7	2,668	--
Ensign	Navy	64	116	13.4	3.0	22.5	2,022	63.4	2,542	--
HY 4181	Navy	65	115	13.6	4.0	21.4	2,122	65.6	2,364	--
Mayflower	Navy	64	117	16.7	7.0	19.5	2,334	64.4	2,609	--
Navigator	Navy	63	115	17.7	8.0	19.6	2,317	64.7	2,903	--
Norstar	Navy	61	115	13.3	3.8	18.1	2,516	65.0	2,339	2,347
Octaine	Navy	59	101	13.0	3.3	18.8	2,420	66.1	1,921	--
Seahawk	Navy	63	117	12.8	3.3	21.1	2,161	64.6	2,107	2,413
Skyline	Navy	59	101	12.6	3.0	18.8	2,424	66.0	1,931	--
Vista	Navy	64	117	15.9	5.5	18.5	2,461	64.6	2,848	2,651
Hime	Otebo	61	111	12.4	2.8	26.9	1,687	64.7	2,326	--
Sedona	Pink	64	106	16.5	3.5	37.3	1,222	61.0	2,324	2,614
Buster	Pinto	58	102	12.6	2.5	36.9	1,234	61.0	2,775	2,931
Croissant	Pinto	63	109	14.4	4.0	37.3	1,217	61.6	2,658	--
GTS 900	Pinto	64	113	14.1	2.8	35.1	1,294	62.4	2,739	2,727
La Paz	Pinto	66	114	16.3	6.0	33.0	1,382	63.1	2,997	--
Lariat	Pinto	63	113	16.5	6.8	40.6	1,119	61.7	3,252	3,457
Mariah	Pinto	62	104	15.2	4.8	34.0	1,339	62.3	2,448	--
Maverick	Pinto	61	107	12.6	2.3	38.7	1,176	60.5	2,921	--
Medicine Hat	Pinto	60	101	13.5	3.3	38.7	1,175	60.3	2,919	--
ND-307	Pinto	62	109	14.8	4.8	38.7	1,177	59.3	2,568	2,903
Othello	Pinto	58	101	10.6	1.5	38.1	1,196	62.9	2,064	2,565
Santa Fe	Pinto	62	110	13.2	3.0	43.5	1,043	59.3	2,701	--
Stampede	Pinto	62	108	15.0	5.0	35.5	1,282	60.5	2,727	2,865
Windbreaker	Pinto	62	106	13.0	3.3	38.0	1,196	60.4	2,873	--
Merlot	Small Red	61	111	17.7	5.5	34.1	1,334	63.1	2,638	2,800
Mean		62	110	14	4	29	1,745	63	2,555	2,700
CV %		2.7	2.1	10.2	17.4	4	4.1	1.1	11.8	--
LSD 0.05		2.3	3.2	2.1	1.1	1.6	102	0.9	428	--

Planted: May 21. Harvested: Sept. 30. Previous crop: spring wheat.
[1]Growth Habit : scale of 1 to 9; 1 = a vining plant type, pods low to the ground, short stature; 9 = very upright plant structure, pods held off the ground.
[2]Days after planting.

2009 Dry Bean Variety Trials

2009 Dry Bean Variety Trial, Langdon.

Variety	Market Class	Maturity[1]	100 Seed Weight	Seed Yield				
				2007	2008	2009	2-yr Avg.	3-yr Avg.
			(gram)	(lb/a)				
Eclipse	Black	M	20.1	3,428	2,511	1,819	2,165	2,586
Jaguar	Black	M	17.8	3,429	2,183	2,139	2,161	2,584
T-39	Black	M	18.9	3,174	2,259	1,750	2,005	2,394
Matterhorn	Great Northern	ME	33.8	4,012	2,383	2,636	2,510	3,010
Avalanche	Navy	ME	18.4	--	2,363	1,824	2,094	--
Ensign	Navy	M	18.9	--	2,539	2,001	2,270	--
Mayflower	Navy	ML	18.4	--	--	1,704	--	--
Navigator	Navy	M	18.3	--	2,275	2,246	2,261	--
Vista	Navy	ML	18.2	3,531	2,179	2,142	2,160	2,617
Sedona	Pink	M	35.3	3,275	2,187	2,394	2,290	2,619
Buster	Pinto	ME	35.7	3,895	2,714	2,785	2,750	3,131
GTS 900	Pinto	L	36.6	3,643	3,018	2,352	2,685	3,004
La Paz	Pinto	L	33.6	--	2,874	3,213	3,044	--
Lariat	Pinto	L	38.3	3,933	3,162	2,607	2,885	3,234
Maverick	Pinto	ME	37.3	3,843	1,8572	2,672	2,672	3,258
ND-307	Pinto	M	37.6	--	--	2,465	--	--
Othello	Pinto	E	37.7	3,200	2,379	2,240	2,309	2,606
Stampede	Pinto	M	32.9	3,846	2,658	2,408	2,533	2,971
Windbreaker	Pinto	M	37.0	--	--	2,894	--	--
Merlot	Small Red	ME	29.2	3,527	2,459	2,402	2,431	2,796
Mean			28.7	3,595	2,509	2,335	2,425	2,832
CV %			--	9.1	12.4	11.1	--	--
LSD 0.05			--	535	504	429	--	--

Planted: May 28. Harvested: Oct. 19.
[1]RM=Relative Maturity;E=Early;ME=Medium Early;M=Medium;ML=Medium Late;L=Late.
[2]Germination was lower than expected, which resulted in lower plant densities.

2009 Miscellaneous Bean Variety Trial, Irrigated, Oakes.

Variety	Market Class	Days to PM[1]	100 Seed Wt.	Test Weight	Seed Yield		
					2008	2009	2-yr Avg.
		(DAP)[2]	(gram)	(lb/bu)		(lb/a)	
Eclipse	Black	95	18.0	62.7	2,525	2,587	2,556
Jaguar	Black	98	18.4	63.6	2,978	2,902	2,940
T-39	Black	101	19.1	63.3	2,734	2,602	2,668
Zorro	Black	98	19.2	63.0		2,925	--
Matterhorn	Great Northern		30.8	60.0	2,575	2,717	2,646
Sedona	Pink	95	35.5	60.4	3,192	2,838	3,015
Merlot	Small Red	100	32.1	61.6	2,952	2,545	2,749
MEAN		98	24.7	62.1	2,886	2,731	2,762
CV %		1.9	4.4	0.9	8.3	9.5	--
LSD 0.05		3	1.6	0.8	355	NS	--

Planted: May 22. Harvested: Sept. 4. Previous crop: spring wheat.
[1]Physiological maturity.
[2]Days after planting.

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including prices since 2010-01-12 as of Tuesday, January 26, 2010

		2010 Dealer Price (USD/cwt)			2010 Grower Price (USD/cwt)		
	Region	**Low**	**High**	**Avg**	**Low**	**High**	**Avg.**
Beans - Pintos							
#1 - Premium Color	ID/MT/NM/OR/WA	41.00	41.00	41.00	30.00	30.00	30.00
#1 - Premium Color	MB/MN/ND/SD/SK	30.00	30.00	30.00	25.00	25.00	25.00
#1 - Good Color	MB/MN/ND/SD/SK	29.00	30.00	29.50	24.00	25.00	24.50
#1 - Fair/Average Quality (FAQ)	MB/MN/ND/SD/SK	29.00	29.00	29.00	23.00	23.00	23.00
		2009 Dealer Price (USD/cwt)			2009 Grower Price (USD/cwt)		
	Region	**Low**	**High**	**Avg**	**Low**	**High**	**Avg**
Beans - Pintos							
#1 - Premium Color	ID/MT/NM/OR/WA	42.00	43.00	42.50	32.00	32.00	32.00
#1 - Premium Color	AB/CO/KS/NE/UT/WY	44.00	44.00	44.00	31.00	31.00	31.00
#1 - Premium Color	MB/MN/ND/SD/SK	36.00	36.00	36.00	30.00	30.00	30.00
#1 - Good Color	ID/MT/NM/OR/WA	42.00	42.00	42.00	32.00	32.00	32.00
#1 - Good Color	AB/CO/KS/NE/UT/WY	36.50	36.50	36.50			
#1 - Good Color	MB/MN/ND/SD/SK	32.00	35.00	33.25	25.00	30.00	27.50
#1 - Fair/Average Quality (FAQ)	ID/MT/NM/OR/WA	41.00	41.00	41.00	32.00	32.00	32.00
#1 - Fair/Average Quality (FAQ)	AB/CO/KS/NE/UT/WY	36.50	36.50	36.50			
#1 - Fair/Average Quality (FAQ)	MB/MN/ND/SD/SK	32.00	35.00	33.00	25.00	30.00	27.67
#2	AB/CO/KS/NE/UT/WY	33.54	35.50	34.52			
#2	MB/MN/ND/SD/SK	31.00	34.00	32.50	29.00	29.00	29.00

Displayed prices in USD ~ Multigrain International LLC ~ Contact George A. Jibilian at 970.490.1878 or info@multigrain.com

2009 Dry Bean Variety Trials

2009 Dry Bean Variety Trial, Minot.

Variety	Market Class	Plant Height	100 Seed Wt.	Seeds/Pound	Test Weight	Seed Yield		
						2007	2009	2-yr Avg.[1]
		(inch)	(gram)	(seeds)	(lb/bu)		(lb/a)	
Eclipse	Black	22	19.1	2,383	60.4	1,882	2,526	2,204
Jaguar	Black	21	18.9	2,407	60.2	1,600	2,496	2,048
T-39	Black	21	18.0	2,660	60.5	1,747	2,357	2,052
Zorro	Black	23	20.6	2,203	60.5	--	2,926	--
Matterhorn	G. Northern	20	29.9	1,578	57.5	1,543	2,630	2,086
Avalanche	Navy	22	19.2	2,375	62.7	--	2,666	--
Ensign	Navy	22	20.5	2,223	62.1	--	2,886	--
Navigator	Navy	23	17.8	2,555	61.1	--	2,627	--
Norstar	Navy	19	18.2	2,497	62.8	1,511	2,303	1,907
Octaine	Navy	15	18.7	2,422	63.7	--	1,610	--
Seahawk	Navy	22	21.1	2,160	63.3	1,505	2,508	2,007
Skyline	Navy	15	18.9	2,412	63.9	--	1,220	--
Vista	Navy	23	16.7	2,723	62.6	1,813	2,818	2,316
Sedona	Pink	22	36.6	1,241	57.9	1,304	2,514	1,909
Buster	Pinto	21	39.5	1,152	57.2	2,165	2,899	2,532
GTS 900	Pinto	25	38.5	1,180	58.2	1,261	2,793	2,027
La Paz	Pinto	25	35.3	1,290	58.9	--	3,348	--
Lariat	Pinto	28	40.7	1,120	57.3	1,439	3,195	2,317
Mariah	Pinto	23	37.5	1,211	58.4	--	3,028	--
Maverick	Pinto	24	39.9	1,141	56.9	1,711	2,745	2,228
Medicine Hat	Pinto	21	40.2	1,131	57.0	--	3,036	--
ND 307	Pinto	22	34.6	1,469	55.9	2,070	2,812	2,441
Othello	Pinto	19	41.8	1,088	58.1	2,367	2,484	2,426
Stampede	Pinto	24	38.1	1,196	56.4	1,727	2,721	2,224
Windbreaker	Pinto	21	38.6	1,178	56.9	--	2,772	--
Merlot	Small Red	22	34.4	1,322	59.3	1,989	2,630	2,309
Mean		22	29.0	1,781	59.6	1,727	2,637	2,190
CV %		8.5	1.0	13.3	1.0	17.8	10.3	--
LSD 0.05		3	4.2	335	0.9	433	384	--

[1]Due to high CV data for 2008 is unavailable.

2009 Dry Bean Variety Trials

2009 Pinto Bean Variety Trial, Irrigated, Williston.

Variety	Days to Flowering	Plant Height	100 Seed Wt.	Seeds/Pound	Test Weight	Seed Yield		
						2008	2009	2-yr Avg.
	(DAP)[1]	(inch)	(gram)	(seeds)	(lb/bu)	(lb/a)		
Buster	59	24.2	41.7	1,088	61.1	3,311	3,079	3,195
GTS-900	58	24.3	38.5	1,179	61.2	2,454	2,475	2,465
La Paz	58	25.5	36.4	1,247	62.2	3,384	3,124	3,254
Lariat	62	26.2	40.8	1,112	61.6	3,593	2,999	3,296
Mariah	59	22.2	39.1	1,160	62.5	--	3,339	--
Maverick	60	26.1	40.3	1,126	60.5	1,924	2,925	2,424
Medicine Hat	58	22.4	42.0	1,080	61.2	--	3,267	--
ND-307	60	23.0	41.4	1,095	58.7	--	2,563	--
Othello	58	20.8	39.7	1,142	62.4	2,140	2,533	2,336
Stampede	60	22.3	38.5	1,180	60.2	2,755	2,127	2,441
Windbreaker	59	23.4	42.5	1,069	60.5	--	2,978	--
Mean	59	23.7	40.1	1,134	61.1	2,794	2,855	2,773
CV %	0.3	8.1	3.0	3.0	0.5	16.0	14.1	--
LSD 0.05	0.2	2.8	2.8	84	0.7	594	582	--

Planted May 21. Harvested Sept. 23. Previous Crop: Potatoes.
Nesson Valley Irrigation Project.
[1]Days after planting.

2009 Pinto Bean Variety Trial, Dryland, Williston.

Variety	Days to Flowering	Plant Height	100 Seed Wt.	Seeds/Pound	Test Weight	Seed Yield		
						2008	2009	2-yr Avg.
	(DAP)[1]	(inch)	(gram)	(seeds)	(lb/bu)	(lb/a)		
Lariat	66	15.2	32.5	1,395	61.1	--	643	--
Maverick	62	13.7	32.6	1,392	61.5	268	617	442
ND-307	66	14.2	33.9	1,337	59.1	--	474	--
Othello	60	15.5	29.9	1,516	62.5	273	423	348
Stampede	65	13.5	31.3	1,451	61.3	--	615	--
Mean	64	14.4	32.3	1,406	61.1	270	554	395
CV %	1.7	11.5	2.0	2.0	0.8	19.2	23.5	--
LSD 0.05	1.7	NS	2.0	87	1.3	74	NS	--

Planted May 20 on fallow. Harvested Sept 18.
[1]Days after planting.

2009 Dry Bean Variety Trials

2009 Navy Bean Variety Trial, Dryland, Williston.

Variety	Days to Flowering	Plant Height	100 Seed Wt.	Seeds/Pound	Test Weight	Seed Yield		
						2008	2009	2-yr Avg.
	(DAP)[1]	(inch)	(gram)	(seeds)	(lb/bu)	(lb/a)		
Avalanche	68.3	12.8	17.7	2,566	64.4	--	559	--
Navigator	69.3	13.9	16.9	2,691	64.1	--	522	--
Norstar	67.5	12.8	14.4	3,160	65.9	220	463	342
Seahawk	66.8	11.9	18.8	2,418	64.5	195	409	302
Vista	69.8	11.8	16.2	2,807	65.2	--	432	282
Mean	68.3	12.6	16.6	2,754	64.8	208	477	309
CV %	1.7	11.6	3.0	2.0	0.6	19.2	20.3	--
LSD 0.05	1.8	NS	1.2	169	1.1	74	NS	--

Planted May 20 on fallow. Harvested Sept 18.
[1]Days after planting.

2009 Navy Bean Variety Trial, Irrigated, Williston.

Variety	Days to Flowering	Plant Height	100 Seed Wt.	Seeds/Pound	Test Weight	Seed Yield		
						2008	2009	2-yr Avg.
	(DAP)[1]	(inch)	(gram)	(seeds)	(lb/bu)	(lb/a)		
Avalanche	59	18.6	22.0	2,062	65.1	2,662	3,121	2,891
Ensign	59	17.6	23.0	1,968	64.9	3,293	2,672	2,982
Navigator	61	21.3	19.9	2,281	64.2	2,345	2,827	2,586
Norstar	60	16.7	18.8	2,411	65.3	2,052	2,033	2,043
Octaine	60	14.0	19.8	2,290	65.9	--	1,646	--
Seahawk	60	16.0	22.8	1,995	64.8	2,700	2,148	2,424
Skyline	60	13.3	19.2	2,363	65.8	--	1,781	--
Vista	61	19.4	18.8	2,417	64.3	3,007	3,042	3,025
Mean	60	17.1	20.5	2,223	65.0	2,677	2,409	2,658
CV %	0.6	7.7	2.0	2.0	0.3	16.0	13.2	--
LSD 0.05	0.5	1.9	0.9	92	0.5	594	468	--

Planted May 21. Harvested Sept 23. Previous crop: potatoes. Ness Valley Irrigation Project.
[1]Days after planting.

2009 Miscellaneous Bean Variety Trial, Irrigated, Williston.

Variety	Market Class	Days to Flowering	Plant Height	100 Seed Wt.	Seeds/ Pound	Test Weight	Seed Yield		
							2008	2009	2-yr Avg.
		(DAP)[1]	(inch)	(gram)	(seeds)	(lb/bu)	(lb/a)		
Eclipse	Black	62	20.3	21.2	2,143	63.9	2,820	2,302	2,561
Jaguar	Black	58	17.9	21.2	2,137	64.1	2,319	3,013	2,666
Matterhorn	Great Northern	58	19.9	39.3	1,156	60.8	2,782	2,757	2,770
Merlot	Small Red	58	22.5	37.9	1,197	62.3	2,590	2,248	2,419
Sedona	Pink	59	22.2	40.9	1,109	61.9	2,245	1,782	2,013
T-39	Black	62	18.9	21.7	2,092	63.9	2,988	2,693	2,841
Zorro	Black	59	19.1	22.8	1,994	65.0	--	2,672	--
Mean		59	20.1	29.3	1,690	63.1	2,624	2,495	2,545
CV %		0	6.0	2.0	1.0	0.4	--	9.9	--
LSD 0.05		NS	1.8	1.3	56	0.6	--	365	--

Planted May 21. Harvested Sept 23. Previous crop: potatoes. Ness Valley Irrigation Project.
[1]Days after planting.

2009 Dry Bean Variety Trials

Variety Descriptions										
				Blight		BCMV				
Class and Cultivar	Origin	RM[1]	Plant Type[2]	Common	Halo[3]	Type	NY15[4]	Fusarium Root Rot	White Mold	Rust
PINTO										
Baja	Provita	E	V	-	-	-	-	-	-	-
Bill-Z	CSU	M	V	-	T	R	R	-	S	MR
Buster	Seminis	ME	UV	S	T	R	R	-	S	R
Croissant	CSU	L	V	-	-	-	-	-	-	-
Durango	Provita	E	V	-	-	-	-	-	-	-
GTS 900	GenTec	L	UV	S	T		-	-	A	S
GTS 903	GenTec	L	UV	-	-	-	-	-	-	-
GTS 904	GenTec	L	UV	-	-	-	-	-	-	-
Kimberly	U. Idaho	M	V	-	-	-	-	-	-	-
La Paz	Rogers	L	USV	-	-	-	-	-	-	-
Lariat	NDSU	L	USV	-	-	R	R	-	A	R
Mariah	Seminis	ME	UV	-	-	-	-	-	-	-
Maverick	NDSU	ME	V	S	T	S	S	-	A	R
Medicine Hat	Seminis	ME	UV	-	-	-	-	-	-	
Montrose	CSU	E	V	-	T	R	R	-	S	R
ND-307	NDSU	M	UV	-	-	R	R	-	-	R
Othello	USDA-Prosser	E	V	S	T	R	R	-	S	S
Pinata	Idaho Seed Bean	VE	V	-	-	R	R	-	A	-
Quincy	WSU/USDA	M	V	-	-	-	-	-	-	
Rally	GenTec	L	UV	-	-	-	-	-	A	R
Remington	Rogers	ME	UV	S	T	-	-	-	A	R
Santa Fe	MSU	M	USV	-	-	-	-	-	A	-
Shoshone	U. Idaho	ML	V	S	-	-	-	-	S	-
Sonora	Provita	E	USV	S	-	-	-	-	S	-
Stampede	NDSU	M	USV	-	-	R	R	-	A	R
Topaz	Rogers	E	V	S	T	R	R	-	S	S-MS
Topaz R	Rogers	E	V	S	-	-	-	-	S	-
Winchester	Rogers	ME	UV	VS	-	-	-	-	A	R
Windbreaker	Seminis	M	UV	-	-	-	-	-	-	-
NAVY										
Avalanche	NDSU	ME	USV	-	-	R	R	-	A	MR
CDC Whitecap	U. Sask	M	USV	S	-	-	-	-	S	R
Cirrus	Hyland	ME	USV	-	-	-	-	-	S	-
Envoy	GenTec	M	B	-	-	R	R	-	S	R
Ensign	Roger	M	USV	-	-	R	R	-	-	R
GTS-544	GenTec	M	USV	-	-	-	-	-	-	-
HMS Medalist	Provita	M	UV	-	-	-	-	-	-	-
HY 4181	Hyland	-	-	-	-	-	-	-	-	-
Lightning	U. of Guelph	M	UV	-	-	-	-	-	-	-
Mayflower	MSU	ML	USV	-	T	R	R	T	T	R
Navigator	Rogers	M	USV	-	-	R	R	-	T	R
Norstar	NDSU	ME	USV	S	T	R	R	-	T	R

2009 Dry Bean Variety Trials

Variety Descriptions										
				Blight		BCMV				
Class and Cultivar	Origin	RM[1]	Plant Type[2]	Common	Halo[3]	Type	NY15[4]	Fusarium Root Rot	White Mold	Rust
NAVY (Continued)										
Octaine	United Pulse	-	-	-	-	-	-	-	-	-
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	-	A	R
Schooner	Rogers	ML	USV	-	-	R	R	-	S	R
Seabiskit	ADM	ME	USV	-	-	-	-	-	-	-
Seahawk	MSU	ML	USV	S	-	R	R	-	T	S
Skyline	United Pulse	-	-	-	-	-	-	-	-	-
T9903	Hyland Seed	ME	USV	-	-	-	-	-	-	-
T9905	Hyland Seed	ME	USV	-	-	-	-	-	-	-
Vista	Ag. Can.	ML	USV	-	-	R	R	-	T	R
Avalanche	NDSU	ME	USV	-	-	R	R	-	A	MR
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 Bean	E	V	-	-	R	-	-	S	-
Garnet	Rogers	M	V	-	-	R	R	-	S	S
Merlot	MSU	ME	USV	S	S	R	R	T	S	R
Ryder	Rogers	M	USV	-	-	MR	-	-	-	-
UI-259	U. Idaho	M	V	-	-	-	-	-	S	S
BLACK										
Black Magic	GenTec	L	USV	S	T	R	R	T	T	R
Blackhawk	MSU	L	USV	S	T	R	R	T	T	R
Black Jack	GenTec	ML	USV	-	-	R	R	-	-	R
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	T	T	R
Jaguar	MSU	M	USV	-	-	R	R	-	T	R
Jet Black	-	L	USV	-	-	-	-	-	-	-
Loreto	Provita	M	USV	-	-	-	-	-	-	-
T-39	U. Calif.	M	USV	S	T	R	R	T	T	R
Zorro	MSU	L	USV	-	-	-	-	-	-	-
PINK										
Alberta Pink	U. Alberta	E	V	S	-	S	S	-	S	S
Flamingo	Idaho Seed Bean	E	V	-	-	-	-	-	S	S
Floyd	Rogers	ML	V	-	-	-	-	-	S	R

2009 Dry Bean Variety Trials

Variety Descriptions										
				Blight		BCMV				
Class and Cultivar	Origin	RM[1]	Plant Type[2]	Common	Halo[3]	Type	NY15[4]	Fusarium Root Rot	White Mold	Rust
PINK (Continued)										
ROG 922	Rogers	M	V	-	-	R	R	-	S	S
Rosalee	U. Sask.	E	V	S	-	-	-	-	S	S
Sedona	MSU/ARS	M	USV	S	-	R	-	R	A	MR
UI-537	U. Idaho	E	V	-	-	R	R	-	S	S
Viva	USDA-Prosser	M	V	-	-	-	-	R	S	S
LIGHT RED KIDNEY										
Blush	WSU/USDA	ML	B	-	-	-	-	-	-	-
California Early (CELRK)	U. Calif.	E	B	S	S	R	R	S	S	S
Chinook 2000	MSU	M	B	-	T	R	R	S	-	R
Foxfire	Rogers	ME	B	T	R	R	R	T	T	R
OAC Lyrik	U. of Guelph	ME	B	-	-	-	-	-	-	-
Sacramento	Agri-Sales	E	B	S	S	S	S	S	S	S
DARK RED KIDNEY										
Cabernet	Rogers	ML	B	VS	S	R	R	MR	S	R
Drake	Seminis	M	B	S	S	R	R	S	T	R
Montcalm	MSU	ML	B	TV	TV	R	R	S	T	R
Redhawk	MSU	M	B	S	T	R	R	-	T	R
WHITE KIDNEY										
Beluga	MSU	M	B	S	T	R	R	S	S	R
Lassen	Agri-Sales	E	B	S	S	R	R	S	S	R
GREAT NORTHERN										
Beryl	Rogers	M	V	S	S	-	-	-	S	-
Gemini	Provita	E	-	-	-	-	-	-	-	-
Hungerford	U. Idaho	M	V	-	-	-	-	-	-	-
Matterhorn	MSU	ME	USV	S	T	R	R	-	A	R
Orion	Provita	E	V	-	-	-	-	-	-	-
Sawtooth	U. Idaho	L	V	-	-	-	-	-	-	-
UI-465	U. Idaho	M	V	S	-	R	R	T	S	R
OTEBO										
Hime	-	ME	B	-	-	S	S	-	-	-
Fuji	MSU	E	B	-		R	R	-	-	-

Not all 2009 trial entries appear in the table due to lack of information.
[1]RM = Relative Maturity; E = Early; ME = Medium Early; M = Medium; ML = Medium Late; L = Late.
[2]V = Vine; B = Bush; UV = Upright Vine; USV = Upright Short Vine.
[3]Disease reactions based upon field observations in North Dakota. A = Avoidance; S = Susceptible; T = Tolerant; R = Resistant; MS = Moderately Susceptible; MR = Moderately Resistant.
[4]BCMV = Bean Common Mosaic Virus reaction with two strains (Type and NY15).

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