

Goal: Compare early-maturing red radicchio from three market classes, and identify best-performing varieties for Canadian growers. The trial emphasized identifying open pollinated (OP) cultivars that compete well with hybrids.

Background: CANOVI participants began trialing radicchio varieties in 2020, evaluating 13 varieties that spanned four different market classes and ranged from early (~65 day) to late (~120 day) maturity. While several varieties were identified as having higher than average uniformity and bolt resistance, we recognized a need to compare varieties within maturity slot and type, and we did so in 2021. In 2022, growers in Alberta, BC, Ontario, and Quebec compared early-maturing red radicchio varieties that might both reach maturity and fit market needs in this regions.

Varieties: All participants planted three core varieties – two OP and one F1 hybrid Chioggia varieties. Participants had the option of planting any of three additional varieties: another F1 Chioggia, an OP Verona variety, and an OP Treviso variety.



Chioggia

Participants: 18

Market Class	Variety	Core Variety	OP / F1	Days to Maturity	Seed Source
Chioggia	Indigo	yes	F1	65	Vesey's
Chioggia	Sirio	yes	OP	65	Osborne
Chioggia	Vesuvio	yes	OP	55-60	Uprising
Chioggia	Leonardo	no	F1	65	Johnny's
Treviso	TVG1	no	OP	75	Osborne
Verona	Pasqualino	no	OP	60-65	Uprising

Planting: Participants planted 16 plants per variety at approximately 12" spacing, using single or multiple rows per bed. Seeds were sown in flats mid-June and transplanted in mid-July for harvest in early-mid fall. Participants used their usual organic methods for soil fertility and weed management.

Evaluation: Participants evaluated varieties using the desktop or mobile [SeedLinked](#) app. Germination, early vigour, bolt resistance, uniformity, yield, marketability, appearance, and flavour were rated on a scale of 1 (low) to 5 (high). A rubric was provided that defined the rating scale for each trait.

Results and analysis: Interactive plots were available on the SeedLinked website immediately after trial closure. In addition, CANOVI researchers performed statistical analysis and presented results in a webinar and in this report.

Please view the **2022 CANOVI Radicchio Trial Protocol** for full instructions and the evaluation rubric.



Treviso

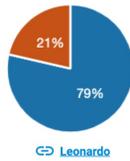


Verona

Varieties by Overall Preference



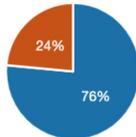
Leonardo F1



Leonardo



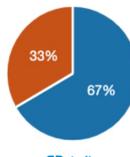
Pasqualino



Pasqualino



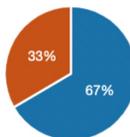
Indigo F1



Indigo



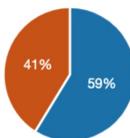
Vesuvio



Vesuvio



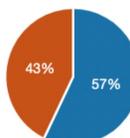
Sirio



Sirio



TVG1



TVG1

Results Summary

- Both OP Chioggia varieties competed well with F1 Chioggia varieties. There were no significant differences in ratings for any trait between Leonardo F1, Indigo F1, Vesuvio, and Sirio.
- Of the two F1 Chioggia varieties, Leonardo F1 showed less variability and received higher overall approval from participants than Indigo F1.
- Vesuvio was slightly less vigorous, uniform, and high yielding than the F1 Chioggia varieties, but it several participants praised its flavour. In a raw vs. cooked taste test at an Organic Alberta Radicchio Field Day (n=18 participants), Vesuvio was rated sweetest both raw and cooked.
- Sirio was rated slightly higher by Western participants than Eastern participants for vigour, bolt resistance, and flavour.
- Pasqualino was rated highly for marketability in both 2022 and 2021. It was highest yielding for Western participants and second-highest for Eastern participants.
- TVG1 was rated a bit higher by Eastern growers than Western growers for yield, marketability, and flavour.

Blue = Would grow again
Red = Would not grow again
 Varieties are ordered by percent of participants who would grow the variety again

This research is part of [Organic Science Cluster 3](#), led by the [Organic Federation of Canada](#) in collaboration with the [Organic Agriculture Centre of Canada at Dalhousie University](#), supported by Agriculture and Agri-Food Canada's [Canadian Agricultural Partnership- AgriScience Program](#), [The Bauta Family Initiative on Canadian Seed Security](#), and the [Centre for Sustainable Food Systems at the UBC Farm](#).

Trial data analysis and report by Dr. Solveig Hanson, CSFS at UBC Farm. For more information, please visit seedsecurity.ca/en/302-canovi or email solveig.hanson@ubc.ca.

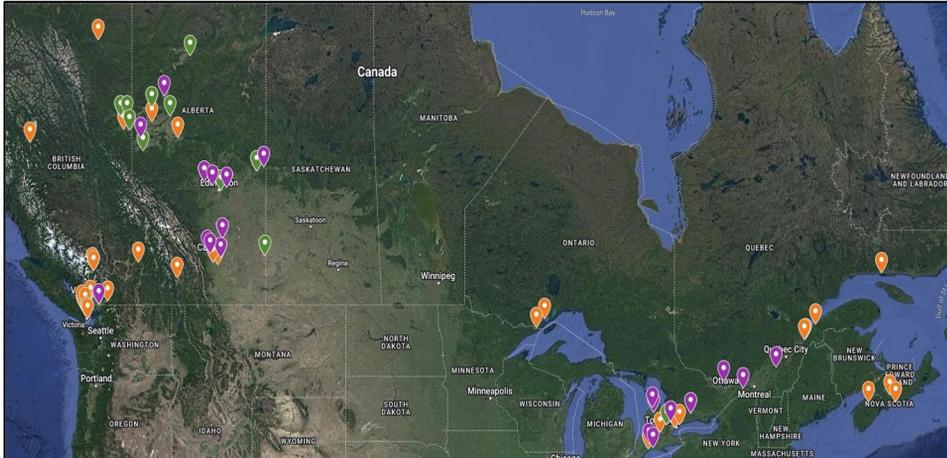


Analytical Methods and Supporting Data: CANOVI Radicchio Trial 2022

Trait ratings were analyzed by variety, region, and variety-region interaction using a **two-way fixed effects Analysis of Variance**. That is, we looked for **significant differences in ratings among varieties and between East-West regions**.

N = 18 participants, with $n_{\text{East}} = 9$ participants in QC and ON and $n_{\text{West}} = 9$ participants in BC and AB.

Participant Locations



Purple Flag = Radicchio Trial Participant

Mean Ratings by Region

	Appearance	Bolt Resistance \wedge	Flavor	Germination	Marketability	Uniformity	Vigor	Yield
East	4.2	4.5	3.7	4.3	4.1	3.6	3.9	3.6
West	4.0	4.2	3.6	4.1	3.7	3.7	3.8	3.2

Means and significant variation by region in 2-way fixed effects ANOVA with East/West as environmental variable
Green = High rating; Yellow = Mid-range rating; Red = Low rating

- **Bolt resistance \wedge was rated slightly higher on Eastern farms than Western farms**, potentially due to the lower average latitude of Eastern farms.
- **All traits except uniformity were rated slightly higher on Eastern farms than Western farms.**
- There were **no cases of genotype x environment interaction (GxE)** in which one variety did significantly worse or better in one region than the other. However, **GxE was suggested for yield**, as TVG1 received the highest average yield rating (4.2) on Eastern farms but lowest average yield rating (2.6) on Western farms. However, there is enough variability in ratings within varieties that this difference is not statistically significant.

Mean Ratings by Variety

	Appearance	Bolt Resistance	Flavor	Germination	Marketability	Uniformity *	Vigor	Yield
Pasqualino	4.7	4.4	3.6	4.2	4.5	3.9	4.0	3.8
Indigo	4.1	4.7	3.6	4.4	3.8	3.8	4.2	3.6
Leonardo	3.9	4.7	3.9	4.4	4.1	3.9	3.9	3.5
TVG1	4.3	3.8	3.4	4.2	3.9	4.1	3.9	3.3
Sirio	3.9	4.3	3.9	3.9	3.7	3.3	3.6	3.0
Vesuvio	3.8	4.2	3.4	4.4	3.4	2.8	3.6	3.0

Means and significant variation by variety in 2-way fixed effects ANOVA with East/West as environmental variable
Green = High rating; Yellow = Mid-range rating; Red = Low rating

- **Only one trait - uniformity*** - showed significant variation among varieties. This difference was driven by Eastern farms, on which **Vesuvio was significantly less uniform than TVG1**. However, Vesuvio, an OP Chioggia variety, was not significantly different in uniformity than any other hybrid or OP Chioggia variety.
- There are two reasons for the lack of statistical significance in these results:
 - **Very similar mean scores among varieties for some traits**, like germination.
 - **Substantial spread among variety mean scores**, but high variation of ratings within varieties. For example, variety means for yield range from 2.8 to 3.9, but yield scores ranged from 1-5 for many varieties.
- **In general, all of these varieties were well liked. Only one variety-trait mean - Vesuvio yield - fell below 3, or "acceptable."**



Image: Alberta Telfer, AB

	P (<F)	Strength of evidence
^	<0.10	Weak
*	<0.05	Moderate
**	<0.01	Strong
***	<0.001	Very strong

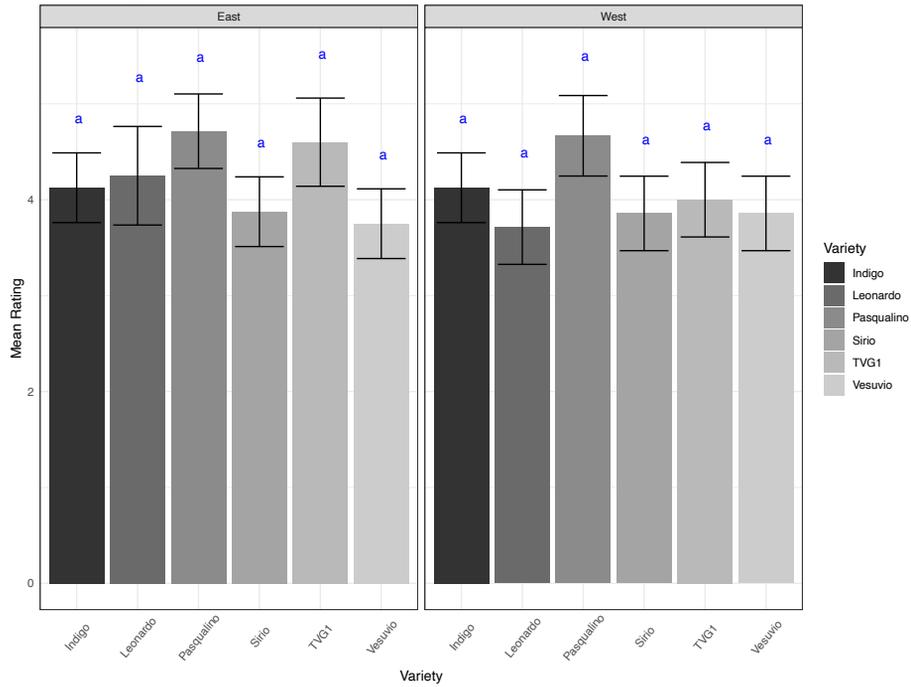
ANOVA and Pairwise Comparisons

Trait	Source of Variation	DF	SS	MS	F	Pr >F Sig
Appearance	Variety	5	7.41	1.48	1.40	0.23
	East_West	1	0.43	0.43	0.40	0.53
	Variety:East_West	5	1.40	0.28	0.27	0.93
	Residuals	70	73.98	1.06	NA	NA
Bolt_Resistance	Variety	5	6.58	1.32	1.51	0.20
	East_West	1	2.38	2.38	2.73	0.104 ^
	Variety:East_West	5	6.41	1.28	1.47	0.21
	Residuals	61	53.25	0.87	NA	NA
Flavor	Variety	5	2.88	0.58	0.42	0.83
	East_West	1	0.24	0.24	0.17	0.68
	Variety:East_West	5	6.65	1.33	0.97	0.44
	Residuals	59	80.60	1.37	NA	NA
Germination	Variety	5	3.47	0.69	0.76	0.58
	East_West	1	1.62	1.62	1.77	0.19
	Variety:East_West	5	2.18	0.44	0.47	0.79
	Residuals	83	76.16	0.92	NA	NA
Marketability	Variety	5	7.77	1.55	1.30	0.28
	East_West	1	2.06	2.06	1.73	0.19
	Variety:East_West	5	0.74	0.15	0.12	0.99
	Residuals	55	65.60	1.19	NA	NA
Uniformity	Variety	5	15.86	3.17	3.30	1.04E-02 *
	East_West	1	0.20	0.20	0.20	0.65
	Variety:East_West	5	1.11	0.22	0.23	0.95
	Residuals	63	60.52	0.96	NA	NA
Vigor	Variety	5	4.09	0.82	0.86	0.51
	East_West	1	0.08	0.08	0.09	0.77
	Variety:East_West	5	3.69	0.74	0.77	0.57
	Residuals	66	62.97	0.95	NA	NA
Yield	Variety	5	7.00	1.40	0.83	0.54
	East_West	1	1.72	1.72	1.01	0.32
	Variety:East_West	5	8.18	1.64	0.96	0.45
	Residuals	69	117.09	1.70	NA	NA

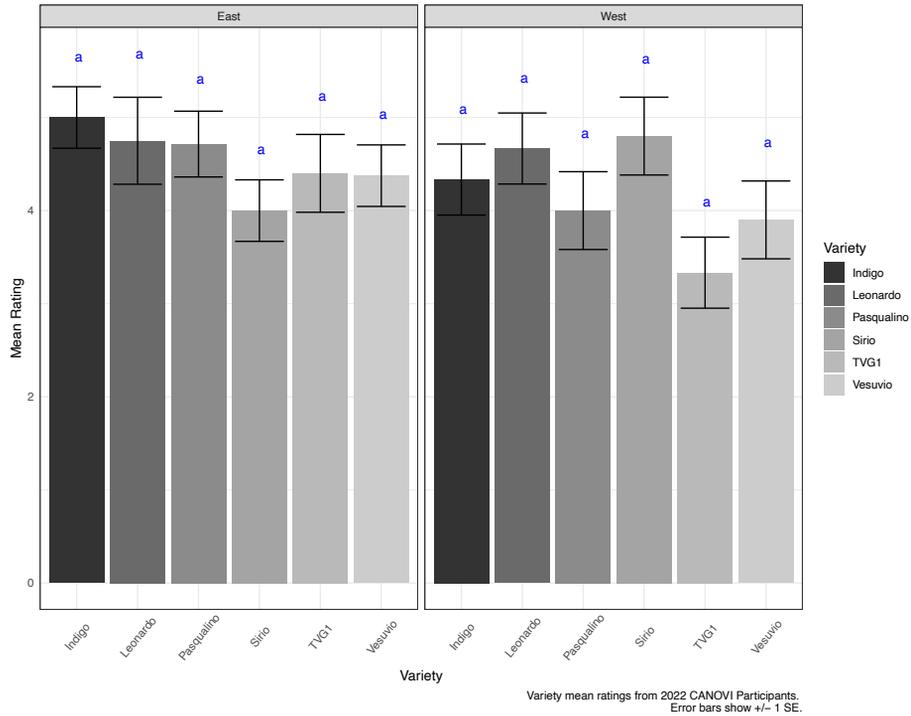
	P (<F)	Strength of evidence
^	<0.10	Weak
*	<0.05	Moderate
**	<0.01	Strong
***	<0.001	Very strong

The following pages display barplots of mean ratings for each trait, with error bars showing +/- 1 SE around the mean. **Different letters denote a statistically significant difference in ratings between varieties within region at P < 0.10.** At times, a significant pairwise comparison appears within a region, even though ANOVA shows no significant variety effect.

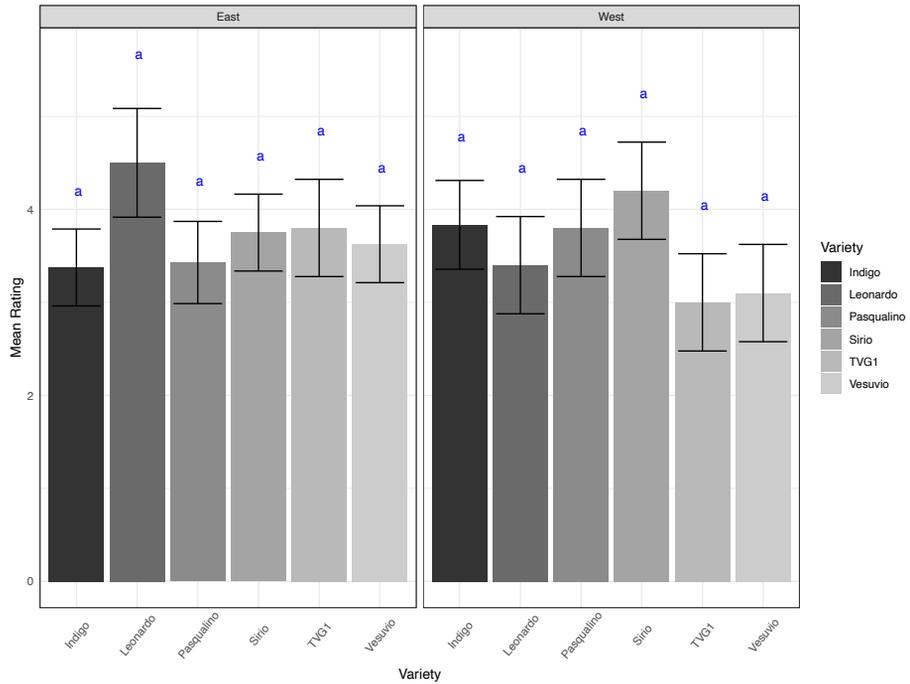
Radicchio Appearance



Radicchio Bolt_Resistance

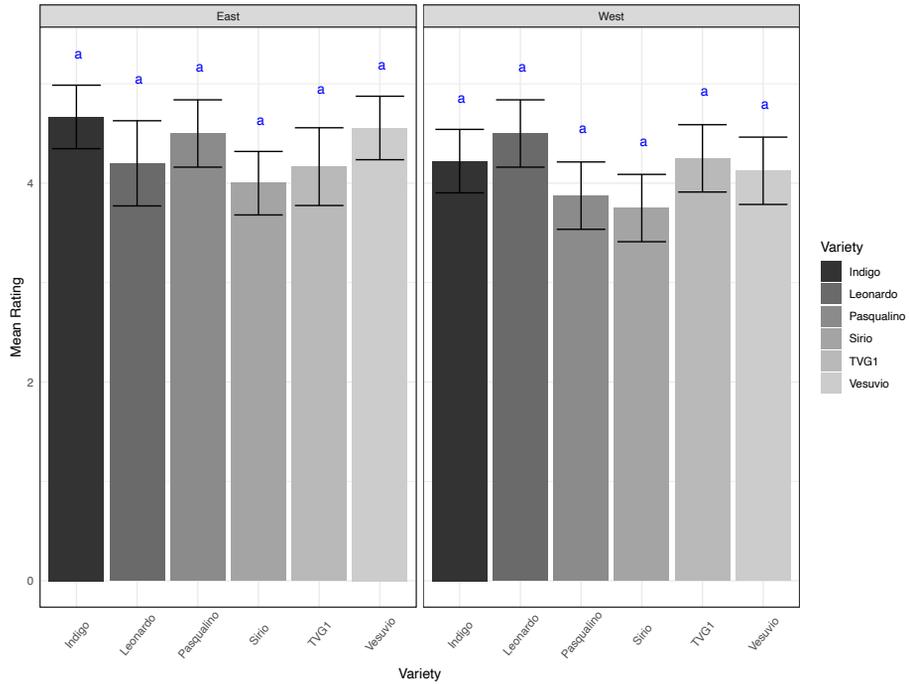


Radicchio Flavor



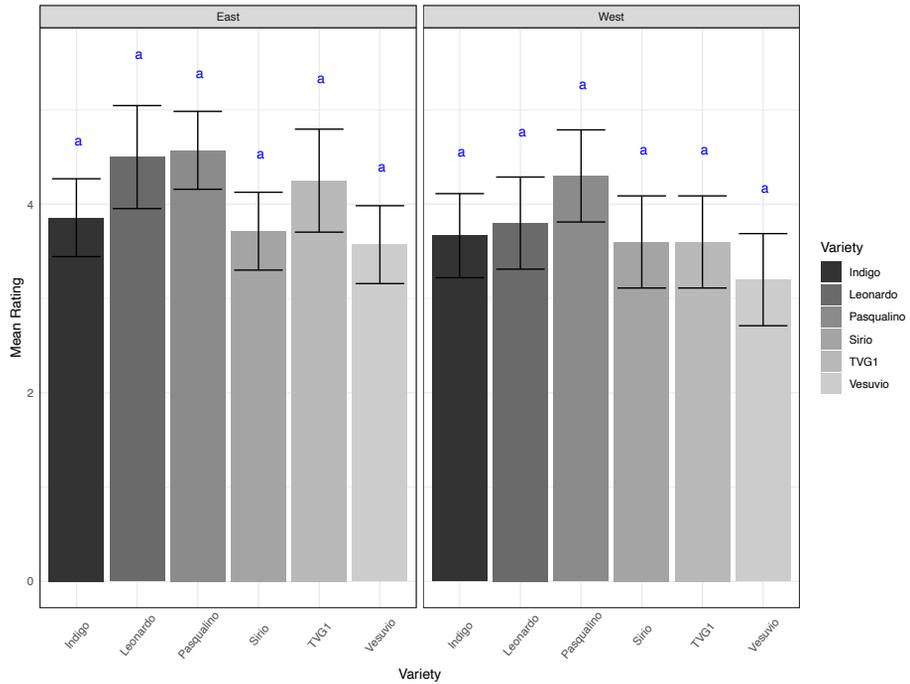
Variety mean ratings from 2022 CANOVI Participants.
Error bars show +/- 1 SE.

Radicchio Germination



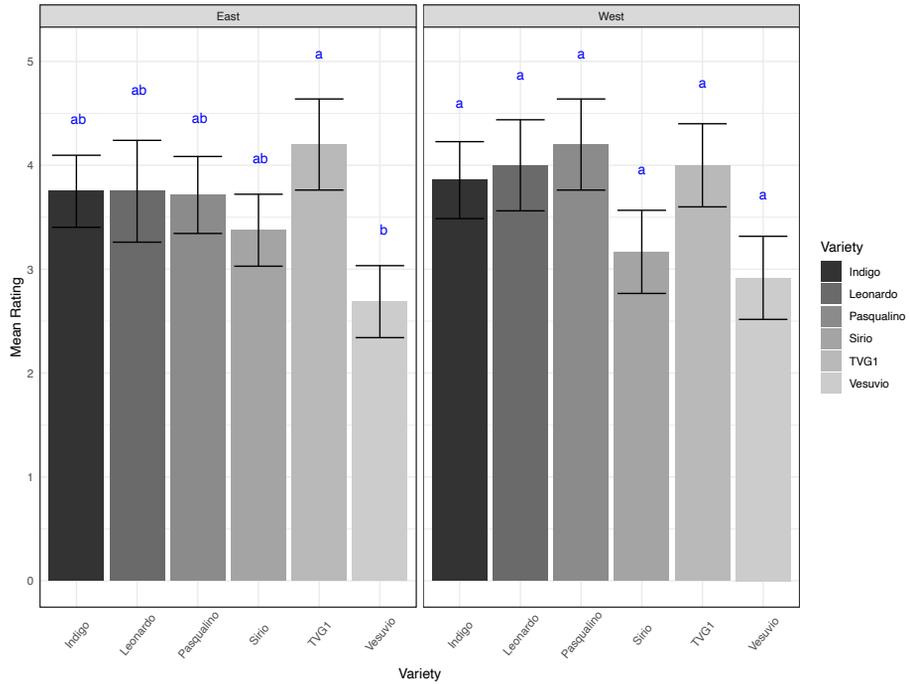
Variety mean ratings from 2022 CANOVI Participants.
Error bars show +/- 1 SE.

Radicchio Marketability



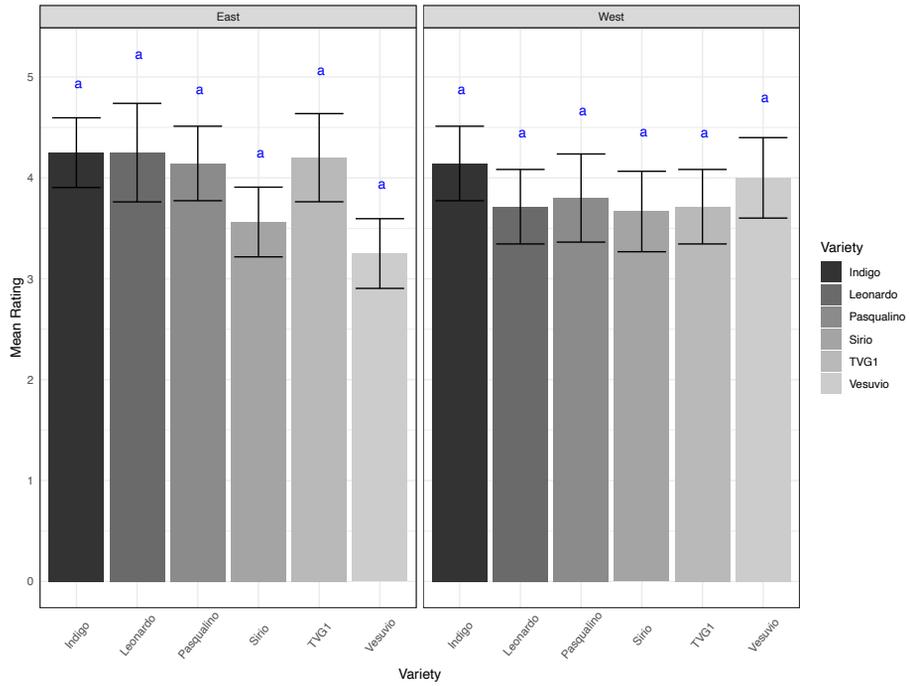
Variety mean ratings from 2022 CANOVI Participants.
Error bars show +/- 1 SE.

Radicchio Uniformity



Variety mean ratings from 2022 CANOVI Participants.
Error bars show +/- 1 SE.

Radicchio Vigor



Radicchio Yield

