

# Iceberg lettuce variety trial

## IN A NUTSHELL

The growers' objectives were to document the best iceberg lettuce varieties for successional head production across different farms in southern Ontario; and to assess the viability of the varieties for seed production in Zone 3 in northern Ontario.

- Iceberg can be a difficult lettuce to grow and market because of the variability and inconsistencies in head development
- Due to issues with replication, no concrete recommendations can be made on which iceberg variety is best for successional head production in southern Ontario
- Two varieties that rose to the top for growers were Laibacher Eis 4 and Marius, both of which came from a co-operative organic breeding network in Germany
- Due to disease pressure, no seed was produced in Zone 3 from any of the iceberg varieties

## MOTIVATION

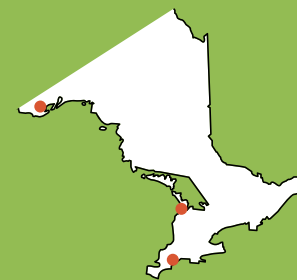
Kristine started growing iceberg lettuce for the first time in 2021 and her customers love it. She was interested in growing more and finding a variety that is flavourful and produces enough to meet her local market's demand. There are currently few varieties available and it doesn't seem to be grown much on a smaller scale by market gardeners for direct market sales.

The objectives of this research were: (1) To identify the most productive and best tasting varieties of iceberg lettuce across different farms in southern Ontario during the 2022 growing season (Kristine, Sarah); and (2) to determine which varieties of iceberg lettuce could produce seed in Zone 3 in northern Ontario (Evalisa).



Iceberg lettuce varieties from the spring planting at Meadow Lynn Market Garden on June 14, 2022

2022



## FARMER-RESEARCHERS

Kristine Hammel, Persephone Market Garden  
Sarah Judd, Meadow Lynn Market Garden  
Evalisa McIlfaterick, Root Cellar Gardens

## FUNDING

Brian and Joannah Lawson Family Foundation  
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## METHODS

The iceberg lettuce variety trial included six organic varieties, as outlined in **Table 1**. Kristine and Sarah collected data for iceberg lettuce planted at two planting dates, at the start (late April) and middle (early July) of the growing season. Kristine had planned to do a third fall planting (mid-August) but an extended dry spell and high temperatures in the greenhouse resulted in a crop failure. To assess the possibility of seed production in Zone 3, Evalisa planted only one planting in the spring.

The farmers grew iceberg as they would normally in the field, including bed and row spacing, with suggested practices outlined in **Table 2**.

## 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 spot which had the same crop on either side.

## TRIAL ARRANGEMENT

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

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

CODE	VARIETY	COLOUR	DTM	SOURCE	ANY INTELLECTUAL PROPERTY ON THIS VARIETY?
LV1	Saladin	green	~62	High Mowing	unknown
LV2	Lava Dome	red stripes /splashes	~60	Wild Garden	OSSI pledged
LV3	Laibacher Eis 4	green with red edge	~60	Bingenheimer	open source
LV4	Marius	green	~60	Bingenheimer	open source
LV5	Guildestern	golden green	~60	Wild Garden	OSSI pledged
LV6	Head Cardinal	red	~60	Wild Garden	unknown

## DATA ANALYSIS

To evaluate the effect of iceberg lettuce variety on germination, flavour, and overall rating we used an analysis of variance (ANOVA) to calculate a p-value based on the difference we observed among treatments. We used a cut-off value of 0.05, meaning we wanted to have 95% confidence in any difference we 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.

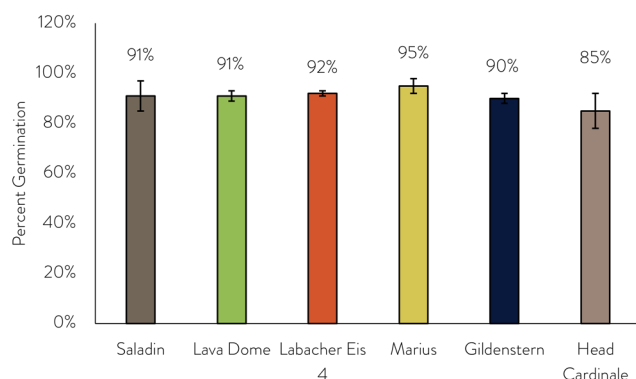
Growers could make these statistical calculations because this trial's experimental design involved replication of the treatments both on-farm and across several farms.

## FINDINGS

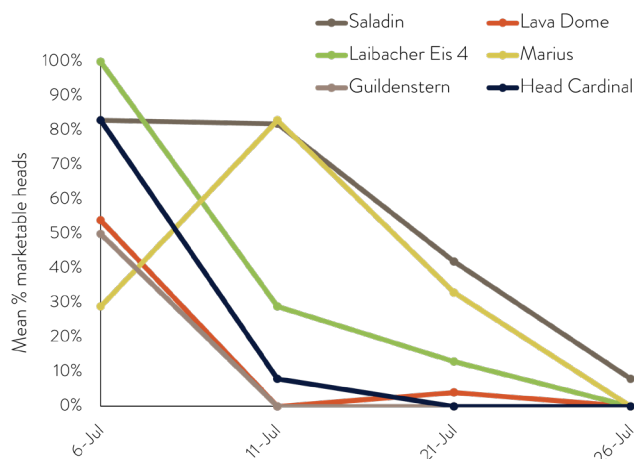
### GERMINATION

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 iceberg varieties. They found no significant difference in germination among varieties ( $P=0.7$ ) as seen in **Figure 1**.



**Figure 1.** Mean (±SE) percent germination for the spring planting across farms. No significant difference was found among any of the varieties.



**Figure 2.** Sarah's observation on mean percent total marketable iceberg heads in her spring planting over four assessment dates from July 6th to July 26th.

### PLANT HEALTH OBSERVATIONS

Growers made observations on plant health, gathering information on both pest and disease pressures for each of the iceberg varieties. They noted that some common pest issues arose from whiteflies, slugs, and cutworms, although none of these pests had a large effect on the marketability of iceberg heads. They also noted that they saw disease pressure from rust, soft rot, and other diseases that caused browning in the head.

### YIELD OBSERVATIONS

Due to the different needs of growers affecting how they collected data, we were unable to perform a statistical analysis on the marketable and non-marketable yields for iceberg.

**Table 3** and **Figure 2** show grower observations on yield and harvest window but because of lack of replication for each measurement we can't draw significant conclusions from these observations.

### SEED PRODUCTION OBSERVATIONS

No varieties of iceberg produced seed for Evalisa in Zone 3 this year due to disease pressure and soft rot. Observations on maturity and bolting are shown in **Table 4**.

Evalisa started to notice a small amount of leaf browning as the lettuce was starting to form heads; loose heads formed and things looked beautiful except for an odd head here and there. Before things could fully mature, however, most of the heads were decimated by disease, except the Saladin variety.

**Table 2.** Suggested cultivation and plant practices for iceberg lettuce variety trial 2022

<b>PLOT SIZE PER VARIETY</b>	12+ plants per variety section, 2 replications = 24+ plants total for each planting date, 3 planting dates (spring, summer, fall) = 72 plants total
<b>ROW AND BED SPACING</b>	In-row: 12"-16"; between row: 12"-18"
<b>SEEDING DATE</b>	Your main spring, summer and fall successions, aiming for around spring: Late March; summer: Early June ; and fall: Mid-July
<b>TRANSPLANTING DATES</b>	All farmers will transplant when acceptable in their regions, aiming for spring: Late April ; summer: Early July ; and fall: Mid-August
<b>DAYS TO HARVEST</b>	62+ days from transplant
<b>HARVESTING</b>	Harvest full grown mature heads



Saladin variety forming the classic iceberg head



Lava Dome variety not forming heads

**Table 3.** Kristine's observation on mean percent total marketable and non marketable iceberg heads in her spring and summer plantings

VARIETY	SPRING PLANTING		SUMMER PLANTING	
	MARKETABLE HEADS	NON-MARKETABLE HEADS	MARKETABLE HEADS	NON-MARKETABLE HEADS
Saladin	96%	4%	88%	13%
Lava Dome	56%	44%	91%	9%
Laibacher Eis 4	39%	61%	75%	25%
Marius	77%	23%	88%	13%
Guildenstern	0%	100%	0% <sup>a</sup>	100%
Head Cardinal	67%	33%	100%	0%

<sup>a</sup> -These heads were non-marketable as iceberg but Kristine sold them as (non-iceberg) lettuce.

**Table 4.** Evalisa observation on maturity and bolting for seed production in Zone 3

VARIETY	50% MATURE	FIRST BOLT	100% BOLTED
Saladin	July 24	NA	NA
Lava Dome	NA	August 1	August 8
Laibacher Eis 4	July 24	August 1	August 8
Marius	July 24	August 22	August 22
Guildenstern	NA	July 14	August 8
Head Cardinal	NA	July 20	NA



Iceberg seedlings at Root Cellar Gardens on May 5, 2022



## FLAVOUR AND OVERALL RATING

Growers rated each variety for flavour and overall rating. For flavour, growers tasted each variety of iceberg 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). Overall ratings were also taken but on a scale for overall performance as follows: poor (1), okay (3), and excellent (5).

The growers did not find a significant difference in flavour ( $P=0.17$ ) or overall rating ( $P=0.14$ ) among any of the iceberg varieties (**Table 5**).

**Table 6** and **Table 7** show the grower notes on flavour and overall performance and the answer to the question “Would you grow this variety of iceberg lettuce again?” respectively. Two varieties of iceberg that all growers would grow again are Laibacher Eis 4 and Marius.

*“Quite variable head formations, size, quality, and disease, not consistent enough for large scale production, very disappointed in the overall variability and DTM of Head Cardinal which bolted at least 2 weeks before other varieties. Head Cardinal formed beautiful heads but did not shape-up as iceberg.” - Sarah*

## CONTEXT & CAVEATS

*“Overall I was really disappointed with this trial. I thought that perhaps the second planting would have been better, but it was quite discouraging. I have really enjoyed the lettuce trials in the past years -- icebergs just don’t seem to grow well for me, which has also been my experience in previous years and one of the reasons why we stopped growing them a number of years ago. I thought that perhaps with some new varieties I would find one that I enjoyed, but the overall consistency of the head formation was not worth it for our situation...” -Sarah*

## NEXT STEPS

Kristine will continue to grow iceberg varieties for her customers; she noted it was interesting that varieties bred by the organic breeding network in Germany (Bingenheimer) rose to the top as a favourite among growers. There is a need for regionally-bred and adapted seed for ecological growers here in Ontario and looking into the Bingenheimer model for inspiration on a cooperative model here in Ontario is at the top of Kristine’s list of next steps.

As for next steps for iceberg seed production in Zone 3, Evalisa is going to ask around about what, if any, iceberg varieties folks in comparable climates are growing for seed before she tries to plant anything else.

Although Sarah will not be growing any of the varieties again in the foreseeable future she noted the great beauty and flavour of some of these varieties and may add them to her lettuce production — but not to be marketed as icebergs.

**Table 5.** Mean flavour and overall rating for each variety across farms

VARIETY	FLAVOUR RATING	OVERALL RATING
Saladin	3.7	2.6
Lava Dome	3.1	1.2
Laibacher Eis 4	3.9	2.8
Marius	3.7	3.4
Guildenstern	2.5	2.0
Head Cardinal	2.4	1.8
<b>LSD</b>	<b>NS</b>	<b>NS</b>
<i>NS- Not significant</i>		



**a)** Lettuce with outside leaves turning brown (Saladin); and **b)** the Saladin showing signs of rot.

**Table 6.** Growers notes on flavour and overall ranking of each variety in the trial

VARIETY	KH	SJ	EM
SALADIN	Crunchy, very consistent, classic iceberg	Crisp, sweet, juicy	Boring. Hint of bitter, hint of sweet but not really a 'flavour'. Good texture.
LAVA DOME	-	Good flavour, not as mild as I expected. Beautiful but not iceberg, no heads!	Similar to Head Cardinale in taste, almost bland, not quite as tender
LAIBACHER EIS 4	Crunchy, pretty pinkish ruffles	Good flavour, sweet juicy	Mild, not bitter at all, juicy, not tough.
MARIUS	Slightly bitter, crunchy, consistent, classic iceberg	Very sweet, crunchy, excellent	Sweet! Little tiny bit bitter, great crunchy texture, a lovely lettuce.
GULDENSTERN	-	Small, no iceberg head stunted, very small, not very marketable	Bitter but pleasantly, the aftertaste is even more bitter. Like texture, crisp and not tough. Would be happy to have this lettuce in a salad.
HEAD CARDINAL	Very good, crunchy, big, attractive with red/green leaves	Gorgeous, uniform colour and low disease, no heads, no heads! Beautiful nice size	Sweet and bitter, chewier, bitter aftertaste, prettier.

KH-Kristine Hammel; SJ-Sarah Judd; EM-Evalisa McIlffaterick

**Table 7.** Growers were asked "Would you grow this variety of iceberg lettuce again?"

VARIETY	KH	SJ	EM
SALADIN	Yes	No	No
LAVA DOME	No	No	No
LAIBACHER EIS 4	Yes	Yes	Yes
MARIUS	Yes	Yes	Yes
GULDENSTERN	No	No	No
HEAD CARDINAL	Yes	No	Yes

KH-Kristine Hammel; SJ-Sarah Judd; EM-Evalisa McIlffaterick



Marius heading nicely; one of the growers' favorites.

## TAKE HOME MESSAGE

Iceberg can be a difficult lettuce to grow and market due to the variability and inconsistency in head development. Although the growers might not market the lettuce as iceberg when growing again, Laibacher Eis 4 and Marius rose to the top in terms of having unanimous approval from growers on flavour and appearance.