

The positioning of edible insects on the Western Market

A literature review

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Abstract

Western society is still not inclined to consume insects, while it could be a fulfilling alternative to foresee in future food demand. It is essential to come up with an appropriate positioning strategy so that insects as food can be successfully introduced on the Western market.

The present paper conducted a literature review on positioning of insect based products on visual appearance and product placement. The objective of the research was to give a clear distinction between the various articles published about the different positioning approaches used concerning visual appearance of insect-based foods.

The present paper has brought to light that no conclusive research is available on which elements should be focused on to increase the acceptance of insect based products among consumers. Therefore future research should give a comprehensive view on marketing and positioning of edible insects based on consumer perspectives. Better use of marketing techniques can help to target the right product to the right customer in the right context.

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Introduction

The world's population is projected to reach 8.5 billion by 2030, 9.7 billion by 2050 and exceed 11 billion in 2100 (UN, 2015). According to these growth rates, the world food production has to intensify to provide food for all people and to prevent famine in the future. However, there is a limited amount of land available for the cultivation of crops or to facilitate animals, oceans are depleted, climate change and related water shortages will also affect food production.

The consumption of insects could probably be a fulfilling alternative. Since it is stated that the consumption of insects is a sustainable alternative for meat production (Tan, van den Berg & Stieger, 2016) it could help to foresee in future food demand. Moreover, many edible insects are rich in protein, good fats, calcium, iron and zinc (van Huis et al, 2014).

Despite its potential, Western society is still not inclined to consume insects. Different positioning strategies are used to increase the attractiveness and acceptance of edible insects, but unfortunately without success. Though, it is essential to come up with an appropriate positioning strategy so that insects as food can be successfully introduced on the Western market.

According to Hartmann et al (2015), the introduction of insects as a food source in Western societies seems more likely to succeed if insects are incorporated into familiar food items. Therefore, the visual appearance of the product seems to be an important attribute in product positioning.

Three different types of consumable products are distinguished, namely granular insects or in paste form, whole insects and extracted insect proteins (van Huis et al, 2014). The costs of extraction of insect proteins are at present prohibitive and not profitable for the industry. That is why in the past few years, only two different approaches concerning visual appearance are used to position edible insects. The first approach involves grinding insects into granular or paste form to subsequently present them in a for the consumer familiar product. The original shape of the insect is hidden because by presenting insects as a whole a feeling of disgust can be elicited and leads to low willingness to eat (Hartmann & Siegrist, 2016). An example of this approach is Jumbo's buffalo worm burger whereby buffalo worms are granulated and are added to a vegetable burger (Jumbo, 2016). In this way the original shape of the insect is hidden and the consumer has no notion of consuming an insect.

The second approach involves leaving the insects' visibilities untouched to subsequently present them as a whole recognizable animal. Consuming insects as a whole can be considered as novel, exotic, and marginal (Looy, Dunkel, & Wood, 2014). An example of this approach is Albert Heijn's buffalo larvae (Albert Heijn, 2016), which are presented as whole

insects. In this way the original shape of the insects is clearly visible and the consumer has fully notion of consuming an insect.

It is arguable which approach is best to present edible insects because there is no conclusive research at the moment.

In short, it is still unknown what the most effective positioning approach is concerning visual appearance to increase the consumption of edible insects in Western society. A lot of information on consumer acceptance and consumer preferences of insect-based food products is available, but still hardly any insect-based food is positioned successfully on the Western market.

The objective of the research is to give a clear distinction between the various articles published about the different positioning approaches used concerning visual appearance of insect-based foods, wherefore the positioning of insect-based food products on the Western market can be improved.

Theoretical framework

The positioning of edible insects proved to be a tough task and has not been successful. Therefor it could be inspiring to have a look at the attributes of successful products. By analysing them, important information about product attributes in general could be extracted and applied to insect based products. This could probably contribute to a successful positioning strategy for edible insects.

First, it is important to know how product attributes are accumulated and qualified. The means-end chain theory provides an analysis in which relationships between product attributes, benefits and consumer values are showed.

Second, the different types and importance of the product attributes is clarified. The definition and importance of concrete and abstract product attributes is given.

Third, the applicability of the different product attributes particular for the food sector is explained. What are successful product attributes within the supermarket sector?

And last, next to the importance of product attributes on the success of positioning, the influence of product placement on product positioning is described. The in store positioning, which includes the designation of products in the vegetarian or in the meat department, and as a subcategory the shelf display are discussed.

The means-end chain theory is often used to accumulate and qualify product attributes. It establishes a link between tangible attributes of a product or the individual and social needs of consumers, such as benefits and values. The means-end chains of consumers provide a

basis for new product development, brand positioning, advertising strategy development and market segmentation. (Vriens & Ter Hofstede, 2000).

Laddering is a traditional technique whereby means-end chain data is gathered through a qualitative interviewing technique. The first part of the interview elicits attributes that are important to the consumer and the preferences within attributes are established. Then, by subsequently raising questions about why issues are important to the consumer, benefits and values are identified. (Gutman, 1982)

The more tightly a product is linked to the various elements in consumers' means-end structures, the more likely it has personal relevance, and the more likely it will be preferred and chosen (Vriens & Ter Hofstede, 2000).

The product attributes accumulated by the means-end chain theory can be distinguished into different types, namely concrete and abstract product attributes.

According to Aaker et al. (1992), concrete attributes "are the most objective, tangible characteristics of a product and can be assessed based on some criteria such as colour, or shape". Meaning that this type of product attribute provides a physical feature. For example, the specification sheet of a sports car. The car has an anti-lock brake system, an engine, leather seating, four doors and chrome wheels. Although, positioning based solely on concrete attributes does not work in markets where the performance of products has become very similar (e.g., fast moving consumer goods). Differentiation and positioning in such product classes may be very difficult only on concrete attributes. (Vriens & ter Hofstede, 2000)

Abstract attributes, on the contrary, "represent intangible and subjective characteristics that are not easily measured" (Aaker et al., 1992). An abstract attribute provides the consumer with a benefit that results. For example, the brand or price of the sports car (Enneking, Neumann & Henneberg, 2007). Information about those abstract attributes is usually retrieved from memory (Hastie & Park, 1986). Hence, when consumers are more familiar with a product, the quantity of accessible information in memory is higher (Van Kleef, van Trijp & Luning, 2005). The concrete product attributes seem to have a primary effect on purchase intent, whereas abstract product attributes have a secondary effect (Haddad et al., 2007).

All products are a combination of concrete and abstract attributes. The decision by a consumer to purchase a product is based on a complex trade-off between the different attributes of the various alternative products (De Pelsmaeker, Dewettinck & Gellynck, 2013). Several product attributes have been extracted from previous studies, namely complexity, quality variance and visibility (DeVecchio, 2001).

Product complexity is described as the function of the product and measured as the perceived difficulty for the store to manufacture it, as a result of required specialized technological knowledge and ingredients. When a consumer perceives a certain retailer to be less likely able to produce a specific product, the more likely it is that the consumer develops a negative attitude towards a product carrying that retailer's store brand.

Quality variance is described as the quality of the product related to the price. When quality variance within a product category is high, it is likely that consumers will choose manufacturer branded products over store brands, to reduce the financial risks associated with that purchase (Semeijn, Van Riel & Ambrosini, 2004).

Visibility is described as public usage of a product. Meaning that it is important for products to have enough public exposure. In this way a producer reduces the chance that consumers will buy another brand, due to the lack of (symbolic) quality or that they will be outperformed by another brand.

Within food products, it is difficult to assess a specific list of important product attributes since they comprise a large array of attributes. These range from abstract attributes, such as price, packaging, product information, labelling and convenience, to concrete attributes, such as taste, colour or smell.

Producers and marketers believe that price is one of the most important attributes that convinces consumers during the purchasing process and therefore all product innovations need to be achieved at the lowest price (Carneiro et al., 2005). However, there are also studies that have shown that price is less important in the buying process than other extrinsic attributes. This tends to be the case with, strawberry yoghurt (Vickers, 1993), milk desserts (Ares, Gimenez, & Gambaro, 2009) and cheddar cheese (Solheim & Lawless, 1996). In addition to price, other attributes are relevant in defining consumer preference. For example, good quality beef. Hereby attributes like taste, tender, juicy, fresh, lean, healthy and nutritious are very important for a consumer (Schnettler et al., 2009). And also research on wine indicated that other attributes played a role in consumer preference, namely a good balance between origin, price and year of production is required (Gil & Sanchez, 1997).

It can be stated that multiple product attributes influence the perception and prevalence of consumers and that the importance of the attributes differs per product category. Within edible insect products, it is an interplay of different attributes and factors. According to House (2016), price, taste and availability play a significant role in the consumer acceptance of edible insect products. Consumers mentioned that the products were prohibitively expensive and that it would hinder future purchase. They also mentioned that not price alone but a range of intersecting factors together would hamper future purchase. One of those intersecting factors is taste. The opinions about the taste of edible insect products were

divided. Another intersecting factor is the availability of the edible insect products. Low availability of those products has as a consequence that consumers are not able to buy them as frequently as they would have liked. This will lead to passive rejection (Shelomi, 2015). Consumers mentioned that despite being aware of edible insect products existence they had difficulties finding them, because they do not often shop from the vegetarian/meat-replacement aisle. They suggested that the products could be better placed by the conventional meat. Other consumers seemed to expect to find the products near the meat substitutes, so the appropriate placement of edible insect products is debatable (House, 2016).

The appropriate placement of edible insect products is potentially an important factor influencing consumers buying behavior, since it also is an important attribute of product positioning in general. Natural and organic products could be placed in a separate department, which delineates the natural section from the rest of the mainstream food departments. But such a scenario has limitations, requiring consumers to deviate from their normal shopping patterns in order to find natural alternatives (Dahm, 2005). Hence, in the supermarket edible insects or processed insect products are displayed in two different departments, namely in the vegetarian department and in the meat department. When insect-based products are placed in the vegetarian department, consumers get the feeling that the product is vegetarian. In contrast, when insect-based products are placed in the meat department, consumers get the feeling that the product is made of animal meat. Integration of these products into mainstream departments has become more common, but this option could be off-putting to consumers if the price difference from a product's conventional counterpart appears unjustified (Dahm, 2005).

Similarly to the visual appearance, the designation of the product is debatable. Since insects contain a lot of proteins it would be appropriate to place them in the meat department. However, the visual appearance, the texture, smell and taste of insects differs from meat. According to the previous statement, insect-based products could not be categorised in the meat department and could therefore be classified as vegetarian. Solely, a vegetarian does not eat or does not believe in eating meat, fish, fowl, but subsists on vegetables, fruits, nuts, grain, etc. Which indicates that categorisation in the vegetarian department also does not provide a good fit.

As a subcategory, the shelf display has a significant influence on the evaluation of the products by the consumers (Buchanan, Simmons & Bickart, 1999). Sales of edible insects could be stimulated if those products are placed well within their department. According to van Herpen et al. (2012), the placement at eye level and the clustering of products are relevant for the stimulation of sales. The amount of shelf facings, however, is mostly relevant.

Thus not only the battle for shelf space is important, mostly the battle for shelf position is relevant. The location of a product on the shelf may be just as, or even more, important than how many facings it receives.

Considering the previous paragraphs, about the potential importance of product specific attributes related to visual appearance and the potential importance of product placement and shelf display, it is essential to get an overview of the existing literature concerning edible insects in combination with positioning. This review could show where literature is missing and could indicate in which areas more research is needed to increase the success of edible insects as a food source.

Methods

To investigate the current scientific practice on the positioning of edible insects on the Western Market, a systematic review was conducted of the published literature. A systematic review was done to provide a replicable and transparent procedure. In the search for relevant articles on the topic of edible insects, the search engine Scopus (<https://www.scopus.com>) was used. Scopus is the largest abstract and citation database of peer-reviewed literature: scientific journals and books. This database was chosen because it delivers a comprehensive overview of the world's research output in the fields of science, technology and social sciences.

Considering the main aim of this paper, to give a clear distinction between the various articles published about the different positioning approaches used concerning visual appearance of insect-based foods, a search expression for the identification of relevant papers was constructed that combines appropriate keywords in a single Boolean expression. To be relevant, a paper had to contain a reference 1) to edible insects, 2) to consumers or marketing, 3) to product positioning and it had 4) to contain quality links obtained by laddering (means-end chain). The construction of the specific syntax with the search terms was iterative. Once a combination of search terms was tried, the full list of papers was checked for relevance. The abstracts of about 10 papers were scanned to see whether there was an acceptable proportion of relevant papers. Based on these findings, the search terms were broadened, limited or adjusted, until there was decided on the final operationalization of the four blocks of search terms.

Each of these four blocks is operationalized in more detail on the next page.

Edible insects (block 1)

The search terms for edible insects were obtained by quick scanning abstracts of articles that were related to insect-based foods. The final selection of search terms consisted of key words that occurred often in those articles or were synonyms for 'edible insects'.

Consumer or marketing links (block 2)

Consumer or marketing links were included by adding broad search terms that included any word with 'consum' or 'marke' as the first two syllables.

Product positioning (block 3)

A variety of labels was used to denote product positioning because this research not only emphasizes the selling location but also the placement of the products on that location.

Quality links (block 4)

Search terms linked to quality of a product are chosen because they represent a variety of terms that could be used to increase the success of a product positioning strategy. The attributes, consequences and values, which are linked to quality of a product and obtained by laddering (MEC), can be categorized in the eight dimensions of quality (Garvin, 1984). Therefore those dimensions are used to concretize the search terms. Reliability, durability and serviceability had to be excluded because those dimensions do not apply to the attributes, consequences or values obtained by laddering (MEC) concerning FMCG or food products.

The previous four blocks were combined into one Boolean expression and the syntax was entered into the advanced search function of Scopus (table 1). The search engine paired the expression only with the title, abstract or key words of a paper. Further limitations were done by only including papers of the subject area of 'agricultural and biological sciences', 'social sciences', 'business, management and accounting' and 'psychology'. Also the type of document was narrowed by only including articles or reviews. For practical purposes, the dataset was further limited to English written literature.

Subsequently, the abstracts of the identified papers were downloaded and a quick scan was conducted. Papers were excluded if:

- The abstract was only about insects in general, e.g. characteristics of an insect, habitat of an insect or experiments with an insect.
- The abstract was about insects used as feed and not as food.
- The abstract was only about food or agriculture in general, e.g. the harvesting of crops or health consequences of eating certain foods.

- The abstract was about the technical processing of food or the extraction of substances from insects, in short, food chemistry.
- The abstract was about a topic that suggested an unlikely relation with edible insects.

Table 1 Boolean expression

Block	Search term
Edible insects	('edible insects') or ('insects as food') or entomophagy)
Consumer or marketing links	AND (consum* or marke*)
Product positioning	AND (shop* or supermarket* or kiosk or position* or shelv* or product or recipe or snack* or cook*)
Quality links	AND (performance or features or conformance or aesthetics or ('perceived quality') or attributes or consequences or values)

Results

The search resulted in 166 papers. Due to further limitations of subject area, document type and language 51 papers were excluded. Based on the abstracts, another 100 papers were left out of the analysis. After the quick scan a set of 15 papers remained. The full text of these 15 papers was downloaded from Scopus by using the download manager.

Of the 15 papers, one could not be retrieved. After reading the 14 retrieved papers in depth, another six were excluded on the same grounds as the quick scan criteria. Even though the abstract had not given enough indication for quick scan exclusion. The papers were excluded on base of their content. Three papers were about the extraction of valuable compounds or the chemical composition of insects. Furthermore, one paper was focused on how to identify edible insects for consumers and another two papers were focused on multiple sources to secure food in the future (Figure 1). All excluded papers had links with the subject of edible insects, but no elements of positioning were present and could therefor not be included in the final set of papers.

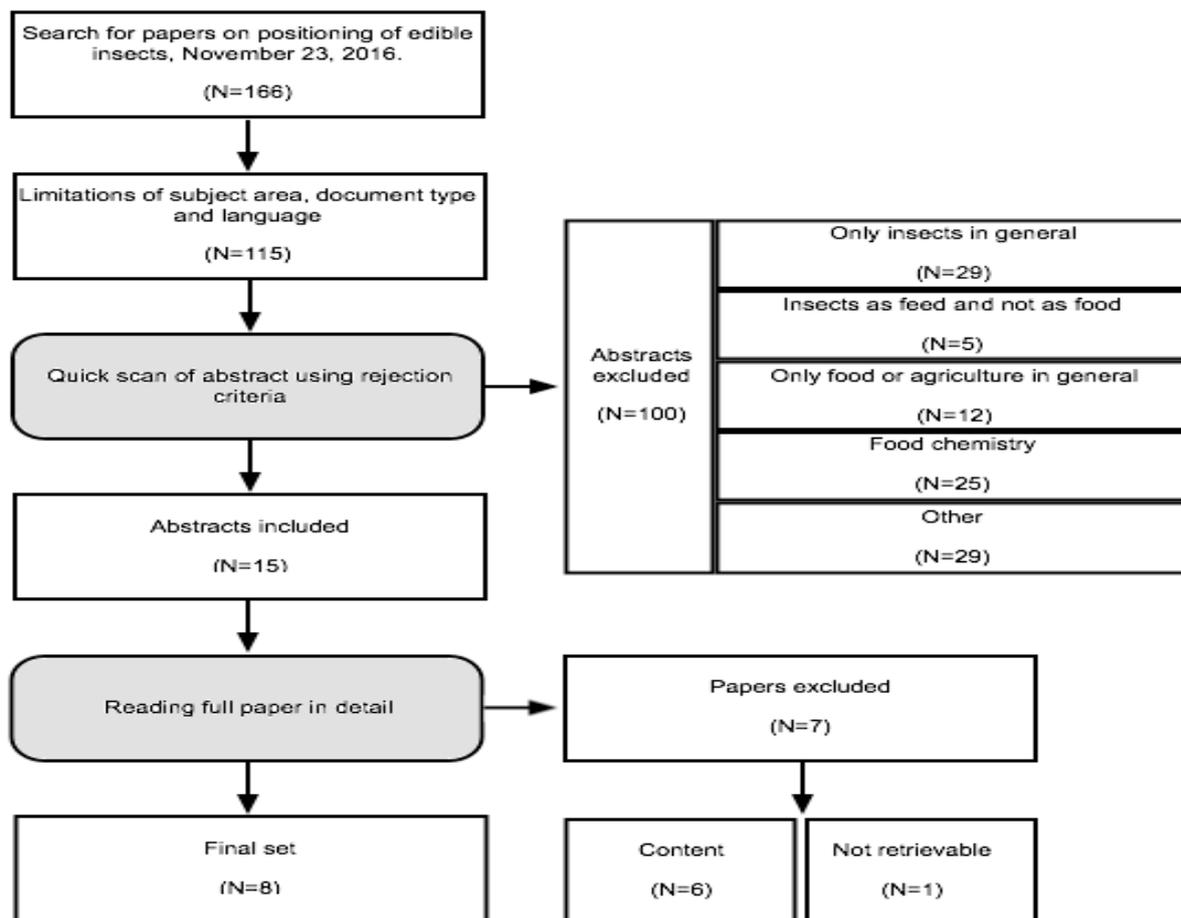
In the final set of eight papers, the first publication dated back to 2013 (van Huis, 2013) and the most recent paper will be published in 2017 (Alemu et al., 2017).

The papers were published in four different journals. One journal (*Food Quality and Preference*) published four of the papers in the final data set and another journal (*British*

Food Journal) published two papers. Two journals (*Trends in Food Science and Technology* and *Annual Review of Entomology*) contributed one paper each to the final set.

Six out of eight papers were an article; the most common document type in the analysis. Only one paper was a review (van Huis, 2013) and one paper was a commentary (Shelomy, 2015). Three papers made use of an (sensory) experiment to gather results, two papers made use of a questionnaire to gather results, two papers reviewed existing literature to gather results and one paper made use of an interview to gather results.

Figure 1 Papers included and excluded



Sensory liking and visual appearance

Studies on acceptance of insects as food mainly focused on sensory liking and visual appearance rather than on consumer preferences for specific product characteristics. According to the analyzed papers, negative sensory perceptions (e.g. flavour, appearance, texture) could lead to aversion towards food products containing edible insects and even rejection of it (Alemu et al., 2017). Low sensory quality of an insect-based product might be a major driver for low acceptance, since sensory quality is considered a major driver of food choice. Therefore it is important that producers of insect-based food pay sufficient attention to

the sensory properties during food product development. To position a product (e.g. insect-based burger) as an alternative to meat it is particularly important to pay attention to sensory properties, because resemblance to meat and its sensory quality is crucial for consumer acceptance (Schouteten et al., 2016).

Expectations of good taste are a powerful determinant for people's willingness to eat. Unfamiliar food is likely to be rejected due to expected distaste (Balzan et al., 2016). When consumers are willing to try an insect-based product, they might not be willing to eat it again if they do not like the taste (Schouteten et al., 2016). For a successful positioning of insect based foods, the food industry should focus on processed insects within a familiar product category, flavour profile, textural preference and food aesthetics, because it is more likely that it will lead to a higher willingness to eat (Hartmann et al., 2015). According to Shelomi et al. (2015), it is more realistic to promote insects as alternatives to nuts, because their texture, macronutrient content, and even flavor are already comparable. In fact, insects are already used in much the same way as nuts are.

Various factors drive people's food choices and sensory appeal is not necessarily the main driver (Hartmann et al., 2015). Visual appearance seems to be an essential factor in deciding whether or not to eat insects (Balzan et al., 2016). According to the papers, edible insects could be best visually presented in a processed form. Balzan et al. (2016) states that the likelihood of acceptance increases with a decreasing degree of perceptibility of the whole insect. This statement is supported by the papers of Schouteten et al., (2016), de-Magistris, Pascucci & Mitsopoulos (2015) and Hartmann & Siegrist (2016). Those papers assert that more participants are willing to consume insect foods if the product is familiar and has a low ingredient visibility, since the physical appearance of insects is not compatible with Western notions of the appearance of "food". In this way characteristics which are repellent to Western consumers are no longer readily visible. Alemu et al. (2017) states previous research has not been conclusive and therefore future commercialization of insect based foods may benefit from introducing products, which are either presented as a whole or in processed form. Although, introducing the processed product may require further information and quality assurances to alleviate perceived food risks and increase willingness to eat. The papers of van Huis (2013) and Hartmann et al. (2015), suggest that processing strategies should be developed and implemented to transform insects into more conventional forms (e.g., cookies based on cricket flour) or to add extracted and purified insect proteins to food items. For example insects could be used to extract fat or oil from and even insect fortified flours can be marketed to those seeking for more protein in their diet, such as bodybuilders (Shelomi, 2015).

Across the papers in the set, the majority states that the averseness of sensory properties and the negative evaluation of the visual appearance of an insect based product, leads to

food rejection due to disgust or food neophobia. Disgust and food neophobia can be seen as contextual factors influencing the willingness to buy insect based products.

Contextual factors

The papers suggest, that not only sensory properties and visual appearance play a significant role in the acceptance of insect based products. There are several contextual factors that play a role for consumers to accept or reject insect based food, such as the consumer himself (e.g., ideational notions, personality traits, psychological states or curiosity), the consumer's environment (e.g., culture, social norms or availability), familiarity (previous experiences) and health and safety concerns (e.g. unsafe, linked with diseases or fear).

Disgust and food neophobia

The contextual factor disgust is associated with a negative visual appearance and a response to undesired sensory properties and therefore influences the acceptance of an insect based product (de-Magistris, Pascucci & Mitsopoulos, 2015). It is most likely to arise by unfamiliar food and animal food that has prominent reminders of its 'livingness or animalness' (Hartmann et al., 2015). Although disgust reactions may result of conditioning, they are unlikely to be changed by education only. Simply informing people about the nutritive or environmental benefits of insect consumption has proven to be insufficient to convince consumers to accept insects as a new food source (Hartmann & Siegrist, 2016). Food neophobia, a personal characteristic that accounts for the great variability among consumers in terms of their attitudes towards novel foods play a role in the acceptance of insect based foods (Hartmann & Siegrist, 2016). It is associated with decreased levels of willingness to eat a novel food and plays a crucial role in the establishment of insects as foods (Hartmann et al., 2015). Just like disgust responses, neophobia is most likely to arise by unfamiliar foods and particularly when they are of animal origin (van Huis, 2013).

The papers in the set all agree on the fact that disgust reactions and food neophobia have an influence on the acceptance of insect based foods. Even though, across the papers there is no agreement on the size of the effect. One paper (Balzan et al., 2016), even states that food neophobia seems to be the most important factor that determines consumers' readiness to adopt insects as food. While another paper (Hartmann et al., 2015), disagrees on that and suggests that other factors have a stronger influence on the acceptance of insect based foods.

Culture and social norms

The consumer's environment, more specific consumer culture and social norms, is mentioned as a determinant of the consumption of insects. Hartmann et al. (2015), suggests that the biggest challenge to the consumption of insects is the strong, socio-culturally defined public bias towards insects. This is confirmed by the fact that in many European social contexts, entomophagy is a cultural taboo. It is difficult to change such a taboo and will be a slow process given that westernized societies are still reluctant to use insects (de-Magistris, Pascucci & Mitsopoulos, 2015). Furthermore, the great majority of European consumers do not associate insects to be food, but consider insects to be food contaminants as well as culturally inappropriate (Hartmann & Siegrist, 2016). Also, eating insects does a consumer not provide status benefits and is socially not accepted (Shelomi, 2015). Social interactions (e.g. with partners or friends) influence the intention to consume edible insects and is therefore a determinant for the willingness to eat (Balzan et al., 2016).

All examined papers payed attention to culture and social norms in relation to the acceptance of edible insect to a certain extend. However, the majority of the papers used a different perspective to give insights in those contextual factors. Two papers (Hartmann et al., 2015; de-Magistris, Pascucci & Mitsopoulos, 2015) have approached this phenomenon from a public bias and taboo perspective. While another paper (Hartmann & Siegrist, 2016), gave insights into the fit between a culture and insect based foods. One paper, (Shelomi, 2015) highlighted the status benefits related to edible insects and another paper (Balzan et al., 2016), showed how social interactions influence the willingness to eat of insect based products. Therefore culture and social norms seem to influence the acceptance of insect based products, but the way in which it influences the acceptance is not conclusive according to the papers in the set.

Familiarity

A way to overcome socio-cultural biases and social taboos is to make consumers familiar with a product. Adding familiarity to an insect-based food is likely to result in higher acceptance of the product. As an exception to all other papers, Hartmann et al. (2015) stated that familiarity was not a significant predictor for willingness to eat. For consumers to believe eating insects is acceptable rather than just plausible, they need to see their peers engaging in entomophagy in everyday environments. For example seeing insects in a supermarket or at a friend's home would have significant impact, since their presence alongside familiar foods in a familiar environment implies edibility and normalization without novelty (Shelomi, 2015). The focus on normalization rather than novelty is important to increase the willingness to eat. Processed insect food may play an important role in familiarizing consumers with insects as a food source and consumers may even conclude that such foods

can taste good. As a consequence, processed insect foods may pave the way for the acceptance of insects in the diet of Western countries (Hartmann & Siegrist, 2016). Early adaptors are needed to begin cooking with insects, because others will see them doing so and may be inspired to try the new ingredients themselves, causing a “snowballing effect” (Shelomi, 2015). More information about the modality of preparation and consumption is needed (Balzan et al., 2016; van Huis, 2013), because after eating insects, most consumers report that they would be open to eat insects again in the future. By actually tasting an insect based product, consumers have the opportunity to associate positive emotions with the product, which might lead to the replacement of the negative expected emotions present prior to consumption (Schouteten et al., 2016).

By providing information on the preparation and consumption of insect based products, health and safety concerns will be weakened. This is important since food safety requirements and uncertainty about the product and its attributes emerge as topic and are still a driver for rejection (Hartmann et al., 2015). Consumers consider insects to be health risks (Hartmann & Siegrist, 2016). This is probably associated with the novelty of these products (Balzan et al., 2016). Without familiarizing consumers with insect based products, they will never purchase insects in the supermarket because of the worry of becoming sick or not knowing how to use them. Consumers prefer to try a new product with someone who knows the product, because they fear something could go wrong (Balzan et al., 2016). However, where safety concerns are a driver for rejection, health benefits are not a driver for acceptance. Consumers of the Western society do not pay much attention to the health benefits of edible insects and do not take it into account when buying such a product (Balzan et al., 2016). In contrary, health benefits might encourage Chinese consumers to accept an insect based product, probably independent of taste expectations (Hartmann et al., 2015). To make consumers familiar with insect based products it needs to be widely available and consumers need to know where they can obtain the insects (van Huis, 2013). At the moment insects are difficult to find in supermarkets and other food stores (Shelomi, 2015), which decreases the opportunity for consumers to adopt edible insects in their daily diet. Even if a consumer has accepted insects as a food source, he or she cannot get access to it. A safe and steady supply has to be created and demand will take care of itself (Shelomi, 2015). Across the papers in the set, the majority states that familiarity is a significant predictor for the willingness to eat of edible insects. Only one paper (Hartmann et al., 2015), states that this is not the case. The papers in the set link different factors to familiarity so its impact could be increased and as a consequence increase the acceptance of insect based products among consumers. The majority of the papers suggest that normalization, the presence of peers, information on preparation and health risks determine the extent in which familiarity is influenced. Two papers (Balzan et al., 2016; Hartmann et al., 2015), elaborate on the effect

of health benefits on familiarity. Another two papers (van Huis, 2013; Shelomi, 2015), point out the importance of availability to make consumers familiar with insect based products. It can be stated that familiarity is a significant predictor for the willingness to eat of edible insects, since the only paper that disagreed (Hartmann et al., 2015), questioned the scale they used to measure familiarity in their research.

Conclusion and Discussion

The identified papers contain elements of sensory properties, visual appearance and contextual factors, that play a role for consumers to accept or reject insect based food. These contextual factors are: disgust, food neophobia, consumer culture, social norms, product availability, familiarity and health and safety concerns. They are to a greater or lesser extent present in all analyzed papers.

All papers acknowledge that sensory properties and visual appearance could play a role in the acceptance of insect based foods by consumers. However, the solutions to overcome these restrictive elements differ per paper. The papers disagree on which element is most important to target for successful positioning of insect based products. For example, Schouteten et al. (2016), states that sensory quality seems to be a major driver of food choice. While Hartmann et al. (2015), suggests that various factors influence people's food choice and sensory appeal is not necessarily the main driver. This is also the case with the visual appearance of insect based products. Balzan et al. (2016), Schouteten et al., (2016), de-Magistris, Pascucci & Mitsopoulos (2015) and Hartmann & Siegrist (2016), state that edible insects in processed form are more likely to be accepted by consumers as a food source than insects as a whole. Alemu et al. (2017) takes this into question and suggests that both approaches could be used to the food industries advantage.

Also, in the papers no consensus is found about the contextual factors. For example, Balzan et al. (2016), states that food neophobia seems to be the most important factor that determines consumers' readiness to adopt insects as food. While Hartmann et al. (2015), suggests that the biggest challenge to the consumption of insects is the strong, socio-culturally defined public bias towards insects. Both papers make use of a technique to elicit the influence of neophobia. Balzan et al. (2016), uses interviews and Hartmann et al. (2015) uses a questionnaire to research this topic. Since, the papers are contradicting each other just as on sensory properties and visual appearance, it could be questioned what the actual influence of neophobia is on the acceptance of edible insects. Therefore we cannot assume that food neophobia is the most important factor in determining the acceptance of edible insects. Future research should take this into account when including neophobia in the research.

Despite the fact that the papers in the set do not agree on which element is most determinant for product positioning, they agree on which marketing strategy is not effective. The papers mention that an advertisement focused on simply informing people about the high nutritional value of insects will not result in a widespread acceptance of insects as food. Instead, consumers need to be convinced by the hedonic characteristics and social acceptability of insects as food, and marketing strategies should focus on taste education and public image modelling. (Hartmann et al., 2015)

Overall, it can be concluded that research on leading positioning elements has no conformity. There is no conclusive research on which element (sensory property, visual appearance or contextual factor) should be focused on to increase the acceptance of insect based products among consumers. As a result, every paper implies different marketing strategies to enhance the likeability and acceptability of insect based products. Therefore, further research is needed to make clear which elements are determinant for the acceptance of edible insects. In addition, it could be helpful to have a look at the attributes of successful products. By analysing them, important information about product attributes per product category could be extracted and applied to insect based products. Depending on the product category and consumer segment, successful elements could be added to the insect based products, which might contribute to a successful positioning strategy for edible insects.

The findings are based on a small range of papers, to be precise eight. This could imply that the search for literature is not conducted in a sound way or that there has not been done a lot of research on edible insects in combination with positioning.

In principle this literature review started with research on positioning edible insects concerning visual appearance and product placement. A Boolean expression was composed with product specific attributes that were retrieved by using means-end chain (MEC). This resulted in zero articles, therefore the expression was broadened with more general positioning terms. Even the snowballing technique is used to increase the number of relevant papers, but most referred papers contained general findings and were not specified on edible insects and could therefore not be included. As a consequence, the search was not only conducted on visual appearance and product placement related to edible insects, but was broadened to marketing and positioning in the retail and food sector in combination with insect based foods. Still a small range of suitable papers was found. In spite of the small number of papers we see no reason to assume the way in which we conducted the literature review was inappropriate. However, the small range of papers could help to explain the differences per paper in conception of which element is more important to focus on for positioning. Since the broadened search terms probably have resulted in papers from a wider variety of disciplines and therefore a wider variety in points of view on marketing or positioning

of insect based products is included in the final set of papers. In the present paper, we conducted a review limited to peer-reviewed articles to assure the relevance for science. Since this resulted in such a small range of relevant papers it could be worthwhile for future research to include grey literature. Grey literature could give other insides, which could be used for further research.

Considering the fact that a small range of papers was found related to edible insects linked to positioning, it can be concluded that there has not been done a lot of research on this topic. When a closer look is taken on the years of publication this is even more evident. The first publication dates back to 2013 (van Huis, 2013) and the most recent paper will be published in 2017 (Alemu et al., 2017). This indicates that this topic is only researched in the last couple of years. Furthermore, research on edible insects linked with positioning seems not to be a widely spread research topic because one paper published half of all the papers of the final set. The present study clearly indicates that future research is to needed on insect based products in combination with product positioning. At the moment no information is available on how to position insect based products in a sound way.

According to the papers, lot of research has been done on the sensory properties of insect based products. Schouteten et al. (2016) conducted research on the acceptance of sensory properties of insect burgers, Hartmann & Siegrist (2016) conducted research on the acceptance of processed insects in tortilla chips and Hartmann et al. (2015) conducted research on the acceptance of processed insects in cookies. This indicates that research and the 'edible insect industry' only uses push product development or push marketing. Push product development or push marketing starts with a company developing an innovative technology and applying it to a product. The company then markets the product. Usually it does not involve market research (Munro & Noori, 1988). Since the positioning and related with that the acceptance of insect based products has not been successful, it could be valuable to switch to a more consumer oriented approach. This approach is called pull product development or pull marketing and makes use of upstream involvement (Munro & Noori, 1988). It refers to the need or requirement for a new product or a solution to a problem, which comes from the market place. Potential customers or market research identifies the need for a product. Based on those needs, products can be developed that fulfil them. The development of the products is an interplay between the producer and the customer (Liu & Ding, 2014).

Research concerning edible insects has focussed on what is technically possible and focussed on what researchers think is needed to increase consumer acceptance. Therefore, it could be the case that consumers do not want insects as a new food source at all. Even if consumers accept edible insects as a new food source, maybe they do not want insects as

substitutes for meat, which is implied by current research. Considering the fact that in previous years insect based products are pushed into the market and no success has been reported, the urge for research on the positioning of edible insects from a consumer perspective is high. To create a breakthrough in the positioning of edible insect products and increase its chance of success, it is essential to involve the consumer perspective in future research.

The previous paragraph indicated that research should be more conducted from a consumer perspective. Different consumers have different opinions and have different levels of acceptance towards novel foods. Consumer segmentation could probably enhance the consumer acceptance of insect based products. According to Shelomi (2015) and de-Magistris, Pascucci & Mitsopoulos (2015) a niche for a limited number of consumers could be created. Consumers who seek a “new food experience” or who are more interested in the functional properties of the products could be targeted. ‘Superfoods’ could function as an example, since they successfully addressed the real (or perceived as real) needs of an increasingly health-conscious society. It is recommended to do research on the segmentation of consumers for insect based products. As a consequence, the appropriate customers could be targeted for the best matching edible insect product.

In short, a comprehensive view on marketing and positioning of edible insects based on consumer perspectives is needed. Better use of marketing techniques can help to target the right product to the right customer in the right context.

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References

Aaker, D.A, Batra, R. & Myers, J.G. (1992). Advertising management. Fourth Edition. Prentice Hall, London.

Albert Hein buffalo larvae. (2016, 5 November). Retrieved from:

<http://www.ah.nl/producten/product/wi236533/goodlife-buffalo-s-larven>

Alemu, M. H., Olsen, S. B., Vedel, S. E., Pambo, K. O., & Owino, V. O. (2017). Combining product attributes with recommendation and shopping location attributes to assess consumer preferences for insect-based food products. *Food Quality and Preference*, 55, 45-57.

Ares, G., Giménez, A., & Gámbaro, A. (2009). Consumer perceived healthiness and willingness to try functional milk desserts. Influence of ingredient, ingredient name and health claim. *Food Quality and Preference*, 20(1), 50-56.

Balzan, S., Fasolato, L., Maniero, S., & Novelli, E. (2016). Edible insects and young adults in a north-east Italian city an exploratory study. *British Food Journal*, 118(2), 318-326.

Buchanan, L., Simmons, C. J., & Bickart, B. A. (1999). Brand equity dilution: retailer display and context brand effects. *Journal of Marketing Research*, 345-355.

Dahm, L. (2005). Where to put the healthy stuff: Opinions differ on optimal shelf placement for natural and organic products. *Private Label Buyer*, 846009-1.

De DS Carneiro, J., Minim, V. P., Deliza, R., Silva, C. H., Carneiro, J. C., & Leão, F. P. (2005). Labelling effects on consumer intention to purchase for soybean oil. *Food Quality and Preference*, 16(3), 275-282

De Pelsmaecker, S., Dewettinck, K., & Gellynck, X. (2013). The possibility of using tasting as a presentation method for sensory stimuli in conjoint analysis. *Trends in food science & technology*, 29(2), 108-115.

De-Magistris, T., Pascucci, S., & Mitsopoulos, D. (2015). Paying to see a bug on my food: How regulations and information can hamper radical innovations in the European Union. *British Food Journal*, 117(6), 1777-1792.

- DeIvecchio, D. (2001). Consumer perceptions of private label quality: the role of product category characteristics and consumer use of heuristics. *Journal of retailing and Consumer Services*, 8(5), 239-249.
- Enneking, U., Neumann, C., & Henneberg, S. (2007). How important intrinsic and extrinsic product attributes affect purchase decision. *Food Quality and Preference*, 18(1), 133-138.
- Garvin, D. A. (1984). Product quality: An important strategic weapon. *Business horizons*, 27(3), 40-43.
- Gil, J. M., & Sánchez, M. (1997). Consumer preferences for wine attributes: a conjoint approach. *British Food Journal*, 99(1), 3-11.
- Gutman, J. (1982). A means-end chain model based on consumer categorization processes. *The Journal of Marketing*, 60-72.
- Haddad, Y., Haddad, J., Olabi, A., Shuayto, N., Haddad, T., & Toufeili, I. (2007). Mapping determinants of purchase intent of concentrated yogurt (Labneh) by conjoint analysis. *Food Quality and Preference*, 18(5), 795-802.
- Hartmann, C., & Siegrist, M. (2016). Becoming an insectivore: Results of an experiment. *Food Quality and Preference*, 51, 118-122.
- Hartmann, C., Shi, J., Giusto, A., & Siegrist, M. (2015). The psychology of eating insects: A cross-cultural comparison between Germany and China. *Food Quality and Preference*, 44, 148-156.
- Hastie, R., & Park, B. (1986). The relationship between memory and judgment depends on whether the judgment task is memory-based or on-line. *Psychological review*, 93(3), 258.
- House, J. (2016). Consumer acceptance of insect-based foods in the Netherlands: academic and commercial implications. *Appetite*, 107, 47-58.
- Jumbo insectburger. (2016, 5 November). Retrieved from:
<http://www.jumbo.com/damhert-nutrition-insecta-groenteburger-met-buffalowormen-2-x-75g/170455BAK/>

Liu, W., & Ding, Z. H. (2014). Innovation modes of new product development with customers involvement. *Computer Integrated Manufacturing Systems*, 6, 006.

Looy, H., Dunkel, F. V., & Wood, J. R. (2014). How then shall we eat? Insect-eating attitudes and sustainable foodways. *Agriculture and Human Values*, 31(1), 131-141.

Munro, H., & Noori, H. (1988). Measuring commitment to new manufacturing technology: integrating technological push and marketing pull concepts. *IEEE Transactions on Engineering Management*, 35(2), 63-70.

Schnettler, B., Vidal, R., Silva, R., Vallejos, L., & Sepúlveda, N. (2009). Consumer willingness to pay for beef meat in a developing country: The effect of information regarding country of origin, price and animal handling prior to slaughter. *Food Quality and Preference*, 20(2), 156-165.

Schouteten, J. J., De Steur, H., De Pelsmaeker, S., Lagast, S., Juvinal, J. G., De Bourdeaudhuij, I., ... & Gellynck, X. (2016). Emotional and sensory profiling of insect-, plant- and meat-based burgers under blind, expected and informed conditions. *Food Quality and Preference*, 52, 27-31.

Semeijn, J., Van Riel, A. C., & Ambrosini, A. B. (2004). Consumer evaluations of store brands: effects of store image and product attributes. *Journal of Retailing and Consumer Services*, 11(4), 247-258.

Shelomi, M. (2015). Why we still don't eat insects: Assessing entomophagy promotion through a diffusion of innovations framework. *Trends in Food Science & Technology*, 45(2), 311-318.

Solheim, R., & Lawless, H. T. (1996). Consumer purchase probability affected by attitude towards low-fat foods, liking, private body consciousness and information on fat and price. *Food Quality and Preference*, 7(2), 137-143.

Tan, H. S. G., van den Berg, E., & Stieger, M. (2016). The influence of product preparation, familiarity and individual traits on the consumer acceptance of insects as food. *Food Quality and Preference*, 52, 222-231.

UN projects world population to reach 8.5 billion by 2030, driven by growth in developing countries. (2015, 29 July). Retrieved from:

<http://www.un.org/apps/news/story.asp?NewsID=51526#.WBdQNHjnLb5>

Van Herpen, E., van Nierop, E., & Sloot, L. (2012). The relationship between in-store marketing and observed sales for organic versus fair trade products. *Marketing Letters*, 23(1), 293-308.

Van Huis, A. (2013). Potential of insects as food and feed in assuring food security. *Annual Review of Entomology*, 58, 563-583.

Van Huis, A., Van Itterbeeck, J., Klunder, H., Mertens, E., Halloran, A., Muir, G., & Vantomme, P. (2014). Edible insects: future prospects for food and feed security. *International Forestry Review*, 16 (1), 112-116.

Van Kleef, E., van Trijp, H. C., & Luning, P. (2005). Consumer research in the early stages of new product development: a critical review of methods and techniques. *Food quality and preference*, 16(3), 181-201.

Vickers, Z. M. (1993). Incorporating tasting into a conjoint analysis of taste, health claim, price and brand for purchasing strawberry yoghurt. *Journal of Sensory Studies*, 8(4), 341-352.

Vriens, M., & Ter Hofstede, F. (2000). Linking attributes, benefits, and consumer values. *Marketing Research*, 12(3), 4.

Appendix

Syntax/Boolean expression

TITLE-ABS-KEY(((('edible insects') or ('insects as food') or entomophagy) AND (consum* or marke*) AND (shop* or supermarket* or kiosk or position* or shelv* or product or recipe or snac* or cook*) AND (performance or features or conformance or aesthetics or ('perceived quality') or attributes or consequences or values)) (166)

Final Boolean expression including further limitations

TITLE-ABS-KEY(((('edible insects') or ('insects as food') or entomophagy) AND (consum* or marke*) AND (shop* or supermarket* or kiosk or position* or shelv* or product or recipe or snac* or cook* or promo* or appearance) AND (performance or features or conformance or aesthetics or ('perceived quality') or attributes or consequences or values)) AND (LIMIT-TO(SUBJAREA,"AGRI") or LIMIT-TO(SUBJAREA,"SOC") or LIMIT-TO(SUBJAREA,"BUSI") or LIMIT-TO(SUBJAREA,"PSYC")) AND (LIMIT-TO(DOCTYPE,"ar") or LIMIT-TO(DOCTYPE,"re")) AND (LIMIT-TO(LANGUAGE,"English"))) (115)