EFAO 2023: Working Draft Research Protocol

Variety Trial of Easy to Pick Bush Beans

Farmer-researcher: Angie Koch, Fertile Ground Farm - West

Project type: Variety trial

Research priorities: Seed selection, production, & breeding

EFAO Contact: Rebecca Ivanoff, rebecca@efao.ca

Objective

To determine which currently commercially available green bush bean varieties are the most efficient for hand harvesting on a market garden scale at Fertile Ground when good germination is achieved.

Background

Angie would like to know which green bush bean varieties are the most efficient to harvest in her market garden system. If a clear winner emerges but doesn't necessarily fit all of her ideal criteria for other reasons, she'd be interested in pursuing a bean breeding project to develop a green bush bean with a growth habit and pod release that offers easy picking with a good yield and pods that are tender and taste good.

Angie has noticed that some varieties of green bush beans are easier to pick than others. Some varieties hold their pods accessible for quick and easy harvest while others have their pods buried within the leaf cover making them harder to find resulting in slower harvest and resulting in a higher probability of damage to flowers and immature pods. She had observed in an uncontrolled screening trial of harvest time on various varieties of green bush beans but nothing in a systematic manner or enough to be confident there is a significant difference in a varieties plant structure that impacts ease of harvest.

Angie has noticed that the variety EZ Pick tends to be about 2 times (2x) as fast to pick as other varieties she has grown. This could be due to the easy release of the pods from the plant but more so its growth habit which produces easy to pick pods high on the plants above the leaves.

To test the ease of harvest Angie and her team will plant a randomized complete block design with 2 replications at planting 1 and 2 replications at the second planting date 2-3 weeks later.

This trial will not answer the question of which variety is able to produce the most beans over a season, but only the most productive over the 2-3 weeks that beans are harvested (the usual practice at Fertile Ground). The main question is about speed of harvest, not yield per plant. As Angie writes, "If I have to plant more row feet of a bean to get my desired lbs (because its productivity is lower), but it is STILL faster to harvest the desired pounds that I need for my CSA, I actually don't care a whole lot!"

Experimental Design

Varieties

This variety trial includes 6 varieties, three of which will be planted in the field with two replicates across two succession plantings 2-3 weeks apart and three of which will be planted in just one replicate across two successions.

- The three core varieties that Angie is particularly interested in accessing will have four replicates spread out over two planting dates
- The three screening varieties that Angie just wants to see if it is worth paying attention to these varieties in the future will have only two replicates over two planting dates.
- For each of the two successions: 2 reps per each of the 3 core varieties and 1 replicate of the 3 screening varieties= 9 sections per succession

Depending on germination and the time it takes to harvest at first planting, some varieties may be cut on the second planting date.

Code	Variety	DTM	Source		Notes:
GB1	EZ Pick	~ 55	David Catzel/ BC Eco Seed Co-op	Core	Non-negotiable inclusion in this trial. Definitely much faster to harvest. Not easily found for sale
GB2	Strike	~ 53	High Mowing	Core	one of Angie's standard green bean for years would like to include this one to see how it compares (Check)
GB3	Red Tail	~ 55	High Mowing	Core	a variety Angie tried last year and liked for germination, quality & productivity, but she thinks it is more time-consuming to harvest. The plants are more flopsy, in contrast to the stiffer upright growth of EZ Pick and Strike. But they're really loaded with beans.She is very curious how they'll fare, and having some different growth habits represented is good.
GB4	Maxi	~ 50	William Dam	Screening	William Dam identifies this as easy to pick and low to get fibrous. Angie had a lot of germination issues with it last year so couldn't really get a sense of it.
GB5	Annihilator	~53	Vesey's	Screening	This variety had bad germination last year, so Angie couldn't screen it however Vesey's says "Annihilator produced the largest yields in our bush bean trials. Produces beans 5.5" long which hang high on the plant for ease of picking." Note that this variety has a PVP on it in the US.
GB6	Valentino	~53	Vesey's	Screening	New to Angie. Described as a strong performer under warm conditions. Dark green, glossy low

					fiber pods are tender and tasty. 6" pods set high on the plant.
GB7	Affirmed		Johnny's		Green. Upright compact plants 5-6" beans. Concentrated set.

Planting and Cultivation Recommendations

Plot size per variety	12 feet (with a larger gap in the row between varieties than usual) Angie and the harvester will harvest and collect data from the inner 10 feet of each replicate.
Row and bed spacing	In-row: 2"-4"; between row: 28" (2 row/bed)
Seeding dates	2-3 weeks apart for the 2 successions
Days to harvest	50-55 days from seeding
Harvesting	2 times per week (matches how Fertile Ground would usually harvest beans). Total of 4-6 harvests per succession

Field Layout

Layout with 2 replicate blocks of the 3 core varieties, with another block of the 3 screening varieties.

Note: each variety is randomly assigned to a plot in each replicate block.

Replicate block A - core			Replicate block B - core			Replicate block C (screening varieties)		
V2	V3	V1	V3	V1	V2	V4	V5	V6

Bed length →

As each bean variety is a different size and the seed plate needed to get ideal spacing for each variety is unknown, Angie will overseed in each 12 row foot row/bed. Since germination rates and plant spacing could have a significant impact on results, and because bean seeds are so variably sized, it is tricky to get consistent germination

especially when Angie introduces new varieties, she will seed heavily and then thin to 3-4 plants/ft if the seeds germinate more aggressively.

Harvesting

Two people will be designated as harvesters (Angie + 1 staff).

Since the order of the varieties is randomized differently in each of the two replicated blocks, harvesters will start at:

- the beginning of block 1 for harvest 1;
- beginning of block 2 for harvest 2;
- end of block 1 for harvest 3;
- end of block 2 for harvest 4.

The blocks will be planted in a random order but the pickers will harvest in one straight direction, just starting in different places.

Statistical model

A model will be fit and an ANOVA will be run to determine any difference among varieties in the measurement variable appropriate.

- Control for the harvester

Measurements

Harvest Speed and Weight *- quantitative*

Harvest speed will be calculated **at <u>every</u> harvest date (2x/wk)** by taking the time to harvest 10 rowfeet (the middle 10 feet of the 12 foot row). Time to harvest per plant can be calculated as a stem count will be taken for each replication. The harvest team would each clock the amount of time it takes to harvest each replicate, note the stem count (at the first harvest only), and weigh the amount of beans they have at the end of each replicate.

- Link to data collection sheet

Bean Quality & Taste*- qualitative*

The following information will be collected **weekly during the season for each replicate:**

- Notes on bean quality for taste, tenderness, fibrousness

- Beans will be tasted raw as fibrousness due being overgrown can be checked by eating them raw.
- Link to data collection sheet

Plant Habit and Pod Location- *qualitative*

The following information will be collected at **a single harvest for each planting** during the season:

- Notes on plant habits stiff vs. floppy, openness of structure, accessibility of pods
- Picture of plant habit
- Link to data collection sheet

Ease of Picking Rating and Harvestability - *qualitative*

The following information will be collected at **a single harvest for each planting** by both Angie and a designated harvester:

- Notes on how easy it was to pick the pods from the plant and if there is any damage to the plant or future production
- Notes on how easily the pods snap from the plant and how damaged were the pods while harvesting
- Rating of ease of picking and harvestability
- Link to data collection sheet

Overall performance

The following information will be collected on this sheet **once at the end of the season**:

- Farmers will rate their impression of the overall performance of each variety by giving a rating and writing some notes about the bean varieties.
- Link to data collection sheet

Photos

Please take photos of the following times/items:

- ☐ Farmer-researchers with FLRP sign
- ☑ ~~Planting~~
- ☐ Germination
- ☑ ~~Plant habit~~
- ☑ ~~Harvest actions shot~~
- ☑ ~~Tasting~~

- [x] ~~Different varietal pods beside each other~~
- [ ] Other

References

References here

Research Plan

Please note that if data is submitted after the submission deadline, EFAO staff cannot guarantee that your data will be analyzed and written up before the Research Symposium and/or the next growing season.

Time	Task	Methods & Measurements or Action Item
June	First Planting	
June-July	Observations	
July	Second Planting	
July-August	Observations	
October 31, 2023	Submit final Data	
December 31, 2023	Farmer-fee and research expense invoice with receipts for expenses	Submit invoices at this site: https://efao.ca/data/
January/February 2024	Finalize and publish research report	Work with EFAO staff to review polished research report for publication.

Staff check-ins

Easy, quick response Rebecca will text. For things requiring thought that have a 24-48 hrs leeway, use email.

Materials

Please list all materials, supplies and equipment that will be reimbursed for this project. If possible, please also indicate a short-list of any in-kind materials, supplies and equipment that you will use.

Material	Unit	Quantity Required	Total Cost*	Note
Total				

Farmer-fee

$1000 for single farm randomized and replicated (3-4 reps) trials; $500 for conducting the trial, and $500 for submitting the data on time!

Invoices for Farmer-Fees & Reimbursements

Farmer-fee

- Submit an **invoice** for your farmer-fee (email will be sent in September)
- **Deadline**: December 15, 2023

Memorandum of Understanding

Please fill out the MOU at https://airtable.com/shrc1mcIYcx5Aq6Ex