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## Abstract

Consumer's interest in sustainable livestock farming methods has grown in response to concerns for the environment and animal welfare. The purpose of this study is to examine the different influences of sustainability product information on sensory characteristics and purchase behaviors. To accomplish this aim, the study used salami, which is an Italian-style sausage processed by fermentation and drying. Three different types of information were provided : salami made from the pork of an antibiotic-free pig (SMAFP), of an animal welfare pig (SMAWP), and of a grazing pig (SMGP). This study was conducted as an off-line experiment with Korean participants (N = 140). As a result, there were sensory differences according to the sustainability information. For the SMAFP, it had a significant difference in , sourness ($p < 0.05$). With the SMAWP, there was a significant difference in gumminess ($p < 0.10$), and the SMGP had significant differences in sourness ($p < 0.01$), sweetness ($p < 0.01$), andmoisture ($p < 0.05$). Moreover, the purchase intention and willingness to pay were significantly higher when the sustainability information was given. Especially, among the three types of salamis, participants were willing to pay the most for the SMAWP. This is one of the first consumer studies to investigate sensory evaluation and purchase behavior for various types of sustainable livestock production. These results contribute by helping sustainable meat producers and marketers become aware of the kind of sustainable information to which consumers are sensitive.



Keywords:

Information effect, Sustainable livestock, Sensory evaluation, Willingness to buy


## 1. Introduction

The livestock industry faces various ethical issues related to environmental and animal

welfare concerns (Verbeke et al., 1999). The global livestock production system is characterized by a competitive business climate and has many side effects that are unsustainable for human health, the environment, and animal welfare (Pluhar, 2010). Current livestock production is advantageous for meeting the high demand for meat at a low price, and the industry has been designed to make it faster and easier than ever to raise livestock (Anomaly, 2015; Williams, 2008). However, animals raised in a conventional livestock production system often do not have enough room to walk and live comfortably in their strictly controlled environments (Appleby et al., 2004), which is closely related to animal welfare issues. Some consumers who are concerned with these issues have shown a preference to purchase meat farmed sustainably (Aiking et al., 2006; Kumar et al., 2017; Webster, 1994). When consuming meat or dairy products, consumers have begun showing more consideration for how livestock is raised (Conner and Oppenheim, 2008; Prickett, 2008; Schnettler et al., 2008). Following this trend, the meat market is changing to meet the needs of consumers by not overusing antibiotics and improving food animals' welfare and rights (Capper, 2013).

### *1.1 Sustainable agriculture and livestock*

The importance of sustainable agriculture should also be highlighted because of the concerns about resource shortages caused by global development and population growth (Gomiero et al., 2011; Horrigan et al., 2002). Although many works in the literature deal with sustainable agriculture and have attempted to devise exact definitions for these terms, the meaning of "sustainable agriculture" is dependent on what "sustainable" and "agriculture" actually means (Yunlong and Smit, 1994). Sustainable agriculture and livestock are complex concepts (Pretty, 1995) and should include diverse aspects, such as economic, environmental, and public welfare concerns (Allen et al., 1991). As interest in sustainability increases, breeding animals in a sustainable way has also received greater attention (Thompson and Nardone, 1999).

55 Many developed countries are striving for sustainable livestock production systems by
56 imposing laws and regulations (Ingenbleek et al., 2012; Mench, 2008). For instance, in the U.S.,
57 there are two federal laws, the Twenty-Eight Hour Law and the Humane Methods of Slaughter
58 Act that regulate how to treat food animals sustainably (Mench, 2008). Moreover, the Royal
59 Society for the Prevention of Cruelty to Animals (RSPCA) imposed certification schemes
60 called Freedom Foods on animal welfare products in the U.K. These regulations and
61 certifications have also led to significant changes throughout the world to certify that high
62 levels of animal rights are observed during the farming process. There are several ways to make
63 livestock farming more sustainable. Grazing livestock, also called pasture-based or pastoral
64 farming, refers to raising livestock without a fence in a sustainable way (Bernués et al., 2011).

65 In South Korea, there are also several certifications, including a farm animal welfare
66 certification, which ensures that livestock are raised with sufficient nutrition and without
67 unnecessary stress (Kim et al., 2013), and an antibiotic-free livestock certification, which
68 indicates that livestock feed contains no antibiotics or hormones (Ahn et al., 2014). Thus, the
69 raising methods can be categorized into three different types: antibiotic-free, farm animal
70 welfare, and grazing livestock. However, there is little integrated research that has examined
71 how and if consumers have different perceptions depending on the way livestock is raised.

72 *1.2 Sustainable products and consumer research*

73 Some previous studies have included experiments related to sustainable food
74 production and consumer research, and there is a growing influence of sustainability-related
75 labels in the global market. According to Siegrist et al. (2015), consumers who think that
76 reducing their meat consumption is good for animals' welfare tend to think that reducing their
77 meat consumption has benefits for the environment. This finding could affect consumers'

78 purchase intentions and provide a positive direction for animal welfare efforts. One experiment
79 on consumers' preference and willingness to pay (WTP) for organically produced beef showed
80 the effects of information spread on organic farming (Napolitano et al., 2010). The study's
81 results addressed consumers' awareness of organic farming benefits related to production
82 safety and ethics and demonstrated that this information increased their expectations for liking
83 and WTP significantly. In terms of sustainable labels, consumers who perceived the existence
84 of more environmental and social problems tended to be deeply involved in sustainable issues
85 and purchased WTB sustainable products (Sirieix et al., 2013). Moreover, concerns related to
86 the agricultural production process affected consumers' attitudes toward their intention to buy
87 meat products from sustainable farming systems (Burnier and Spers, 2019; Stampa et al., 2020).
88 Although, previous studies have suggested that there is a positive relationship between
89 consumer behaviors and sustainable products, consumer research related to various sustainable
90 farming methods has been limited. Thus, an integrated view of livestock production issues is
91 needed.

92 *1.3 Information effects on food choice*

93 Food choices and preferences include a complex process that is related to the evaluation
94 of sensory attributes (e.g., appearance, taste, smell, and texture) and extrinsic cues (e.g., price
95 and information). In addition, consumers' values and beliefs have a major impact on their
96 purchase and consumption decisions (Finch, 2006). Cardello (1994) explained that a food-
97 related behavior model demonstrated the process of receiving food and making related
98 decisions. According to Cardello's model, food is regarded as a sensory stimulus, as it includes
99 taste, smell, texture, and visual components. Moreover, when perceiving foods, consumers
100 interact with various elements and sensory stimuli to create food experiences.

Many factors influence the acceptance of food, but what the present study is particularly interested in is the effects of information about food. Based on this research model, we investigated the relationship between the information provided about a food and consumers' purchase behaviors. Previous studies have conducted experiments on the relationship between information and the consumer valuation of the products. According to Pohjanheimo and Sandell (2009), product information, such as a manufacturer's name, brand name, and so on, positively affects hedonic scores in every evaluation of drinking yogurt. Further, the word "organic" has been shown to increase consumers' liking of and preference for organic bread (Annett et al., 2008). The availability of nutritional and health information also has a positive influence on food choices (Hellyer et al., 2012).

Very few studies to date have dealt with the relationships between various types of sustainable livestock production systems and information cues. Moreover, the exact reasons why consumers' purchase behaviors change in a positive manner have yet to be clearly demonstrated. Therefore, we integrally investigated the relationship between the sensory evaluation and information effects of three animal-raising methods. The aims of this study were: (1) to show the difference in sensory evaluations depending on the presence or absence of information and (2) to figure out the most efficient way to raise livestock that affects consumers' purchase behaviors. In this study, we identified three types of sustainable livestock production systems (antibiotic-free, farm animal welfare, and grazing livestock) and conducted an experiment to figure out the differences between them in consumers' minds based on information effects.

## 2. Materials and Methods

We conducted the experiments in two separate parts. The consumer panel procedures

were approved by the Seoul National University Institutional Review Board (IRB No. 1905/003-005). The participants were recruited with help-wanted advertisements in an online bulletin board. The population targeted for this study consisted of participants in their 20s and 30s. The pilot tests were also conducted in two separate periods for salami made of pork from antibiotic-free pig (SMAFP) (n = 5) in January of 2019 and for salami made of pork from animal welfare pig (SMAWP) and salami made of pork from grazing pig (SMGP) (n = 10) in March of 2019 in order to finalize the experimental design.

*2.1 Material*

Products were obtained from Johncook Deli Meats, which is one of the processed-meat companies producing ham, sausage, bacon, barbecue, etc in Korea. Three types of salami samples were used made from antibiotic-free pigs feeding natural ingredients, animal welfare pigs, and grazing pigs. This study selected salami as it contributes to the creation of high added-value products by processing pork legs, which are usually non-preferred parts.

Samples were offered to the participants immediately after receiving the cut salami. Salami samples (a semicircle with a radius of 1.5cm and height of 0.3cm) were given to the participants (two pieces per person). Participants were instructed to rinse their mouths with tepid water after tasting a sample.

The salami used in this study was a type of Italian-style cured salami that is processed by fermentation and drying. We especially focused on three kinds of pork that were from antibiotic-free, farm animal welfare, and grazing pigs. These salamis were used to estimate the association among sustainable information, sensory evaluation, and purchase behaviors.

*2.2 Experiment design*

146 The experiment was conducted as a within-subject design. The participants were
147 randomly assigned to 12 groups to minimize the ordering effects. All the experiments had four
148 situations (two samples * with/without information). Table 1 and Figure 1 show a summary of
149 the experiment design. The experiment was planned in two tests. In the first test, the
150 participants received SMAFP (S641, S492) and SMPG (S537, S189) which were not analysis
151 targets and in the second test, they were offered SMAWP (S518, S117) and SMPG (S948, S179)
152 according to randomization to minimize ordering effects.

153 The survey consisted of two parts, and all the constructs were selected and transformed
154 from previous research. The first part dealt with sensory evaluation including flavor and texture
155 attributes. The sensory test questionnaire was first created from previous literature about
156 fermented sausage sensory properties (Cenci-Goga et al., 2008; Marangoni and Moura, 2011),
157 and we then modified the items by expert sensory panels. Finally, 12 sensory features were
158 selected with five tastes, four flavors, and three textures. Table 2 shows the definition of each
159 profile and the additional meanings used in the survey. The sensory properties were measured
160 by a 7-point Likert scale (1 = “never” to 7 = “extremely”). The second part was related to
161 purchase behavior including satisfaction, willingness to buy, and price premium. The
162 satisfaction scale was adopted from Juhl et al. (2002) and dealt with consumers’ satisfaction
163 and loyalty in European food retailing; we changed the words to suit salami-purchasing
164 situations. The willingness-to-buy scale was selected and transformed from Dodds et al.
165 (1991)’s measurements. Those two questionnaires were answered using a five-point Likert
166 scale (1 = “strongly disagree” to 5 = “strongly agree”). The price premium question stated the
167 price of the original price of salami (200g), and we asked respondents to answer the price they
168 were willing to pay for the new salami. In social science studies, a significance level of 0.1 is
169 often used to verify whether a factor is significant. Several studies dealing with sensory

evaluation showed not only the level of 0.05 but also 0.1 statistically significant testing (Chakraborty et al., 2011; Sánchez-Molinero & Arnau, 2010; Mudgil et al., 2017; Molony et al., 2011), so this study also indicated up to the level of 0.1.

## 3. Results

### *3.1 General characteristics of the participants*

The demographic profile of the respondents that participated in the experiment is presented in Table 3. The study sample consisted of 22 males and 28 females in Group 1 (N = 50) and 44 males and 46 females in Group 2 (N = 90) for a total of 140 participants.

### *3.2 Sensory evaluation*

The collected data were averaged and analyzed using principal component analysis (PCA). Figure 2 is a sensory map of the results of the PCA in which 80% of the variance was explained. It demonstrates the characteristics of the samples. The PCA map depicts three groupings of salami samples based on the ways the pigs were raised, with the sensory attributes noted accordingly. The sensory map shows how a salami's flavors, odor, and texture changed according to the effects of the revealed information.

#### *3.2.1 Salami Made from Antibiotics-Free Pigs (SMAFP)*

The SMAFP in both the blind (S492) and revealed conditions (S641) were characterized as salty, gummy, and sour. The participants perceived salami to be saltier without any given information (S492). The results show that participants considered salami to be less salty when they had information about its antibiotic-free nature (S641).

#### *3.2.2 Salami Made from Animal Welfare Pigs (SMAWP)*

191 The SMAWP in both the blind (S117) and revealed conditions (S518) were grouped
192 and characterized by sensory attributes that include milky, mouth-coating, and cheesy. The
193 SMAWP with the information given (S518) had a stronger cheesy flavor, while the SMAWP
194 without information (S117) had a stronger milky flavor. It can be interpreted that when the
195 information was revealed concerning the pigs' animal welfare conditions, participants
196 perceived it to have stronger cheesy odor than milky odor.

197 *3.2.3 Salami Made from Grazing Pigs (SMGP)*

198 The SMGP in both the blind (S179) and revealed conditions (S948) were characterized
199 as rancid and fishy. For the SMGP with the revealed information (S948), participants rated the
200 salami as sourness and sweetness, compared to the salami without any given information
201 (S179).

202 *3.3 Measurement of sensory evaluation and purchase behavior*

203 To statistically examine the changes in the ratings of the flavor, odor, and texture and
204 the consumers' preferences based on the blind and informed conditions, this study conducted
205 paired t-tests to compare the results. We found minor changes in flavors and texture based on
206 the product information, but noted that participants reported higher satisfaction levels and a
207 heightened willingness to buy and pay more in the informed condition.

208 *3.3.1 Salami Made from Antibiotics-Free Pigs (SMAFP)*

209 For the SMAFP, there was a significant difference ($p<0.05$) in flavor. In contrast to the
210 salami made from the pork of grazing pigs, the participants considered this salami to be more
211 sour in the blind condition (S492) (Table 4). The participants had a higher purchase intention
212 ($p < 0.1$) and willingness to pay for the salami in the informed condition ($p < 0.01$) (Table 5).

They were willing to pay more, about 647 Korean won (60 cents USD), for the 200g of salami when the information was revealed. In contrast, there was no difference in terms of the consumers' satisfaction for this salami between the blind and informed conditions.

### *3.3.2 Salami Made from Animal Welfare Pigs (SMAWP)*

For the SMAWP, there was a difference in texture and gumminess ($p < 0.1$), and participants considered the salami to be gummier in the blind condition (Table 6). Moreover, there was a significant difference in their satisfaction ($p < 0.1$), purchase intention ($p < 0.05$), and willingness to pay more ($p < 0.01$) based on the effects of the revealed information (Table 7). According to these results, the participants showed high levels of satisfaction and purchase intention for salami in the informed condition. Participants were willing to pay more, about 868 Korean won (80 cents USD), for 200g of the salami in the informed condition.

### *3.3.3 Salami Made from Grazing Pigs (SMGP)*

Lastly, for the SMGP, there were significant differences ($p<0.01$) in the flavor and texture between the salamis in the blind and informed conditions (Table 8). Participants considered the salami to be more sour, sweet, and moist when its information was revealed. Additionally, the participants had higher satisfaction levels ($p < 0.1$), purchase intention ($p < 0.05$), and were more willing to buy in the informed condition ($p < 0.01$) (Table 9). They were willing to pay more, about 637 Korean won (60 cents USD), for the 200g of salami when the information was revealed.

## 4. Discussion

As realizing the ethical issueson meat consumption, consumers have lots of interest in sustainable livestock. Due to increasing levels of interest in sustainable agriculture in recent

235 years, many previouspapers have started to look at the sustainable livestock systems in terms
236 of economical, environmental, purchase behavior, and so on (Garcia et al., 2017; Kaufmann,
237 2015; Lebacq et al., 2013). There are, however, little research has investigated the types of
238 sustainable livestock in terms of consumer behavior. This study was the first to conduct a
239 sensory evaluation regarding the three kinds of animal raising styles and to identify the effects
240 of revealing the information on purchase behavior.

241 The main purpose of this study was to investigate the effect of sustainability-related
242 information on sensory evaluations and consumers' purchase behaviors. Existing papers
243 dealing with meat and sustainability-related information collected the data only through
244 surveys to investigate consumers' characteristics or factors affecting purchase intentions (Hoek
245 et al., 2017; Mohr and Schlich, 2016). Thus, this study added sensory experiments to
246 understand consumers' purchase behavior more deeply.

247 Before analyzing the effects of revealing information, this study used PCA and found
248 that salami produced from pork using three different animal raising methods—antibiotic-free,
249 farm animal welfare, and grazing—had different sensory attributes. From these results, we can
250 state that consumers perceived the taste of salami produced from farm animal welfare pork to
251 be milky, mouth-coating, and cheesy. Salami made from the antibiotic-free pork was
252 characterized by its saltiness, gumminess, and sourness. Lastly, participants perceived salami
253 made from the pork of grazing pigs as rancid and fishy.

254 The absence or presence of information had a significant effect on the consumers'
255 purchase behaviors, which included satisfaction, purchase intention, and willingness to pay.
256 Participants were willing to pay more for salami in all three informed conditions. This result
257 indicates that consumers believe salami made from pigs that are raised in a sustainable

environment and using humane methods is usually more expensive and valuable than other salami. The results of this study are consistent with de-Magistris and Gracia, (2016) and motivates for producers to do sustainable agriculture. Several studies also demonstrated that consumers have an increasing interest in farming practices and show their willingness to pay more for products obtained using sustainable production systems (Dransfield et al., 2005; Swanson and Mench, 2000). Participants showed high satisfaction and purchase intention in the informed condition for salami made from both the animal welfare and grazing pigs. It is the first time we know a paper that investigated the way livestock are raised and found the differences in willingness to pay and buy, and satisfaction. Therefore, this study contributes to a better understanding of sustainable livestock.

The information about sustainable livestock production had a positive influence on participants' perceptions and their purchase behaviors. These results correspond with previous studies that show product information, such as brand names and ethical values, have an influence on consumers' liking and preference for a product (Napolitano et al., 2010; Sirieix et al., 2013; Vraneševic and Stančec, 2003). Information influences consumers' intentions to purchasecrucially(Bower et al., 2003; Kihlberg et al., 2005). Therefore, it is important to know what information based on livestock-rearing practices could affect consumers' purchase behaviors. In this study, among the three types of salami produced using sustainable practices, participants were willing to pay the most for animal welfare salamis when this information was revealed. This finding shows that consumers are willing to pay higher premiums for specific sustainable products. Moreover, the results indicate that purchasing behaviors for sustainable products are affected not only by ethical issues but also by the different cognitions of taste. Taste preferences can be affected by cognitive factors, such as information (Bower et al., 2003), so information can make the situation change so that the same taste is perceived in different

282 ways. With the above in mind, this study offers practical information for understanding
283 consumers' sensory evaluations and purchase behaviors. Thus, marketers and farmers can
284 effectively use sustainable information publicly and employ it as one of the important
285 marketing factors that may both satisfy consumers and sustain the welfare conditions of their
286 animals.

287 A number of studies have examined food choices and preferences based on sensory
288 attributes and extrinsic cues from an academic standpoint (Deliza and MacFie, 1996; Murray
289 and Delahunty, 2000). However, very few studies have investigated sustainable livestock
290 production from consumers' perspectives. This study examined whether or not consumers'
291 sensory evaluations, including flavor, odor, and texture, and their purchase behavior change
292 based on the information provided. The results confirmed that consumers' behaviors and
293 responses in the informed condition changed their sensory evaluations, and the effects were
294 different depending on the production method. The results of this study support Cardello's
295 model that food is regarded as sensory stimulus and that consumers relate with various factors,
296 including the information about the food, to create their food experiences (Cardello, 1994).

297 The present study has focused on understanding various aspects of sustainable livestock
298 production by evaluating the differences in consumers' sensory evaluations, perceptions, and
299 purchase behaviors depending on the presence or absence of information regarding livestock
300 production methods. This implies that sustainability-related information can positively affect
301 consumers' purchase behavior, and this is the first paper that has compared the results of
302 sensory tests and purchase behaviors between present and absent information situations in
303 terms of detailed classifications of sustainable livestock. This study is intended to be a useful
304 source for further empirical research on sustainable livestock products.

While the results of this study provide a useful guideline for sustainable livestock marketers, it also has several limitations. First, this study only dealt with pigs raised in three types (antibiotic-free pigs, animal welfare pigs, and grazing pigs), but it seems that further research is needed on livestock raised in other sustainable ways and products other than salami to examine the sensory evaluation and purchasing behavior of consumers.Further studies are needed to include various kinds of livestock to understand these issues more deeply and to generalize the results. Second, to obtain more reliable and accurate research results, future studies should investigate the sustainable markets of other countries with participants from various sample groups. We only conducted surveys in Korea, so a sampling bias could be one error of this study. If future studies extend the methods presented here and include other populations, the results could be confirmed and extended further.

## 5. Conclusion

This study demonstrated the effects of sustainability-related information on consumers' sensory evaluations and purchase behaviors. Despite evaluating the same products, there were some factors that made consumers feel differently based on sensory attributes under the absence and presence of information. This study confirmed that sensory evaluations are affected by external cues. Moreover, when sustainability information was provided to participants, their satisfaction and purchase intention increased in a positive way. In addition, the price premium of sustainable livestock varied positively with the types of information. In conclusion, this study investigated consumers' needs for sustainable livestock farming and provides meat producers and marketers with guidelines on how to effectively promote sustainable livestock to consumers.

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454 Tables

455 **Table 1. Summary of the experimental design**

| Test | Situation | | | Analysis target | Number of participants | Period |
|---|---|---|---|---|---|---|
| | Number | Raw material | Information | | | |
| 1 | 641 | Antibiotic-free | Yes | Yes | 50 | January 2019 |
| | 492 | Antibiotic-free | No | Yes | | |
| | 537 | Grazing | Yes | No | | |
| | 189 | Grazing | No | No | | |
| 2 | 518 | Farm animal welfare | Yes | Yes | 90 | March 2019 |
| | 117 | Farm animal welfare | No | Yes | | |
| | 948 | Grazing | Yes | Yes | | |
| | 179 | Grazing | No | Yes | | |

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458 **Table 2. The definitions of the sensory profiles**

| | Profile | Definition | The additional meanings we used | Reference |
|---|---|---|---|---|
| Flavor | Salty | Taste elicited by salts | Taste when you eat salt | Maughan et al., 2012, p. 117 |
| | Sour | Taste elicited by acids | Taste when you eat vinegar | Maughan et al., 2012, p. 117 |
| | Sweet | Taste elicited by sugar | Taste when you eat sugar | Maughan et al., 2012, p. 117 |
| | Umami | Fundamental taste sensation of which MSG is typical | Taste that attracts appetite | Hwang & Hong, 2013, p. 116 |
| | Nutty | Aromatics associated with nuts such as peanut or walnut | Taste from roasted sesame oil | Hwang & Hong, 2013, p. 116 |
| Odor | Milky | Odor of whipping milk | Odor from milk or powdered milk | Kaaki et al., 2012, p. 523 |
| | Cheesy | Odor of yellow ripened cheese, resemblance to the odor of Parmesan cheese powder | A luxurious odor of fermentation | Jinjarak et al., 2006 , p. 2431 |
| | Rancid | Odor associated with oxidized oils/old butter | Unpleasant odors of fermentation | Jinjarak et al., 2006 , p. 2431 |
| | Fishy | The aromatics or volatiles which are derived from fish products perceived by smell | A nauseous smell from raw beans or fish | Ritthiruangdej & Suwonsichon, 2006, p. 183 |
| Texture | Gummy | Denseness that persists throughout mastication or the energy require to disintegrate a semisolid food to a state ready for swallowing | The power required to crush semi-solid foods enough to swallow | Cardello et al., 1982, p. 1191 |
| | Moist | Degree of fluids present in the sample mass during the first 3–5 chews | The amount of moisture detected on the sample surface | Lyon, 1980, p. 1342 |
| | Mouth-Coating | Degree to which the mouth remains coated after expectoration | The degree of fat or oil coated on the mouth after chewing the sample | Jinjarak et al., 2006 , p. 2431 |

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460 **Table 3. General characteristics of the participants**

| | | Group 1 (N = 50) | | Group 2 (N = 90) | |
|---|---|---|---|---|---|
| | **Item** | **Frequency (n)** | **Percentage (%)** | **Frequency (n)** | **Percentage (%)** |
| Age | 20–29 | 34 | 68 | 62 | 68.9 |
| | 30–39 | 13 | 26 | 14 | 15.6 |
| | 40–49 | 3 | 6 | 14 | 15.6 |
| Gender | Male | 22 | 44 | 44 | 48.9 |
| | Female | 28 | 56 | 46 | 51.1 |
| Occupa-tion | Undergraduate/ grad. student | 40 | 80 | 45 | 50 |
| | Office worker | 8 | 16 | 37 | 41.1 |
| | Job seeker | - | - | 7 | 7.8 |
| | Stay at home | 2 | 4 | 1 | 1.1 |

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463 **Table 4. The results of the sensory evaluation for the SMAFP**

| Sensory Variables | | *n* | Average scores 0–7 scale (standard deviations in parentheses) | | Comparison of individual scores between blind and informed conditions | |
|---|---|---|---|---|---|---|
| | | | Blind test ($B_n$) S492 | Informed test ($I_n$) S641 | $B_n$–$I_n$ | *p*-value |
| Flavor | Salty | 50 | 5.80(0.90) | 5.60(1.20) | 0.200 | 0.255 |
| | Sour | 50 | 3.34(1.53) | 2.86(1.25) | 0.480 | 0.018 |
| | Sweetness | 50 | 3.34(1.21) | 3.36(1.31) | -0.020 | 0.916 |
| | Nutty | 50 | 5.08(1.24) | 5.30(1.28) | -0.220 | 0.207 |
| | Umami | 50 | 5.30(0.10) | 5.30(0.10) | 0.000 | 1.000 |
| Odor | Milky | 50 | 4.22(1.45) | 4.38(1.40) | -0.160 | 0.364 |
| | Cheesy | 50 | 4.92(1.47) | 4.74(1.32) | 0.180 | 0.351 |
| | Rancid | 50 | 2.78(1.31) | 2.84(1.45) | -0.060 | 0.659 |
| | Fishy | 50 | 2.96(1.39) | 2.94(1.48) | 0.02 | 0.916 |
| Texture | Gumminess | 50 | 5.72(1.23) | 5.52(1.23) | 0.20 | 0.327 |
| | Moisture | 50 | 3.80(1.20) | 3.98(1.13) | -0.18 | 0.361 |
| | Mouth-Coating | 50 | 5.06(1.30) | 4.82(1.19) | 0.200 | 0.255 |

464 **Table 5. The results of the purchase behavior for the SMAFP**

| Variables | *n* | $B_n$-$I_n$ | *t* | *P* |
|---|---|---|---|---|
| Satisfaction | 50 | -0.127 | -0.889 | 0.376 |
| Purchase intention | 50 | -0.253 | -1.680 | 0.096 |
| Willingness to pay | 50 | -647.00 | -2.879 | 0.005 |

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**Table 6. The results of the sensory evaluation for the SMAWP**

| Sensory Variables | | n | Average scores 0–7 scale (standard deviations in parentheses) | | Comparisons of individual scores between blind and informed conditions | |
|---|---|---|---|---|---|---|
| | | | Blind test ($B_n$) S117 | Informed test ($I_n$) S518 | $B_n$–$I_n$ | *p*-value |
| Flavor | Salty | 90 | 5.22(1.32) | 5.10(1.13) | 0.122 | 0.392 |
| | Sour | 90 | 2.93(1.39) | 2.81(1.27) | 0.122 | 0.354 |
| | Sweetness | 90 | 3.31(1.49) | 3.40(1.44) | -0.094 | 0.491 |
| | Nutty | 90 | 5.03(1.18) | 5.20(1.15) | -0.167 | 0.163 |
| | Umami | 90 | 5.17(1.18) | 5.32(0.99) | -0.1487 | 0.239 |
| Odor | Milky | 90 | 4.50(1.45) | 4.59(1.37) | -0.089 | 0.542 |
| | Cheesy | 90 | 4.99(1.34) | 5.04(1.27) | -0.056 | 0.698 |
| | Rancid | 90 | 3.11(1.69) | 3.11(1.66) | 0.000 | 1.000 |
| | Fishy | 90 | 3.13(1.53) | 2.99(1.54) | 0.144 | 0.329 |
| Texture | Gumminess | 90 | 5.02(1.23) | 4.78(1.22) | 0.244 | 0.099 |
| | Moisture | 90 | 5.30(0.99) | 5.17(1.01) | 0.133 | 0.250 |
| | Mouth-Coating | 90 | 5.39(1.18) | 5.23(1.01) | 0.156 | 0.305 |

**Table 7. The results of the purchase behavior for the SMAWP**

| Variable | *n* | $B_n$–$I_n$ | *t* | *P* |
|---|---|---|---|---|
| Satisfaction | 90 | -0.222 | -1.083 | 0.073 |
| Purchase intention | 90 | -0.325 | -2.335 | 0.021 |
| Willingness to pay | 90 | -868.738 | -3.894 | 0.000 |

471 **Table 8. The results of the sensory evaluation for the SMGP**

| Sensory Variables | | *n* | Average scores 0–7 scale (standard deviations in parentheses) | | Comparison of individual scores between blind and informed conditions | |
|---|---|---|---|---|---|---|
| | | | Blind test ($B_n$) S179 | Informed test ($I_n$) S948 | $B_n$–$I_n$ | *p*-value |
| Flavor | Salty | 90 | 5.21(1.29) | 5.37(.99) | -0.156 | 0.154 |
| | Sour | 90 | 2.88(1.43) | 3.27(1.44) | -0.390 | 0.005 |
| | Sweetness | 90 | 2.98(1.27) | 3.41(1.36) | -0.433 | 0.001 |
| | Nutty | 90 | 4.68(1.20) | 4.89(1.29) | -0.211 | 0.110 |
| | Umami | 90 | 4.70(1.35) | 4.89(1.33) | -0.189 | 0.107 |
| Odor | Milky | 90 | 4.37(1.52) | 4.58(1.41) | -0.211 | 0.164 |
| | Cheesy | 90 | 4.70(1.47) | 4.93(1.23) | -0.233 | 0.111 |
| | Rancid | 90 | 3.53(1.70) | 3.36(1.65) | 0.178 | 0.155 |
| | Fishy | 90 | 3.23(1.48) | 3.19(1.53) | 0.0427 | 0.784 |
| Texture | Gumminess | 90 | 5.28(1.17) | 5.29(1.14) | -0.011 | 0.941 |
| | Moisture | 90 | 4.72(1.17) | 4.97(1.16) | -0.244 | 0.048 |
| | Mouth-Coating | 90 | 4.96(1.33) | 5.03(1.13) | -0.078 | 0.628 |

472 **Table 9. The results of the purchase behavior for the SMGP**

| Variable | *n* | $B_n$–$I_n$ | *t* | *P* |
|---|---|---|---|---|
| Satisfaction | 50 | -0.211 | -1.760* | 0.080 |
| Purchase intention | 50 | -0.348 | -2.450 | 0.015 |
| Willingness to pay | 50 | -637.401 | -2.965 | 0.003 |

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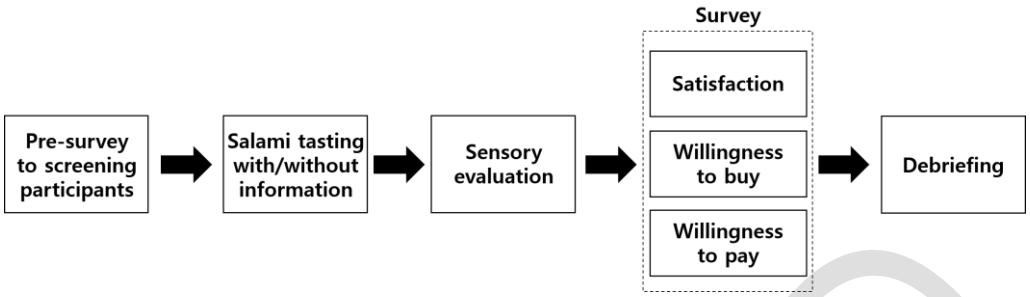
475 Figures

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477 **Figure 1. Summary of the experimental design**

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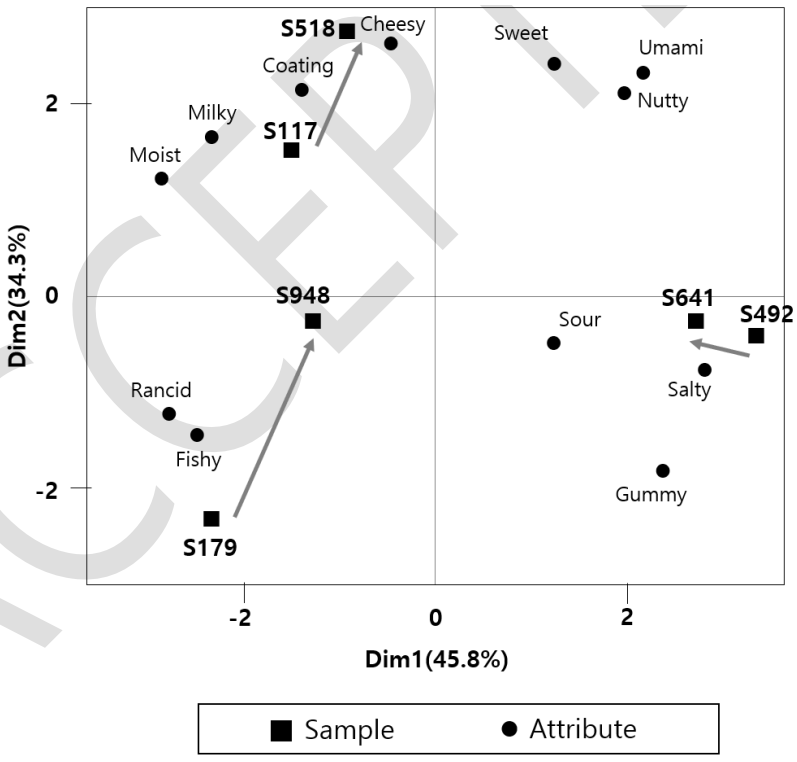


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480 **Figure 2. Principal component analysis of the sensory profile of the salami samples**

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