

Agricultural Demonstration of Practices and Technologies (ADOPT)

FINAL REPORT

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DEMONSTRATION OF HEIRLOOM DRY BEAN TYPES

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Demonstration of heirloom dry bean types

Lana Shaw, South East Research Farm

Final Report

Introduction

Several landraces of dry beans that were grown successfully in Redvers in 2015 were grown in a replicated trial in Redvers in 2016 and 2017. The purpose of the replicated demonstration was to determine whether these prairie landraces have some value as specialty beans. There may be domestic markets that value these beans as part of prairie history, since they have been maintained through generations by families and organizations from early settlement days and before. Dry beans were cultivated by indigenous peoples and early European settlers in Canada and the northern US well before organized breeding programs were in place. Breeding programs have focused on particular market classes, excluding much of the diversity of dry beans that was available a century ago. Many of these old landraces of beans are still available through specialty seed retailers and seed saving organizations like Seed Savers Exchange. There may be potential for small-scale production of some of these landraces for farmers markets, direct-to-consumer markets, health food stores, and bulk food retailers like Bulk Barn.

1. CDC Pintium – Early pinto bean from Crop Development Center that is suited to dryland conditions and is very early. Pinto markets are less particular about quality than many other market classes.
2. Arikara Yellow – An heirloom bean landrace registered by AAFC. Seeds were originally obtained from the Arikara tribe of North Dakota and introduced in Oscar Will's Pioneer Indian Collection of seeds (1914). Yellow-tan seeds with red-brown eye rings. Excellent for use as a baking bean. Known for drought tolerance.
3. Early Mohawk – Obtained from Heritage Harvest seed company and was originally grown by the Iroquois. It was used as a fresh-eating bean in seed catalogues since the late 1800's. It is similar to a Cranberry or Borlotti type bean with large, plump seed. Samples will be sent to bean breeders to determine whether it fits in an existing market class.
4. Soldier Bean – This large, cylindrical white bean has a distinctive dark red hilum marking that is said to look like a soldier.
5. Mennonite Triple K A – A Manitoba and Saskatchewan landrace that resembles a light red kidney bean, but with mottled red and dark red markings. It is very early.
6. Orca (Calypso type) – This plump, egg-shaped bean has two-tone black and white markings. It is sometimes called Yin Yang due to the similarity to this symbol. It has a small, established specialty market and is a very striking seed.
7. Speckled Algonquin – This bean was obtained from Heritage Harvest seed. It is an indigenous bean from the Algonquin people in Quebec. It resembles a Cranberry or Borlotti bean but may not be suitable for that market class. It is considerably later than the other beans in the trial.

8. Jacob's Cattle AKA Trout Bean – This Maritimes bean type was once common in baked beans in New England and the Maritimes. It has bicolor maroon and white coloring with maroon speckles and a cylindrical shape.
9. Minnesota 1940's - The seed is dark brown and white bicolor with medium seed size. This was the smallest bean type in the trial. It fits no established market, but is an attractive seed that was first collected in Minnesota in the 1940's.

These beans were chosen based on seed availability, some success with production in 2015 at Redvers, and reasonable maturity.

Materials and Methods

2016

The trial was seeded May 28 using the cone seeder on the home quarter at SERF on loam soil. The area was treated with Edge and harrowed prior to seeding. Seed number per plot was consistent between varieties at 180 seeds per plot, which works out to about 4 seeds per square foot. Seed was inoculated using a garden bean rhizobial inoculant from Vesey's, since there is limited inoculant available for dry beans. Nitrogen was broadcast and P was banded at seeding. The trial was sprayed on June 28 with Viper to control broadleaf and grassy weeds. There was a considerable amount of bacterial blight that developed through July, especially in the Jacob's Cattle, Early Mohawk, and Speckled Algonquin. Beans with partial red coloring are prone to bacterial blight. Weed control was generally good. Beans reached maturity well before the first frost and the trial was harvested by cutting plants and feeding them into the Wintersteiger combine. The trial was harvested Sept 13. Moisture was recorded within 24 hours of harvest before drying. Thousand seed weight was determined from 200 seeds of each yield sample.

2017

The trial was seeded May 27 using the cone seeder on the home quarter at SERF on loam soil. The area was harrowed prior to seeding. Seed number per plot was consistent between varieties at 4 seeds per square foot. About 20 lb/ac of P and 50 lb/ac N was applied in a band during seeding. The trial was sprayed on June 28 with Viper to control broadleaf and grassy weeds. Centurion applied June 20 and on June 26 Viper was applied. Weed control was very good. Beans reached maturity well before the first frost and the trial was direct harvested. The beans were dessicated with Reglone on Sept 6 to finish drying down plants. The trial was harvested on Sept 11. Total yields including cracked seeds were used for yield calculation. Thousand seed weight was determined from 200 whole seeds for each plot.

Taste tests were conducted by cooking each of the nine types on the stovetop from dry with salt. Each type was evaluated the next day by 12 participants in a bean cooking class. The bean cooking class at the Redvers Library was held on Jan 20 and included a demonstration of how to cook beans from dry with an Instant Pot in about 1 hour. The evaluation asked participants to rate each variety (1-5) on dry appearance, cooked appearance, and cooked taste. The event was very well received and this model could be replicated for having taste evaluations for beans and encourage use of local beans. The public does generally not realize that fresh beans cook faster than older beans and taste better.

Results – 2016 and 2017

In 2016, the trial established well. Pictures were taken of each variety during podding. In general the plants had good growing conditions and matured in a timely fashion. Speckled Algonquin was the latest variety. The harvest timing on the beans was optimized by threshing at about 15% moisture, which reduces cracking. Plant emergence was not counted due to an oversight, but was generally even and adequate. Yields were determined by cutting plants and feeding them into the combine to reduce harvest losses and limit mixing between plots.

In 2017, the trial established well. Weed control was very good. Even though there was only about 5 inches of rainfall, the beans were productive and healthy. There was a little bacterial blight in some lines. The trial got overly dry after desiccation and before yield collection. Some varieties had substantial shattering before harvest and on the cutter bar. Thousand seed weight was determined from 200 seeds of each yield sample. Yields are adjusted to 14% moisture. Most varieties were at 11% at harvest, which is lower than recommended for harvest. As such, harvested yields were less than potentially harvested yield. In 2017, yields were determined by straight combining and losses were high. The yields from 2017 better reflect yield potential.

Taste tests were done for each variety and the participants were surprised that there were some that tasted quite good only cooked with salt. The type with the overall highest rated cooked taste and texture was Minnesota 1940's.

Plant Height and pod clearance were measured or estimated at physiological maturity. Pod clearance is the estimate of the percentage of pods that would clear a cutter bar. It is a commonly used measure in beans.

Figure 1. Plant Height (cm) of beans in two replicates, 2016.

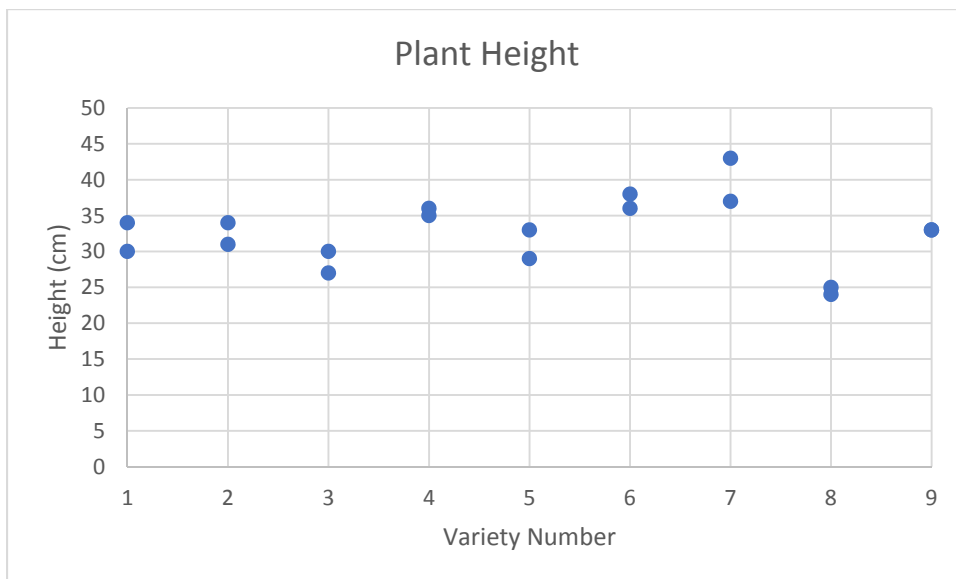
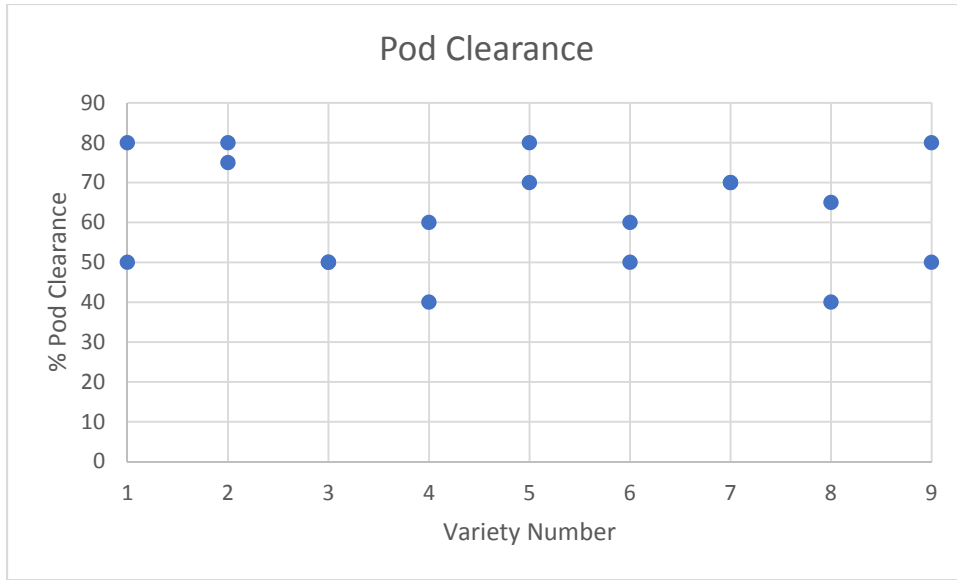


Figure 2. Pod Clearance (%) of dry bean types, 2016.



The data was analyzed a simple RCBD with three replicates using Statistix.

Table 1. Data table for 9 bean types, 2016.

	Variety	Yield lb/ac	TKW (g)	Moisture %	Days to Maturity
1	CDC Pintium	2274	396	15	89
2	Arikara Yellow	2438	381	16	91
3	Early Mohawk	1613	458	16	93
4	Soldier Bean	1666	550	17	94
5	Mennonite Triple K A	2490	382	16	90
6	Orca	1812	445	17	96
7	Speckled Algonquin	2242	383	21	99
8	Jacob's Cattle	1489	445	16	90
9	Minnesota 1940's	1984	363	16	92
	Mean	2001	423	17	93
		**	***	***	***
LSD		617.46	18.106	0.5552	4.9842

** Statistically significant factor a p<0.05

*** Statistically significant factor at p<0.01.

Table 2. 2017 results for yield, thousand seed weight (TKW), maturity, height of plant after senescence, taste rating.

	Variety	Pl/m ²	TKW (g)	Days to Maturity	Height (cm)	Yield (lb/ac)	Pod Clear (%)
1	CDC Pintium	36.0	347	90	44	2216	95
2	Arikara Yellow	52.6	365	90	43	1681	80
3	Early Mohawk	39.3	437	92	40	1582	73
4	Soldier Bean	38.7	518	98	51	1143	67
5	Mennonite TKA	38.2	339	89	42	1537	78
6	Orca	44.3	418	96	45	987	80
7	Speckled Algonquin	38.7	397	99	48	1449	83
8	Jacob's Cattle	36.5	423	90	44	772	68
9	Minnesota 1940's	31.5	325	95	51	909	87
	Mean	39.5	397	93	45	1364	79
p		ns	***	***	***	***	ns
LSD		14.6	43	4	5	362	6

** Statistically significant factor a $p < 0.05$

*** Statistically significant factor at $p < 0.01$.

Overall, the yields for the trial were good for the region. Yield of two of the heirloom varieties, Mennonite Triple KA and Speckled Algonquin, were comparable to the check variety CDC Pintium in 2016 but were quite a bit lower in 2017. The others were somewhat lower but still in an agronomically useful range, depending on marketability of the beans. Seed quality was good generally.

Eight more varieties were evaluated in 2017.

Table 4. Other agronomic comments and taste rating based on 10 evaluators.

Trt #	Comments	Taste Rating (1-poor, 5-great)	Std Error
1	Tall, upright, good pod clearance	4	0.29
2	Poor pod clearance	3.1	0.38
3	Bad blight, shattering, pod clearance poor	4.1	0.43
4	Poor pod clearance	3.85	0.33
5	Medium pod clearance	3.75	0.31
6	Medium pod clearance	4.25	0.21
7	Later, higher pod set	3.85	0.43
8	Low pod height, blight killed some plants	4.15	0.21
9	Good pod height, prone to leaning	4.7	0.43

Discussion and Conclusions

Some of these heirloom beans show promise in being early and productive. They may be useful to specialty markets and the information developed will assist potential producers. Some types like Jacob's Cattle and Soldier Bean with poor pod clearance, especially in a dry season like 2017, are not well suited to direct harvest. They may be adapted to wide-row production or intercropping production.

Yield data from 2017 is very different from 2016 due to different harvest method (manually cutting plants in 2016, direct harvest in 2017). The main reason for harvesting manually in 2016 was to ensure that there would be enough seed with good germination for planting in 2017 and extra for quality evaluation. It is difficult to do variety evaluations on dry beans and chose the best timing for harvesting when there are maturity differences between varieties. While yield results from 2017 were less useful than we would like, there was other data generated from the 2017 crop year that suggest some promising beans for specialty use. The Minnesota 1940's beans are visually attractive, did the best in the taste evaluations, and seem quite productive in spite of high harvest losses in 2017. This and the Speckled Algonquin will be discussed with the CDC bean breeder for variety registration.

Taste evaluations of dry beans has not been emphasized in variety development. Our local bean cooking event suggested that there was interest from people in learning how to cook dry beans from scratch using the Instant Pot, a new electronic pressure cooker that can cook beans from dry in one hour. The Instant Pot can be an effective way of cooking beans consistently for taste evaluations and public cooking demonstrations. There is potential for bean growers and dealers to market beans to the public based on improved taste, fast cooking time, interesting colors, and possibly using the history of some of these bean lines in marketing. Marketing beans within 18 months of harvest is a way of having some market differentiation from low-value, variable-quality dry pack dry beans on grocery shelves. It is not necessary to pre-soak beans for cooking in a pressure cooker. Canned dry beans are not generally pre-soaked. They are cooked in the can.

This trial is part of a set of projects with interesting lines of beans and intercropping dry bean trial that were initially called 'Lana's Bean Adventures' in 2015 by staff at SERF and the name has stuck. The cooking and tasting portion of this demonstration also fit well as part of this designation.

Extension

This trial was part of the SERF Annual Tour on July 20th, 2016 and July 19, 2017. The trial fell under the umbrella of 'Lana's Bean Adventures', which is how it was signed at the tour. Dale Risula talked at the SERF tour about why beans are a crop that people in southeast Saskatchewan could revisit. Results were presented at the SERF Annual General Meeting on April 11, 2017. The bean cooking and tasting learning event in Redvers was very well received and this model could be replicated for having taste evaluations for beans and encourage use of Saskatchewan beans in Saskatchewan kitchens. The public generally does not realize that fresh beans cook faster than older beans and taste better. SERF may have a bean cooking and tasting session as part of its summer events.

Abstract

Eight heirloom dry bean landraces were compared with a CDC pinto bean variety for yield and maturity in 2016 and 2017 in a small plot trial. Three replicates were grown using seed sourced from specialty seed catalogues. The Minnesota 1940's line and the Speckled Algonquin line may be of interest for commercial production. Other types might be of interest but seem less suited to narrow-row dryland production.

