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### **► To cite this version:**

Muhammad Adzran Che Mustapa, Zein Kallas, Charles Silande, Valérie Gagnaire, Gwénaél Jan, et al.. From taste to purchase: Understanding the influence of sensory perceptions and informed tasting on plant-based product purchases - An extension of the theory of planned behavior. *Journal of Agriculture and Food Research*, 2024, 16, pp.101188. <10.1016/j.jafr.2024.101188>. <hal-04572984>

**HAL Id: hal-04572984**

**<https://hal.inrae.fr/hal-04572984v1>**

Submitted on 13 May 2024

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# From taste to purchase: Understanding the influence of sensory perceptions and informed tasting on plant-based product purchases - An extension of the theory of planned behavior

Muhammad Adzran Che Mustapa<sup>a</sup>, Zein Kallas<sup>a,\*</sup>, Charles Silande<sup>b</sup>, Valérie Gagnaire<sup>b</sup>, Gwénaél Jan<sup>b</sup>, Laura López-Mas<sup>a</sup>, Ingrid Aguiló-Aguayo<sup>c</sup>

<sup>a</sup> Centre for Agrofood Economics and Development-UPC-IRTA (CREDA), Universidad Politècnica de Catalunya (UPC), Castelldefels, 08860, Spain

<sup>b</sup> French National Institute for Agriculture, Food, and Environment (INRAE), UMR Science and Technology of Milk and Eggs (STLO), F35000, Rennes, France

<sup>c</sup> Institute of Agrofood Research and Technology (IRTA), Postharvest Programme, Parc Agrobiotech Lleida, Parc de Gardeny, 25003, Lleida, Spain

## ARTICLE INFO

### Keywords:

Plant-based diets  
Alternative protein  
Theory of planned behavior  
Purchase intention  
Sensory analysis

## ABSTRACT

Although suggestions to shift towards plant-based diets have been proposed, and consumers have indicated their willingness to reduce meat consumption, there is a scarcity of research exploring consumers' attitudes and intentions regarding plant-based products. Therefore, this study analyses consumers' hedonic sensory acceptance and its impact on the attitudes and predictors associated with purchasing intentions with regard to various plant-based products. Data were collected from 132 consumers using a validated questionnaire designed on the Qualtrics platform. Statistical package for the social sciences software was used to analyze the descriptive statistics relating to consumers' attitudes towards plant-based products, and partial least squares structural equation modeling was employed to identify the factors influencing their purchasing intentions. The results showed that consumers have tended to adopt moderate attitudes towards plant-based products. They rated their perceived behavioral control, subjective norms, and perceptions of the sensory characteristics of these products as high. However, they also reported only a moderate level of satisfaction after tasting the product. The results of the structural equation modelling analysis demonstrated that four factors significantly influenced consumers' intentions to purchase plant-based products: perceived behavioral control, sensory perceptions, attitude, and informed tasting. This study contributes to existing knowledge and provides empirical support for explaining the factors influencing Spanish consumers' decisions to purchase plant-based products. These findings have promising implications for the future sales of plant-based food products in Spain and other European countries.

## 1. Introduction

In recent years, consumers have become increasingly aware of the health and environmental impact of their dietary choices, leading to a growing interest in reducing their consumption of animal-based products [1]. Food derived from animals such as cows, pigs, sheep, goats, poultry, and seafood, as well as animal-based products such as eggs, milk, yoghurt, and butter, are vital sources of protein, fat, vitamins, and essential amino acids that contribute to a well-rounded human diet [2, 3]. However, meat production, particularly that of red meat, poses significant environmental challenges [4], which contribute substantially to CO<sub>2</sub> emissions [5], account for one-third of the world's water usage, and

consumes 98 % of animal feed resources [6]. Moreover, it drives the conversion of large expanses of arable land, resulting in a loss of biodiversity [7].

A range of studies have documented the negative effects of meat consumption on human health [8–10]. For instance, Grosso et al. [11] conducted a comprehensive meta-analysis to assess the correlation between total, red, and processed meat consumption and various health outcomes. Their findings concluded that an excessive intake of such meat is linked to an elevated risk of colorectal adenoma, lung cancer, coronary diseases, stroke, and ovarian, prostate, renal and stomach cancers. Similarly, Bellavia et al. [8] investigated the relationship between high red meat consumption and mortality risks, particularly

\* Corresponding author.

E-mail addresses: [adzran.mustapa@upc.edu](mailto:adzran.mustapa@upc.edu) (M.A.C. Mustapa), [zein.kallas@upc.edu](mailto:zein.kallas@upc.edu) (Z. Kallas), [charles.silande@inrae.fr](mailto:charles.silande@inrae.fr) (C. Silande), [valerie.gagnaire@inrae.fr](mailto:valerie.gagnaire@inrae.fr) (V. Gagnaire), [gwenael.jan@inrae.fr](mailto:gwenael.jan@inrae.fr) (G. Jan), [laura.lopez.mas@upc.edu](mailto:laura.lopez.mas@upc.edu) (L. López-Mas), [Ingrid.Aguilo@irta.cat](mailto:Ingrid.Aguilo@irta.cat) (I. Aguiló-Aguayo).

<https://doi.org/10.1016/j.jafr.2024.101188>

Received 5 March 2024; Received in revised form 9 April 2024; Accepted 1 May 2024

Available online 6 May 2024

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focusing on cardiovascular disease and cancer, in the case of 74,645 Swedish men and women. The study revealed that high meat intake was associated with increased all-cause and cardiovascular disease mortality risks, although there was no significant increase in cancer mortality risk. Additionally, the study found no evidence of an interaction between red meat consumption and fruit and vegetable intake in predicting mortality.

According to the Food and Consumption Statistics Market Data in 2024, the global market for plant-based foods is on a significant upward trajectory, expected to grow from \$23.9 billion in 2019 to over \$74 billion by 2027 [12]. This surge in demand reflects a growing interest among academics, policymakers, and food companies in plant-based alternatives to meat and dairy products [13]. In line with this trend, the Market Analysis Report [14] reveals that the global market for plant-based meat alternatives reached a value of USD 10.1 billion in 2023, with forecasts projecting an exponential growth to over USD 233.87 billion by 2030, indicating an approximate 2218.71 % increase. Similarly, the global dairy alternatives market, valued at USD 28.55 billion in 2023, is expected to experience substantial growth, reaching USD 91.15 billion by 2032, reflecting an approximate 218.88 % increase from 2023 to 2032 [15]. Notably, while meat alternatives often garner more attention, plant-based milk substitutes reign supreme in Europe. The market for milk alternatives in the European Union surpasses that for plant-based burgers, sausages, and similar products by about one billion Euros [16]. In 2023 alone, the plant-based milk market in the EU-27 boasted a staggering worth of nearly USD 3 billion, with Germany and Spain emerging as the leading markets for these products [16].

Plant-based dishes are revered in cuisines worldwide, serving as a testament to the diversity of cultures and culinary customs. From the Middle East, hummus, a popular creamy spread made from mashed chickpeas, tahini, and olive oil, is often served with pita bread [17]. Indonesian cuisine offers gado-gado, a vibrant salad featuring a medley of blanched vegetables topped with fried tofu or tempeh and dressed in a flavorful peanut sauce [18]. Italy's classic Caprese salad highlights the beauty of simplicity, featuring fresh tomatoes, mozzarella cheese, and basil leaves delicately drizzled with olive oil [19]. In France, the iconic ratatouille steals the spotlight, a hearty stewed medley of tomatoes, zucchini, eggplant, and bell peppers, seasoned with aromatic herbs like thyme and basil [20]. Meanwhile, from the vibrant kitchens of India comes vegetable curry, a symphony of spices, tomatoes, coconut milk, and an assortment of vegetables, enticing with its rich flavors [21]. These culturally representative plant-based dishes exemplify the richness and variety of vegetarian and vegan culinary traditions worldwide.

Plant-based diets have been shown to have numerous positive effects on human, animal, and environmental health [22–24]. Various studies have indicated that such diets are associated with favorable health indicators for chronic conditions [22]. Compared with an omnivorous dietary pattern, adopting a plant-based diet has been shown to lead to lower overall cholesterol levels, reduced low-density lipoprotein (LDL) cholesterol levels, better management of blood sugar levels, improved blood pressure, and a healthier body mass index (BMI) [25–27]. These diets also require fewer natural resources for production compared to meat-containing diets, making them more environmentally sustainable [23]. Additionally, adopting plant-based diets aligns with the third objective of the United Nations' Sustainable Development Goals (SDGs) for 2030, which aim to "promote healthy lives and well-being for all age groups" [28].

Numerous studies have assessed consumer perceptions and attitudes regarding plant-based food products. For instance, Moss et al. [29] found that Canadian consumers generally hold favorable attitudes towards plant-based milk alternatives, viewing them as offering health benefits, sustainability advantages, and appealing sensory characteristics. A study conducted by Moussaoui et al. [30] analyzed consumer attitudes towards plant-based burgers and found that the type of plant protein used did not affect consumer responses. Nevertheless, the study revealed a substantial and consistent impact on attitudes towards meat

reduction in Spain. Consumers who favored reducing meat consumption showed a strong inclination towards accepting plant-based burgers as being healthier, less processed, and more sustainable alternatives. Furthermore, a separate study conducted by Jaeger et al. [3], who investigated Australian consumers' intentions regarding plant-based yoghurt and eggs, found that consumers reacted positively when provided with information highlighting the environmental and personal health advantages of plant-based foods.

To the best of the authors' knowledge, there is a scarcity of studies that specifically examine consumers' attitudes and purchasing intentions with regard to plant-based products in Spain. This is at a time when, according to data from the 2023 Mintel Global New Products Database (GNPD), there has been a recent surge in the availability of plant-based products in Spain (Fig. 1). Understanding consumer acceptance of, or attitudes towards, plant-based products is a significant area of research, especially given the growing interest in sustainable and health-conscious food choices [31]. Therefore, this study aims to investigate Spanish consumers' attitudes and intentions to purchasing plant-based products and to explore the factors influencing their purchasing decisions. Specifically, it explores the relationship between purchasing intentions with regard to plant-based products (i.e. almond and chickpea yoghurt analogues and fermented almond drinks) as substitutes for conventional milk from animals, and three constructs derived from the theory of planned behavior (TPB): attitude, perceived behavioral control, and subjective norms. Furthermore, an extension of the TPB is proposed by examining two additional constructs: the sensory perception of plant-based products and tasting experiences (informed tasting). By focusing on this underexplored area, we contribute to the existing literature and provide valuable insights into the potential acceptance and adoption of plant-based products within the Spanish market. Additionally, the insights gained from this research can be utilized to develop effective marketing strategies tailored to the preferences and behaviors of Spanish consumers.

The first part of this study presents a theoretical framework and literature review with regard to each variable used in the conceptual model. The second section elaborates on the research methods employed in this study in terms of the derived hypotheses. Finally, the last section discusses the results and their implications, as well as the study's contribution to both theory and practice. This study provides recommendations for future research in this field.

## 2. Theoretical framework and research hypotheses

### 2.1. Theory of planned behavior

The theory of planned behavior (TPB) is a widely-used theoretical psychological framework for predicting human behavior. It posits that attitude, subjective norms, and perceived behavioral control collectively influence an individual's behavioral intentions [32]. The TPB proposes that an individual's intention to engage in a particular behavior is the primary predictor of whether or not that individual will actually perform that behavior.

Attitude with regard to a particular behavior refers to an individual's positive or negative evaluation of the outcome of performing the behavior. It is based on beliefs about the consequences of the behavior and the value the individual places on these consequences.

Subjective norms refer to the belief about the extent to which most people approve or disapprove of a particular behavior. It relates to a person's beliefs about whether peers and people of importance to the person think he or she should engage in the behavior.

Meanwhile, perceived behavioral control reflects the individual's perception of the ease or difficulty with regard to performing the behavior, and is related to self-efficacy.

TPB has been successfully applied in various studies to predicting consumer intentions and behaviors. For example, several researchers have applied TPB to investigate consumers' intentions to purchase

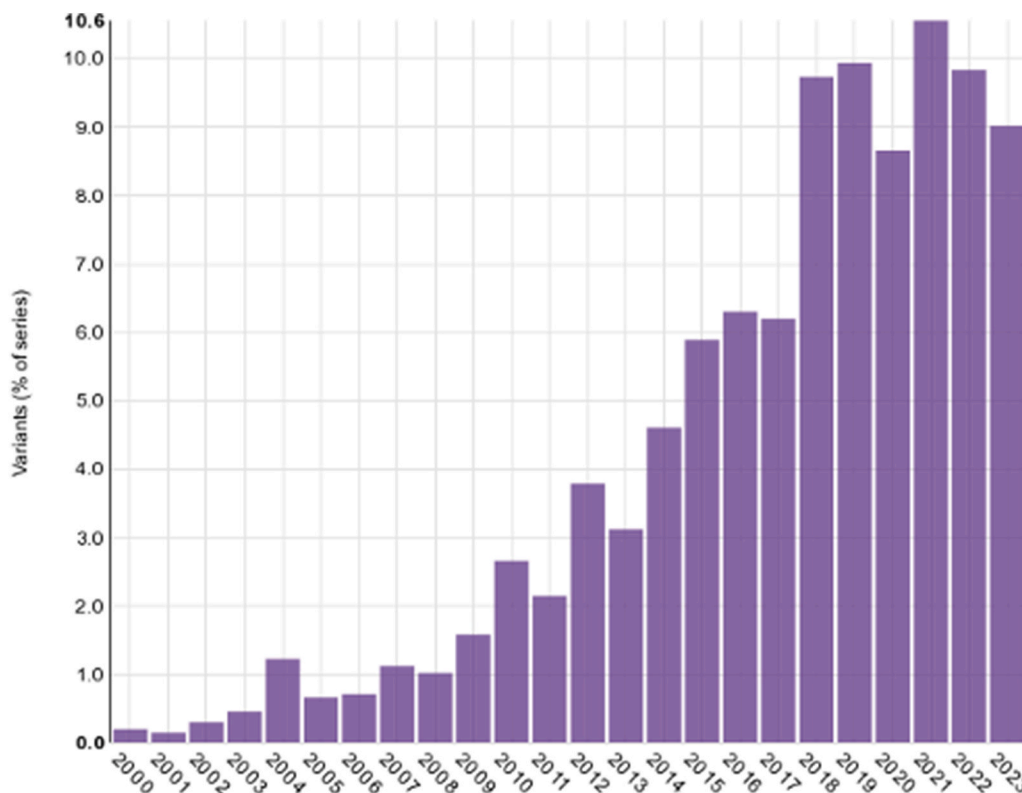


Fig. 1. Database of plant-based products from the 2023 Mintel Global New Products Database (GNPD).

environmentally-friendly products [33–36]. In this study, we acknowledge the significance of incorporating additional variables into the central model (attitude, subjective norms, and perceived behavioral control) in the so-called extended TPB (informed tasting and sensory perceptions), as this theory has proven to be an effective predictor of human behavior.

Several studies have underscored the profound impact of hedonic experiences on consumers’ willingness to pay for food choices [37–39]. In fact, various studies have highlighted that the sensory experience during consumption plays a crucial role in the acceptance of new products and the formation of preferences [38,40]. Moreover, previous studies have reported that the eating experience significantly influences consumers’ decisions to repurchase a product [39,41,42]. For instance, Banovic et al. [43] highlighted the substantial influence of sensory perceptions on consumers’ attitudes and intentions to buy hybrid products. Furthermore, their study underscores the importance of addressing sensory expectations to facilitate consumer acceptance of

sustainable and plant-based products. Therefore, we propose that informed tasting (experienced tasting) and sensory perceptions play a crucial role in influencing consumers’ intentions with regard to the purchase of plant-based products. As a result, we have included sensory perception and informed tasting as additional variables in our study.

This study presents an extended TPB framework that explores the elements that influence consumers’ purchasing decisions. The framework shown in Fig. 2 illustrates the proposed approach. To this end, we have developed the following hypotheses to investigate the influence of attitude, perceived behavioral control, subjective norms, informed tasting, and sensory perceptions of plant-based products on consumers’ intention to buy them.

**H1.** Attitudes influence consumers’ behavioral intentions to purchase plant-based products.

**H2.** Perceived behavioral control influences consumers’ behavioral intentions to purchase plant-based products.

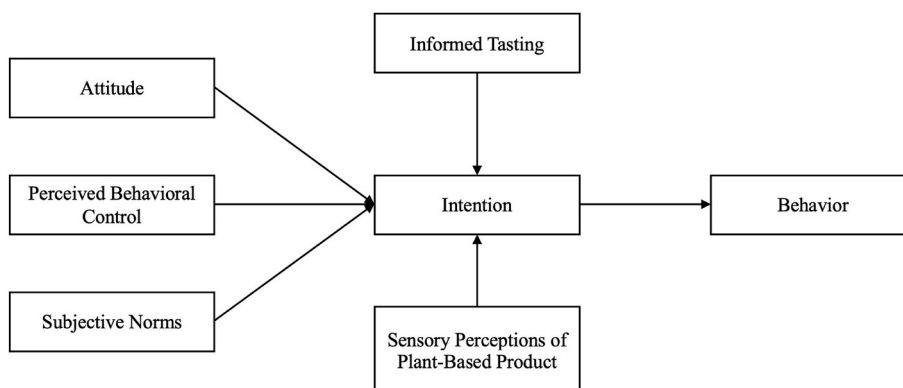


Fig. 2. Conceptual framework of purchase intention of fermented plant-based product model based on the original structure of the theory of planned behavior (TPB).

**H3.** Subjective norms influence consumers' behavioral intentions to purchase plant-based products.

**H4.** Informed tasting influences consumers' behavioral intentions to purchase plant-based products.

**H5.** Sensory perceptions influence consumers' behavioral intentions to purchase plant-based products.

### 3. Research methods

#### 3.1. Data collection

Data collection for this study was conducted using the Qualtrics platform from 11th to October 17, 2023. The online survey instruments were administered face-to-face to Spanish consumers invited to the sensory laboratory (ISO 8589:2007) at the Barcelona School of Agri-Food and Biosystems Engineering of the Universitat Politècnica de Catalunya (UPC).

A random sampling method was employed to recruit consumers, ensuring a diverse selection of participants. Additionally, to ensure the sample's representativeness in terms of gender and age, a quota sampling procedure was implemented. This procedure involved setting specific quotas for both gender and age groups. This approach was adopted to obtain a balanced and representative sample composition, enhancing the validity and generalizability of the study's findings. A survey was conducted targeting Spanish residents over 20 years of age, who were primarily responsible for household purchases and had no food allergies. The survey was originally developed in English based on previous research and was subsequently translated into Spanish for the main study. A pilot sample consisting of twenty consumers was utilized to verify the questions and implement any necessary modifications.

The sample size used in this study is considered adequate in terms of the "minimum  $R^2$  method". In our model, the maximum number of arrows pointing at a latent variable is 5, and the minimum  $R^2$  value in the model is 0.330. Consequently, the estimated minimum acceptable sample size stands at 70. Notably, the sample size obtained for this study ( $n = 132$ ) surpasses this threshold, fulfilling the recommended minimum sampling requirement [44]. Furthermore, this sample size also meets the minimum necessary for sensory acceptability testing as proposed by Hough et al. [45], which suggests a sample size of  $n = 112$ . Additionally, to enhance participants' involvement and motivation with regard to the experiment and ensure representativeness, they were economically compensated with €40, delivered at the end of the experiment in the form of a receipt. Considering the potential variability or heterogeneity within the population, an error term of 8.53 % in this study is deemed less critical, especially in studies involving market dynamics and behavioral analysis.

Each experimental session lasted approximately 1 h. Participants were informed about the duration of the session prior to starting. Furthermore, the participants were informed that for every ten selected participants, there was a 20 % chance of being rewarded with an additional €10. During the session, participants engaged in a simulated real shopping scenario where they were required to purchase a selected product at their stated bid.

The experiment was approved by the ethics committee of the Center for Agro-Food Economy and Development and was conducted according to the ethical principles expressed in the Declaration of Helsinki, with a specific focus on protecting personal information based on the new European regulations. Before conducting the experiment, the participants signed a consent form and received an explanation of the experiment, which was read to them aloud and projected using a power point presentation before starting.

#### 3.2. Survey instrument

The development of a survey instrument that assesses consumer

attitudes with regard to plant-based products and their predictive factors was based on the TPB model [32]. The instrument consisted of six variables: attitude (ATD) (3 items) [46–48], perceived behavioral control (PBC) (5 items) [49,50], subjective norms (SN) (3 items) [46,51,52], plant-based sensory perceptions (SP) (3 items) [46,53], informed tasting (IT) (6 items) [54] and behavioral intention (BI) (4 items) [46,49].

In this study, the items were assessed using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Additionally, in the case of informed tasting, a 9-point hedonic scale was implemented, encompassing a range from 1 (dislike too much) to 9 (like too much).

In hedonic studies, there exists a widespread consensus within industry, government and academia to utilize the traditional 9-point Likert scale, first introduced by Peryam and Girardot in 1952 [55]. Since its introduction, the 9-point hedonic scale [55,56] has remained the predominant method for assessing consumer preference and the acceptability of food products [57]. This scale guides consumers to rank their liking from "dislike extremely" to "like extremely", aligning with established sensory study recommendations. As for the use of the 7-point scale, this study adheres to validated scales when selecting dimensions to ensure consistency with the original scale employed. As noted by Damsbo-Svendsen et al. [58], and supported by Preston and Colman [59], scales with 7 and 9 response categories tend to yield more reliable results compared to shorter ones.

#### 3.3. Data analysis

SmartPLS software (version 4.0.9.6) was used to analyze the data. Four stages were involved in this analysis: verifying the reliability of the constructs, verifying the validity of the constructs, examining the structural path coefficients, and assessing the overall model fit. Partial least squares structural equation modelling (PLS-SEM) is a widely-recognized approach that has been frequently utilized by researchers from various disciplines [60–62]. PLS-SEM was chosen in this study because it is thought to be particularly suitable for predictive analysis and can maintain the relevant indicator variables without compromising the predictive accuracy and robustness of  $R^2$ . In addition, many researchers consider PLS-SEM to be the most appropriate technique for assessing research models rather than CB-SEM because of its minimal demands in terms of measurement models (reflective and formative), sample size, and residual distributions [63].

#### 3.4. Product samples

Two variations of innovative alternative protein were used: 1) almond and chickpea yoghurt analogue, and 2) fermented almond drink. The product description is provided in Appendix A.

## 4. Results

#### 4.1. Sample description

Table 1 presents the demographic breakdown of the survey respondents across various categories. The age distribution was well balanced, with 31.1 % falling within the 20–35 age range, 36.4 % between 36 and 55 years, and 32.6 % aged 56 years and above. Moreover, the majority of respondents were female (62.1 %), 37.1 % were male, and only 0.8 % did not disclose their gender. With respect to education, the highest proportion of respondents (46.2 %) had a high level of education, followed by 40.2 % at the intermediate level and 13.6 % at the basic level. It is worth noting that the majority of the respondents (66.7 %) always lived within their budget, 22.0 % did so occasionally, and 11.4 % never did so. In terms of their perceived financial situation, 52.3 % of the respondents felt that their situation was good, 36.4 % found it adequate, and 11.4 % experienced difficulty.

**Table 1**  
Respondent profile.

	Category	Frequency (n = 132)	Percentage (%)
Age	20–35	41	31.1
	36–55	48	36.4
	56 and above	43	32.6
Gender	Male	49	37.1
	Female	82	62.1
	Prefer not to disclose	1	0.8
Education	Basic (unfinished studies or primary)	18	13.6
	Intermediate (college or vocational training)	53	40.2
	High (university degree and above)	61	46.2
Monthly expense coverage	Never cover household expenses	15	11.4
	Sometimes cover household expenses (from rarely to very often)	29	22.0
	Always cover household expenses	88	66.7
Perceived financial situation	Very challenging	15	11.4
	Adequate	48	36.4
	Very good	69	52.3

4.2. Descriptive analyses

The results in Table 2 show that Spanish consumers had a moderate attitude as measured by the Likert scale towards plant-based products, with a mean score ( $\bar{x}$ ) of 4.60 and a standard deviation (SD) of 1.32. Notably, consumers indicated a strong sense of perceived behavioral control (self-efficacy) when consuming plant-based products ( $\bar{x}$  = 5.19, SD = 1.04) and subjective norms ( $\bar{x}$  = 5.22, SD = 1.32). They also tended to perceive the sensory perception of plant-based products as high ( $\bar{x}$  = 5.04, SD = 1.00). However, after tasting the product, they expressed moderate levels of informed tasting ( $\bar{x}$  = 5.69, SD = 1.31). Additionally, they portrayed highly positive intentions with regard to purchasing plant-based products ( $\bar{x}$  = 5.94, SD = 0.91).

4.3. Sensory characteristics of plant-based products

Table 3 presents the mean and standard deviation of the scores for the extent of liking the two products evaluated by the consumers on a 9-point hedonic scale, focusing on various sensory characteristics. Overall, the results show that consumers reported a high liking for the color of both almond-chickpea yoghurt-type analogues and the fermented almond drink, with mean scores of 6.41 and 6.10, respectively. Next, consumers reported a moderate liking for other sensory characteristics (i.e. smell, taste, appearance, texture, and global acceptance), with mean scores around the midpoint of the scale (5.00) or above.

**Table 2**  
Descriptive statistics of respondents' attitude variables.

Dimension	Mean	Standard deviation	Interpretation
Attitude	4.60	1.32	Moderate
Perceived behavioral control	5.19	1.04	High
Subjective norms	5.22	1.32	High
Informed tasting	5.69	1.31	Moderate*
Sensory perceptions of plant-based product	5.04	1.00	High
Behavioral intention	5.94	0.91	High

The seven-point Likert scale ranged from 1 (strongly disagree) to 7 (strongly agree), except for informed tasting, which was measured on a nine-point scale from 1 (dislike too much) to 9 (like too much). Note: 1.00–3.00 = Low; 3.01–5.00 = Moderate; 5.01–7.00 = High.

\*1.00–3.00 = Low; 3.01–6.00 = Moderate; 6.01–9.00 = High.

**Table 3**  
Mean ( $\bar{x}$ ) and standard deviation (SD) of acceptance scores for two plant-based fermented products evaluated by consumers (on a 9-point hedonic scale).

Sensory characteristics	Almond and Chickpea Yoghurt Analogues		Fermented Almond Drink	
	$\bar{x} \pm SD$	Interpretation	$\bar{x} \pm SD$	Interpretation
Color	6.41 ± 1.29	High	6.10 ± 1.49	High
Smell	5.82 ± 1.77	Moderate	5.26 ± 1.81	Moderate
Flavor/Taste	5.05 ± 1.93	Moderate	5.05 ± 1.89	Moderate
Appearance	5.95 ± 1.38	Moderate	5.56 ± 1.46	Moderate
Texture	5.44 ± 1.68	Moderate	5.23 ± 1.71	Moderate
Global acceptance	5.47 ± 1.78	Moderate	5.24 ± 1.69	Moderate



Items measured on Scales 1–9). The seven-point Likert scale ranged from 1 (strongly disagree) to 7 (strongly agree), except for informed tasting, which was measured on a nine-point scale from 1 (dislike too much) to 9 (like too much). Note: 1–3.00 = Low; 3.01–6.00 = Moderate; 6.01–9.00 = High.

4.4. Assessment of common method bias

Common method bias (CMB) is a potential issue in research involving the use of self-reported surveys. It refers to the systematic variance attributable to the measurement method itself, rather than to the constructs being measured. In this study, the CMB was assessed using Harman's single-factor test and the Variance Inflation Factor (VIF) values of the inner model [64,65]. It was found that the first factor explained 21.419 % (<40 %) of the variance in Harman's single-factor test, indicating that CMB was not a problem (Appendix B). In addition, all VIF values were lower than 3.33. Consequently, the model was considered free of CMB (Table 4) [66,67].

4.5. Assessment of the reflective measurement model

Based on the results shown in Table 5, all outer loading values were above the threshold value of 0.70, with the exception of the SP2 item [68,69]. Subsequently, for the composite reliability (CR) and average variance extracted (AVE) scores, all values displayed were above 0.70 and above 0.50, respectively [69,70]. Thus, internal consistency was achieved. The heterotrait-monotrait (HTMT) values shown in Table 6 are less than 0.85, indicating good discriminant validity [69].

**Table 4**  
Collinearity statistics (variance inflation factor; VIF): inner model.

Hypothesis	VIF
H <sub>1</sub> : Attitude → Behavioral intention	1.183
H <sub>2</sub> : Perceived behavioral control → Behavioral intention	1.204
H <sub>3</sub> : Subjective norms → Behavioral intention	1.182
H <sub>4</sub> : Informed tasting → Behavioral intention	1.078
H <sub>5</sub> : Sensory perceptions of plant-based product → Behavioral intention	1.100

**Table 5**  
Assessment of reliability and convergent validity.

Construct and item	Loadings	CR	AVE
<b>Attitude</b>			
ATD1 The quality of plant-based products is better than non-plant-based products.	0.759	0.839	0.635
ATD2 I believe that buying plant-based products is better than buying non-plant-based products.	0.810		
ATD3 I am going to buy plant-based food products because of the positive image I have of them.	0.820		
<b>Perceived behavioral control</b>			
PBC1 I believe I can afford to buy plant-based food.	0.822	0.885	0.608
PBC2 I have time to look for plant-based food when I want to have it.	0.727		
PBC3 Despite being expensive, I prefer to consume plant-based food.	0.771		
PBC4 If I wanted to, I could easily consume plant-based food.	0.756		
PBC5 I believe that I have the resources and the ability to consume plant-based food.	0.818		
<b>Subjective norms</b>			
SN1 Many people who are important to me in life think that I should buy plant-based products.	0.840	0.882	0.714
SN2 Many people who are important to me in life ask me to buy plant-based products.	0.863		
SN3 People who are important to me think that eating plant-based food contributes to good health.	0.831		
<b>Informed tasting</b>			
IT1 Color	0.755	0.910	0.628
IT2 Smell	0.781		
IT3 Flavor/Taste	0.836		
IT4 Appearance	0.797		
IT5 Texture	0.713		
IT6 General acceptance	0.864		
<b>Sensory perceptions of plant-based product</b>			
SP1 Plant-based food products taste good.	0.848	0.812	0.597
SP2 The appearance of plant-based food products is appealing and attractive.	0.582		
SP3 Plant-based food products have a good and pleasant texture.	0.857		
<b>Behavioral intention</b>			
BI1 I am willing to buy plant-based food in my usual purchase.	0.811	0.898	0.689
BI2 I have a positive attitude toward consuming plant-based food.	0.849		
BI3 I will likely consume plant-based food.	0.887		
BI4 I intend to consume plant-based food in the near future	0.768		

Note: CR = composite reliability; AVE = Average variance extracted.

4.6. Assessment of the structural model

The path analysis of the data showed that most of the hypotheses ( $H_1$ ,  $H_2$ ,  $H_4$ , and  $H_5$ ) were statistically significant, with the exception of the path of subjective norms to behavioral intention ( $H_3$ :  $\beta = 0.025$ ,  $t$ -value = 0.276) (Table 7 and Fig. 3).

The  $R^2$  value, or coefficient of determination, is a statistical measure

that represents the proportion of variance for a dependent variable that is explained by an independent variable [69]. In this study, the final endogenous variable explains 33 % of the variance in the intention to purchase plant-based products ( $R^2 = 0.330$ ). This is considered satisfactory, as it is higher than the 0.26 value suggested by Cohen [71] (Table 8 and Fig. 3).  $Q^2$  is predictive relevance, measuring whether a model has predictive relevance (>0 is considered good and has predictive relevance) [68,69,72,73]. The results in Table 8 show that the  $Q^2$  value for the endogenous construct was greater than zero, indicating predictive relevance.

4.7. Assessment of the overall model

The overall model fit was used to assess the validity and explanatory power of the model by assessing the standardized root mean square residual (SRMR) value and the normed fit index (NFI) [74]. The SRMR value obtained in this study was 0.079 which is considered a good fit (<0.080) [75]. The NFI value for this model was 0.671 which was considered acceptable (i.e. above 0.50) (Table 8) [76].

5. Discussion

In this study, two fermented products were studied: fermented almond milk and almond-chickpea yoghurt-type analogues. The results show that four factors significantly influence consumers' decisions to purchase plant-based products.

First, the research findings highlight that perceived behavioral control is the most crucial direct predictor of positive purchasing intention for plant-based products on the part of Spanish consumers. This indicates that when consumers feel confident that they can easily find, afford, and buy such products without facing major obstacles, they are more likely to express a strong intention to purchase them. In essence, their belief in their ability to purchase plays a significant role in shaping their purchasing intention. This is not surprising, as numerous studies have reported that perceived behavioral control significantly influences an individual's behavior with regard to various products such as plant-based foods [77,78], environmentally-friendly food products [33,34,79], and organic foods [80,81]. According to the literature, the lack of

**Table 7**  
Assessment of the structural model and significance testing results.

Hypothesis	Path Coefficient	t-value	Results
$H_1$ : Attitude → Behavioral intention	0.131*	1.805	<b>Supported</b>
$H_2$ : Perceived behavioral control → Behavioral intention	0.401***	4.832	<b>Supported</b>
$H_3$ : Subjective norms → Behavioral intention	0.025	0.276	Not Supported
$H_4$ : Informed tasting → Behavioral intention	0.108*	1.894	<b>Supported</b>
$H_5$ : Sensory perceptions of plant-based product → Behavioral intention	0.213**	2.906	<b>Supported</b>

Note: Significance level of path coefficient = \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

**Table 6**  
Assessment of discriminant validity using HTMT.

Construct	1	2	3	4	5	6
1) Attitude						
2) Behavioral intention	0.369					
3) Informed tasting	0.218	0.270				
4) Perceived behavioral control	0.316	0.604	0.253			
5) Sensory perceptions of plant-based product	0.258	0.474	0.200	0.329		
6) Subjective norms	0.434	0.258	0.110	0.340	0.274	

Note: The shaded boxes represent the standard reporting format for the HTMT procedure.

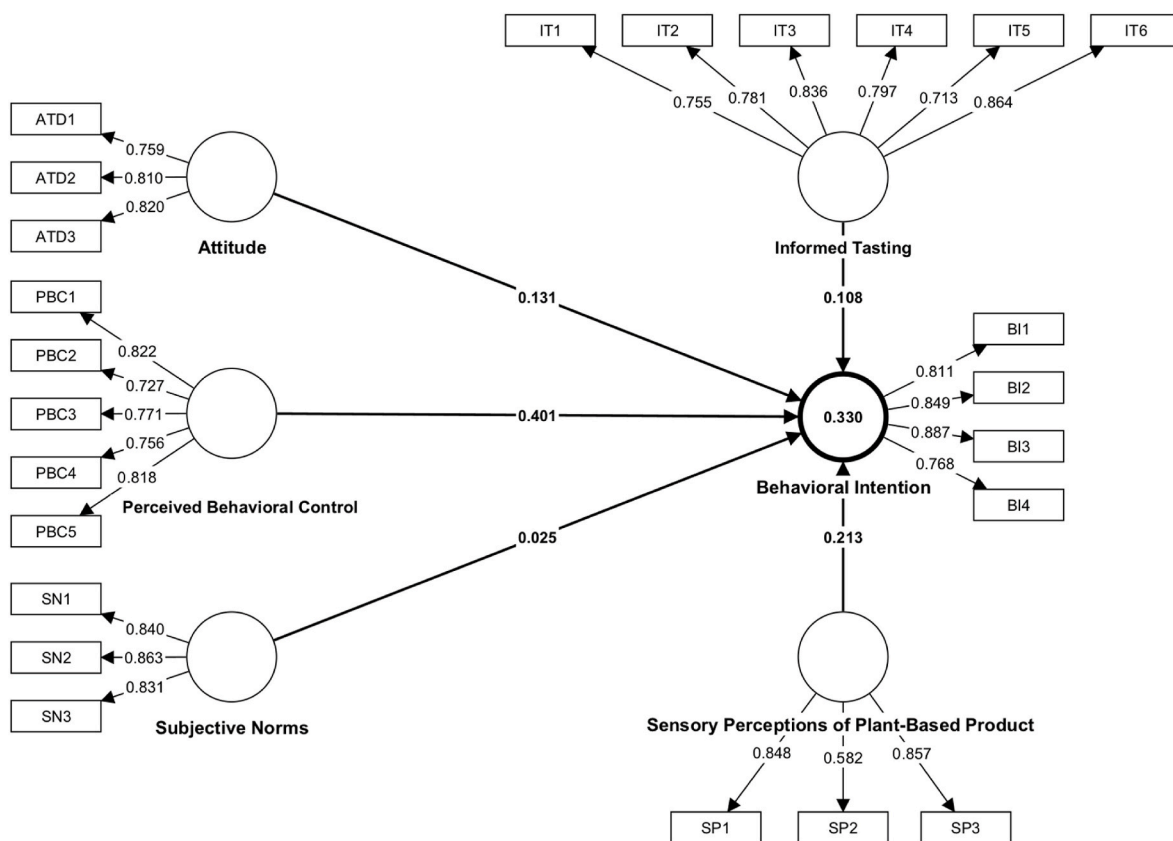


Fig. 3. Structural equation model of the intention to purchase plant-based products.

Table 8

Coefficients of determination ( $R^2$ ) and Predictive Power ( $Q^2$ ).

	$R^2$	$Q^2$
Intention to purchase plant-based products	0.330	0.268
SRMR = 0.079; NFI = 0.671		

Note: SRMR: Standardized Root Mean Square Residual; NFI: Normed Fit Index.

sustainable products available on the market is a significant barrier that hinders consumers from purchasing such products. For instance, Nath and Agrawal [82] indicated that the low availability of sustainable products is one of the reasons for there being a statistically significant negative impact on consumers' sustainable purchasing intentions in India. Meanwhile, in their study, Weissmann and Hock [83] found that the availability of sustainable products positively impacts consumer purchasing intentions, as demonstrated in a behavior-intention model. Hence, this information is valuable for businesses and marketers, as it suggests that enhancing the ease of purchasing plant-based products can boost consumers' intentions and desire to buy them.

Second, this study highlights that consumers' perceptions of the sensory characteristics (color, smell, taste, appearance, etc.) of plant-based products significantly influence their purchasing intentions. This indicates that when consumers believe that a plant-based product provides a positive sensory experience similar to, or better than, that delivered by traditional animal-based products, they are more likely to express a stronger intention to purchase it. In the case of dairy analogues, the white color is prominent and clearly appears as a main positive discriminant factor (Table 3). Banovic et al. [43] reported similar findings and subsequently confirmed the key role of sensory perceptions of mixed products (combining meat and plant-based ingredients) in mediating the effect of consumers' attitudes on the intention to buy such mixed products. The findings of Hati et al. [84] also

suggest that sensory appeal is a key factor that influences positive attitudes towards frozen meat, and subsequently boosts purchasing intentions. This is particularly relevant in the context of plant-based or alternative animal products, where consumers may be concerned about taste, texture, or other sensory attributes [85]. Hence, for effective marketing and product development, it is essential to align consumer expectations with real sensory experiences to stimulate purchases and promote product intention.

The model presented in this study indicates that informed sensory evaluation significantly affects purchase intention. This indicates that favorable sensory characteristics can lead to positive buying decisions. A similar finding was reported by Moss et al. [29], who indicated that the sensory characteristics of plant-based products play a significant role in determining consumers' overall acceptance of the product. In the context of wine products, most wine buyers consider taste a crucial component of their repurchasing decisions [86]. For instance, Mueller et al. [87] highlighted the impact of actual sensory experience on repurchasing decisions on the part of Australian consumers regarding red wine. This suggests that sensory approval is a critical driver of consumer purchasing behavior, reinforcing the significance of product experience in shaping consumer intent.

In this study, attitudes toward plant-based products also played a significant role in influencing consumers' purchasing intentions, although only to a moderate extent. This observation aligns with the findings of a study conducted by Pandey et al. [77] in Denmark. Their research indicated that consumers' attitudes toward plant-based yoghurt alternatives had a noticeable effect on their intention to consume such products. When consumers have a positive attitude toward plant-based items, and perceive them as healthy, environmentally friendly, etc., they are more inclined to express their intention to purchase them [43]. Conversely, when individuals have negative attitudes, and perceive plant-based products as expensive, their intention to buy them is likely to be lower. Consequently, it is suggested that consumers

be informed about the benefits of shifting towards plant-based products in their diets, as this can positively shape their attitudes and, subsequently, their intention to purchase. There is also some discrepancy with regard to what they can expect in terms of milk analogue tasting of almond, and the final global acceptance of the real fermented almond drink that was more acidic and with no almond taste and smell due to fermentation involving lactic acid bacteria. This created a shift in their initial expectations and must be considered when innovative products are presented to consumers.

## 6. Conclusions

This study contributes to understanding Spanish consumers' attitudes and the factors influencing their intention to purchase plant-based products. The findings underscore the importance of sensory characteristics in shaping consumer preferences within the plant-based food market, with taste and quality being highly valued by consumers. Additionally, perceived behavioral control emerges as a critical factor influencing purchasing intention. For producers and marketers, these insights offer practical recommendations. Prioritizing taste and quality is paramount, and investment in research and development can aid in creating unique plant-based alternatives that closely resemble traditional dairy products, thereby enhancing consumer acceptance. Moreover, ensuring widespread availability across various retail channels is crucial for meeting consumer demand and expanding market reach effectively.

Although this study was able to accomplish its objectives, it had a few shortcomings that require further consideration. Firstly, our research focused solely on the metropolitan area of Barcelona, potentially limiting the generalizability of the findings. Therefore, future studies should expand to include other regions in Spain. Additionally, examining a wider range of plant-based products and increasing the sample size are essential in order to enhance the reliability and robustness of the results. Moreover, it would be insightful to investigate the price premium that consumers are willing to pay for plant-based products. Another limitation is that the predictive factors used in this study to assess intention were not exhaustive. Future research should consider additional factors such as trust, health consciousness, and environmental concerns, which have been shown in previous studies to influence consumer acceptance of plant-based products.

## Ethical statement

The ethical committee at the Centre for Agrofood Economics and Development-UPC-IRTA (CREDA) authorized the experimental procedure in accordance with the basic legislation in force on Data Protection (Spanish Organic Law March 2018 and Regulation EU 2016/679) and the legal requirements linked to ethical principles on research with human participants (Declaration of Helsinki and The Belmont Report).

## CRedit authorship contribution statement

**Muhammad Adzran Che Mustapa:** Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation. **Zein Kallas:** Writing – review & editing, Supervision, Resources, Funding acquisition, Conceptualization. **Charles Silande:** Writing – review & editing, Resources. **Valérie Gagnaire:** Writing – review & editing, Resources. **Gwénaél Jan:** Writing – review & editing, Resources. **Laura López-Mas:** Writing – review & editing, Validation. **Ingrid Aguiló-Aguayo:** Writing – review & editing.

## Declaration of competing interest

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

## Data availability

Data will be made available on request.

## Acknowledgements

This research was supported by the LOCALNUTLEG research grant. Grant Agreement number: [2033] [LOCALNUTLEG] [Call 2020 Section 1 Agrofood IA]. The CERCA Program (Generalitat de Catalunya) also supported this research.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jafr.2024.101188>.

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