

Okra variety trial for southern Ontario and southern Québec

IN A NUTSHELL

Rav and the other farmers wanted to document the best okra varieties for production across different farms in southern Ontario and Québec. From their replicated multi-farm trial they found:

- High variability among varieties made it difficult to distinguish “best” and “worst” okra varieties
- Emerald Green performed well with respect to germination, yield, ratings, and grower preferences
- Market and CSA customers like all varieties, so go with the varieties that are best suited to your production system

MOTIVATION

Locally and ecologically grown niche crops like okra are in high demand in urban city centres, but not a lot of local farmers are growing these crops - and not a lot is known about which are the best varieties to grow for specific regions. This lack of local supply encouraged Rav Singh to start growing different varieties of okra in 2021, and in 2022 she led a variety trial to learn more about which varieties are most productive on ecological farms in southern Ontario and southern Québec.

METHODS

Five growers in southern Ontario completed the okra trial in 2022. They were joined by three growers in southern Québec who participated in cooperation with the Bauta Family Initiative on Canadian Seed Security. Three other farms began the trial but were unable to continue.

In 2022, growers compared six varieties of organic okra (**Table 1**) in a randomized and replicated trial. Each grower grew at least three common varieties (Clemson Spineless, Burgundy, Jing Orange) but could choose to grow other varieties specific to their farm. The varieties that farmers chose for this trial were both green and red, spineless and with spines, and of various shapes. All were open-pollinated so that in future years, if growers have enough isolation distance between other okra varieties, they can save their own seed. The farmers sourced varieties from local ecological seed companies. The varieties planted by each farmer can be found in **Table 2**.

Farmer-researchers planted the plants in the trial as they would normally grow okra in the field, including bed and row spacing. Each farmer received approximately 30 seeds of each variety, and sowed all of the seeds. Their goal was to get at least 20 seedlings in order to plant at least 2 replicated blocks of 3 varieties with each variety plot having at least 10 plants of the variety.

Crop management records for seeding dates, transplant dates, and varieties grown can be found in **Table 3**. Growers used either drip or overhead sprinkler irrigation and organic fertilizers as required.

PLOT LOCATION

- Growers avoided the edge of the field and the end of the bed when planting the trial
- Growers planted the trial in a homogenous area of the field and avoided areas with known soil, shade, or irrigation differences which may have affected plots
- When possible, they planted the trial in a location where the same crop was growing on either side

TRIAL ARRANGEMENT

- For each planting, growers created two replicated blocks with a plot for each of the six varieties containing 10+ okra plants each.
- Growers distributed the plots randomly either in multiple side-by-side beds or across one bed.
- Suggested spacing for growers in-row: 12"-18" and between-row: 24"-36"
- Growers used stakes to label plots and drew field maps showing the order and location of varieties.

2022



FARMER-RESEARCHERS

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Nikola Barsoum, CASSP
Demonstration Gardens at Fertile Ground
Jessica Tong, Wild Path Farm, Rashel Tremblay
Locally Germinated
Nasser Boumenna, Arlington Gardens (Québec)
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FUNDING

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The Bauta Family Initiative on Canadian Seed Security, a program of SeedChange

Table 1. Complete list of okra varieties that the growers selected to trial in 2022

CODE	VARIETY	COLOUR	DTM	SOURCE	HARVEST LENGTH INFO
OV1	Clemson Spineless	Green	56	Hawthorn Farm Organic Seed	2.5 - 3 inches
OV2	Burgundy	Red	55	Gaia Organic Seeds	6-8 inches
OV3	Jing Orange	Red	60	Hawthorn Farm Organic Seed	5-6 inches
OV4	Emerald Green	Green	55	Gaia Organic Seeds	3-4 inches
OV5	Dwarf Lee	Green	55	Gaia Organic Seeds	6-7 inches
OV6	Lady Finger	Green	53-64	Gaia Organic Seeds	2-4 inches

DATA ANALYSIS

To evaluate the effect of okra variety on germination, early season/post transplant vigour, day to first flower, first harvest and last harvest, yield, marketability, flavour and texture, and overall rating, we used an analysis of variance (ANOVA) to calculate a p-value based on the difference the farmers observed among treatments. We used a cut-off value of 0.05, meaning we wanted to have 95% confidence in any difference observed. If the p-value was less than the cut-off value, we had confidence to say the treatment produced differences. If the p-value was more than the cut-off value, we concluded there was no statistical difference. If we detected a difference among treatments, we conducted another test (i.e. a post-hoc test called the least significant difference, LSD) to determine where the differences occurred between treatments.

We could make these statistical calculations because this trial's experimental design involved replication of the treatments both on-farm and across multiple farms.

FINDINGS

GERMINATION

Seed source can affect the germination rate and performance of a variety, such that the results presented here are based on the specific varieties and seed sources trialed.

Growers recorded germination rates for each of the okra varieties at 12 and 24 days post seeding. They found a significant difference in germination among varieties for 12 days ($P=0.001$) and 24 days ($P=0.001$). Using an LSD of 15% for both 12 and 24 days post seeding as seen in **Table 4**, growers found that Clemson Spineless had the best germination and Burgundy had the worst germination out of the varieties.



Okra seedlings are transplanted in a randomized and replicated manner at Fertile Ground CSA

EARLY SEASON VIGOUR

Growers evaluated early season vigour of all varieties around a month after planting. For each replicate they ranked seedling vigour, including seedling size, health, and growth rate, on a scale from very poor (1) to very high (5). Growers found no significant difference ($P=0.52$) in early season vigour of okra among varieties in the trial (**Table 5**).

PEST AND DISEASE OBSERVATIONS

Growers made observations on both pest and disease pressures faced by each of the okra varieties (**Table 6**). They noted that the largest pest issues appeared to come from aphids, cucumber beetles, and japanese beetles. They also noted disease pressure from rust, powdery mildew, and leaf spot.

YIELD

Each week during the harvest season, growers collected yield data from each plot. Once the okra was harvested, they graded it into marketable and non-marketable pods and counted and weighed both grades. The data shows the mean total number and weight of both marketable and non-marketable okra collected over the growing season, averaged across farms.

Growers did not find a significant difference in marketable pod count ($P=0.25$), marketable weight ($P=0.39$), non-marketable pod count ($P=0.99$) or non-marketable weight ($P=0.85$) among varieties. There were no statistical differences found among varieties due to the variation among farms (**Table 7**).

MARKETABILITY, FLAVOUR AND OVERALL RATING

During the trial, growers rated each variety for marketability and flavour, and gave each an overall rating. For marketability, growers rated the ease of sale at market as follows: difficult to sell (1), average sales (3), and would sell out (5).

For flavour, growers tasted each variety of okra and rated them on a scale for general taste and bitterness as follows: poor taste and bitter (1), okay (3), and excellent taste and sweet (5). Farmers noted overall ratings on a scale for overall performance as follows: poor (1), okay (3), and excellent (5).

Growers did not find a significant difference in marketability ($P=0.92$), flavour ($P=0.28$), or overall rating ($P=0.17$) among any of the okra varieties; They found that marketability, flavour, and overall ratings were statistically similar (**Table 8**).

Table 2. Varieties grown by each farmer-researcher in 2022

FARMER	CLEMSON SPINELESS	BURGUNDY	JING ORANGE	EMERALD GREEN	DWARF LEE	LADY FINGER
RAV SINGH	x	x	x	x	x	x
ORLANDO MARTIN LOPEZ GOMEZ	x	x	x	x	x	x
NIKOLA BARSOUM	x	x	x	x	x	x
JESSICA TONG	x	x	x	x		
RASHEL TREMBLAY	x	x	x	x	x	x
NASSER BOUMENNA	x	x	x	x	x	x
PATERNE MIRINDI		x		x	x	x
HAMIDOU MAÏGA	x	x	x		x	



Burgundy (OV2) producing fruit at the Solstice at Locally Germinated



Japanese beetle damage on the okra at Fertile Ground in late August

Table 3. Crop management records

FARMER	SEEDING DATE	TRANSPLANT DATE	WEEKS BETWEEN SEEDING AND TRANSPLANT	BEGAN HARVESTING	STOPPED HARVESTING	WEEKS OF HARVESTING
RAV SINGH	April 6	May 26	7 weeks	21-Jul-22	20-Sep-22	8 weeks and 5 days
ORLANDO MARTIN LOPEZ GOMEZ	May 5	June 2	4 weeks	7-Jul-22	9-Aug-22	4 weeks and 5 days
NIKOLA BARSOUM	April 5	June 2	8 weeks	18-Jul-22	22-Sep-22	9 weeks and 3 days
JESSICA TONG	April 13	June 12	8.5 weeks	7-Aug-22	20-Sep-22	6 weeks and 2 days
RASHEL TREMBLAY	April 4	May 31	8 weeks	19-Jul-22	21-Sep-22	9 weeks and 1 day
NASSER BOUMENNA	April 25	May 30	5 weeks	26-Jul-22	13-Aug-22	2 weeks and 1 day
PATERNE MIRINDI	June 13	July 20	5 weeks			
HAMIDOU MAÏGA	May 16	June 16	4.5 weeks	27-Jul-22	14-Sep-22	7 weeks

Table 4. Mean germination rate for each variety across farms

VARIETY	GERMINATION 12 DAYS ^a	GERMINATION 24 DAYS ^a
Clemson Spineless	84% a	87% a
Burgundy	45% d	46% c
Jing Orange	57% cd	64% bc
Emerald Green	71% abc	73% ab
Dwarf Lee	58% bcd	62% bc
Lady Finger	83% ab	84% ab
LSD	15%	15%

^a - Lower case letters denote significant differences between varieties, based on a Tukey post-hoc multiple comparisons test. Varieties with the same letter are not significantly different from one another.

Growers' notes on marketability, flavour, and overall rating of each variety in the trial can be seen in **Table 9**. Growers' answers to "Would you grow this variety of okra again?" can be found in **Table 10**.

As Rav reported, "We found customers were interested in all okra — not much preference for different sizes or colours."

CONTENT AND CAVEATS

Working together with other farmers on variety trials can provide both more data from more replicates and also a sense of working together as a team. However, some of the variability seen in our data may be due to the fact that these multi-farm trials span different growing conditions across southern Ontario and Québec.

Table 5. Mean early season vigour rating for each variety across farms.

VARIETY	EARLY SEASON VIGOUR RATING
Clemson Spineless	3.23
Burgundy	3.33
Jing Orange	2.95
Emerald Green	3.55
Dwarf Lee	3.55
Lady Finger	3.94
LSD	NS
<i>NS- Not significant</i>	

NEXT STEPS

Growers will use the data collected from this research trial as baseline data as they continue to explore which varieties are best suited to southern Ontario and Québec.

Several other trial ideas around okra have blossomed through this multi-farm trial including looking at what causes germination issues, how to make okra more profitable on a small scale by companion planting or inter-cropping, and optimal seed saving techniques, with the possibility of a landrace trial.



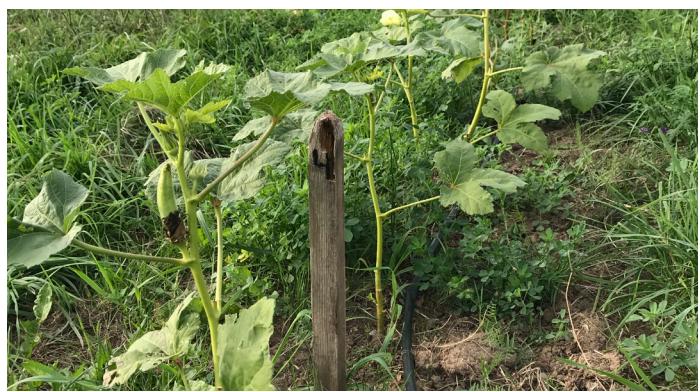
Raw and cooked taste testing of the six okra varieties at the August Demo Garden Field Day

Table 6. Pest and disease observations on varieties across farms

VARIETY	PESTS	DISEASES
Clemson Spineless	Cucumber beetle, aphids, snail, caterpillar, japanese beetle,	Powdery mildew, rust, leaf spot
Burgundy	Cucumber beetle, aphids , flea beetle, caterpillar, stink bug	Powdery mildew, rust, leaf spot
Jing Orange	Cucumber beetle, aphids, flea beetle, caterpillar, japanese beetle	Powdery mildew, leaf spot
Emerald Green	Cucumber beetle, aphids, leaf hooper, snake, flea beetle, caterpillar, japanese beetle	Powdery mildew
Dwarf Lee	Cucumber beetle, aphids, caterpillar	Powdery mildew, rust
Lady Finger	Cucumber beetle, aphids, ants, japanese beetle, caterpillar	Powdery mildew, rust



Okra Varieties on display at Rav Singh's market table



Okra Replicates at Wild Path Farm in September

Table 7. Mean total marketable and non-marketable pod count and weight for each variety across farms

VARIETY	MARKETABLE POD COUNT	MARKETABLE POD WEIGHT (G)	NON-MARKETABLE POD COUNT	NON-MARKETABLE POD WEIGHT (G)
Clemson Spineless	52	919.8	13	563.5
Burgundy	32	417.5	11	753.3
Jing Orange	48	643.0	12	444.4
Emerald Green	60	741.8	14	1091.1
Dwarf Lee	64	840.8	16	785.0
Lady Finger	67	989.3	13	521.5
LSD	NS	NS	NS	NS

NS- Not significant

Table 8. Mean marketability, flavour, and overall rating for each variety across farms

VARIETY	MARKETABILITY RATING	FLAVOUR RATING	OVERALL RATING
Clemson Spineless	4.6	3.8	3.6
Burgundy	4.3	3.7	3.7
Jing Orange	4.4	3.6	3.1
Emerald Green	4.8	4.0	4.1
Dwarf Lee	4.4	4.3	4.3
Lady Finger	4.3	3.6	3.2
LSD	NS	NS	NS

NS- Not significant

Table 9. Growers' notes on marketability, flavour, and overall ranking of each variety in the trial

VARIETY	NJB	JT	RT	PM	HM
Clemson Spineless	One of the highest producing, consistently great taste. stand out. Thick walled, large seeds, not very sweet or flavourful but not bad, produced really well- lots to offer, tasty	Impressed with the germination. Low-medium pest damage. Medium sized plants with more spindly stems. Described as "the standard, regular okra" some slime. The pods were a pretty standard size . I worry that we gave it the highest rating only because it fits the "standard" idea of what we are used to from okra, rather than being open to different ways that okra can be like.			Good production, green okra is appreciated by consumers familiar to this vegetable
Burgundy	My favourite tasting, smooth pods, beautiful, less productive. yummy, tender, slim, quick cooking, held shape, quite large and poppy seeds, would be great for slicing or cooking whole, large seeds maybe not everyone's favourite. Loved the colour	Gorgeous plants. Large, healthy looking leaves and stems. Low pest damage to the leaves. Did have significant dark spots on the leaves. Seemed to be a bit less slimy than the others, and was a bit stringy/fibrous. Intrigued by the colour and thought both red okras were beautiful.	People are interested in the red colour.	Low marketability	Good production, red okra attracts consumers not familiar with okra, who prefer Red Burgundy bc fruits are as small as green okra
Jing Orange	No complaints, good overall. Quick cooking, holds shape, quite mushy inside, less seedy, very good for recipes calling for short whole okra. Another great on taste.	The plants were small. High pest damage. Dark spotting on most leaves. Was stringy but that was probably due to the larger size of the pods when I harvested them compared to the others. If I had harvested the pods earlier when they were smaller, I feel like they would not have received this rating. They said that they would have bought either red variety just to try, since they had never tried red okra before.	Poor germination, weak plants, low producers, insect pressure. Lovely fruits that are easy to market. People are interested in the red colour.		Good production, red okra attracts consumers not familiar with okra, but they find the fruits too big (even if its not the case with Jing, consumers associate fruits too big with fibrous and woody and harvested too late. More fibrous than other varieties
Emerald Green	Fair bit of variation between pods (perhaps because of harvest size?) longer to cook, firm skin, quite mushy inside, seeds tender and small after cooking not sweet. Lots of comments on the colour.	Small to medium plants. Medium pest damage. Leaves are all quite beautiful! There were only 6 plants that lasted in this replicate to the end of the trial, so I do feel like that should be noted. Smaller sample size to draw observations from. The skin was a bit smoother? Was interesting on the tongue. But we found that one of the pods tasted a bit bitter. Intrigued by the softness of the okra skin compared to the clemson spineless. They said it didn't really make a difference in whether they would buy this variety over the other variety.		High marketability	

Table 9. Growers' notes on marketability, flavour, and overall ranking of each variety in the trial

VARIETY	NJB	JT	RT	PM	HM
Dwarf Lee	<p>Very consistent, well producing. So good! Similar to OV2 (burgundy) in many ways but less prominent seediness, great flavour, easy to cook, would work for all styles. Great pods developed well. Basic one</p> <p>Really good overall! Well in productivity and resistant to insect damage. Similar to OV1 (clemson) seeds a bit smaller and slightly thinner walls. Produced well and consistent sizing up.</p>		Lowest producers. Had more misshapen pods.	High marketability	Good production, green okra is appreciated by consumers familiar with this vegetable. similar taste to dwarf lee and clemson spineless
Lady Finger	<p>Really good overall! Well in productivity and resistant to insect damage. similar to OV1 (clemson) seeds a bit smaller and slightly thinner walls. Produced well and consistent sizing up.</p>			Good marketability	
RS-Rav Singh; NJB-Nikola Barsoum; JT-Jessica Tong; RT-Rashel Tremblay; PM-Paterne Mirindi; HM-Hamidou Maïga					

Table 10. Growers' answers to the question, "Would you grow this variety of okra again?"

VARIETY	RS	NJB	JT	RT	PM	HM
Clemson Spineless	No	Yes	Yes	Yes	-	Yes
Burgundy	Yes	Yes	Yes	Yes	Yes	Yes
Jing Orange	Yes	No	No	No	-	Yes
Emerald Green	Yes	Yes	Yes	Yes	Yes	-
Dwarf Lee	Yes	No	-	No	Yes	Yes
Lady Finger	No	Yes	-	Yes	Yes	-

RS-Rav Singh; NJB-Nikola Barsoum; JT-Jessica Tong; RT-Rashel Tremblay; PM-Paterne Mirindi; HM-Hamidou Maïga

TAKE HOME MESSAGE

Due to variability among sites it was hard for growers to distinguish between the "best" and "worst" okra varieties for production in southern Ontario and Québec. Anecdotally, Emerald Green appeared to perform well with respect to germination, yield, ratings, and grower preferences. Many growers found customers at both markets and CSAs enjoyed all varieties offered.

Noting the importance of multi-year crop trials to help growers better understand the impact that our changing climate has on our food system, Rav mentioned that "some okra varieties that I was familiar with and had grown successfully in previous years did not perform well this year."

Although each culture and community might have a preference for a different type of okra, growers found that people were happy to consume any locally grown okra available. While okra can be a very successful niche crop to sell at markets, growers noted the importance of finding companion crops when growing it on a small scale.

Finally, Rav noted the importance of growing world crops and its ability to engage BIPOC and newcomer market shoppers in conversations about climate change and food systems.