



How local pig breed and processing methods affect consumer preferences for dry-cured ham

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ABSTRACT

Two dry-cured hams were produced using a local breed Krškopolje pig, trimmed/shaped either as 'Kraški pršut' (K—K) or 'Istrski pršut' (I—K). Consumers ($n = 118$) were recruited to evaluate the hams in blind, expected, and informed tests. Overall liking was rated on a 5-point Likert scale, while sensory perceptions were assessed with Check-All-That-Apply method in blind and expected tests. In blind, expected, and informed test, K—K received higher liking scores than I—K. Specifically, for K—K, liking was the highest in informed, the lowest in the blind, and intermediate in the expected test, suggesting that information about local breed positively influenced consumer perception. In contrast, I—K showed similar liking scores in both, blind and informed tests, while the expected liking was notably higher, indicating a mismatch between expectations and actual experience. Check-All-That-Apply results, analyzed with correspondence analysis, showed that I—K and K—K hams were differentiated by consumers based on sensory descriptors. Furthermore, the analysis highlighted differences between expected and perceived sensory descriptors.

1. Introduction

Dry-cured ham is a traditional product whose quality depends on factors of pig rearing (breed being important one) and processing. While modern pig breeds dominate current dry-cured ham production, interest in local breeds is growing due to their unique, better quality and positive consumer attitudes (Cerjak, Karolyi, & Kovačić, 2011; Villanueva, Salazar-Ordoñez, Granado-Díaz, & Rodríguez-Entrena, 2021). Slovenia has two geographically protected dry-cured hams, 'Kraški pršut' and 'Istrski pršut' are made from white pigs but use different trimming. 'Kraški pršut' trimming retains the skin and subcutaneous fat. In contrast, 'Istrski pršut' trimming is more open, skinless. 'Kraški pršut' is by far the most recognised pork products among Slovenian consumers (Čandek-Potokar & Arh, 2004). The Krškopolje pig is an autochthonous Slovenian breed highly valued for its high intramuscular fat, favourable sensory traits, and contribution to local heritage (Kastelic & Čandek-Potokar, 2013). Dry cured hams from this breed are usually not produced (Savić, Škrlep, Radovčić Marušić, Petričević, & Čandek-Potokar, 2025). Consumer perceptions about pork quality are usually higher for local breeds (Cerjak et al., 2011; Vitale et al., 2020). Information influences how consumers will accept the product, and this effect can be understood

with assimilation theory i.e. consumers will align new information with what they already believe (Piqueras-Fiszman & Spence, 2015). Thus, the acceptability of the product is often studied by looking at the interaction of intrinsic and extrinsic attributes under blind, expected, and informed conditions (Deliza & MacFie, 1996). Such an approach can help to understand the mismatch between consumer expectations and real product experiences (Font-i-Furnols, Claret, Guerrero, & Dalmau, 2022; Grasso, Rondoni, Bari, Smith, & Mansilla, 2022; Schiebler, Lee, & Brodbeck, 2025), aiding in product development and marketing strategies. A recent study (Savić et al., 2025) showed that two types ('Kraški' and 'Istrski') of dry-cured hams differ in their physico-chemical characteristics. However, little is known about how consumers perceive these differences, particularly in relation to trimming, which represents a key research gap. In view of developing a product i.e. dry-cured ham from Krškopolje pig breed (K), this study aimed to explore the sensory perception using CATA and liking of the hams in informed, expected and blind conditions for two new variants of dry-cured hams differing in trimming, an innovative version of 'Kraški pršut' produced from the fat-type Krškopolje pig (K—K), and alternative trimming method, based on the 'Istrski pršut' style (I—K) to see which type of product would be preferred by consumers.

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2. Material and methods

2.1. Dry-cured hams

Two products were made from green hams of Krškopolje pigs, one according to 'Kraški pršut' trimming (K–K), and one following 'Istrski pršut' trimming (I–K). Dry-cured hams were developed in a pilot study and details on their physical-chemical properties can be found in Savić et al. (2025). Consumer test samples were taken from the same anatomical position, the central part containing the *semimembranosus* (SM), *semitendinosus* (ST), and *biceps femoris* (BF) muscles. One entire 1-mm thick slice of ham with standardized fat layer thickness (1 cm) was provided to each consumer in each test.

2.2. Consumer sensory analysis

2.2.1. Participants

A total of 118 consumers were recruited by a specialized agency. Consumers were selected based on their regular consumption of dry-cured ham, with age and gender considered to ensure a balanced sample (32 % aged 18–34, 36 % aged 35–54, 31 % over 55; 45 % male and 55 % female). The reported frequency of dry-cured ham consumption among respondents was as follows: 2–3 times per month (34 %), once a week (27 %), 2–5 times per week (19 %), once a month (15 %) or every day (<1 %). Four sensory sessions, each involving 29–30 consumers, were conducted in east and west cohesion region (2 per region) of Slovenia. Ethical standards for studies with consumers were followed, ensuring the right to withdraw at any moment, confidentiality, anonymity, do no harm and obtaining a written informed consent (institutional review board approval EK_KIS/02/11042022).

2.2.2. Evaluation procedure

Each session involved three rounds of evaluation, a blind, an expected and an informed test. In the blind test, two products of dry-cured hams were coded and presented on identical white plates without any identifying information. Consumers were instructed to taste the samples from left to right, and to neutralize the taste between the samples with water and breadsticks. To assess the sensory attributes, a Check-All-That-Apply (CATA) questionnaire was used. Participants were provided with a list of 16 terms or descriptors (selected together with experts from the dry-cured ham consortium) related to texture and flavor: hard, soft, soluble, dry, raw, mature, crumbly, juicy, tasty, off-taste, aromatic, salty, fatty, lean, sweet, and non-salty. They were instructed to select/check the terms they perceived while tasting each ham. Additionally, participants were asked to rate the overall liking using a 5-point Likert scale (1 = 'did not like at all', 5 = 'I liked it very much'). In the expected test, consumers did not taste the dry-cured hams. Instead, they received a card with the names of dry-cured hams to be evaluated (what level of liking they expect from the product). Participants selected CATA descriptors that reflected their expectations about the sensory attributes and rated their expected overall liking using the same 5-point Likert scale. The last round was the informed test, in which the consumers were presented with both, ham samples and the information which product they are to taste (name of the product and breed). In this test, participants were only asked to provide an overall liking score using the 5-point Likert scale. In all the tests, the presentation order of ham samples was balanced.

2.3. Statistical analysis

Repeated measures analysis was performed on liking scores followed by Bonferroni-adjusted pairwise comparisons to assess differences between different types of dry-cured hams within the blind, expected, and informed test as well as to assess the liking for the same product across different tests. Correspondence analysis (CA) with χ^2 distances was conducted on the CATA from the blind and expected tests to visualize

the relationships. A cut-off value $>|0.5|$ for dimension scores was considered as meaningful for the interpretation of associations. McNemar's test was used to compare CATA attributes of the two hams in the blind and expected tests. All statistical analyses were performed using SPSS Statistics, version 28.0.0 (IBM Corp., Armonk, NY, USA, 2021).

3. Results and discussion

3.1. Overall liking score

Average liking scores ranged from 3.2 to 4.2, suggesting that consumers expressed a positive perception toward both dry-cured hams tested (Table 1). A blind test can be considered to provide an unbiased opinion and/or preferences of consumers about the taste of the tested product (Ghose & Lowengart, 2001) despite potential limitations e.g. previous experience, visual cues (Motoki, Spence, & Velasco, 2023). On the other hand, extrinsic cues like brand can affect/raise expectations (Piqueras-Fiszman & Spence, 2015). In the blind test, a higher liking score was observed for K–K than I–K (3.8 vs. 3.2, $P < 0.05$). The fact that I–K was less liked by consumers suggests that the consumers recognised the properties (more dry, salty) consistent with physico-chemical properties determined for this product (Savić et al., 2025). In the expected test, indicative of familiarity with the product and its image (Oliver & Winer, 1987), K–K again received a higher liking score than I–K (3.9 vs. 3.6, $P < 0.05$). The higher liking score for K–K in expected test is somewhat understandable as it is the most well-known and appreciated dry-cured product among Slovenian consumers. In the informed test, the consumers know which product they taste, so this information may influence their attitudes and preferences (Schouteten et al., 2016). In line with its better performance in both blind and expected test, a higher liking score of K–K than I–K was confirmed in informed test (4.2 vs. 3.2, $P > 0.05$). On the other hand, I–K received a lower score than K–K in expected test (3.6 vs. 3.9, $P < 0.05$), which can be indicative of lower familiarity of consumers with the product. Namely, 'Istrski pršut' is less commonly available in Slovenia than it is in the neighbouring Croatia (this EU protected dry-cured ham is jointly protected by Croatia and Slovenia), and consumer preference may be influenced not only by sensory traits, but also by cultural and market factors, leading to variability among consumers and may result in segmentation. Tasting with product information showed that the expectations were met or exceeded in the case of K–K. In contrast, I–K showed clear evidence of expectancy disconfirmation, where actual experience did not match expectations (3.2 vs. 3.6, $P < 0.05$). In the informed test, the increase in K–K liking score (from 3.8 to 4.2; $P < 0.05$), but not in I–K (3.2 vs. 3.2; $P > 0.05$) can be attributed to brand image of the former and actual taste perception of the latter. However, the potential halo effect from conducting the blind and informed tests on the same day cannot be excluded and may represent a limitation.

Table 1

Overall liking of dry-cured hams (1 = 'did not like at all', 5 = 'I liked it very much') expressed by consumers ($n = 118$) in blind, expected and informed tests.

Overall liking (1–5 Likert scale)	K-K	I-K
Blind test	3.8 ^{b, A}	3.2 ^{a, A}
Expected test	3.9 ^{b, A}	3.6 ^{a, B}
Informed test	4.2 ^{b, B}	3.2 ^{a, A}

K-K = 'Kraški pršut' made from Krškopolje pig; I-K = 'Istrski pršut' made from Krškopolje pig.

Repeated measures analysis of variance showed significant ($P < 0.000$) within subject interaction between test and product. Values assigned different small letters denote significant difference ($p < 0.05$) between products, values assigned capital letters denote significant difference ($p < 0.05$) between tests.

3.2. Correspondence analysis

CATA results were further analyzed by CA to visualize sensorial associations for two tested dry-cured hams, and between blind and expected test (Fig. 1). Overall, the first and second dimensions combined explained 93.5 % of the variance in the data, with a strong first dimension (80.7 %) separating by type of product and a less important second dimension (12.8 %) separating by type of test. Based on dimension scores ($>|0.5|$) and relative contribution we considered descriptors 'hard', 'soft', 'soluble', 'raw', 'dry', 'crumbly', 'juicy', 'off-tastes', 'non-salty', and 'fatty' as most important for the differentiation of the products. Descriptors near the origin (e.g., mature, sweet, lean) indicate low discriminative power. CA plot showed that K–K and I–K were positioned more closely in the expected condition than in the blind condition, highlighting a divergence between anticipated and actual sensory experiences and confirming the expectancy disconfirmation of the overall liking score. Second dimension separated the products and showed that K–K was characterised by 'fatty', 'juicy', 'soluble' and 'soft', while I–K was characterised by 'hard', 'dry', 'salty', 'crumbly', and 'off-tastes', indicating the sensory attributes contributing to the reduced liking score. Our results corroborate with the well-established influence of both intrinsic product attributes and extrinsic information on consumer preferences, as highlighted in comprehensive reviews of traditional food products (Espejel, Fandos, & Flavián, 2007).

4. Conclusion

Results of the present study show that both innovative variants of dry-cured ham made from the fat-type Krškopolje pig were appreciated by consumers, although 'Kraški pršut' style was preferred over the

'Istrski pršut' style. Local pig breed can serve as a powerful marketing tool, besides providing a product liked by consumers. These findings enhance our understanding of the factors shaping consumer attitudes toward dry-cured ham acceptability, while providing important implications for product development and marketing strategies. The study showed to producers which product type (trimming) was preferred by consumers and that it is important to match expectations with their preferences (not to deceive consumers) which is critical for repurchase and market success.

Consent form

Consumers participating in the study were recruited by a specialized agency ARHEA (<https://www.arhea.si/>).

All participants provided a written informed consent prior to participation.

CRediT authorship contribution statement

Bojana Savić: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation. **Martin Škrlep:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis. **Maria Font-i-Furnols:** Writing – review & editing, Methodology, Investigation, Formal analysis, Conceptualization. **Marjeta Čandek-Potokar:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

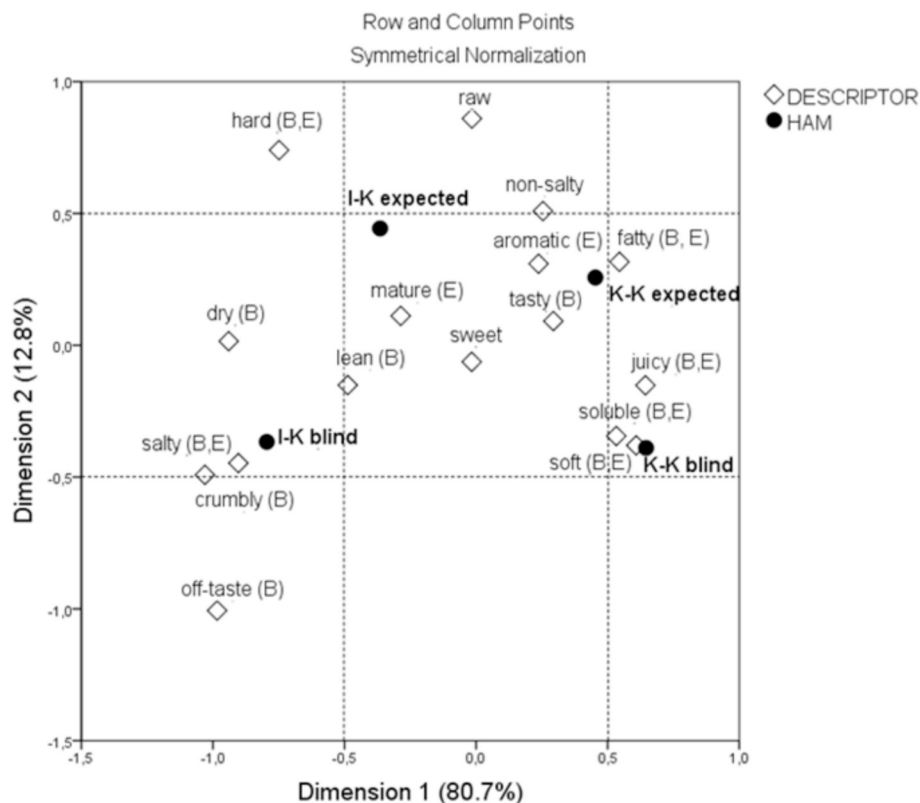


Fig. 1. Correspondence analysis of Check-all-that-apply (CATA) attributes describing two types of dry-cured hams based on the first two dimensions with χ^2 -distances (blind and expected tests). Dotted lines represent a cut-off value $>|0.5|$ for dimension scores considered as meaningful for the interpretation of associations. CATA attributes with statistically significant differences (McNemar test) are indicated by capital letters, denoting significance in the blind (B) or expected (E) test. K–K = 'Kraški pršut' made from Krškopolje pig; I–K = 'Istrski pršut' made from Krškopolje pig.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

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