SUITABILITY OF PINTO AND NAVY BEAN VARIETIES FOR DIRECT HARVEST

AN MPGA ON-FARM NETWORK® PROJECT

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Brent VanKoughnet of Agri Skills Inc. was contracted to explore the effect of two different harvest methods on multiple varieties of pinto and navy beans. Varieties and harvest methods for each project were as follows:

Pinto Bean Project

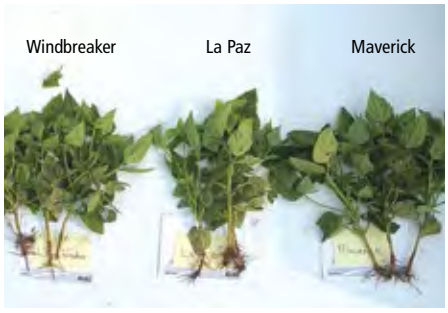
Varieties included:

- Windbreaker – *most common*
- Maverick – *common alternative*
- La Paz – *considered an upright variety*

Harvest methods included:

- Traditional undercutting and windrowing
- John Deere 9870 STS combine with 635F flex header and CWS wind bar

Each variety and harvest method comparison was replicated five times.



Pinto beans – July 17

Growing Season Observations

All pinto varieties emerged within 8–10 days with good vigour and survival rates (82–85% of the 75,000 seeds planted). Throughout the season all pinto varieties looked ideal.

Maverick and Windbreaker matured and were ready for harvest about one week prior to La Paz. In the case of this trial, all pinto varieties were more than mature. Harvest had been delayed by intermittent rain showers.

Table 1. Architecture of pinto bean plant at harvest

Variety	Plant height at harvest (inches)	Estimated % of pods below 2 inches
Windbreaker	12–16	20
La Paz	15–18	15
Maverick	10–14	25

HARVEST

Pinto bean harvest took place October 5. For each pinto variety a 35 ft (14 rows by 30 inches) by 1250 ft strip was undercut, windrowed and picked up versus direct harvested with a flex header. Cutting and windrowing took place in the morning on the same day of harvest. The pintos were harvested by a John Deere 9870 STS with a Sund pickup compared to the same combine with a 35 ft 635F flex header with a CWS wind bar.

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Pinto beans – September 12

There was considerable yield variability due to normal field variability, random weed patches and steep drains. Over five replicates it is believed that the variability affected each variety and each harvest method equitably and reflects actual field conditions most producers would experience.

Both undercut and flex header samples had very little dirt and foreign material with no significant differences to affect yield comparisons. In previous years excess dirt and foreign material has been significant.

At the time of publication detailed quality analysis on each replicate of each treatment had not yet been completed.

Table 2. Pinto bean yield summary

Variety and harvest method	Average yield of five replicates* (lbs/ac)	Average difference between harvest methods
Windbreaker *cut*	2155 a	500
Windbreaker *flex*	1655 d	
La Paz *cut*	2079 ab	197
La Paz *flex*	1882 c	
Maverick *cut*	1979 bc	412
Maverick *flex*	1567 d	
CV%	13.1	
LSD (P<0.001)	131	

*values followed by the same letter within a column are not significantly different at the 90% confidence interval

Do you know about The Bean Report Scouting Network?

The Bean Report Scouting Network is a representative sample of farmers from across the province that allows MPGA's production specialist to survey their fields throughout the summer, as well as monitor crop conditions and pest pressure.

To join the network for 2015, contact Kristen.

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Navy Bean Project

Varieties included:

- Envoy – *old standard durable at harvest*
- Vigilant – *new upright variety (North Dakota)*
- Lightning – *upright variety (Ontario)*
- T9905 – *common traditional architecture*

Harvest methods included:

- Traditional undercutting and windrowing
- Case 7230 combine with MacDon FD75-S flex draper

Each variety and harvest method comparison was replicated four times.

Growing Season Observations

Envoy, Vigilant and T9905 emerged within 9–11 days with good vigour and survival rates (81–82% of the 110,000 seeds planted). Lightning took 11–14 days with poorer survival rates (65% of planted).

Throughout the season navy varieties with the exception of Lightning looked ideal and above average. Lightning was thin and in a range of growth stages.

There were some intense patches of green foxtail and barnyard grass that escaped and were believed to have affected each variety and harvest comparison equally.

Envoys were mature 5–6 days before T9905 and Vigilant, and 10 days before Lightning. Harvest took place after waiting for Lightning to mature and a few rain shower delays.

HARVEST

Navy bean harvest took place October 5. For each variety of navy bean a 35 ft (14 rows by 30 inches) by 1250 ft strip was undercut, windrowed and picked up versus direct harvested with a flex header. Cutting and windrowing took place in the morning on the same day of harvest and harvested by a Case 7230 with a Sund pickup compared to the same combine with a 35 ft MacDon FD75-S flex draper header.

The first replicate of Vigilant and Lightning were not cut and windrowed

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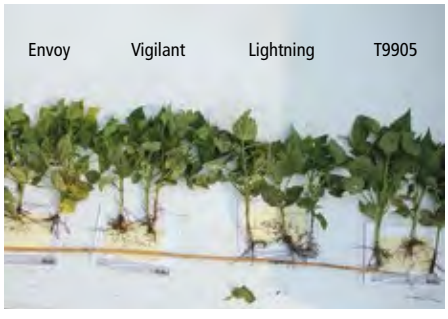
Navy beans – July 17



FIELD PREPARATION

Edge was incorporated with light duty cultivation and heavy harrows May 17. All treatments were sown into an ideal seedbed 1.5 inches deep into moisture on May 31.

Pinto varieties were sewn at 75,000 plants/acre and navy varieties at 110,000 plants/acre with a Case IH vacuum planter.

Consideration was given to rolling the field after planting. Due to the very light land, minimal crop residue from the previous year, and a concern for blowing, the field was not rolled.

OTHER FIELD OPERATIONS

Fertility: 50N-40P-15K-15S-1Zn

Herbicide: Viper June 26 and Basagran/Reflex July 7

Fungicide: Considering the challenge of multiple crop staging and timing, as well as very low disease pressure, no fungicide was applied

Pre-harvest: Glyphosate and Heat September 20

Harvest: September 27 and October 5

Table 3. Architecture of navy bean plant at harvest

Variety	Plant height at harvest (inches)	Estimated % of pods below 2 inches
Envoy	11–14	20
Vigilant	13–16	10–15
Lightning	14–18	15
T9905	12–14	15

as clean as the other varieties and/or the other replicates. A combination of tougher stalks and driving slightly off centre with the cutter, left a number of plants that looked cut but were still anchored to the ground and did not move with windrower or get picked up by the Sund pickup. It is expected that the true yield potential for Vigilant and Lightning could have been higher on the first replicate with more precise cutting.

All four varieties were between 17–18% moisture with few splits. Both undercut and flex header samples had very little dirt and foreign material with no significant differences to affect the yield comparisons.

Although more upright and easier to flex given the good pod height, Vigilant, under these harvest conditions, demonstrated considerably more pod shatter at the knife of the flex header. Many seeds did not make it onto the canvas of the draper header and into the combine. Slightly different harvest conditions may have significantly altered losses.

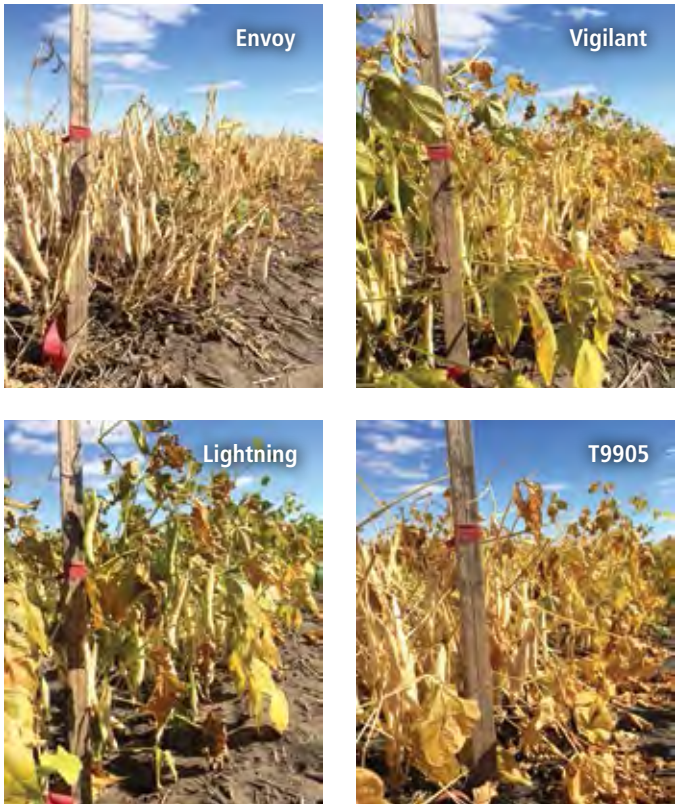
At the time of publication detailed quality analysis on each replicate of each treatment had not yet been completed.

Table 4. Navy bean yield summary

Variety and harvest method	Average yield of four replicates* (lbs/ac)	Average difference between harvest methods
Envoy *cut*	2039 a	180
Envoy *flex*	1859 b	
Vigilant *cut*	1794 bc	300
Vigilant *flex*	1494 d	
Lightning *cut*	1733 c	18
Lightning *flex*	1715 c	
T9905 *cut*	2114 a	215
T9905 *flex*	1899 b	
CV%	11.7	
LSD (P<0.001)	123	

*values followed by the same letter within a column are not significantly different at the 90% confidence interval

Navy beans – September 12



OVERALL OBSERVATIONS FOR PINTOS AND NAVIES

All pinto and navy bean varieties plants were shorter than usual due to the year's growing conditions. Bigger plants, both taller and with more plant material would likely have improved the effectiveness of the flex header treatments on all varieties.

Due to minor delays in harvest, (in this case waiting for the later varieties to mature and then rainfall delays), the plants were more mature than they would have needed to be. Harvesting earlier may have reduced losses for both harvest methods from shatter and plant shrinkage or from laying flat and becoming more difficult to get. Earlier harvest on the other hand increases the likelihood of un-threshed pods getting spit out of the back of the combine and/or affecting the quality of the sample with the odd green seed. Best practices for flexing edible beans would normally suggest taking them a little earlier than we were able to in this trial. Ideally there would be more plant material to help feed into the combine.

Cutting conditions were almost ideal. Light soil with not too much or too little moisture. With exception of the first replicate of Vigilant and Lightning where there were some cutting misses, the remaining flat areas losses were very low. In areas where there were step drains, it is understood that there will be high harvest losses with both methods of harvest. It is a relatively small percentage of the field and if not for the trial design considerations, on commercial farms double-cutting the drains or flexing the length of the drain, could be considered to limit those losses.

Warning – To try to get all of the beans, the flex headers (particularly the MacDon) put many rocks in the rock trap of the combine and many smaller rocks through the combine.

The field was as smooth as you can expect for not having been rolled. It is

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uncertain to what degree rolling would have reduced harvest losses for cutting or flexing and influenced the difference between the two. It may have also limited the number of rocks picked up.

Although there is understood to be great variability in losses from one spot to another for each treatment, Table 5 provides a summary of beans on the ground at a number of representative sites for each treatment.

On the ground plant counts generally support the weigh wagon numbers with the exception of Lightning. Given the more extreme variability of this variety it was difficult to choose representative areas that account for the variation. It is expected that Lightning had more areas with higher losses in cutting than were captured by the chosen representative sample areas. This supports the need to do actual harvested weight differences to understand the full effect. Counting beans on the ground does not always tell the whole story. See photos of ground counts.

Table 5. Ground harvest losses of pinto and navy beans

Variety and harvest method	Estimated harvest losses (lbs/ac)	Harvest losses flexing minus cutting (lbs/ac)
Windbreaker *cut*	34	
Windbreaker *flex*	564	531
La Paz *cut*	115	
La Paz *flex*	295	181
Maverick *cut*	47	
Maverick *flex*	425	379
Envoy *cut*	102	
Envoy *flex*	293	191
Vigalant *cut*	280	
Vigalant *flex*	506	225
Lightning *cut*	251	
Lightning *flex*	457	206
T9905 *cut*	128	
T9905 *flex*	372	244

GROUND HARVEST LOSSES

La Paz *cut*

La Paz *flex*

T9905 *cut*

T9905 *flex*

CONCLUSIONS

Variety matters. It is clear that varieties with plant architecture designed for direct harvesting show fewer losses than more conventional varieties.

For pintos, there was a significant yield advantage for La Paz over Windbreaker and Maverick with the flex header harvest system (Table 2). With conventional undercutting, all varieties were within 200 lbs/ac of one another. If committed to using a flex header, La Paz clearly outperformed the other varieties by minimizing harvest losses to 200 lbs/ac as compared to 400 and 500 lbs/ac with Windbreaker and Maverick.

In the case of navy beans, Envoy and T9905 had the highest yields and were not statistically different from one another with conventional undercutting (Table 4). These two varieties also had similar losses with the flex header harvest, at 180 and 215 lbs/ac for Envoy and T9905 respectively. Lightning, with the tallest plant height (Table 3), had the lowest harvest losses and yielded similarly in both harvest systems. However, overall Lightning yields were significantly lower compared to Envoy and T9905. This was likely in part due to the poor stand establishment with no obvious explanation for the poor stand. The lower plant populations and extreme stand variability at harvest resulted in yields that likely do not represent the full potential of this variety.

Being upright is not the only important harvest characteristic. The shatter losses observed with Vigilant represent a completely different harvest challenge for direct harvesting that perhaps timing or swathing may resolve.

There remains considerable interest in growing edible beans without the manpower demands of cutting and windrowing even with the current evidence of financially significant losses. Considerations for future trials may be to look at flexing slightly earlier (when there is more plant material), comparing losses with and without rolling, and comparing to swathing (when greener) and picking up.

Acknowledgements

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