



Neophobia and seaweed consumption: Effects on consumer attitude and willingness to consume seaweed

Chema Losada-Lopez^{a,*}, Domingo Calvo Dopico^a, José Andrés Faína-Medín^b

^a Business Department, Facultad de Economía y Empresa, Universidad de A Coruña, 15701, A Coruña, Spain

^b Economics Department, Facultad de Economía y Empresa, Universidad de A Coruña, 15701, A Coruña, Spain

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ABSTRACT

Neophobia has become an increasingly researched phenomenon given its importance on the evaluation and acceptance of new products such as seaweeds, especially in a country where these products are not a part of the culinary tradition, for example, Spain. Seaweed is a form of algae, a nutritional and healthy product. Studies have investigated not only the influence of neophobia on the satisfaction and intention to consume seaweed, but also on its impact on the evaluation of the seaweed's credence attributes such as health benefits. Previous research has concluded that consumers who are willing to consume novel products, like cooking and also demand elements of modernity and naturalness in their food. Considering this finding, a convenience sample comprising attendees of cooking workshops and young consumers was selected. Participants were evaluated about their opinion and attitude toward seaweed as food item, credibility of chefs, and the Food Neophobia Scale (FNS) prior to the tests. After the seaweed tasting, consumers were asked about their feedback and willingness to consume seaweed again. The results confirm that neophobia affects the intention to consume algae. However, consumer assessments of the credence attributes and confidence in the cues sent out by chefs regarding seaweed-based dishes are not influenced by neophobia. Hence, promotion of credence attributes such as health and natural properties of algae should be used to engage consumers potentially interested in new experiences. Simultaneously, the use of credible cues from chefs also represents an excellent way to increase consumer confidence and surpass the barrier created by neophobia.

Introduction

Neophobia is a personality trait which exerts a major influence on consumers' acceptance of new products. In developed countries, numerous innovative food products are launched in the market (Bäckström et al., 2004). In Spain and Europe, consumers have the opportunity to choose from a wide variety of foods (Veeck, 2010). However, this massive influx of new products can generate consumer insecurity and meet consumer opposition and suspicion (Grunert and Valli, 2001). Furthermore, professionals do not seem to be able to predict the success of new products (Van Kleef et al., 2002) and most launches fail (Stewart-Knox and Mitchell, 2003). In this scenario, the study of the phenomenon of neophobia becomes relevant.

Many food companies continue trying to introduce a large number of new products in order to become more competitive, guarantee their viability, and create augmented added value (Barcello et al., 2009). The challenge of achieving consumer acceptance is much greater when these

products are not part of the consumer's culinary tradition. In this case, the degree of novelty in the market would be very high, so the perceived risk could be a barrier to consuming or buying the product. An excellent example of this is algae.

Edible seaweed represents one of the trendy foods in the market. Their nutritional and health characteristics adapted to our prevailing living conditions explain why edible algae are being labeled as "super food." Hotchkiss (2010) explains that algae are widely consumed in Asia, but in the western world and in Europe they are largely unknown. In Europe and in Spain in particular, edible algae are considered as a radically new food product since they have not been traditionally consumed. Although there are growth signs in algae consumption in Spain and France (Dringet et al., 2013), the consumption of seaweed in Europe is still limited. Thus, in the western world, edible seaweed remains a new product, alien to main diet and eating habits.

Prior research (Martins and Pliner, 2005; Tuorila et al., 2001) has concluded that food neophobia is associated with eating the same

* Corresponding author.

E-mail addresses: jose.maria.losada@udc.es (C. Losada-Lopez), domingo.calvo.dopico@udc.es (D.C. Dopico), jose.andres.faina.medin@udc.es (J.A. Faína-Medín).

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products and not trying new ones (Bäckström et al., 2004; Urala and Lahteenmaki, 2007; Henriques et al., 2009; Chung et al., 2012). As Buschmann (2017) indicates, very few studies are available on usage of edible algae as food. Recent research on Australian consumers has shown that neophobia acts as a mediating variable influencing consumption and hence, neophobic consumers are less likely to consume algae. (Birch et al., 2019a, 2019b). Moreover, Palmieri et al. (2020) also find significant levels of neophobic attitude regarding seaweed consumption in Italy. Other studies such as Annelise et al. (2015) and Al-Thawadi (2018) conclude that neophobia affects consumers' decision to eat seaweed. However, research has also shown that information and the promotion of so-called credence attributes can improve the image of the product in the consumers' minds and influence their willingness to try unknown foods (Woodward, 1945; Cardello et al., 1985; Tuorila et al., 1994; Pelchat and Pliner, 1995; Mcfarlane et al., 1997). Another important variable in this regard is the credibility of information cues, especially those that provide confidence to the consumer, which places the stakeholders in a very favorable position to stimulate consumption of the product or to encourage tasting it.

Apart from the most recent publications quoted above, no study has investigated the influence that neophobia may have on both the satisfaction and willingness to consume seaweed and the assessment of credence attributes. This paper is aimed at addressing these concerns.

This research aims to analyze neophobia's influence on consumer attitudes towards edible algae. Specifically, this study examines how neophobia can influence consumer confidence in the health properties commonly attributed to algae or the influence it can have on the credibility of inferential cues like the ones issued from chefs.

This study provides significant contribution towards research on this subject by examining the role of neophobia in consumers' assessment and acceptance of seaweed based food in a country where there is no culinary tradition of using this product. An experiment, combining a sensory product tasting and two questionnaires (before and after the tasting) was used to analyze the influence of neophobia both on the satisfaction and willingness to consume seaweed, as well as its possible impact on the consumers' perceptions regarding the credence attributes commonly associated with seaweed.

This paper is structured as follows. The first section presents a review of prior research on neophobia and credence attributes with a focus on seaweed products, as well as a credibility analysis of the informative cues. The second section describes the methodology used. The third section presents and analyzes the results obtained regarding neophobia's influence on consumers' attitude, satisfaction, and willingness to consume seaweeds. The next section discusses the primary results and details the conclusion and future prospects of research.

Literature review

The importance of credence variables in forming consumers' attitudes and purchase intentions in the agrifood industry has been proven in a considerable number of studies. The fact that seaweed taste and texture depend on culinary knowledge and techniques, as well as on experimentation and *learning by doing* can entail relatively high costs for most consumers.

Neophobia, new food products, and seaweed consumption

Food choice is influenced by many interacting factors (Köster, 2009) including those having a symbolic meaning for people and their lifestyles (Warde, 1997). What we eat or do not eat represents our beliefs and culture (Bessiere, 1998). In addition to cultural variables, increased interest and attention is being paid to other variables of an individual nature such as neophobia.

Neophobic behavior can be considered as an adaptive strategy present among omnivorous species, to avoid eating unknown and potentially poisonous foods (Lafrairet et al., 2016), which even manifests

physiological responses that may indicate fear of new foods (Raudenbush and Capiola, 2012) and is related to increased anxiety about food (Galloway et al., 2003; Pliner and Hobden, 1992; Pliner et al., 1993). Schnettler et al. (2017) explains that there is a coexistence between the demand for modernity, novelty, and naturalness in diet and food as well as the presence of caution and even aversion regarding new and unknown foods (Coppola et al., 2014).

Food neophobia is one of the barriers to the success of new food products (Fenko et al., 2015). However, considered as a personal trait independent of the consumer's culture, it is grounded in the refusal to try unknown products or the aversion to new flavors (Pelchat and Pliner, 1995). Neophobia can be defined either as a state of unwillingness to try new foods or as the propensity to refuse to try unknown foods and flavors (Barrena and Sanchez, 2013). According to Tuorila et al. (2001), exposure to unknown foods can reduce neophobic responses (Pliner et al., 1993). Food neophobia is seen as a fear of new flavors, styles and ingredients (Johns et al., 2011) associated with eating the same products regularly (Martins and Pliner, 2005; Tuorila et al., 2001). Neophobia is also related to avoiding non-traditional foods and functional food products (Urala and Lahteenmaki, 2007), as well as the tendency towards not trying new foods (Arvola et al., 1999; Bäckström et al., 2004; Chung et al., 2012; Henriques et al., 2009) and rejecting ethnic foods (Choe and Cho, 2011).

Information is known to influence the willingness to try unknown foods (Cardello et al., 1985; Woodward, 1945) and even mitigate neophobia by reducing the propensity to reject new foods (Pelchat and Pliner, 1995) and reduce uncertainty (Tuorila et al., 1994; Mcfarlane et al., 1997). Several studies have shown that the food neophobia scale (FNS) (Pliner and Hobden, 1992) accurately predicts responses to new or unknown foods (e.g., Donadini et al., 2012; Schnettler et al., 2017).

This study identifies three outcomes of interest with respect to seaweed. The first outcome states that neophobia exerts a negative influence on consumer intent. Different studies converge on this finding. Birch et al. (2019a, 2019b) shows that neophobia acts as a mediating variable influencing consumption and that neophobic consumers are less likely to consume algae. This same result was concluded by Al-Thawadi (2018) and Annelise et al. (2015) who demonstrated how neophobia affects consumers' decision to eat seaweed. Moreover, Palmieri & Forleo (2020) also find significant levels of neophobic attitudes regarding seaweed consumption in Italy. The second result of interest relates to the influence that sensory properties, especially the improved taste or presentation (Annelise et al., 2015), can have on increased product acceptance. This means that an improvement in presentation by pairing each type of seaweed with an adequate main ingredient, mainly fish or vegetables, may enhance the product's acceptance. The final interesting result focuses on the consumer and the conclusion and states that consumers who prefer innovative food are more prone to consume novel dishes containing algae, such as sushi (Altintzoglou et al., 2016).

As mentioned, no prior studies have analyzed the influence of neophobia on the assessment of credence attributes. Further, the credibility of information cues has also not been studied in the context of neophobia.

Credence attributes, attitude, and seaweed consumption

The importance of credence variables in shaping consumers' attitudes and purchase intentions in the agrifood industry has been proven in a considerable number of studies (Wirth et al., 2011). According to evidence found in many studies (Wirth et al., 2011; Lee and Yun, 2015), the value of credence attributes has been increasing. Fernqvist and Ekelund's (2014) literature review provides an overview of the different credibility attributes that have been explicitly considered in a series of studies on health and awareness (Huang et al., 2019), well-being (Goetzke et al., 2014; Dhargalkar, 2015), naturalness (Van den Heuvel et al., 2007; Hemmerling et al., 2016), respect for the environment (Bryla, 2016; Dowd and Burke, 2013; Lockie et al., 2002), animal

welfare (Aboahand Lees, 2020; Lagerkvist et al., 2011; Tonsor et al., 2009), and place of origin (Peritoet al., 2019; Aprile et al., 2016) are also highly relevant in creating positive consumer attitudes and purchase intentions (Loureiroand Hine, 2002). To sum up, the studies conclude that credibility attributes have a very strong influence on the formation of positive attitudes and willingness to buy in consumers.

Unlike search attributes (color, size, price) and experience attributes (taste, texture, flavor), credence attributes are those which consumers are not able to appreciate directly even after purchasing and consuming the product (Ford et al., 1988). The fact that seaweeds' taste and texture depend on culinary knowledge and techniques, as well as on experimentation and learning by doing, can entail relatively high costs for most consumers. As already explained above, edible seaweeds are not commonly consumed in western countries and their flavor and texture depend on culinary techniques. As most consumers in Western countries are unfamiliar with seaweed gastronomy, they cannot verify the attributes of flavor and texture in the products, once they are properly cooked and served.

There are many interesting pieces of evidence in the literature regarding the credence attributes of seaweed, those related to their health properties. Scientific research has recently accumulated evidence about the nutritional benefits of seaweed for a balanced diet. Additional research on this topic also establish seaweed as a rich source of antioxidants, micronutrients (potassium, magnesium, iodine) (Gupta and Abu-Ghannam, 2011), and fiber (Hall et al., 2012), as well as a food which helps in the prevention of digestive-tract related diseases (Brown et al., 2014).

The above-mentioned scientific studies highlight the health benefits of algae. However, very few studies have investigated this phenomenon from the consumer's point of view. These studies highlight how algae's health properties are valued positively by consumers. Birch et al. (2019a) find that healthy, nutritious, and natural were the most important reasons for consuming seaweed, whereas other important reasons were consumption safety (57.2%), freshness (57.4%), a good source of protein (53.6%), low calorie count (52.4%), and a good source of iodine (51.8%). Similarly, a study carried out in France (Lucas et al., 2019) concludes that while consumers value their health and sustainability attributes, the expansion of seaweed consumption essentially requires eliminating apprehension towards tasting these new products. This finding indirectly reveals that neophobia is a barrier to the consumption of seaweed. Interestingly, as previously noted, it has not been investigated whether neophobia influences the assessment of the credence attributes of seaweed and the credibility of information cues.

Unsurprisingly, credence attributes are based on credibility and trustworthiness. Consumers assess the credibility and trust levels of different players (companies, non-for-profit organizations, and government agencies) based on the information about them as well as their perceived images. Generally, trust levels will be higher if the communication is more credible and there is more evidence regarding the contribution of that food towards well-being or health. With regards to consumers' values and attitudes, there is evidence in the literature that consumers are increasingly becoming aware and prioritizing healthy diet (Beardsworth et al., 2002; Verbeke, 2005). The trustworthiness of information about the health and nutritional benefits of seaweed depends on relevant communication and reports by health and nutrition experts and professionals, which can promote seaweed consumption among consumers.

Recent studies on the profiles of consumers who eat algae (Birch et al., 2019a; Palmieri and Forleo, 2020), pointed out the significance of innovative and lifestyle consumer features as well as the elements of image and social status in defining the consumers' food preferences. Thus, the importance of emotions, reputation, as well as perceived symbolic values should also be considered when examining neophobia in relation to food. Particularly, the continuous inclusion of algae dishes in the menus of prestigious restaurants and its consumption by the top segments of the society may associate an element of image and social

status with it. Barrena and Sánchez (2013) corroborate the findings of Rogers (2010) and Foxall (1988) that the purchase of novel products is perceived as a way to improve one's social status. Along the same line of research, Perrea et al. (2017) conclude that consumption of certain trendy or novel foods can serve as a means of building an image and social status, and thus seaweed consumption may have some symbolic value for its consumers.

There is a growing interest in phycogastronomy—including edible algae on menus—in avant-garde restaurants (Pérez-Lloréns, 2020; Pérez-Lloréns et al., 2018; Mouritsen et al., 2018, 2019), and they are an excellent example of the taste of the sea (Sørensen and Mouritsen, 2019). The new gastronomy of seaweed, the phycogastronomy, has been recently revised by Mouritsen et al. (2019).

Agents directly linked to gastronomy provide one of the most interesting cues to investigate when a very novel product is launched in the market. This is explained below.

Credible cues and seaweed consumption

Current gastronomic tendencies to experiment with new products and flavors have introduced algae as ingredients in "haute cuisine." The Basque Culinary Center is an interesting case, as well as two of the greatest European chefs (Ferran Adria and Heston Blumenthal, chefs of the highly reputed restaurants El Bulli and the Fat Duck). This movement could be just "the tip of an iceberg particularly given contemporary concerns about 'healthy diets', seaweed as a superfood" (Hotchkiss et al., 2010, page 176) and the growing interest in phycogastronomy (Mouritsenet al., 2019).

Chefs observe their customers' tastes at their restaurants and experiment with them on new products and dishes every day. Consequently, they serve those products which are well accepted and demanded by their customers. The fact that successful restaurants and thriving businesses with satisfied customers regularly offer seaweed products is an evidence of the acceptability of their products and a good consumer experience. Therefore, reputable chefs keep seaweed on their menus because their customers are satisfied. Customer satisfaction reveals a sign of credibility and the product's superior quality. This cue can influence seaweed consumption, in line with Cox (1967) and Olson and Jacoby's (1972) findings. Therefore, the presence of seaweed on top restaurant menus can be interpreted as an indicator or signal of quality and, through inference, it influences the consumer's perception on the product's quality (Huber and McCann, 1982). Seaweed is present on restaurant menus because consumers have accepted it, which might lead other consumers to believe in the quality of such a dish.

There is also a prominent logical inference factor that fits well in a Cox's cue (1967). The fact that accredited restaurants, as well as specialty food retailers, both prosperous businesses with satisfied customers, regularly offer seaweed products is a cue of their products acceptance by at least a significant share of their customers.

Backward induction is a logical method characteristic of game theory. Its initial formulation dates back to the study for the game of chess (Schwalbe and Walker, 2001). However, nowadays it is a tool with wide practical applications in commercial and consumer strategies (Shankar, 2019).

Backward induction is a logical tool consisting in looking forward (towards the final nodes of the decision or the game) and then reasoning backwards to select the best decisions and answers in the previous nodes. We will see next how this logical inference method can be used to deduce a positive customer experience from the fact that highly reputed chefs keep algae on their menus, as well as from specialty food retailers who keep algae on their shelves.

Backward induction shows how decisions to keep offering a novel food product by retailers and fine restaurants send a credible signal about the acceptability of its quality attributes. Chefs can observe their customers' tastes at their restaurants. Day by day they are testing new products and dishes. Consequently, as they want their businesses to

thrive, they only keep on serving those products which are well accepted and demanded by their customers.

Repeated supply of novel products by chefs, restaurants, and reputed specialty food retailers provide credible information that allows consumers to infer the true relationship between real and claimed product attributes.

The diagram below shows -left to right-the process line of decisions from chefs offering seaweed products. At the next stage, consumers try products and dishes and chefs get feedback from their customers. This is the real point; chefs can observe the tastes and reactions of consumers. Consequently, they will only continue to offer those seaweed products and dishes which their customers like and appreciate (Fig. 1).

The logical inference from the backward induction process goes the other way round, from right to left. As fine restaurants keep on serving seaweed products, seaweeds must be well rated and demanded at least by a significant share of their customers. The real test lies in the positive consumer experiences of those who enjoy algae dishes at the restaurant and keep demanding more. Through backward induction, consumers can assume that the sensory experiences of the select customers of those restaurants have been satisfactory, so that seaweed remains on the menus, and that is the relevant information highlighted in this point.

Methodology: an experiment based on seaweed tasting

The methodology used in this study can be divided into 2 sections: 1. The design of the experiment, and 2. The measurement scales used.

Tested product descriptions Fig. 2

Sampling and experiment design

A survey and a sensorial tasting session were conducted in Spain with a heterogeneous sample of cooking workshop attendees and young consumers. The attendees were selected using a convenience sampling method. As previous research has emphasized, consumers who are willing to consume new products show a positive attitude towards novelty (Nieand Zepeda, 2011) and also like cooking (adventurous consumers). Moreover, these consumers also demand modernity and naturalness in their diet and food (Schnettler et al., 2017). Traynor et al. (2020) revealed that individuals with culinary education are more prone to accepting a new food.

An experiment was carried out during a cooking workshop to which the regular attendees of these workshops and consumers interested in innovation were invited. The sample consisted of 50 people from two

groups: 1) attendees to the cooking workshops and 2) consumers with a high degree of taste for cooking (average 5.4 out of 7, standard deviation 1.14). These potential consumers served as the participants to the first survey on the acceptability of the new seaweed food products and the credibility of the information cues inferred from the chefs who usually serve seaweed products at their restaurants.

The participants' personal profiles reveal an interest in cooking and innovation. The random distribution (normal) of the study variables can be considered representative of the profiles of people who have completed medium and high-level studies (87%) and who are in the age group of 21–30 years and are interested in food and cooking (49%). These profiles have relatively open views on new food products. Most of the participants are the decision makers in their households in terms of purchase (79%) and the majority of them have never tried seaweed before (64%) as a main dish (not as a complement as it can be in the preparation of the sushi). The sample's demographics are presented below.

Attitude towards algae among the respondents may be relatively positive due to the selection profile. Nevertheless, the distribution of neophobia in the sample covers a wide range, with a variation coefficient of 50%, between a minimum of 1 and a maximum of 6, very close to the upper end of the scale [1–7]. Consequently, the sample yielded interesting results, which are highlighted in the main findings section.

Concerning the empirical strategy, we designed a sensory test developed in two phases. In the first phase, right after the reception and presentations, attendees were asked to fill in a questionnaire to ascertain their initial attitude towards seaweed food products. The questions were aimed at measuring their personal attitudes towards edible algae (health properties), the refusal to try new foods (their levels of food neophobia scale, FNS) and evaluating the credibility of signals emitted by chefs. In the second phase, one of the teachers from the cooking workshop provided information and gave a practical demonstration on seaweed dishes. A short talk on the role of seaweed in the menus of *haute cuisine* restaurants was followed by the preparation of some seaweed specialties (natural wakame, sea spaghetti, and seaweed tartare curry). There was a break to taste the seaweed dishes prepared by the chef. The menu was the same for everyone and no one refused the test. Finally, after the informative talk and tasting session, without discussing among themselves, the attendees were asked to fill in a second questionnaire to reassess their previous beliefs. The design of this experiment allowed us to reassess the confidence of the attendees in the nutritional properties of algae, the credibility of the chefs, the attendees' satisfaction with the product, and their willingness to buy.

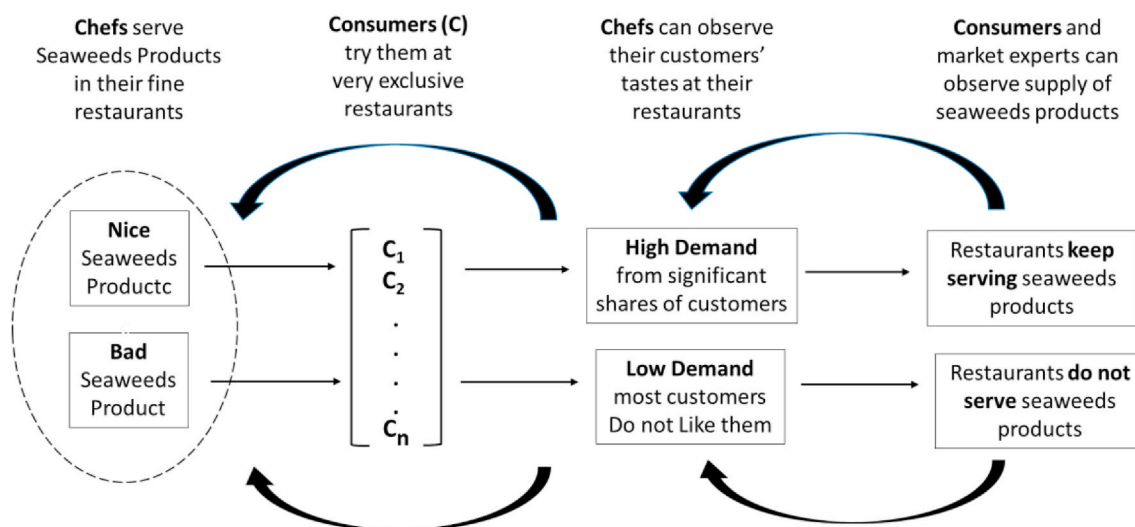


Fig. 1. Backward inference from sustained supply of seaweed food products
Source: Own elaboration based on the well-known logical inference in Game Theory, developed from an initial idea dating back to Zermelo (1913).



Fig. 2. Products used in the experiment.

To sum up, only after receiving detailed information on the subject (perceived quality and attributes of edible seaweeds), the participants in our experiment made their assessments on satisfaction and willingness to consume a seaweed dish again (64% of the people in the sample had never tried seaweed products).

3.2 Variables selected and measurement scales

To measure consumers' confidence in seaweed (CCO), we used the brand confidence scale developed by Lassoued and Hobbs (2015) by adapting it for a product with no previous purchase experience. Consumers' confidence in algae as food was measured through questions such as "I am certain [I am optimistic] about the quality and safety of edible seaweeds [overall quality of algae]." Concerning the credibility of chefs (CHEFS), we used the scale developed by Lassoued and Hobbs (2015). We framed statements like "I think the varieties and types [the brands and types] of seaweed used by the chefs deserve confidence for their high quality" [are of reliable quality]. Consumers' attitude towards edible seaweeds (SWATT) was measured to derive the overall impression of edible seaweed products. It was adapted from Goldsmith et al. (2000), containing items like "My overall impression of edible seaweeds products is good" [favorable or satisfactory]. The Food Neophobia Scale (FNS) was adapted from Pliner and Hobden (1992). It contained items like "I am afraid to eat things I have never had before" [I don't trust new foods] or with reverse scoring, "I will eat almost anything"® [At dinner parties I will try a new food®]. Consumers' Satisfaction (SAT) was adapted from Babin and Griffin (1998), Oliver (1997), and Taylor et al. (2004). It contained items like "I feel [in general terms] satisfied [happy] with edible seaweeds" and [my expectations have been fulfilled with regard to edible seaweeds]. Willingness to consume (WILLI), was measured with a scale adapted from Mittal et al. (1999) and Chandon et al. (2005) with items like "I am going to buy edible seaweeds again,"

"I would recommend" ..., "I will invite my family and friends to try edible seaweeds."

Results

Neophobia: attitudes, satisfaction, and willingness to consume

Both, cooking workshop attendees and young consumers, were satisfied with the dishes, providing a score higher than the average (5 out of 7) (Table 1). Same was the case with consumption willingness and to a lesser extent with purchase intention (see Table 3). However, these

Table 1
Sample demographics.

Gender	n = 47	%
Male	17	36%
Female	30	64%
Age (years)		
21–30	23	49%
31–40	6	13%
41–50	5	10%
51–60	7	15%
Over 60	6	13%
Indicate your work situation		
Unemployed	17	36%
Retired	5	11%
Employed	24	51%
No answer	1	2%
Indicate if you are the regular buyer in your family		
No, I don't usually do the shopping in my family	10	21%
Family		
Yes, I usually do the shopping in my family	37	79%
Have you ever tried seaweed before?		
No, I haven't tried it before	30	64%
Yes, I've tried it before	17	36%

Table 2

Design of the experiment (n = 50), variables, scales (Likert 1–7) and labels.

1) Before tasting CCO (Adapted from Lassoued and Hobbs, 2015)	CCO1 CCO2	I am certain about the quality and safety of edible seaweed for consumption I am optimistic about the overall quality of algae for consumption and I will buy in the future
CHEF (Adapted from Lassoued and Hobbs, 2015)	CHEFT1 CHEFT2 CHEFT3	I think the brands and types of seaweeds that are used by the chefs deserve confidence for their high quality I think the brands and types of seaweeds that are used by the chefs are of reliable quality I believe that good chefs use brands and types of seaweeds of the highest quality
SWATT (Adapted from Goldsmith et al., 2000)	SWATT1 SWATT2 SWATT3	My overall impression of edible seaweeds products is good My overall impression of edible seaweeds products is favorable My overall impression of edible seaweeds products is satisfactory
FNS (Adapted from Pliner and Hobden, 1992)	FNS1 FNS2 FNS3 FNS4 FNS5 FNS6 FNS7 FNS8	<i>I am constantly sampling new and different foods (R)</i> I don't trust new foods <i>I like foods from different countries (R)</i> <i>At dinner parties I will try a new food (R)</i> If I do not know a food I do not try I am afraid to eat things I have never had before I am very particular about the food I eat <i>I will eat almost anything (R)</i>
2) The seaweed tasting session, after the chef's explanation		
		
3) After the seaweed tasting SAT (Adapted from Babin and Griffin, 1998; Olive, 1997; Taylor et al., 2004)	SAT1 SAT2 SAT3 SAT4 SAT5 SAT6	I feel satisfied with edible seaweeds I am happy with edible seaweeds My expectations have been fulfilled with regard to edible seaweeds In general terms, I am satisfied with edible seaweeds I am satisfied with edible seaweeds Edible seaweeds satisfy my needs
WILLI (Adapted from Mittal et al., 1999; Chandon et al., 2005)	WILLI1 WILLI2 WILLI3	I am going to buy edible seaweeds again I would recommend edible seaweeds to others in the future I will invite my family and my friends to try edible seaweeds

Source: Own elaboration.

Table 3

Descriptive statistics of the main variables.

Label	Variable Name	Mean	Std. Dev.
<i>Cco</i>	Consumers' confidence in the quality of seaweeds	4.3	1.2
<i>Cheft</i>	Credibility of chefs' quality signal	4.9	1.1
<i>Swat</i>	Consumers' attitude towards seaweeds	4.6	1.2
<i>Sat</i>	Consumers' satisfaction (after tasting)	5.1	1.4
<i>Fns</i>	Food Neophobia Scale	3.0	1.4
<i>Willi</i>	Willingness to consume	4.9	1.7

results should consider the personal attribute of reluctance to try new foods, revealed by the neophobia variable (Pliner and Hobden, 1992; Ritchey et al., 2003). Although the determining factors in the purchase process of novel foods are different, one must undoubtedly control for neophobia to achieve more accurate results (Table 2).

After identifying that neophobia can exert an important influence on the consumption of seaweeds, the sample was divided into three levels (low, medium, and high) according to the degree of neophobia. The neophobia (*fns*) variable was recoded into three levels (*lfns*) in order to carry out a MANOVA test about the significance of its effects on attitudes

towards seaweed, confidence in seaweed attributes, and credibility of chefs, as well as consumers' satisfaction and willingness to consume.

As for the effects of neophobia on attitudes, satisfaction, and willingness to consume it results, after controlling for neophobic attitudes, that both satisfaction and willingness to consume indexes showed a significant effect of the levels of neophobia. On the other hand, data drew a clear psychological profile of neophobic attitudes. Evidence confirms the influence exerted by neophobia on the assessment or evaluation of algae. Thus, neophobia has been proven to exert a highly significant discouraging effect on consumers' behavior towards novel seaweed products, as well as on their satisfaction and willingness to consume the product after tasting it. Thus, neophobia has a clear negative impact on consumers' attitude towards seaweed (*swatt*), satisfaction after tasting seaweed products (*sat*), and willingness to consume (*willi*).

Neophobia and credence attributes

The different tests provide a clear pattern, pointing to a different impact of neophobia on the variables connected to personal and emotional factors and those based on inferences about the credibility of

cues from chefs on the trustworthiness of public information on nutrition and food.

Another interesting finding is that neophobia levels do not significantly affect consumers' cognitive assessments, such as confidence in seaweed attributes and credibility of the signals issued by chefs when offering seaweed products. These variables are relatively immune to neophobic behaviors and show no significant differences due to them. These results still hold if we consider only two separate groups of observations, one with high and the other with low neophobia, which should correspond with those people who are above or below the median. All of them systematically show higher mean values at significance [confidence] levels higher than 0.01% [99.9%]) for the low neophobia groups.

In this study, we have chosen the median as the value to determine the dividing line between the two groups, given that the values between the medium and the mean were very similar in both cases. Most prior studies have opted for using the mean (Choe and Cho, 2011; Henriques et al., 2009; Meiselman et al., 2010; Ritchey et al., 2003) and the median (Doveyet al., 2012), while other studies have used a cut-off point to divide respondents into neophilic and neophobic (Tuorila et al., 1994).

The cognitive aspect, in the sense of a Cox's cue (1967), of the credibility of the signal emitted by chefs is not significantly affected by the sensory experience of seaweed tasting. On the whole, our sample consumers' confidence in seaweeds is not significantly altered either. However, in a somewhat different way, the experience of a satisfactory tasting is associated with certain reinforcement of consumers' confidence in edible seaweeds, except for consumers with a high level of neophobia.

Discussion

The analysis of the evidence from our experiment reveals that there are two clearly differentiated groups of consumers in what regards personal neophobia levels. On the one hand, individuals with high levels of neophobia and on the other hand consumers with low scores. Given that this variable exerts a significantly different influence on the assessment of both satisfaction and consumption intention, it is interesting to prioritize consumer groups and study what may be the best communication strategy.

However, the case with credence attributes is that they are not significantly altered by neophobia. This finding could be used as an element to include in the design of a differentiated communication strategy for both groups, particularly for the group of consumers with a less neophobic attitude. Finally, there is also a credibility variable, haute cuisine chefs and high reputed restaurants can issue signals of high credibility for the final consumer. This element can also serve as a key driver for the communication strategy. The integration of these elements and their business implications are discussed below.

The aim is to favor the acceptance rate of new products in markets where consumers are not used to consuming them and where neophobic attitudes can induce rejection to try or consume these products. In this context, communication plays a decisive role since it influences the formation and change of attitudes. A communication strategy can directly influence on consumers' knowledge and induce a change of attitudes becoming an excellent instrument to create positive images in the mind of the consumer towards algae as food. Given that neophobic attitudes differ remarkably between consumers, a segmentation and positioning strategy must suggest prioritize less neophobic consumers over the others, as well as presenting differentiated messages to each of these consumer groups.

Therefore, to foster the introduction of algae products, less neophobic consumers should be prioritized with a message focused, not only highlighting the credence attributes of edible seaweeds (excellent health or well-being properties that algae have as food) but mainly by highlighting the credibility of the signals issued from highly reputed haute cuisine chefs. Their signals exert a very positive influence not only

because they have a wide credibility for consumers and markets, but also because over time, their recipes and ways of having seaweed food can spread to other restaurants or family homes. Thus, the elaboration of dishes must begin with the great chefs. These highly reputed chefs will send a signal that will be deployed towards the elaborations and tables of final consumers. Their professional recipes will be taken as a reference for the elaborations of less prestigious restaurants and for family kitchens, in a similar way to what was previously stated for the most successful technologies tested in the avant-garde restaurants (Spence and Piqueras-Fiszman, 2013).

In this introductory phase, the attention of the most neophobic consumers would not be prioritized. It can be expected that with the passage of time, consumers with lower levels of neophobia may indirectly influence those other consumers and induce an increased acceptance of the seaweed dishes prepared by prestigious chefs in most avant-garde restaurants. Moreover, in a similar way, this culinary knowledge will be spread to other restaurants and will finally spill over many home kitchens.

In a parallel way, the increasing health awareness of many consumers, as well as the increasing tendencies towards naturalness and sustainable food, which continue to emerge in the markets, may stimulate many other consumers (further beyond the less neophobic ones) to try these new algae products either as a main dish or even as a complementary ingredient in the medium and long term.

Implications for gastronomy

This study was conducted with packaged seaweed, as a main dish, without any accompanying or culinary preparation. In this way, we were able to analyze the signal issued by the chefs as an information cue leaving apart the positive influence of high-quality recipes and elaborations usually carried out by a professional cook. Though, chefs' culinary art would certainly increase consumer satisfaction after tasting the product.

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The promotion of health, wellness, and natural attributes of seaweeds, and the credibility of the cues issued from haute cuisine chefs are elements that, if creatively exposed, could draw the attention of consumers interested in new experiences or emotions. The combination of gastronomy with new science-based cooking techniques, as well as the creation of elaborations in which seaweeds are the main component, will improve the satisfaction when tasting algae. The creation and offer of these new "recipes" in the menus of avant-garde or recognized restaurants will help consumers to increase the interest and reduce the rejection towards edible seaweed.

Conclusion

The acceptance of highly innovative products in markets where there is no culinary tradition involving these products, as well as the influence of psychological variables that can negatively affect the acceptance and testing of a new food product is a phenomenon that requires special attention. There is still a gap in the literature on this subject. This study aims to bridge this gap.

We have chosen a seaweed food product that is highly accepted in the Asian market but largely unknown in the European market. Therefore, it is a product with a very high degree of novelty. Specifically, this study investigates how neophobia can affect the consumers' behavior towards algae and their satisfaction and intention to consume the product, as well as the possibility of influencing consumer confidence in the credence attributes commonly attributed to algae food such as its

health and wellness properties. Likewise, this study also examines neophobia's influence on the perception of credibility of extrinsic signals issued by chefs that offer this product as a delicacy. This study was conducted with packaged seaweed, as a main dish, without any accompanying or culinary preparation. In this way, we were able to analyze the signal issued by the chefs as an information cue leaving apart the positive influence of high-quality recipes and elaborations usually carried out by a professional cook. Though, chefs' culinary art would certainly increase consumer satisfaction after tasting the product. This is compatible with and complements the practical contribution of the research of Cifci and others (2020).

Our findings show that neophobia negatively influences the consumers' interest in edible seaweed both before and after consumption, thereby affecting their satisfaction and their willingness to consume. This finding is consistent with the results provided by previous research (Birch et al., 2019a; Al-Thawadi, 2018; Annelise et al., 2015). We have also investigated whether neophobia alters the valuations of credence attributes (health, wellness, and naturalness) as well as the credibility of signals from chefs. In this case, an interesting outcome has been achieved, representing a notable contribution: consumers' assessments of both seaweed credence attributes, as well as their confidence in the signals issued by chefs are not significantly influenced by neophobia.

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Declaration of interest

No conflict of interest.

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