



Liking and willingness to eat of landrace porridges: A comparison between consumer groups

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ABSTRACT

Consumer interest and knowledge of landrace cereals has increased in recent years, which could aid in mitigating the environmental impacts of the modern agricultural system. The aim of this study is to evaluate consumer liking of porridge based on landrace cereal. Participants answered questions based on taste, texture, and willingness to eat the porridge again. The results indicated that consumers liked and would eat porridge based on landrace cereals again, suggesting that there is a potential to broaden the market for landrace cereals.

An increased consumer interest in sustainability means that origin and environmental impacts are becoming increasingly important factors regarding food choice. Product attributes such as *natural* and *organic* are important factors for consumers (Teuber et al., 2016; Gosine and McSweeney, 2019). Furthermore, there is a large consumer interest in locally produced food products, as seen in the success of the *farm to table* service model (Pesci and Brinkley, 2021). This has resulted in an increase of consumer awareness and interest in landrace cereal has grown steadily over the last few years (Ortman et al., 2023; Wendin et al., 2020).

Cereal-based foods have been an important source of nutrition and a staple part of the human diet since the dawn of agriculture (Valamoti et al., 2019). Porridge fed the earliest human civilizations and has a rich history that dates back many millennia and reaches almost all corners of the globe (Rogosa, 2016). Particularly in Sweden, porridge has had common place on breakfast tables since the Viking Age (Ashby and Evan Tang, 2021; Notaker, 2008). This affordable and versatile dish can be made from almost any cereal, and in recent years there has been a revival in interest for this basic dish, evident in the rise of popular dishes such as overnight oats and porridge-based eateries such as the Danish chain restaurant GRØD, literally meaning 'porridge' (Grød, 2023). In 2022 Sweden held the first Organic Porridge championship with both professional and hobby chefs competing with sweet and savory porridge dishes (Goot, 2022). However, porridge consumed in Sweden is generally made of conventional and monocultural varieties of cereal (Notaker, 2008).

For clarification, there is no official definition of landrace cereal, and they are known under several other names such as heritage grains, ancient grains, and farmer's variety (Camancho Villa et al., 2005). These underutilized cereals typically have high genetic diversity, are of historical origin, and were cultivated before the modernization of agriculture during the 20th century (Rogosa, 2016). They also hold cultural and historical significance as they are connected to the region they are cultivated in, especially in countries with a rich agrarian history such as Sweden (Myrdal, 2011). The cultivation of landraces builds diversity and resilience in the face of climate change as they generally have an extensive root system, can cope with limited nitrogen supply, withstand weed competition, and are highly resilient in that they can tolerate environmental variations, including poorer soil conditions and harsh weather such as drought or flood (Cheng, 2018; Ortman et al., 2023).

The benefits of landrace cereals go beyond the mitigation of sustainability challenges. They are typically of higher quality, possess a richer, more complex taste (Wendin et al., 2022), and have a suitable protein content for baking (Zamaratskaia et al., 2020). Landrace cereals are generally more nutrient rich than modern cereals due to their higher mineral content and have been observed to be a healthier choice compared with modern grains (Johansson et al., 2021; Spisni et al., 2019), making them an attractive choice for health-conscious and culinary-minded consumers alike (Dinu et al., 2018 & Valli et al., 2018). Furthermore, due to their cultural and historical value, many consumers are willing to pay premium price (Løes et al., 2020).

The use of landrace cereals in common food products such as

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porridge could potentially satisfy a growing consumer market interested in landrace cereals. Furthermore, the cultivation of landrace cereals could aid in managing and mitigating the risks associated with climate change, heighten food security in vulnerable areas, and reinstate autonomy to farmers.

The aim of this study is to evaluate consumer liking of and interest in products based on landrace cereal, specifically neutral flavoured porridge and porridge with toppings. A further aim was to compare two groups of consumers: *Athletic* and *Culinary*. The Athletic group consisted of orienteers and families of orienteers. Orienteering often involves an athletic lifestyle, conscious of food quality and nutrition (Birkenhead and Slater, 2015). The Culinary group consisted of consumers who have a particular interest in food and cooking, and a keen awareness of food trends (Getz and Robinson, 2014; Richards, 2015). These groups were selected as they represent two unique groups of consumers with unique attributes, making them potentially interesting groups to compare.

Respondents were invited to evaluate porridge made from landrace wheat kernels from Källunda farm, situated in southern Sweden. Unlike the conventional and monocultural varieties of wheat, Källunda wheat is an evolutionary cereal, which is developed by blending and cultivating a variety of wheat genotypes which allows the crop to genetically adapt over several years in response to specific pedoclimatic conditions' (Spaggiari et al., 2022). The respondents belonged to either the Athletic group or Culinary group, and the goal was to reach a minimum of 300 respondent per group. The Athletic group evaluated the porridge in July 2022, at an international orienteering event known as *O-Ringen* in Uppsala, Sweden. The Culinary group evaluated the porridge in September 2022 at a biannual artisan food event known as *Terra Madre* in Stockholm, Sweden.

The coarse stone-milled wheat kernels were fermented in equal parts water overnight, after which more water was added, and the wheat was then cooked at a low temperature for approximately 10 min¹ the following day. The serving size was approximately 150 ml of porridge, in which respondents ate one serve of neutral porridge (NP), containing no flavour supplements, and porridge with toppings (PWT), which contained one teaspoon (5 ml) of the following: Sunflower seeds, toasted buckwheat, and sugar-free apple sauce. The porridge samples were served together in one 200 ml paper cup with a wooden teaspoon to eat with, with topping in the bottom and the warm (approximately 60 °C) neutral porridge on top. The software *EyeQuestion* (Version 5.4, Netherlands) was used for the collection of the data, and the questionnaire (Table 1) was accessed by the respondents by scanning a QR-code on their mobile phones. The respondents were instructed to start their assessments by eating the neutral porridge at the top of the serving. Once they had answered the questions they were invited to continue eating

Table 1
Questionnaire.

No	Question	Answer alternatives
1	Gender	1 = male, 2 = female
2	Age	Age in years
3	NP Liking Taste	1-9 (where 1 = dislike extremely and 9 = like extremely)
4	NP Liking Texture	1-9
5	NP Would You Eat Again	1-9 (where 1 = absolutely not and 9 = absolutely)
6	PWT Liking Taste	1-9
7	PWT Liking Texture	1-9
8	PWT Would You Eat Again	1-9

NP = Neutral Porridge; PWT = Porridge with Toppings.

and make their assessment of the PWT at the bottom of the cup.

Consumer data from a total of 771 Swedish respondents aged 0–97 years was collected during the test period. Of these, 58% were female and 42% male. Regarding age, the median age was 42 years, with 46% of respondents being under the age of 40 and 54% aged 40 and over. All the participants under 18 years were required to have parental consent, and they were also informed that participation was voluntary, and that they could withdraw from the study at any time without being required to give reason. Participants who were too young to respond to the survey themselves received assistance from parents and guardians. The study followed Swedish Ethics Review Act, which applies to research carried out in Sweden if the research includes the processing of sensitive personal data. This study includes questions about food opinions which, according to the Data Protection Ordinance, are not classified as sensitive personal data. According to GDPR, no responses to any of the questionnaires used in this study include information that can be traced to or used to identify any individual.

Descriptive data was calculated, and the resulting data was analysed using Student's t-test to compare included samples and groups. The significance level was set to $p < 0.05$. Effect size was calculated using Hedge's *g* test to show the substantial differences between the two groups, Excel 365 (Microsoft Office 365). Principal Component Analysis (PCA) was performed to give an overview of the results (Panel Check V 1.4.2, Nofima, Norway).

Mean values, standard deviations, effect sizes and significant differences between groups are shown in Table 2. It is evident that both consumer groups liked both the neutral porridge and porridge with toppings. Overall, participants from both groups rated porridge with toppings significantly higher ($p < 0.05$) than neutral porridge, as with texture of porridge with toppings versus neutral porridge. Participants rating of whether they would re-eat porridge with topping or neutral porridge did not significantly differ.

As can be seen in Table 2, in comparison to the Athletic group, the Culinary group consistently rated neutral porridge higher on taste, texture, whether they would re-eat the porridge, and on an overall rating, and significantly so for overall and texture. Similarly for porridge with toppings, the Culinary group rated more highly, with significant ratings for all evaluated qualities, than compared with the Athletic group on all metrics including taste, texture, whether they would re-eat the porridge, and on an overall rating.

Within the Athletic group, porridge with toppings was rated more highly overall than neutral porridge. Participants rating of taste was also greater for porridge with toppings versus neutral porridge, as was their rating of texture for porridge with toppings, versus neutral porridge. There was no significant difference between participants indication of whether they would re-eat porridge with topping or neutral porridge.

When comparing the substantial differences between the groups,

Table 2
Results – mean, standard deviation and effect size.

	Athletic (N = 396)	Culinary (N = 375)	All/Overall (N = 771)	Effect size
Neutral Porridge				
Overall	6.65 (±2.02) ^a	7.61 (±1.30) ^b	7.11 (±1.77)	0.56
Taste	6.54 (±2.05)	7.60 (±1.35)	7.05 (±1.82)	0.61
Texture	6.69 (±2.04) ^a	7.53 (±1.59) ^b	7.10 (±1.88)	0.46
Eat	6.39 (±2.35)	7.49 (±1.75)	6.92 (±2.15)	0.53
Porridge with Toppings				
Overall	7.35 (±1.89) ^a	7.79 (±1.30) ^b	7.61 (±1.66)	0.27
Taste	7.28 (±1.87) ^a	7.78 (±1.30) ^b	7.53 (±1.64)	0.31
Texture	7.19 (±1.97) ^a	7.89 (±1.22) ^b	7.53 (±1.68)	0.42
Eat	6.39 (±2.35) ^a	7.49 (±1.75) ^b	6.92 (±2.15)	0.12

Different letters in the same row indicate significant differences between groups, $p \leq 0.05$. Effect size is calculated by Hedge's *g*-test.

¹ Cooking time varies depending on quantity of porridge.

effect sizes of neutral porridge ranged from medium to large, indicating the results have practical significance, whereas porridge with toppings had relatively small effect sizes, indicating limited practical implications for the results.

An overview of the results is shown as a PCA-plot, Fig. 1. Principal component 1 (PC1) shows 92.2% of the variation in data and PC2 shows 7.1%, meaning a total explanation of 99.3%. The PCA shows clearly that the porridge with topping was the most liked in both groups, but that the Culinary group rated it higher than the Athletic group.

This study indicated that consumers like landrace cereals, with most respondents from each group showing positive reactions to taste and texture with both types of porridge and indicating that they would be willing to eat porridge based on landrace cereals again. The results corroborate with previous literature that indicates that landrace cereals are currently trending amongst consumers who are willing to pay a premium price for their products (Løes et al., 2020). The results also support the results of a previous study which showed that consumers have a good awareness of, and positive attitudes towards landrace cereals (Wendin et al., 2020). Previous studies have also shown that locally produced foods have been shown to have more value for consumers than organically produced foods (Ditlevsen, et al., 2020), and that consumers are becoming increasingly motivated to support local food producers (Benos et al., 2022).

Liking and willingness to eat again can be explained by each groups' background. The Culinary group consisted of attendants at the artisan food event Terra Madre, indicating that are generally highly interested and involved with food and cooking. Attendees at Terra Madre likely belonged to a consumer group known as "foodies", which can be described as consumers that have a particular interest in unique and artisan food products (Getz and Robinson, 2014; Richards, 2015). Landrace cereals are culturally unique and possess a complex and rich flavour, making them a substance of high interest to participants at Terra Madre. Furthermore, the idea behind Terra Madre was to celebrate food culture by bringing producers and consumers together, indicating that the Culinary group was interested in locally produced food products.

The Athletic group consisted of orienteers, and athletes' food choices are often dictated by the competitive demands of sport, meaning that nutrition and energy content of food are important factors (Birkenhead and Slater, 2015; Pelly et al., 2018). As previous research shows, landrace cereals are more nutrient dense, higher in fibre, contain anti-inflammatory properties and have prolonged satiating properties (Spisni et al., 2019), making them a healthier choice over conventional cereals. Porridge is a popular breakfast choice in general due to its affordability, accessibility, nutritional value, and slow energy release (Isaksson et al., 2008). This kind of rather coarse, crushed whole grain porridge had a very positive response among the test groups, indicating a potential to diversify the "porridge market" in Sweden. Porridge has been one of the fundamentals of Scandinavian food culture from prehistoric times until the 21st century (Notaker, 2008), and porridge made from rolled oats is still a very common breakfast choice amongst Swedish consumers.

To summarize, a changing climate together with shifting food trends and an increase in consumer awareness signify that environmental and ethical consciousness are increasing amongst consumers when making food choices (Brom, 2000; Ghvanidze et al., 2016). This indicates that along with taste, texture, quality and nutritional factors, consumer food choice in general is becoming increasingly influenced by environmental impacts (Benos et al., 2022). Given this and coupled with the results of this study, it is suggested that there is potential to broaden the market for landrace cereals.

Future studies could examine the nutritional properties of landrace porridge in other to solidify them as a superior alternative in terms of health benefits and baking quality. The role of prehydration for digestibility, satiation and nutrient uptake should be further studied for landrace cereal porridge. This study focused on a single product made

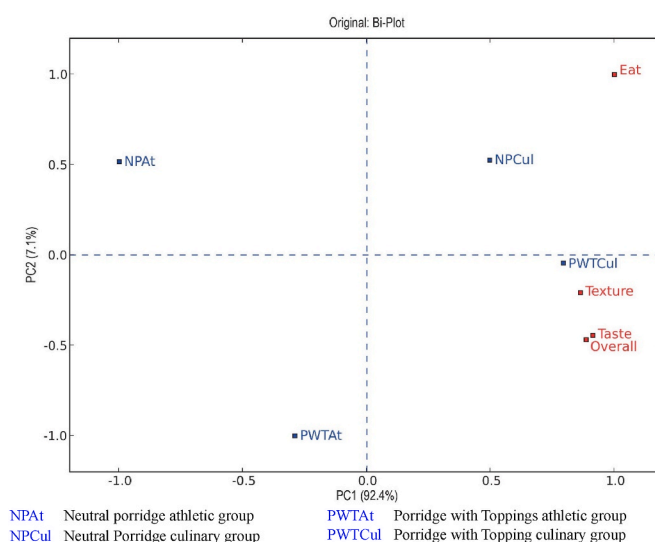


Fig. 1. PCA plot giving an overview of the results.

from landrace cereals and results may differ for other types of food products, therefore the potential of other products made from landrace cereals should be tested. Furthermore, the study examined two specific consumer groups which may not be representative for an entire population. The results of this study help to support the use of landrace cereals in common food products, thus supporting sustainable changes in the food system. Implications for the gastronomy and catering sector include a requirement for increased knowledge among personnel of landrace cereals and other climate-resistant food products, including knowledge of consumer liking and trends.

Implications for gastronomy

The overall aim of this study was to evaluate consumer preference and interest in porridge based on landrace cereal. However, from a larger perspective this study paves way for a broader use of landrace cereals, for example in the form of innovative, well tasting, and nutritious products by taking into account both sustainability and consumer preferences.

CRedit authorship contribution statement

Hannah Y. Kristofers: Formal analysis, Visualization, Writing – original draft. **Karin Gerhardt:** Conceptualization, Funding acquisition, Writing – review & editing. **Karin Wendin:** Formal analysis, Investigation, Methodology, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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