

Trial Report Brief: Heat-Tolerant Lettuce 2023

Executive summary: 2023 is the first year of CANOVI’s heat-tolerant lettuce variety trials on farms across Canada. The average of national data (n = 52) indicated that “Magenta” was rated significantly higher for bolt resistance, yield, marketability, appearance, flavor, and overall performance. Participants voted “Magenta”, “Sangria”, and “Biscia Rossa” most highly as the varieties they would grow again. While these results are promising, we aim to conduct more multi-year, on-farm trials that can provide more robust insight on how these varieties perform in the age of ever-changing climate conditions, especially extreme heat or rainy weather that can cause lettuce to bolt prematurely.



Background: Leafy greens are a critical part of smaller scale market garden systems, with participants consistently ranking leafy greens as a high priority crop in need of breeding improvement.

Considering the challenges of climate change and increasing summer temperatures, this trial aims to evaluate lettuce varieties sourced from open-pollinated (OP) and regionally grown seeds for their ability to perform in the middle of the summer, specifically their tolerance to premature bolting and their ability to maintain other desirable qualities.

Varieties: We chose 12 lettuce varieties across three market classes of lettuce with the least number of heat-tolerant varieties: Batavian (Summer Crisp), Butterhead, and Oak Leaf. All the varieties that we selected were OP varieties. Seeds of all varieties were grown in Canada, except “Gentilina,” which was grown in New York State within the same bioregion of southern Ontario and Quebec.

Results: Variety had a significant impact on all agronomic traits except uniformity, according to ANOVA statistical analysis. “Magenta” had the most and highest significantly different ratings for bolt resistance, yield, marketability, appearance, flavor, and overall performance (Table 1).

Participants voted “Magenta” (82%), “Sangria” (78%), and “Biscia Rossa” (71%) most highly as the varieties they would grow again.

Table 1. Average rating for agronomic traits across lettuce varieties.

Market Class	Variety	Germination ***	Vigor ***	Bolt Resistance **	Uniformity -	Yield *	Marketability *	Appearance ***	Flavor ***	Overall *
Batavian	Cardinale	3.68	3.95	4.00	3.86	3.71	3.58	4.15	3.44	3.51
	Cougar	3.20	3.56	3.72	3.43	3.35	3.35	3.83	3.45	3.55
	Gentilina	4.15	3.74	3.39	3.65	3.72	3.16	3.74	3.32	3.06
	Magenta	3.24	3.94	4.37	3.88	3.85	3.84	4.21	3.95	3.75
Butterhead	Buttercrunch Bibb	3.92	3.06	4.11	3.41	2.96	2.72	3.19	3.79	2.88
	Butter King	2.06	3.03	4.06	3.42	3.19	3.18	3.56	3.50	3.00
	Grosse Blonde Paresuuese	3.95	4.00	3.95	3.97	3.71	3.29	3.82	2.97	3.20
	Sangria	3.52	3.35	4.40	3.53	3.35	3.23	3.83	3.72	3.44
Oak Leaf	Bronze Beauty Arrowhead	3.56	3.75	3.90	3.95	3.60	3.61	3.87	3.43	3.64
	Biscia Rossa	3.00	3.71	3.61	3.91	3.63	3.62	3.61	3.75	3.46
	Red Oak Leaf Alberta	3.18	2.77	3.18	3.40	2.68	2.86	3.24	2.87	2.62
	Red Oak Leaf Quebec	3.15	3.04	3.96	3.51	2.94	3.14	3.57	2.90	3.06

1. The asterisks indicate the significant level of the impact of Variety; *** p<0.001, ** p<0.01, * p<0.05, - Not significant.

2. Darker green color = higher score; Bold number in red indicates the highest score among the 12 varieties (multiple highlighted scores in the same column means they have no statistical difference).

Takeaways and next steps: “Magenta” and “Sangria” were the strongest performing varieties across agronomic traits including bolt resistance, while “Red Oak Leaf Alberta” and “Red Oak Leaf Quebec” were the poorest performing varieties.

Despite this, **we encourage participants to access SeedLinked to review which lettuce varieties worked best in their specific regional climate and farming systems**, with national data also available to act as a point of comparison as needed. In the future, we will conduct more on-farm trials to build multi-year data on how lettuce varieties perform under ever-changing climate conditions that encourage premature bolting, like extreme heat or rain.

More results can be found in full report below

Participant Locations

This study included 76 participants across Canada (Figure 1) with 52 completing the trial (68.4% completion). The University of British Columbia (UBC) Organic Farm acted as the “mother site” of this trial, as researchers there sowed triplicate plots of each variety for observation.

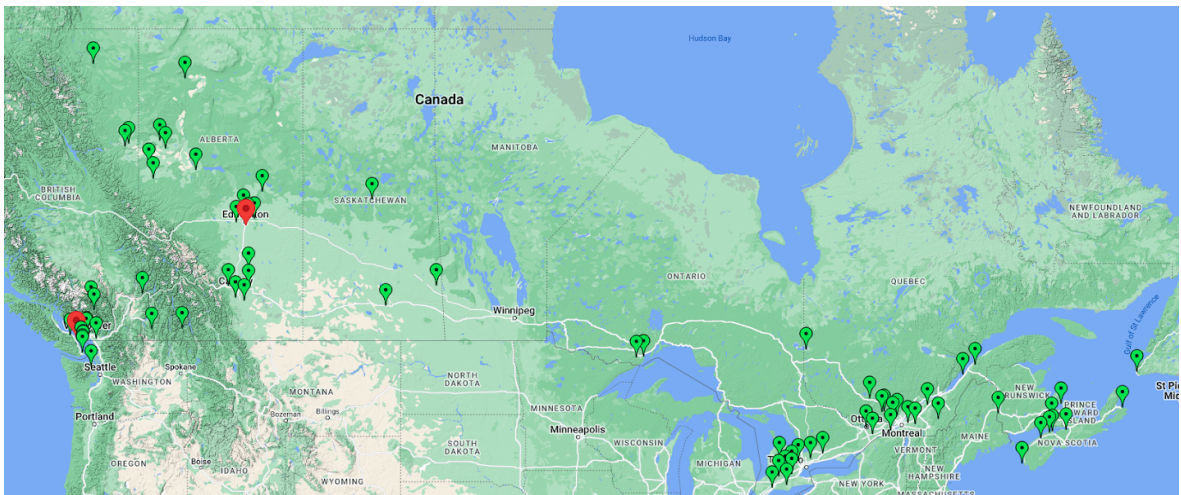


Figure 1. Geographical spread of CANOVI lettuce participants across Canada.

Lettuce Varieties

Table 2 shows the full list of the lettuce varieties we selected for this study and their agronomic and breeding history.

Table 2. Overview of the agronomic and breeding history of the lettuce varieties included in this study.

Market Class	Cultivar	DTM	Breeder	Seed Grower
Batavian	Cardinale	60	French Heirloom brought back to popularity by Frank Morton of Wild Garden Seeds	Annapolis Seeds, NS
	Cougar	55	Frank Morton of Wild Garden Seed, an OSSA variety	Hawthorn Farm Organic Seeds, ON
	Gentilina	48	Heirloom adapted by Fruition	Fruition Seeds, NY, USA
	Magenta	50	No records on the breeding history but well documented online to be heat tolerant	Saanich Organics, BC
Butterhead	Buttercrunch Bibb	50	George Raleigh at Cornell University and an All-America Selection winner in 1963.	Jardin de l'Écoumène, QC
	Butter King	60	AAFC in Ottawa in 1965	Yonder Hill Farm, NS
	Grosse Blonde Paressuèse	55	Vilmorin, a French seed company, in the 1800's	Jardin de l'Écoumène, QC

	Sangria	55	Bred from “Mereville des Quatre Saisons” by Vilmorn in 1989, the PVP expired in 2009	Salt Spring Seeds, BC
Oak Leaf	Bronze Beauty Arrowhead Oakleaf	46	Introduced by the Germania Seed & Plant Co. in the 1940s	Sage Garden, MB
	Biscia Rossa	50	Italian heirloom, dates back to at least 1977	La Société des plantes, QC
	Red Oak Leaf Alberta	60	Heirloom, breeder unknown	Wild Rose Heritage Seed Company, AB
	Red Oak Leaf Quebec	45	Heirloom, breeder unknown, dates back to the 1770s	Ferme Tournesol, QC

Planting

We asked participants to plant a minimum of 10 plants at approximately 8-12" spacing. In all regions, we recommended seeding in mid-May to early June for transplanting just after the summer solstice (June 21). Using these planting dates, varieties with 50-60 days to maturity are ready for harvest in mid-August. Participants used their usual organic methods for soil fertility and weed management.

Evaluation

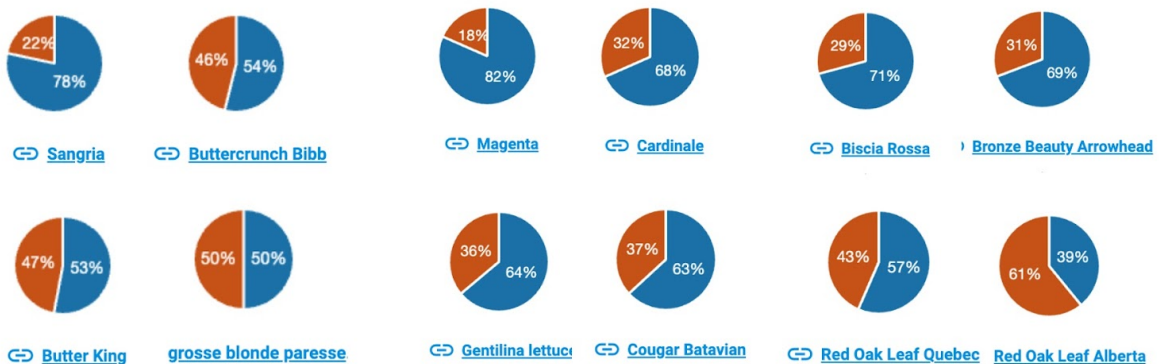
Participants evaluated varieties using the desktop or mobile [SeedLinked app](#) for vigor, germination, bolt resistance, uniformity, yield, marketability, appearance, flavour, and overall performance on a scale of 1 (low) to 5 (high). We provided a rubric that defined the rating scale for each trait. Further planting and evaluation details are available in the [2023 Lettuce Trial Protocol](#).

Analysis

Evaluation summaries were available on the SeedLinked website immediately after trial closure. In addition, CANOVI researchers performed statistical analysis and presented results in this trial report.

Would you grow this again?

We asked participants which lettuce varieties they would grow again, with a summary of results available in Figure 2. Overall, participants most commonly voted “Magenta” (82%), “Sangria” (78%), and “Biscia Rossa” (71%) as the varieties they would grow again.



Butterhead

Batavian (Summer Crisp)

Oak Leaf

Figure 2. Percentage of participants who voted to grow a lettuce variety again, split up by marketclass. Red depicts the percentage of participants who would **not** grow a variety again, while blue depicts that percentage of participants who would grow a variety again.

In the butterhead market class, 78% of participants voted that they would grow “Sangria” again, while less than 60% of participants voted to grow other varieties in this market class again. In the Batavian (summer crisp) market class, at least 60% of participants voted to grow all the varieties again, with the variety “Magenta” having the highest votes at 82%. In the oak leaf market class, at least 60% of participants voted to grow “Biscia Rossa” and “Bronze Beauty Arrowhead” again. The lowest rated variety across varieties and market classes was “Red Oak Leaf Alberta” with only 39% of participants voting to grow it again.

Distribution of “Overall Performance” Rating by Varieties

We asked all participants to rate the overall performance of a variety from 1-5 (low - high). Figure 3 depicts the ratings for overall variety performance. Varieties with data points distributed in the 3-5 range, like “Cardinale”, “Gentilina”, “Magenta”, “Sangria”, and “Bronze Beauty” indicate good agronomic performance and marketability across farms. Varieties with widely distributed data points in the 1-5 range, like “Buttercrunch Bibb”, “Grosse Blonde Paresseuse”, “Red Oak Leaf Alberta”, and “Red Oak Leaf Quebec,” show variable agronomic performance and marketability across farms.

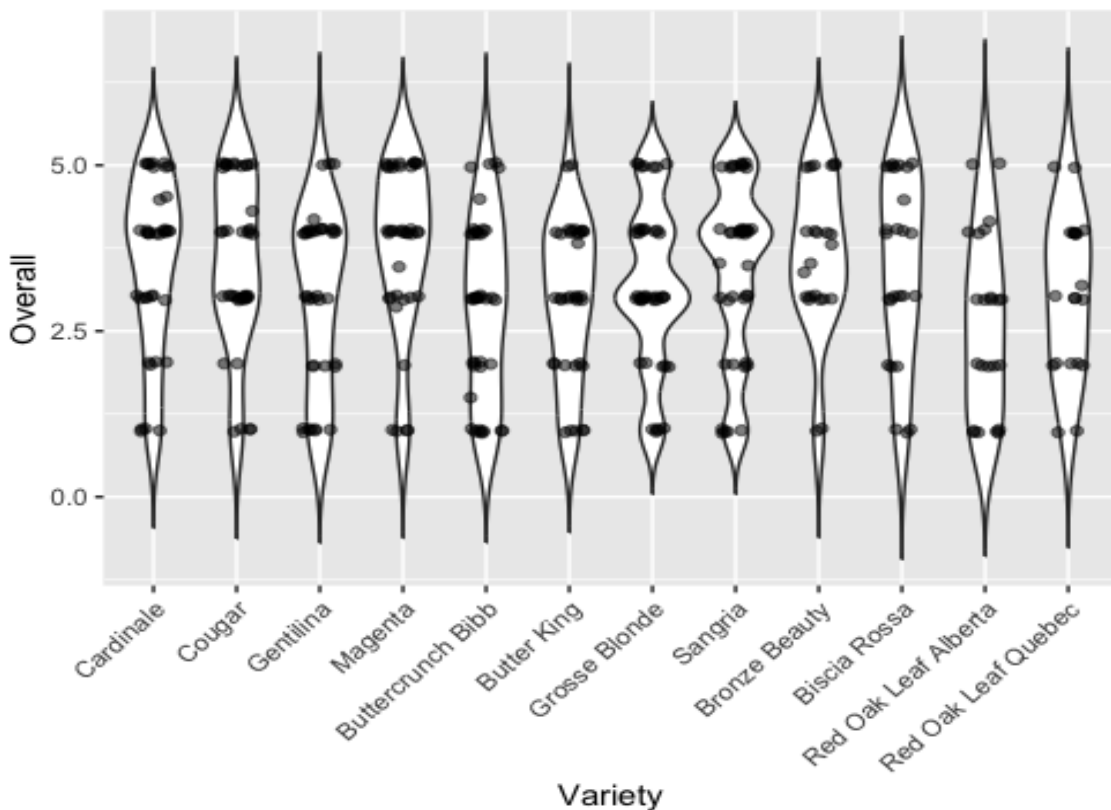


Figure 3. Distribution of overall performance ratings (1-5) of lettuce varieties across participants. Dots on the bars represent individual ratings.

Effect of Variety, Market Class, and Hardiness Zone on Agronomic Traits

When analyzing the effect of variety and hardiness zone on agronomic traits, variety had a significant effect on all agronomic traits except uniformity, and hardiness zone had a significant effect on all agronomic traits except germination. Despite these significant effects, the interaction between these factors did not produce a significant effect for any agronomic traits (Table 3A).

When analyzing the effect of market class and hardiness zone on agronomic traits, market class had a significant effect on vigor, bolt resistance, yield, and appearance, while hardiness zone had a significant effect on vigor, bolt resistance, and yield. There were no significant interactions between these factors for any agronomic traits (Table 3B).

Table 3. Summary of ANOVA analyses on the effect of market class, variety, and hardiness zone on agronomic performance across lettuce varieties. Significant level: p-value <0.01**, p-value < 0.05 * A. ANOVA analysis results for the effect of variety, hardiness zone, and their interaction. B. ANOVA analysis results for the effect of market class, hardiness zone, and their interaction.

A

	Germination	Vigor	Bolt Resistance	Uniformity	Yield	Marketability	Appearance	Flavor	Overall
Variety	***	***	***	-	*	*	***	***	*
Hardiness Zone	-	***	***	***	***	***	***	***	***
Variety x Zone	-	-	-	-	-	-	-	-	-

B

	Germination	Vigor	Bolt Resistance	Uniformity	Yield	Marketability	Appearance	Flavor	Overall
Market class	-	**	**	-	*	-	**	-	-
Hardiness Zone	-	*	***	-	***	-	-	-	-
Market class x Zone	-	-	-	-	-	-	-	-	-

When comparing the performance of individual varieties to each other, there were significant differences between varieties across agronomic traits (Table 4). “Magenta” performed significantly better than other varieties for bolt resistance, yield, marketability, appearance, flavour, bolt resistance, and overall performance. Although not as top performing as “Magenta,” the lettuce varieties, “Grosse Blonde Paresseuse”, “Biscia Rossa”, and “Bronze Beauty Arrowhead”, were consistently rated in the top three performing varieties for various agronomic traits. “Red Leaf Alberta”, “Red Leaf Quebec”, and “Butter King” were and consistently rated the lowest three performing varieties for various agronomic traits. While we found “Buttercrunch Bibb” to be rated among the highest for germination, bolt resistance, and flavour, it also ranked the lowest for uniformity, yield, appearance, and in its overall performance.

Table 4. Summary of Fisher's LSD multiple pairwise comparisons for average agronomic trait ratings across lettuce varieties. Varieties are sorted by highest to lowest ratings for each agronomic trait. Varieties that have letters that differ from each other indicate significant differences.

	Germination			Vigor			Bolt Resistance	
Gentilina	4.15	a	Grosse Blonde Paresuuese	4.00	a	Sangria	4.40	a
Grosse Blonde Paresuuese	3.95	ab	Cardinale	3.95	a	Magenta	4.37	a
Buttercrunch Bibb	3.92	ab	Magenta	3.94	a	Buttercrunch Bibb	4.11	ab
Cardinale	3.68	abc	Bronze Beauty Arrowhead	3.75	ab	Butter King	4.06	ab
Bronze Beauty Arrowhead	3.56	abcd	Gentilina	3.74	ab	Cardinale	4.00	ab
Sangria	3.52	bcd	Biscia Rossa	3.71	ab	Red Oak Leaf Quebec	3.96	abc
Magenta	3.24	cd	Cougar	3.56	abc	Grosse Blonde Paresuuese	3.95	abc
Cougar	3.20	cd	Sangria	3.35	bcd	Bronze Beauty Arrowhead	3.90	abc
Red Oak Leaf Alberta	3.18	cd	Buttercrunch Bibb	3.06	cd	Cougar	3.72	bcd
Red Oak Leaf Quebec	3.15	cd	Red Oak Leaf Quebec	3.04	cd	Biscia Rossa	3.61	bcd
Biscia Rossa	3.00	d	Butter King	3.03	d	Gentilina lettuce	3.39	cd
Butter King	2.06	e	Red Oak Leaf Alberta	2.77	d	Red Oak Leaf Alberta	3.18	d

	Uniformity			Yield			Marketability	
Grosse Blonde Paresuuese	3.97	a	Magenta	3.85	a	Magenta	3.84	a
Bronze Beauty Arrowhead	3.95	ab	Gentilina	3.72	ab	Biscia Rossa	3.62	ab
Biscia Rossa	3.91	ab	Grosse Blonde Paresuuese	3.71	ab	Bronze Beauty Arrowhead	3.61	ab
Magenta	3.88	ab	Cardinale	3.71	ab	Cardinale	3.58	ab
Cardinale	3.86	ab	Biscia Rossa	3.63	abc	Cougar	3.35	ab
Gentilina lettuce	3.65	ab	Bronze Beauty Arrowhead	3.60	abc	Grosse Blonde Paresuuese	3.29	abc
Sangria	3.53	ab	Sangria	3.35	abcd	Sangria	3.23	abc
Red Oak Leaf Quebec	3.51	ab	Cougar	3.35	abcd	Butter King	3.18	bc
Cougar	3.43	b	Butter King	3.19	bcd	Gentilina	3.16	bc
Butter King	3.42	b	Buttercrunch Bibb	2.96	cd	Red Oak Leaf Quebec	3.14	bc
Buttercrunch Bibb	3.41	b	Red Oak Leaf Quebec	2.94	cd	Red Oak Leaf Alberta	2.86	bc
Red Oak Leaf Alberta	3.40	b	Red Oak Leaf Alberta	2.68	d	Buttercrunch Bibb	2.72	c

	Appearance			Flavor			Overall	
Magenta	4.21	a	Magenta	3.95	a	Magenta	3.75	a
Cardinale	4.15	ab	Buttercrunch Bibb	3.79	ab	Bronze Beauty Arrowhead	3.64	ab
Bronze Beauty Arrowhead	3.87	abc	Biscia Rossa	3.75	ab	Cougar	3.55	ab
Sangria	3.83	abc	Sangria	3.72	ab	Cardinale	3.51	ab
Cougar	3.83	abc	Butter King	3.50	ab	Biscia Rossa	3.46	abc
Grosse Blonde Paresuuese	3.82	abc	Cougar	3.45	abc	Sangria	3.44	abc
Gentilina	3.74	abc	Cardinale	3.44	abc	Grosse Blonde Paresuuese	3.20	abcd
Biscia Rossa	3.61	bcd	Bronze Beauty Arrowhead	3.43	abc	Gentilina	3.06	bcd
Red Oak Leaf Quebec	3.57	bcd	Gentilina	3.32	bc	Red Oak Leaf Quebec	3.06	bcd
Butter King	3.56	cd	Grosse Blonde Paresuuese	2.97	c	Butter King	3.00	bcd
Red Oak Leaf Alberta	3.24	cd	Red Oak Leaf Quebec	2.90	c	Buttercrunch Bibb	2.88	cd
Buttercrunch Bibb	3.19	d	Red Oak Leaf Alberta	2.87	c	Red Oak Leaf Alberta	2.62	d

When comparing the performance of individual market classes to each other, there were significant differences between varieties across agronomic traits (Figure 4). Batavian had the highest ratings for germination, vigor, yield, marketability, appearance, and overall performance. Butterhead had the highest rating for bolt resistance. The three market classes were not statistically different in uniformity, flavor, and average of all ratings.

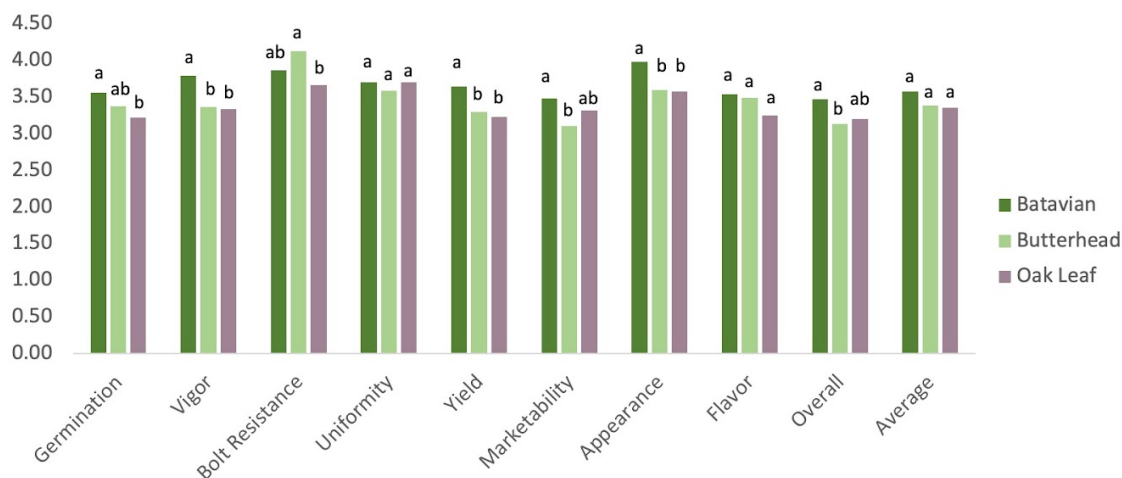


Figure 4. Average agronomic trait ratings across market classes with Fisher’s LSD multiple pairwise comparisons. Varieties that have letters that differ from each other indicate significant differences.

Mean Ratings by Variety and Hardiness Zone

Variety had a significant impact on all traits except uniformity. “Magenta” had the highest ratings for yield, marketability, appearance, flavor and overall performance (Table 5).

Table 5. Average ratings for agronomic traits across varieties.

Market Class	Variety	Germination ***	Vigor ***	Bolt Resistance **	Uniformity -	Yield *	Marketability *	Appearance ***	Flavor ***	Overall *
Batavian	Cardinale	3.68	3.95	4.00	3.86	3.71	3.58	4.15	3.44	3.51
	Cougar	3.20	3.56	3.72	3.43	3.35	3.35	3.83	3.45	3.55
	Gentilina	4.15	3.74	3.39	3.65	3.72	3.16	3.74	3.32	3.06
	Magenta	3.24	3.94	4.37	3.88	3.85	3.84	4.21	3.95	3.75
Butterhead	Buttercrunch Bibb	3.92	3.06	4.11	3.41	2.96	2.72	3.19	3.79	2.88
	Butter King	2.06	3.03	4.06	3.42	3.19	3.18	3.56	3.50	3.00
	Grosse Blonde Paresuese	3.95	4.00	3.95	3.97	3.71	3.29	3.82	2.97	3.20
	Sangria	3.52	3.35	4.40	3.53	3.35	3.23	3.83	3.72	3.44
Oak Leaf	Bronze Beauty Arrowhead	3.56	3.75	3.90	3.95	3.60	3.61	3.87	3.43	3.64
	Biscia Rossa	3.00	3.71	3.61	3.91	3.63	3.62	3.61	3.75	3.46
	Red Oak Leaf Alberta	3.18	2.77	3.18	3.40	2.68	2.86	3.24	2.87	2.62
	Red Oak Leaf Quebec	3.15	3.04	3.96	3.51	2.94	3.14	3.57	2.90	3.06

1. The asterisks indicate the significant level of the impact of Variety; *** p<0.001, ** p<0.01, * p<0.05, - Not significant.
2. Darker green color = higher score; Bold number in red indicates the highest score among the 12 varieties (multiple highlighted scores in the same column means they have no statistical difference).

Different varieties performed best in different hardiness zones (Table 6). There was no significant interaction between hardiness zone and variety, indicating variety performance does not differ significantly from zone to zone. However, there could be other environmental factors that were not included in the data analysis that could have actually affected the general performance of specific varieties on specific farms.

Table 6. Average of all agronomic traits ratings for varieties across hardiness zones.

Market Class	Variety	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 8 & 9
Batavian	Cardinale	3.79	3.85	3.84	3.78	3.17	4.22
	Cougar	3.45	3.72	3.57	3.30	3.24	3.70
	Gentilina	3.41	3.80	3.78	3.48	3.21	3.50
	Magenta	3.61	3.89	3.73	3.92	3.89	4.38
Butterhead	Buttercrunch Bibb	2.63	3.62	3.48	3.42	2.86	3.40
	Butter King	2.88	3.46	3.20	3.31	2.52	3.48
	Grosse Blonde Paresseuse	3.30	3.73	4.06	3.74	3.00	3.80
	Sangria	2.96	3.74	4.11	3.76	2.66	3.92
Oak Leaf	Bronze Beauty Arrowhead	3.17	3.55	3.79	3.70	3.64	4.35
	Biscia Rossa	3.44	3.82	3.70	3.36	3.95	3.34
	Red Oak Leaf Alberta	2.39	3.25	2.87	2.83	3.00	3.26
	Red Oak Leaf Quebec	2.89	2.95	2.98	3.54	3.39	3.44

Darker green color = higher score; Bold number in red indicates the highest score among the 12 varieties.

UBC Organic Farm Mother Site

The climatic conditions at the UBC mother site is shown in Figure 5. The temperature and precipitation is from June 16, which was transplanting day, to July 25, which was the 2nd assessment day. The temperature ranged from 11.6 - 22.5 °C over the course of the season, with most of the days having temperatures within 15 - 20 °C. Most days did not have any precipitation except a total of 0.075mm on June 18 and 19, and 0.43mm on July 24.

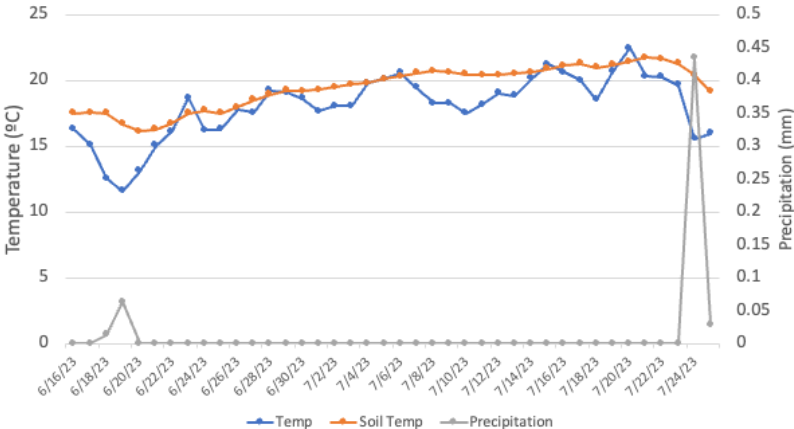


Figure 5. Temperature (°C), soil temperature (°C), and precipitation (mm) at UBC Organic Farm during the lettuce growing season.

At the UBC mother site, researchers planted three replicated plots for each variety and two assessments were conducted on July 19th and July 25th. Germination only had one assessment after planting and overall performance only had one assessment on July 25th.

Variety showed significant impact on all agronomic traits except bolt resistance. None of the varieties had bolting issues at UBC farm, which was different from the national results. The varieties in Batavian market class had best performance among all varieties, which was the same as national data results. The ratings were also higher than their ratings in the national results for those varieties. In the butterhead market class, "Butter King" had the best overall performance score at UBC, whereas "Sangria" had the best overall rating nationwide. In the oak leaf market class, "Bisca Rossa" had the highest overall performance score at UBC, while "Bronze Beauty" had the highest overall rating nationwide.

Table 7. Average ratings for agronomic traits across varieties at UBC Organic Farm. Ratings were the average of the three replicates and the two assessments.

Market Class	Variety	Germination ***	Vigor ***	Bolt Resistance -	Uniformity ***	Yield ***	Marketability ***	Appearance ***	Flavor ***	Overall ***
Batavian	Cardinale	5	5.0	5.0	4.3	5.0	5.0	5.0	3.8	4.5
	Cougar	3	4.5	5.0	3.8	4.3	4.8	4.8	3.8	4.3
	Gentilina	5	5.0	5.0	4.9	5.0	4.3	4.2	3.8	4.0
	Magenta	3	4.7	5.0	4.2	4.5	4.9	4.8	4.7	4.2
Butterhead	Buttercrunch Bibb	4	2.6	5.0	3.1	2.0	1.5	1.5	3.5	2.0
	Butter King	1	4.7	5.0	3.5	4.0	4.6	4.1	4.2	3.8
	Grosse Blonde Paressuese	5	4.6	4.8	3.5	4.8	2.3	2.2	3.2	2.8
	Sangria	5	3.8	5.0	4.1	3.7	4.0	4.1	4.4	3.5
Oak Leaf	Bronze Beauty	4	5.0	5.0	4.8	5.0	4.3	4.2	3.8	3.8
	Biscia Rossa	1	5.0	5.0	4.8	5.0	4.8	4.9	4.8	4.5
	Red Oak Leaf Alberta	1	3.8	5.0	3.7	3.8	3.7	3.7	3.8	3.2
	Red Oak Leaf Quebec	2	3.8	5.0	3.9	4.3	4.5	4.5	4.8	4.2

1. The asterisks indicate the significant level of the impact of Variety; *** p<0.001, ** p<0.01, * p<0.05, - Not significant.
2. Darker green color = higher score; Bold number in red indicates the highest score/scores among the 12 varieties.

Supplemental Materials

Correlation of Agronomic Characteristics

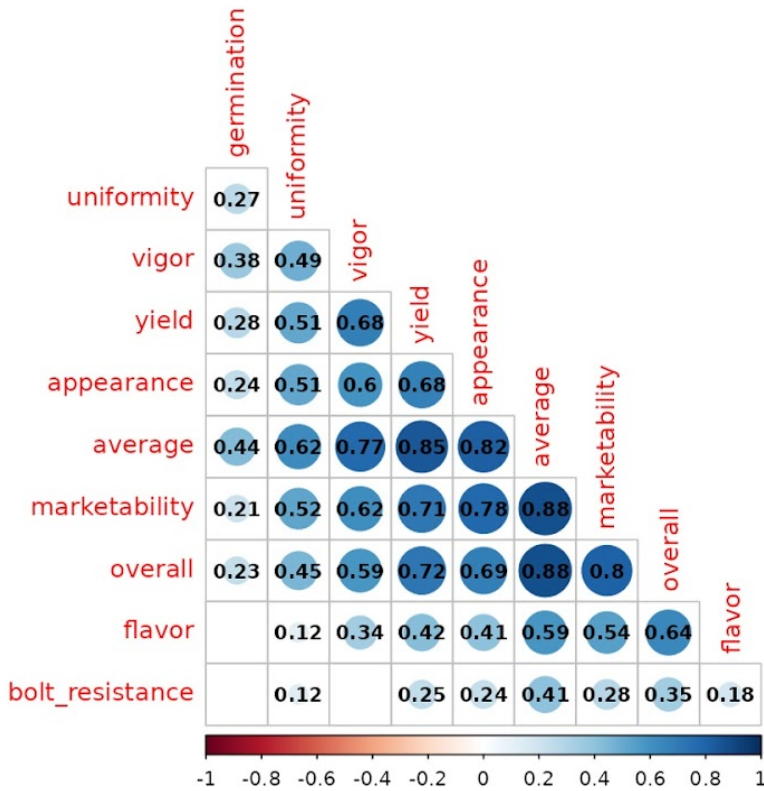


Figure 8. Correlation matrix between agronomic traits.

Figure 8 shows the correlation between the evaluated traits as well as the “average” of all traits. Darker colors indicate a higher correlation between any two traits and the associated values (known as r-values) indicate the strength and directionality of the correlation. Higher values indicate that two traits change strongly together, while lower values indicate that two traits change weakly or not at all with each other. The sign of the r-value indicates whether the correlative changes are positive or negative. Marketability was highly correlated with overall performance. Better appearance, marketability and overall performance was also correlated with higher average scores. However, bolt resistance was not found to have strong correlation with any of the other traits.

Comparing East and West

Participant farms located in Alberta, British Columbia, and Saskatchewan were considered as West, and farms located in Ontario, Quebec, Nova Scotia, and Prince Edward Island were considered as East. Among all evaluated traits, germination, bolt resistance, and flavor had statistically significant differences between East and West, while other traits did not show difference.

Table 8. Average ratings for agronomic traits by East and West.

	Germination **	Vigor -	Bolt Resistance **	Uniformity -	Yield -	Marketability -	Appearance -	Flavor *	Overall -
East	3.58	3.62	3.77	3.61	3.46	3.38	3.73	3.60	3.31
West	3.24	3.42	4.09	3.72	3.37	3.21	3.75	3.31	3.23

The asterisks indicate the significant difference between East and West; ** p<0.01, * p<0.05, - Not significant.

Table 8. Breeding histories of lettuce varieties included in this lettuce trial.

Variety	Breeding history
Butter King	<p>The Canadian Journal of Plant Science reported on the development of “Butter King” in 1967 (Vol. 47). It was bred at the Central Experimental Farm Research Station in Ottawa from an Israeli variety, “Rinat Hakfar.” “Three of the most vigorous plants that were also the slowest to bolt and to develop tipburn comprised the initial selection. Rigid selection in seed plots was continued for 4 years to eliminate variability in several traits and produce this remarkably uniform strain.”</p> <p>Butter King was awarded the Bronze Medal in the “1964 All-American Selections open trial-ground competition” and was introduced commercially in 1965 in the US and Canada.</p> <p>References:</p> <ul style="list-style-type: none"> • cucurbitbreeding.wordpress.ncsu.edu/2016/06/02/lettuce-a-l/ • cdnsiencepub.com/doi/pdf/10.4141/cjps67-081
Grosse Blonde Paresseuse	<p>“Grosse Blonde Paresseuse” translates to “The Big Lazy Blonde” and is also known as “Cuirassière blonde de Nonpareille,” “Very Large Yellow Paresseuse,” and “Large White Stone Summer Lettuce.” The variety was introduced by Vilmorin in France and dates back to at least 1854.</p> <p>It was noted in variety trials in the late 1800’s as “well adapted to summer culture.”</p> <p>References:</p> <ul style="list-style-type: none"> • plus.lapresse.ca/screens/f2ebf65b-7edc-4ff5-8de7-89bbecef2d5f0%7C_0.html • horticultural-history.blogspot.com/2017/04/1885-e-l-sturtevant-l-ettuce-lettuce-and.html • tile.loc.gov/storage-services/public/gdcmassbookdig/descriptio

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Sangria

“Sangria” was bred by Vilmorin from the variety “Merveille des quatre Saison” in 1987. According to the USDA PVP certificate issued to Vilmorin, the variety was bred to “create a Butterhad type that was not only resistant to Bremia and LMV (Lettuce Mosaic Virus) but also much more resistant to heat than the parent variety.”

Sangria was released in the market in 1989 and the PVP expired in 2010.

References:

- apps.ams.usda.gov/cms/adobeimages/008900182.pdf
- www.ams.usda.gov/sites/default/files/media/2016%20PVPO%20Application%20Status%20Report.pdf

Buttercrunch Bibb

“Buttercrunch Bibb” was developed by George Raleigh at Cornell University in the late 1950’s to early 1960s. It was a 1963 All-America Selection *Edible Vegetable* winner, which mentioned that this variety “holds well under stress and has good bolt resistance.” It was the first Cornell-bred crop variety to win this award.

Buttercrunch Bibb was listed as a recommended home vegetable garden variety in Michigan State University Extension Bulletin E-760a in 1983, and in University of Minnesota Agricultural Extension Service Fact Sheet #104 in 1981.

References:

- cucurbitbreeding.wordpress.ncsu.edu/2016/06/02/lettuce-a-l/
- all-americanselections.org/product/lettuce-buttercrunch/
- conservancy.umn.edu/bitstream/handle/11299/207251/MN2000_FSY_104.pdf?sequence=1&isAllowed=y
- archive.lib.msu.edu/DMC/Ag.%20Ext.%202007-Chelsie/PDF/e760arev5.pdf
- www.seedquest.com/News/releases/usa/Universities/n3904.htm

<p>Bronze Beauty Oak Leaf</p>	<p>“Bronze Beauty,” also known as “Bronze Beauty Arrowhead,” was introduced by Germania Seed and Plant Co. It was an AAS bronze winner in 1947. It is not registered in the UPOV or <i>EU Common Catalogue Information System</i> databases for seed.</p> <p>References:</p> <ul style="list-style-type: none"> • https://shop.seedsavers.org/bronze-arrowhead-lettuce • https://all-america-selections.org/product/lettuce-bronze-beauty/
<p>Feuille de chene rouge and Red Oak Leaf</p>	<p>The rather generic variety “Red Oak Leaf” does not seem to have much available breeding history information. Multiple websites, including the US National Gardening Association, date the oak leaf lettuce variety back to Vilmorin in 1771.</p> <p>References:</p> <ul style="list-style-type: none"> • garden.org/plants/view/92473/Lettuce-Lactuca-sativa-Oakleaf/
<p>Biscia Rossa</p>	<p>Biscia Rossa translates to “Red Snake.” It is referenced in many places as an Italian heirloom variety and listed in the EU Seeds database where it is registered by Assosementi. It dates back to at least 1977. It is also known as, “Rossa a foglia riccia da taglio” (Red curly leaf for cutting).</p> <p>References:</p> <ul style="list-style-type: none"> • www.sementi.it/documenti/registri/ITA-ortive/ortive-03.pdf • ec.europa.eu/food/plant-variety-portal/index.xhtml
<p>Cardinale</p>	<p>“Cardinale” is noted in many places online as a French heirloom but has no details about its breeding or development history. It is listed in the EU Seed Database as registered (but surrendered) to Gautier Seeds in France. It is not listed in the UPOV database. Cardinale is not listed by Seed Savers Exchange. Seeds of Diversity Canada lists it but with no historical info.</p> <p>This variety is a non-heading variety, in contrast to the variety “Head Cardinale”, which was bred from Cardinale by Frank Morton and is carried by many North American small seed companies.</p> <p>References</p> <ul style="list-style-type: none"> • https://osseeds.org/ossi_variety/head_cardinal/ • https://ec.europa.eu/food/plant-variety-portal/index.xhtml

<p>Gentilina</p>	<p>This variety of “Gentilina” came from Fruition Seeds who have been growing it for over 10 years. The variety is described in several places as originating from Northern Italy.</p> <p>Franchi Seeds in Italy refers to Gentilina as a lettuce <i>type</i> (lettuce with large loose leaf with frilly leaves), and sells it under the variety name “Grand Rapids,” a popular looseleaf. As a result, Gentilina and Grand Rapids may have the same or similar histories.</p> <p>References:</p> <ul style="list-style-type: none"> ● franchisementi.it/?s=gentilina&post_type=product&type_aws=true ● www.fruitionseeds.com/shop/vegetables/lettuce/organic-gentilina-lettuce/ ● www.theheirloomseedstore.com/product/lettuce-lattuga-gentilina ● ruthreichl.com/wp-content/uploads/2013/12/index1.php ● issuu.com/italseeds/docs/email_franchi_seeds_of_italy_catalogue_2024
<p>Cougar Batavian</p>	<p>The variety “Cougar Batavian” is an OSSI-pledged variety selected by Frank Morton. Its origin is described as “an errant seedling in a flat of unrelated lettuce. It appears to be one of our Batavian types crossed to ‘Brown Goldring.’”</p> <p>This is distinct from the variety “Cougar” bred by Jodi Grossen of Seminis-Genecorp, described as a “Romaine with dark green colored leaves, leaf surface moderately blistered, tall, wide long leaves.”</p> <p>References</p> <ul style="list-style-type: none"> ● cucurbitbreeding.wordpress.ncsu.edu/2016/06/02/lettuce-a-1/ ● cucurbitbreeding.wordpress.ncsu.edu/files/2016/04/vegetable-cultivar-descriptions-for-north-america-list-26-2002.pdf ● osseeds.org/ossi_variety/cougar-batavian-2/ ● hawthornfarm.ca/products/copy-of-cougar?_pos=1&_sid=a85bfe5d&_ss=r