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L'OPUNTIA COME INGREDIENTE FUNZIONALE DELLA PASTA

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SCOPO DELLA RICERCA

In questo 7° numero presentiamo una ricerca condotta dal CREA di Roma sull'utilizzo dell'Opuntia ficus-indica nella produzione di una nuova varietà di pasta funzionale e esplora i fattori che influenzano la scelta dei consumatori riguardo a questa pasta. Attraverso un sondaggio online condotto su 328 partecipanti, sono stati identificati sette segmenti di consumatori distinti in base alle loro abitudini alimentari e percezioni della pasta funzionale. L'istruzione è emersa come un fattore importante nella percezione della pasta funzionale, con persone istruite che mostravano opinioni diverse rispetto a quelle meno istruite. Gli intervistati hanno dimostrato un interesse significativo per i benefici per la salute, gli aspetti nutrizionali e ambientali della pasta funzionale con Opuntia, il che potrebbe favorire il suo consumo. Inoltre, le preferenze degli intervistati riflettono un valore di esperienza nei confronti della pasta, suggerendo che l'Opuntia utilizzata nella produzione debba mantenere le proprietà organolettiche e fisiche della pasta tradizionale italiana.

TITOLO:

INTRODUZIONE:

Opuntia ficus-indica come ingrediente nella nuova pasta funzionale: Preferenze dei consumatori in Italia

Gli alimenti funzionali hanno l'aspetto degli alimenti tradizionali ma offrono maggiori benefici per la salute umana e la prevenzione delle malattie croniche rispetto agli alimenti convenzionali.

Diversi ricercatori hanno considerato i componenti funzionali di molti alimenti convenzionali e hanno cercato di sviluppare nuovi prodotti. Altri autori hanno invece esaminato l'accettazione da parte dei consumatori e la percezione dei prodotti alimentari funzionali e hanno scoperto che fattori socio-demografici e cognitivi/attitudinali potrebbero ostacolare la domanda di alimenti funzionali. Secondo altri autori, l'accettazione da parte dei consumatori dei prodotti funzionali è determinata principalmente dalla correlazione percepita tra aspetti come la dieta e la salute. I consumatori, infatti, sono consapevoli che alcuni alimenti potrebbero prevenire le malattie e migliorare il benessere umano. Per questi motivi si è assistito, nell'ultimo decennio, ad una crescita importante del mercato degli alimenti funzionali in Europa.

In altre parole, il cibo funzionale rappresenta un'interessante opportunità per le imprese e l'introduzione di nuovi prodotti consente l'esplorazione di nuove opportunità di mercato al fine di soddisfare le esigenze dei consumatori e aumentare la redditività delle imprese nel settore alimentare. In questo contesto, l'Opuntia ficus-indica è un'importante fonte di vitamine C, B1, B2, A ed E e di minerali come potassio, calcio, magnesio e fosforo, presentando così proprietà benefiche per la salute umana con il suo consumo. Inoltre, viene utilizzato per trattare malattie come l'obesità, il diabete, l'arteriosclerosi, l'ipercolesterolemia e i disturbi cardiovascolari e presenta anche proprietà antinfiammatorie, antiossidanti, ipoglicemizzanti, antimicrobiche e neuroprotettive.

Su scala globale, il Messico rappresenta la maggiore coltivazione di Opuntia, seguito dall'Italia e poi dal Sud Africa. In Italia, l'Opuntia è coltivata principalmente in Sicilia e conta 7400 ettari di coltivazione a livello nazionale e la produzione di 78.000 tonnellate all'anno di frutta fresca, classificando l'Italia sia come il secondo produttore di Opuntia a livello internazionale che come il più grande produttore in Europa.

Il frutto dell'Opuntia viene consumato sia come alimento fresco che sotto forma trasformata per le sue spiccate caratteristiche organolettiche e l'alto contenuto di zuccheri. Viene infatti utilizzato per preparare alimenti come pane, nachos, tortillas, succhi, marmellate e biscotti. Alcuni autori, inoltre, hanno provato a utilizzare l'Opuntia per realizzare una nuova pasta funzionale e hanno dimostrato che potrebbe essere considerata un alimento salutare senza alterare le caratteristiche organolettiche e fisiche del prodotto alimentare finale. Altri autori hanno invece studiato l'arricchimento della pasta di semola di grano duro con il 3% di Opuntia e hanno sottolineato che la pasta con il 3% di Opuntia come additivo è un buon alimento funzionale per il mantenimento del peso corporeo normale e la prevenzione dei disturbi metabolici legati all'età.

Come si è visto con il recente interesse della letteratura verso l'Opuntia come ingrediente di arricchimento alimentare, con i benefici per la salute dell'Opuntia, l'uso comune della pasta nella dieta mediterranea, il consumo quotidiano di pasta per gli italiani e le preferenze dei consumatori italiani verso la pasta funzionale, l'arricchimento con l'Opuntia potrebbero rappresentare una prospettiva interessante per le indagini.

Per quanto ne sappiamo, non è stato condotto nessun altro studio sulle preferenze dei consumatori per la pasta a base di farina arricchita con Opuntia. Pertanto, questo studio si propone di colmare questa lacuna analizzando le preferenze dei consumatori per la pasta funzionale con Opuntia in un campione di consumatori italiani. In particolare, lo studio mira a determinare i principali fattori che potrebbero influenzare le scelte dei consumatori riguardo alla pasta funzionale e a caratterizzare ipotetici segmenti di consumatori distinti in termini di abitudini alimentari, scelte di pasta e percezioni verso la pasta funzionale con Opuntia. In generale, le preferenze dei consumatori verso le caratteristiche della pasta rappresentano un aspetto importante per le imprese per sviluppare strategie di marketing efficaci. Infatti, i profili di gruppi di consumatori con esigenze simili vengono spesso utilizzati per sviluppare strategie di marketing. In altre parole, l'individuazione delle preferenze che guidano un consumatore nella scelta della pasta funzionale con Opuntia può rappresentare un'interessante opportunità per le aziende di identificare nuove nicchie di mercato in un paese caratterizzato da una tipica dieta mediterranea.

CONCLUSIONI:

Gli atteggiamenti e le percezioni dei consumatori nei confronti dei nuovi alimenti sono importanti da considerare quando si tenta di introdurre tali alimenti. Il coinvolgimento dei consumatori nel processo di sviluppo di nuovi prodotti è un fattore importante da considerare per la progettazione di nuovi alimenti. I nuovi prodotti rappresentano anche potenziali ricavi per le aziende alimentari.

Sebbene il campione utilizzato in questa ricerca non possa essere considerato rappresentativo dell'intera popolazione italiana a causa dell'approccio esplorativo dello studio, come in molte ricerche sul comportamento dei consumatori, i risultati ottenuti forniscono spunti interessanti per comprendere il processo di decisione dei consumatori fatte a questo riguardo. Sono infatti necessari ulteriori studi per comprendere meglio l'accettazione dei consumatori italiani nei confronti della pasta funzionale contenente Opuntia in termini di preferenze, atteggiamenti o preoccupazioni individuali.

Questo studio ha tentato di fornire approfondimenti e discutere le preferenze dei consumatori italiani per la pasta funzionale contenente Opuntia utilizzando cactus disponibili localmente come ingrediente individualmente e culturalmente accettato. Sono stati individuati sette profili di consumatori italiani al fine di sviluppare una migliore comprensione delle opinioni dei consumatori e facilitare la progettazione di strategie di marketing. I principali risultati mostrano che il ruolo della percezione tra le persone dipende dal loro livello di istruzione.

Infatti, sebbene i nostri cluster fossero caratterizzati da variabili diverse, sono emersi alcuni aspetti interessanti, ovvero i cluster associati agli intervistati con un livello di istruzione elevato differivano da quelli con un livello di istruzione basso.

Tra i cluster composti da intervistati con un livello di istruzione elevato, due gruppi di consumatori erano composti rispettivamente da persone neofobiche e tecnofobiche; tuttavia, anche a loro sembrava essere positivo verso gli aspetti degli alimenti funzionali contenenti Opuntia. Inoltre, i risultati mostrano che i benefici per la salute e gli aspetti nutrizionali e ambientali della pasta funzionale dovrebbero incoraggiare l'accettazione e il consumo di questa nuova pasta funzionale.

Le preferenze degli intervistati riflettono il valore dell'esperienza nei confronti della pasta, ovvero la convinzione di cucinare la tipica pasta italiana. Ciò significa che l'utilizzo di Opuntia per la produzione di pasta funzionale dovrebbe mantenere le proprietà organolettiche e fisiche della pasta a base di grano duro. Inoltre, le preferenze degli intervistati per la pasta contenente Opuntia potrebbero essere guidate anche dal prezzo del prodotto.

Pertanto, dai risultati ottenuti in questo studio, è possibile sviluppare strategie di marketing considerando sia le percezioni positive dei consumatori riguardo all'uso dell'Opuntia ficus-indica nella produzione di pasta, sia i criteri utilizzati dai consumatori italiani per valutare la pasta; tuttavia, è importante tenere presente l'approccio esplorativo dello studio.

**A SEGUIRE, LA RICERCA
SCIENTIFICA COMPLETA**

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Opuntia ficus-indica e Opuntia stricta. Leganti pittorici a base di mucillagini per la conservazione dei beni culturali

Article

Opuntia ficus-indica as an Ingredient in New Functional Pasta: Consumer Preferences in Italy

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Abstract: *Opuntia ficus-indica* is a source of minerals and vitamins and has recently been used as ingredient to make a new functional variety of pasta. Italy was the first country in the world to produce pasta and is also the second largest producer of *Opuntia* in the world. According to an Italian sample, this study considers the main factors that could influence consumers when choosing functional pasta (featuring *Opuntia*) and characterizes distinct hypothetical consumer segments in terms of their food habits, pasta choices, and perceptions toward functional pasta featuring *Opuntia*. Data were collected using a web-based survey and with 328 respondents. Factor analysis (FA) with orthogonal rotation (varimax) was used to simplify the observed variables and hierarchical cluster analysis was performed with the FA results. Seven clusters were identified and the main results show that the level of education plays an important role in the perception of functional pasta. In fact, the perceptions of well-educated people differed from poorly-educated people. Moreover, the results showed significant respondent interest regarding health benefits and the nutritional and environmental aspects of functional pasta, which should encourage people's acceptance and consumption of this new functional food. In addition, the respondent preferences reflect a value of experience towards the pasta, i.e., the belief of cooking typical Italian pasta. This means that *Opuntia* used for the production of functional pasta should maintain the organoleptic and physical properties of durum wheat-based pasta. In addition, respondent preferences for pasta featuring *Opuntia* could also be driven by its price.

Keywords: consumer preferences; *Opuntia ficus-indica* (L.) Mill; functional food; pasta; Italy



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1. Introduction

Functional foods have the appearance of traditional food but provides more benefits for human health and chronic disease prevention than conventional foods [1,2].

Several researchers [3–5] have considered the functional components of many conventional foods and have tried to develop new products [6,7]. Other authors have instead examined consumer acceptance and the perception of functional food products and have found [8] that socio-demographic and cognitive/attitudinal factors could hamper the demand for functional food. According to other authors [9–13], consumer acceptance for functional products is mainly determined by the perceived correlation between aspects such as diet and health [13]. In fact, consumers are conscious that some foods might prevent diseases and improve human wellbeing [14]. For these reasons there has been important growth in the market of functional food in Europe over the last decade [15,16]. In other words, functional food presents an interesting opportunity for firms [17,18] and the introduction of new products allows the exploration of new market opportunities in order to satisfy consumer needs and increase firm profitability in the food sector [13].

In this context, *Opuntia ficus-indica* is an important source of vitamins C, B1, B2, A, and E and minerals such as potassium, calcium, magnesium, and phosphorus [19], thereby

presenting beneficial properties for human health with its consumption [13]. Moreover, it is used to treat diseases such as obesity, diabetes, arteriosclerosis, hypercholesterolemia, and cardiovascular disorders [20,21], and it also presents anti-inflammatory, antioxidant, hypoglycemic, antimicrobial, and neuroprotective properties [22].

At the global scale, Mexico represents the greatest cultivation of *Opuntia*, followed by Italy and then South Africa [23]. In Italy, *Opuntia* is mainly cultivated in Sicily and accounts for 7400 ha of cultivation at the national level and the production of 78,000 tons per year of fresh fruit, ranking Italy as both the second largest producer of *Opuntia* internationally [23] and the largest producer in Europe [24,25].

The fruit of *Opuntia* is eaten in both fresh food and processed forms due its strong organoleptic characteristics and high sugar content [19]. In fact, it is used to make food such as bread, nachos, tortillas, juice, jam [26], and biscuits [27]. Moreover, some authors [28] have tried to use *Opuntia* to make a new functional pasta and have shown that it could be considered a healthy food without altering the organoleptic and physical characteristics of the final food product [28]. Other authors [29] have instead studied the enrichment of durum wheat pasta with 3% *Opuntia* and have underlined that pasta with 3% *Opuntia* as an additive is a good functional food for maintaining a normal body weight and the prevention of age-related metabolic disorders [29].

As seen with the recent interest in the literature towards *Opuntia* as a food enrichment ingredient (e.g., [13,19,27,28]), with the health benefits of *Opuntia* [13,19,28], the common use of pasta in the Mediterranean diet [30,31], the daily pasta consumption for Italians [32], and Italian consumer preferences towards functional pasta, pasta featuring *Opuntia* may be an interesting prospect for investigation.

To the best of our knowledge, no other study has been conducted concerning consumer preferences for pasta made from flour enriched with *Opuntia*. Thus, this study aims to fill this gap by analyzing consumer preferences for functional pasta with *Opuntia* in a sample of Italian consumers. In particular, the study aims to determine the main factors that could influence consumer choices regarding functional pasta and to characterize distinct hypothetical consumer segments in terms of their food habits, pasta choices, and perceptions toward functional pasta featuring *Opuntia*. In general, consumer preferences towards the attributes of pasta represents an important aspect for enterprises [30] to develop effective marketing strategies [32]. In fact, the profiles of consumer groups with similar needs are often used to develop marketing strategies [33]. In other words, the individualization of the preferences that drives a consumer in choosing functional pasta featuring *Opuntia* may represent an interesting chance for firms to identify new market niches in a country characterized by a typical Mediterranean diet [34,35].

2. Materials and Methods

2.1. Data Collection

The study data were collected using a web-based survey administered during the period of September–December in 2020. The survey was delivered through social media and e-mail as similarly performed in papers investigating consumer behaviors (e.g., [33–38]). Moreover, a snowball sampling recruitment method was also adopted in order to obtain a large number of participants [39]. The inclusion criteria were an age over 18 years, responsible for the grocery shopping in the family, and being willing to eat functional pasta containing *Opuntia*. From an initial sample of 350 consumers, 22 respondents were later excluded from the analysis because they were not willing to consume pasta featuring *Opuntia*, resulting in a final sample of 328 respondents. It is important to underline that the sample is not representative of the whole Italian population as found in other studies on consumer behaviors (e.g., [33–35,37]).

2.2. Questionnaire

The survey was conducted using a structured questionnaire following the current literature about consumer behavior (e.g., [30,32]). It is important to underline that the

study did not require ethics committee approval survey as in other consumer studies (e.g., [40]). The research followed the Italian National law (d.lgs. 196/2003) and following modifications by the EU. Prior to answer the questions, participants were briefly informed by research staff about the project that motivated the survey and their free decisions on their involvement with the research and assurance of no explicit or implicit coercion. Moreover, the information gathered for the present study is treated confidentially and the respondent identities are anonymous. All participants gave their informed consent before answering the questionnaire. The structured questionnaire was divided into four sections: (1) and (2) consider consumer habits about food and pasta choices, (3) considers consumer behaviors towards functional pasta featuring Opuntia, and (4) pertains to socioeconomic and demographic information. The first three sections asked questions with ten-point Likert scales with growing levels of evaluation (i.e., 1 denotes total disagreement and 10 denotes total agreement) as in other studies [32,34,35].

The first and the second sections of the questionnaire investigated respondent consumption characteristics, habits, and preferences for pasta in general (e.g., frequency of consumption, type of pasta consumed, places of consumption of pasta, preferences for pasta made with foreign durum wheat or for pasta made with Italian durum wheat, attributes of pasta worthy of attention etc.) [32]. Moreover, the attention people pay to the environmental- and health-related aspects of their food consumption behavior and also food neophobia and food technology neophobia have been considered, as highlighted by some authors [36,41].

The third part of the questionnaire focused on consumer behaviors towards functional pasta featuring Opuntia. According to similar studies concerning consumer behavior [34,35,41], participants were informed both according to the scientific literature [13,29] and the method used to make functional pasta featuring Opuntia, and that it is a good functional food for maintaining a normal body weight and the prevention of age-related metabolic disorders.

Respondent willingness to eat functional pasta containing Opuntia was evaluated by asking respondents to provide their positive or negative opinion about the question of “would you be willing to eat functional pasta containing Opuntia?” It is important to highlight that if participants were not willing to consume Opuntia then they would have been excluded from the analysis. Respondents were also asked to indicate their familiarity with eating functional pasta by questioning if they had ever heard about consuming functional pasta containing Opuntia before and their past consumption by asking if they had ever consumed functional pasta containing Opuntia in the past [35]. In addition, following [34], consumer perceptions for functional pasta containing Opuntia (i.e., disgust and environmental issues) and appreciation towards the nutritional content of functional pasta were investigated.

Finally, the fourth section contained detailed questions regarding the socioeconomic and demographic characteristics of respondents and their family (the questionnaire is available in the Supplementary Materials).

2.3. Methods

Factor analysis (FA) is commonly used to study consumers preferences and motivations with the aim to simplify the observed topic [32,42]. In other words, FA is a method used to study a topic by simplifying it into a smaller number of elements underlying a large number of detected variables [43]. In particular, FA allows the measurement of a latent variable which cannot be measured with a single variable, thus observing the relationship with a set of known variables [44].

In this study, a framework of preferences was drawn using FA with the answers of the questionnaire [32]. In other words, the FA technique with orthogonal rotation (varimax) was used to discover the main factors that could influence consumers to choose functional pasta containing Opuntia. Moreover, Keiser–Meyer–Olkin (KMO) and Barlett testing were applied in order to verify the sampling and correlation adequacy, while Kaiser’s criterion was applied to identify the appropriate number of factors to include in the analysis.

Hierarchical cluster analysis based on the FA results was later performed. The aim was to identify homogeneous groups with respect to a set of factors characterized by similarity and elements of difference amongst groups. Clusters were identified using Euclidean distances and Ward's method [33,36].

All statistical elaborations were carried out using R (version 3.6.2, RStudio, Boston, MA, USA) [45].

3. Results

3.1. Sample Characteristics and Behaviors

Participants for the study were conveniently sampled in the period of September–December in 2020. From an initial sample of 350 consumers, about 6% of respondents were excluded from the analysis as they were not willing to consume pasta containing *Opuntia*. This unwillingness (6% of the whole sample) was due to neophobia, technophobia, or disgust towards this new functional food. At the end, a total of 328 respondents were used for data analysis.

Table 1 shows some of the participants characteristics. In particular, the sample consists of more females (61.40% of the sample) than males, with a mean age of 50 years, a higher share of well-educated (88.60% of respondents) and married participants (64.47% of the sample). About 35% of the sample earned an income between 20,001–30,000 Euros per year, followed by 28% of respondents with an annual income between 30,001–40,000 Euros.

Table 1. Socioeconomic and demographic characteristics of the sample ($n = 328$).

Variables	%
Gender	
Male	38.60
Female	61.40
Total	100.00
Education	
Low education	11.40
High education	88.60
Total	100.00
Status	
Unmarried	23.68
Married	64.47
Separated/divorced	11.85
Total	100.00
Annual income (Euros)	
<10,000	4.39
10,001–20,000	13.60
20,001–30,000	35.08
30,001–40,000	28.07
40,001–50,000	11.84
>50,001	7.02
Total	100.00

Source: Our elaboration on survey data.

It is interesting to observe that 35% of the sample consumed pasta more than twice a week and about 59% of respondents consumed it at home (Table 2). Another important finding is that about 57% of the participants declared to alternate the consumption of durum wheat pasta with other types of pasta (e.g., stuffed pasta) once a month, while 55% of the sample claimed to consume fresh pasta and about 55% consumed egg pasta once a month. Moreover, some people claimed to never consume pasta with added vitamins (about 95% of the sample), cooked pasta (about 91%), frozen and then cooked pasta (about

90% of the respondents) and Kamut® wheat pasta (Table 3). Finally, some people claimed to consume neither organic (64%) nor integral pasta (about 36% of the sample). It is important to underline that 100% of respondents had never consumed functional pasta containing Opuntia in the past. This is probably due to the unavailability of functional pasta on the market. Moreover, 95% of the sample had heard about eating functional pasta in the past.

Table 2. Frequency of durum wheat pasta consumption and places of consumption.

Variables	%
Frequency of consumption	
never	2.19
Once a month	5.26
Once a week	14.91
Twice a week	20.18
More than twice a week	35.08
Every day	22.38
Total	100.00
Places of consumption	
At home	58.77
Out of home (bars and restaurants)	2.19
Both	39.04
Total	100.00

Source: Our elaboration on survey data.

Table 3. Periodicity of the consumption of other pasta types.

Frequency of Consumption	Integral Pasta	Fresh Pasta	Organic Pasta	Stuffed Pasta	Egg Pasta	Frozen Pasta Cooked	Pasta Cooked	Pasta with Added Vitamins	Kamut® Wheat Pasta
Never	35.96	13.60	64.03	25.88	18.42	89.91	90.79	94.74	81.58
Once a month	32.89	55.26	21.93	57.46	54.82	8.33	7.02	2.63	14.03
Once a week	17.54	28.95	7.01	15.35	25.00	0.88	1.32	2.19	3.07
Twice a week	6.14	1.75	2.19	0.88	1.32	0.44	0.87	0.44	0.88
More than twice a week	3.95	0.44	3.51	0.43	0.44	0.00	0.00	0.00	0.44
Every day	3.52	0.00	1.33	0.00	0.00	0.44	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	10.00	100.00	100.00	100.00

Source: Our elaboration on survey data.

With regard to the consciousness of Italians with respect to the origin of durum wheat, it is important to note that about 83.78% of the sample knew the origins of the raw materials. In particular, about 54% of respondents claimed that the pasta they consume is made with durum wheat cultivated in Italy (Table 4).

Table 4. Knowledge of the origin of durum wheat used to make the consumed pasta.

Variables	%
I do not know	16.22
Wheat cultivated only in Italy	53.96
Wheat cultivated only in Southern Italy	8.33
Wheat cultivated abroad	0.00
Wheat cultivated both in Italy and abroad	21.49
Total	100.00

Source: Our elaboration on survey data.

3.2. The Factors Explain Preferences of Respondents

The KMO test result was equal to 0.81 and the Barlett's test result ($\chi^2 = 13.901$; $df = 3.741$; p -value < 0.001) was significant [46], indicating that the sample and corre-

lation matrix were appropriate for such analysis. Seven factors had eigenvalues over a Kaiser's criterion of 1 and together explained 74% of the original variance.

Table 5 shows the seven factors included in the analysis with their Cronbach's α values. Moreover, following [32], we removed items with factor loading less than 0.45.

Table 5. Factor analysis with a varimax rotation.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
<i>Health aspects</i> ($\alpha = 0.95$) **							
Health effects	0.87						
Proteic	0.78						
Caloric	0.86						
Fat	0.84						
Hygienic	0.84						
Geographic	0.76						
Seasons	0.77						
Traditions	0.69						
Environmental impact	0.80						
Social impact	0.77						
Production method	0.76						
<i>Food neophobia</i> ($\alpha = 0.99$) **							
New *		0.72					
Different culture *		0.95					
New food *		0.78					
Ethnic restaurant *		0.82					
<i>Food technology neophobia</i> ($\alpha = 0.76$) **							
No technology			0.74				
Environmental benefits overestimated			0.88				
World hunger overestimated			0.87				
Low quality			0.77				
Good enough			0.75				
Unknown effect on health			0.56				
<i>Type of pasta</i> ($\alpha = 0.75$) **							
Fresh pasta				0.57			
Stuffed pasta				0.66			
Egg pasta				0.62			
<i>Italian pasta tradition</i> ($\alpha = 0.91$) **							
Origin as quality indicator					0.64		
Italian wheat					0.69		
Southern Italy wheat					0.52		
Recycled packaging					0.60		
Info health benefits					0.75		
Info production					0.82		
Territorial brand					0.80		
Low impact					0.86		
Quality certification					0.85		
Health certification					0.83		
Ethical certification					0.81		

Table 5. Cont.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
<i>Attributes of pasta</i> ($\alpha = 0.91$) **							
Method						0.73	
Type						0.73	
Origin						0.80	
Pasta brand						0.73	
Labeled nutrition						0.82	
Color						0.68	
Time						0.67	
Cooking method						0.63	
Quality certification						0.77	
Price						0.48	
<i>Functional pasta</i> ($\alpha = 0.87$) **							
Curiosity							0.74
Health benefits							0.86
More nutrients							0.81
Low environmental impact							0.89
Low cost							0.58
Pasta factory							0.62
More info							0.83

* Reversed coded. ** The questionnaire is available in the Supplementary Materials, along with details about the abbreviations of the variables.

Factor analysis (FA) was used to identify the main preferences that could influence consumers in choosing functional pasta. It is important to consider that the sample was composed of people that were willing to consume pasta containing Opuntia.

By reading Table 5, the seven main factors can be defined as observed below:

Factor 1, “*health aspects*”, denotes a preference for the values of health and food tradition, as well as the nutritional and hygienic aspects of food, which are linked to both environmental and social issues and the food production methods. Another value underlying this factor is the one related to the seasonality of food that is directly linked to the environmental concerns [47].

Factor 2, “*food neophobia*” and factor 3, “*food technology neophobia*”, reflect people’s beliefs in their country’s culinary traditions. Similar results can also be seen for factor 4, “*types of pasta*”, which shows preferences for other types of pasta consumed than dry durum wheat (i.e., fresh pasta, stuffed pasta, and egg pasta) and reflects a tradition which is typical for local Italian products.

Factor 5, “*Italian pasta tradition*”, shows a preference for the basic Italian values of pasta in terms of the origin, territorial brand, and certification (i.e., quality, safety, and ethical certifications). Other values for this factor are related to both information about the health benefits of pasta, its production processes, and environmental impacts.

Factor 6, “*attributes of pasta*”, shows the attributes to which consumers pay attention when choosing pasta. This factor illustrates preferences for intrinsic and extrinsic characteristics of pasta. In this case, the preference shows a value of experience by consumers towards the product, that is the belief of cooking the typical Italian pasta.

Finally, factor 7, “*functional pasta*”, reveals potential preferences for functional pasta characteristics that are related with health and nutritional aspects, its potential price, its potential environmental impacts, and curiosity about this new food and the necessity to receive information about its production. Another value underlying this factor is the one related to customer loyalty to a pasta brand. In other words, the potential preference for pasta containing Opuntia might also be driven by customer loyalty to a brand and the price of the product.

3.3. Cluster Analysis: Potential Consumer Profiling

Cluster analysis allowed us to successfully and consistently identify seven clusters ($R^2 = 0.70$) and the results are presented in Table 6. It is important to consider that the examined sample was composed of people that were willing to consume pasta containing Opuntia.

Table 6. Profiles of consumers segments ($n = 328$) with mean scores of variables within the groups.

n	Label of Consumers Profiles	%	Edu	Food Consumption Attitudes			Pasta Consumption Attitudes			
				Health Aspects	Food Neophobia	Food Technology Neophobia	Type of Pasta	Italian Pasta Tradition	Attributes of Pasta	Functional Pasta
1	Healthy and traditional consumer	7.71	0.74	7.36	4.55	4.09	1.10	7.36	6.83	5.80
2	Refractory consumer	5.56	0.58	5.29	3.15	2.20	1.07	3.89	4.87	5.55
3	Neophobic and traditional consumer	4.75	0.51	2.29	6.86	3.18	1.35	7.14	7.34	6.31
4	Healthy, technophobic, and traditional consumer	43.23	0.60	8.39	4.59	6.51	1.10	8.70	8.34	7.33
5	Healthy and expert consumer	28.10	0.94	8.73	5.62	6.03	0.44	3.16	9.38	8.02
6	Neophobic and critical consumer	3.64	0.11	4.23	8.28	5.43	0.71	3.87	5.67	3.14
7	Neophobic consumer	7.01	0.28	2.84	8.73	3.08	1.10	2.71	2.34	2.29
The whole sample		100.00	0.90	6.58	5.17	4.41	1.07	6.67	6.68	6.77

Legend: Edu = education of respondent: 0 = low education; 1 = high education level. For health aspects, food neophobia, food technology neophobia, Italian pasta tradition, attributes of pasta, and functional pasta, ten-point Likert scales have been used (1: totally disagree, to 10: totally agree). The periodicity values for other types of pasta are coded as 0 = never; 1 = once a month; 2 = once a week; 3 = twice a week; 4 = more than twice a week; 5 = every day.

Cluster 1, “healthy and traditional consumers”, represented 7.71% of the sample. This group was characterized by well-educated people who paid attention to health characteristics and the social and environmental impacts of their food choices. Moreover, members of this group pay attention to traditions and the attributes of pasta but did not fear new food products. In fact, these consumers appeared to be neither neophobic nor technophobic, and their perceptions for functional pasta were positive in terms of both curiosity and attention towards the health, nutritional, and environmental aspects of this new food.

Cluster 2, “refractory consumers”, represented about 6% of the sample. This group was characterized by educated people who were not neophobic or technophobic, and they did not pay attention to the health characteristics of their food choices, Italian traditions, or attributes of pasta. The perceptions of functional pasta were positive for this group.

“Neophobic and traditional consumers” formed cluster 3 and represented 4.75% of the sample. In this cluster, respondents were neophobic and they showed a low level of technophobia. They appeared sensitive to aspects such as the tradition, and intrinsic and extrinsic characteristics of pasta and they perceived functional pasta containing Opuntia in a negative light. Although consumers belonging to this cluster were neophobic, they did not perceive pasta containing Opuntia as a potential new food.

Cluster 4, “healthy, technophobic, and traditional consumers”, represented 43% of respondents. In this group, consumers were well-educated, technophobic, and paid great attention to the health and environmental impacts of their food choices. The perceptions towards of pasta containing Opuntia among consumers in this group appeared to be in line with the average level measured over the whole sample. They did not appear to be negative with respect to the themes proposed in the questionnaire (curiosity, healthy

and nutritional aspects of functional pasta, its potential price, its potential environmental impacts, and the necessity to receive information about the production methods).

Cluster 5, “healthy and expert consumers”, accounted for 28% of the sample. The cluster was associated with well-educated people who paid a large amount of attention to the health and environmental impacts of their food choices and attention to the intrinsic and extrinsic characteristics of pasta. This group featured the belief of cooking typical Italian pasta. Moreover, respondent perceptions for functional pasta were more positive than those of consumers belonging to the other groups.

“Neophobic and critical consumers” formed cluster 6 and accounted for about 4% of the sample. In this cluster, respondents (with low education level) were neophobic but did not show a high level of technophobia and also paid attention to attributes of pasta; however, although the examined sample was composed of people that were willing to consume functional pasta, they appeared to negatively consider the specific themes of the factor “functional pasta”.

Similar perceptions were shown by consumers belonging to cluster 7, “neophobic consumers”, which represented 7% of respondents. Indeed, these consumers with a low education level appeared to be the most negative of all the groups with respect to the themes of “functional pasta”, although the whole sample was composed by people that were willing to consume functional pasta. Moreover, consumers belonging to cluster 7 had neophobic attitudes and did not pay attention to the health characteristic or social and environmental impacts of their food choices.

4. Discussion

According to an Italian sample, this study has attempted to elucidate the main factors that could influence a consumer in choosing functional pasta containing *Opuntia* and to characterize distinct hypothetical consumer segments in terms of their food habits, pasta choices, and their perceptions towards functional pasta containing *Opuntia*. In particular, the preferences driving consumers to choose functional pasta containing *Opuntia* and hypothetical consumer segments have been identified here.

The study has been carried out with an Italian sample, since Italy is a reference country for the Mediterranean diet [34,48] and was the first country in the world to produce pasta [32], and it is also the second largest producer of *Opuntia* worldwide [23].

The study featured an explorative approach due to the non-representativeness of the sample to the Italian population. In fact, according to ISTAT (2020) [49], the average Italian is female, has a mean age of approximately 46 years (vs. 50 years for our sample), and a low education level (vs. a high education level for our sample). Nevertheless, the authors believe that this study offers the opportunity to add some new insights and to propose discussions regarding little-known food issues concerning the topic of consumer preferences and attitudes towards functional pasta containing *Opuntia* as a new food.

The analysis showed very interesting results with respect to the understanding of both the perceptions of functional pasta containing *Opuntia* and also the main drivers of these perceptions.

The sample was composed of 328 respondents which were willing to consume pasta containing *Opuntia*, with 61.40% females, a mean age of 50 years, and a high education level (88.60% of respondents). The study confirmed the importance of pasta for Italian consumers and our results are consistent with the literature (e.g., [32]). In fact, according to Altamore et al. [32], pasta is a traditional food for the Italian population and people occasionally replace dried pasta with fresh pasta or other typical local pastas. In our case, in all identified clusters (except for cluster 5, “healthy and expert consumers”), people declared to alternate the consumption of durum wheat pasta once a month with other types of pasta, such as stuffed pasta, fresh pasta, and egg pasta (i.e., the “type of pasta”).

According to some authors [50], consumers choose pasta on the basis of credentials (i.e., origin of raw material, brand, and price, etc.), while according to others authors [30] the origin, tradition, and healthy features of pasta lead consumers to have greater preferences

for pastas that present ideal values for these attributes. In our case, the findings illustrate respondent preferences for the intrinsic and extrinsic features of pasta. In particular, the respondents choose pasta on the basis of characteristics like the origin of wheat, methods of production, nutritional characteristics, producer brand, type and color of pasta, time and type of cooking, quality certification, and price (i.e., “attributes of pasta”). In other words, the respondent preferences reflect the value of consumer experience towards the product, i.e., the belief to know and cook the typical Italian pasta. In fact, five out of seven clusters showed a good level of appreciation for pasta attributes (Table 6). The results highlight that consumers believe to be profoundly aware about which features a good pasta must have in order to be defined as a typical Italian pasta. In other words, consumer mindfulness governs the knowledge of this food under aspects such as external appearance, experience during preparation, and consumption etc.

As mentioned above, the raw material origin is another important indicator for the quality of pasta for Italian consumers [32]. In our case, about 83.78% of the sample knew the origin of the wheat and, in particular, about 54% of respondents claimed that the pasta that they consume is made with durum wheat cultivated in Italy. Similar results were found reached by Altamore et al. [32], who found that Italian consumers preferred to eat pasta with only Italian grain or alternatively with grains cultivated entirely in Southern Italy. Moreover, the findings showed preferences for the basic Italian characteristics of pasta in terms of the origin, territorial brand and quality, safety, and ethical certifications (i.e., the “Italian pasta tradition”). According to some authors [51], labels are frequently known as useful tools to help customers in the food selection decision-making process. Besides, information provided on the label gives consumers the opportunity to make choices more consciously and make them aware regarding the complex aspects of consumption [52] and the environmental, social, and ethical aspects of the product. In our case, people belonging to three out of seven clusters (i.e., cluster 1, “healthy and traditional consumers”, cluster 3, “neophobic and traditional consumers”, and cluster 4, “healthy, technophobic, and traditional consumers”) claimed a need during purchase to receive information about the pasta production processes, origin of durum wheat, information about the quality, safety, and ethical issues, and the product’s environmental impact (i.e., the “Italian pasta tradition”).

According to Defrancesco et al. [31] people are looking not only for nutritional features of pasta but also for new characteristics like health and environmental features that express a perceived quality. Also, in our case, the sample showed an underlying preference for the values of healthy and tradition of food, as well as nutritional and hygienic aspects which were linked to both environmental and social issues and production methods (i.e., “health aspects”). According to Altamore et al. [32], Italian people who values healthiness also value sustainability, and these values in consumer perceptions are linked to the origin of durum wheat and in particular to the Italian regions where durum wheat is traditionally cultivated. Moreover, our results are consistent with other authors [53,54] which have shown that the interest levels for educated individuals in functional foods are higher than others. In particular, highly educated consumers are prone to look for foods which provide greater health benefits [53,54]. In our case, five out of seven clusters were composed of well-educated respondents and among them three clusters were composed of respondents who paid attention to elements such as the health and tradition characteristics, as well as nutritional and hygienic. In particular, in cluster 5, “healthy and expert consumers”, well-educated respondents paid attention to healthy aspects of food and to the intrinsic and extrinsic characteristics of pasta. This cluster appeared to be the most positive of all the groups with respect to the themes proposed in the factor “health aspects”.

It is important to observe that even if our results reflect people’s membership in their country’s culinary traditions due to the neophobic and technophobic aspects highlighted in the sample (factors 2 and 3), our findings (four out of seven clusters, i.e., clusters 1, 2, 4, and 5) are consistent with the current literature [55], in which it has been shown that low food neophobia, together with familiarity with a new ingredient, increase consumer acceptance.

It is important to consider that 95% of the sample had heard about the consumption of functional pasta containing *Opuntia* in the past and thus they showed familiarity with this new type of pasta. Moreover, among the clusters composed of respondents with a high education level, two consumers groups (i.e., clusters 3 and 4) were composed of neophobic and technophobic people, respectively; however, they appeared to be positive in terms of the consideration of aspects of functional food containing *Opuntia* as proposed in the questionnaire (curiosity, health, and nutritional aspects of functional pasta, along with its potential price, potential environmental impacts, and the necessity to receive information about its production). In particular, in the case of cluster 3, “neophobic and traditional consumers”, although consumers were neophobic and did not pay attention to healthy aspects of food, they did not perceive pasta containing *Opuntia* as a new food. These findings could be due to *Opuntia* being used as an ingredient in [56] some Southern Italian recipes (such as Sicily, Sardinia, and Campania) and in some Italian food events [57]. Thus, this familiarity with a new ingredient increases consumer acceptance [55], as highlighted in other studies about consumer behaviors (see e.g., [36]). In cluster 4, although consumers were technophobic they did not perceive pasta containing *Opuntia* as a new food. These results could be due to respondents propensity to pay attention to healthy aspects of food (one of the themes proposed both in the factor titled “*health aspects*” and the factor titled “*functional pasta*”). This may also pertain to their familiarity with to the use of *Opuntia* in some Italian recipes [56] and some Italian food events [57]. On the other hand, the highest food neophobia scores showed in the clusters 6 and 7 (“neophobic and critical consumers” and “neophobic consumers”, respectively) were due to the low education of participants, as seen in other studies regarding consumer behavior (e.g., [41]). Moreover, although the whole sample was composed of people that were willing to consume pasta containing *Opuntia*, respondents belong to cluster 6 and 7 appeared to be negative with respect to specific themes of the factor “functional pasta” (i.e., the healthy and nutritional aspects of functional pasta and the necessity to receive information about its production method), while they were positive towards other functional pasta aspects (i.e., the potential price). These findings were due to low annual income (<10,000 Euros per year and 10,001–20,000 Euros per year). It is important to observe that cluster 6 and 7 were differentiated in terms of respondent attention to pasta attributes. In fact, consumers belonging to cluster 6 were more careful regarding pasta attributes.

Moreover, the proposal of unusual food (as functional pasta containing *Opuntia*) emphasizes the need to understand consumer preferences and their expectations as a starting point for production [58]. In this context, people’s expectations are important factors of new product acceptance [59]. The findings showed a lot of interest among respondents in terms of health benefits, and the nutritional and environmental aspects of functional pasta should encourage acceptance and the consumption of this new functional food (i.e., factors relating to “*functional pasta*”). In fact, five out of seven clusters (i.e., clusters 1, 2, 3, 4, and 5) were composed of well-educated respondents who were interested in the functional pasta aspects and, among them, three clusters (i.e., clusters 1, 4, and 5) were composed of people who paid attention to elements such health aspects and tradition, along with the nutritional and hygienic aspects, social and environmental impacts, and production methods. These results have been confirmed by other studies regarding new food (see e.g., [33,36]), which have reported that a high education level and information regarding the organoleptic and nutritional characteristics of a new food are important aspects for any attempt to increase market acceptance. Moreover, the findings have highlighted, in agreement with other studies about Italian consumer preferences towards new food [33–36,39], that information about the production method and curiosity towards this new food could drive product acceptance. According to Altamore et al. [32], one of the aspects which Italian consumers rely on to evaluate pasta is the place and method of production, as well as the product price. In our case, respondent preferences for pasta containing *Opuntia* could be driven by its price (i.e., “*functional pasta*”). In fact, respondents belonging to clusters 6 and 7

appeared to have a positive behavior towards some functional pasta aspects because of the potential price.

5. Conclusions

Consumer attitudes and perceptions towards new foods are important to consider when attempting to introduce said foods. Besides, the involvement of consumers in the process of new product development is an important factor to consider for the design of new foods. Moreover, new products also represent potential revenue for food companies.

Although the sample used in this research cannot be considered to be representative of the entire Italian population due to the explorative approach of the study, like in many research studies about consumer behavior, the obtained results provide interesting hints to understand the process of consumer decision-making in this regard. In fact, further studies are necessary to better understand the acceptance of Italian consumers towards functional pasta containing *Opuntia* in terms of their individual preferences, attitudes, or concerns.

This study has attempted to provide insights and discuss Italian consumer preferences for functional pasta containing *Opuntia* using locally available cactus as an ingredient that is individually and culturally accepted. Seven profiles of Italian consumers were identified in order to develop a better understanding of consumers' opinions and to facilitate the design of marketing strategies. The main findings show that the role of perception among people depends on their education level. In fact, although our clusters were characterized for different variables, some interesting aspects arose, namely, clusters associated with respondents with a high education level differed from those with a low education level. Among clusters composed of respondents with a high education level, two consumers groups were composed of neophobic and technophobic people, respectively; however, they appeared to be positive toward aspects of functional food containing *Opuntia*. Moreover, the findings show that the health benefits and nutritional and environmental aspects of functional pasta should encourage the acceptance and consumption of this new functional food. In addition, the respondent preferences reflect a value of experience towards pasta, i.e., the belief of cooking the typical Italian pasta. This means that *Opuntia* use for functional pasta production should maintain the organoleptic and physical properties of durum wheat-based pasta. In addition, respondent preferences for pasta containing *Opuntia* could also be driven by the product price.

Therefore, from the results obtained in this study, it is possible to develop marketing strategies considering both positive consumer perceptions regarding the use of *Opuntia ficus-indica* in pasta production and the criteria used by Italian consumers to evaluate pasta; however, it is important to keep the explorative approach of the study in mind.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/foods10040803/s1>, Table S1: Variables used in the questionnaire.

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References

1. Çakiroğlu, F.P.; Uçar, A. Consumer attitudes towards purchasing functional products. *Prog. Nutr.* **2018**, *20*, 257–262.
2. Ross, S. Functional foods: The Food and Drug Administration perspective. *Am. J. Clin. Nutr.* **2000**, *71*, 1735S–1738S. [[CrossRef](#)] [[PubMed](#)]

3. Troszyńska, A.; Estrella, I.; López-Amóres, M.L.; Hernández, T. Antioxidant activity of pea (*Pisum sativum* L.) seed coat acetone extract. *LWT-Food Sci. Technol.* **2002**, *35*, 158–164. [[CrossRef](#)]
4. Yasuda, A.; Kuraya, E.; Touyama, A.; Higa, O.; Hokamoto, K.; Itoh, S. Underwater shockwave pretreatment process for improving carotenoid content and yield of extracted carrot (*Daucus carota* L.) Juice. *J. Food Eng.* **2017**, *211*, 15–21. [[CrossRef](#)]
5. Ilić, J.D.; Nikolovski, B.G.; Petrović, L.B.; Kojić, P.S.; Lončarević, I.S.; Petrović, J.S. The garlic (*A. sativum* L.) extracts food grade W1/O/W2 emulsions prepared by homogenization and stirred cell membrane emulsification. *J. Food Eng.* **2017**, *205*, 1–11. [[CrossRef](#)]
6. Laiño, J.E.; Juárez del Valle, M.; Savoy de Giori, G.; LeBlanc, J.G.J. Development of a high folate concentration yogurt naturally bio-enriched using selected lactic acid bacteria. *LWT-Food Sci. Technol.* **2013**, *54*, 1–5. [[CrossRef](#)]
7. La Scalia, G.; Micale, R.; Cannizzaro, L.; Marra, F.P. A sustainable phenolic compound extraction system from olive oil mill wastewater. *J. Clean. Prod.* **2017**, *142*, 3782–3788. [[CrossRef](#)]
8. Perito, M.A.; Di Fonzo, A.; Sansone, M.; Russo, C. Consumer acceptance of food obtained from olive by-products: A survey of Italian consumers. *Br. Food J.* **2019**, *122*, 212–226. [[CrossRef](#)]
9. Bech-Larsen, T.; Grunert, K.G. The perceived healthiness of functional foods: A conjoint study of Danish, Finnish and American consumers' perception of functional foods. *Appetite* **2003**, *40*, 9–14. [[CrossRef](#)]
10. Frewer, L.; Scholderer, J.; Lambert, N. Consumer acceptance of functional foods: Issues for the future. *Br. Food J.* **2003**, *105*, 714–731. [[CrossRef](#)]
11. Saher, M.; Arvola, A.; Lindeman, M.; Lähteenmäki, L. Impressions of functional food consumers. *Appetite* **2004**, *42*, 79–89. [[CrossRef](#)]
12. Urala, N.; Lähteenmäki, L. Reasons behind consumers' functional food choices. *Nutr. Food Sci.* **2003**, *33*, 148–158. [[CrossRef](#)]
13. Micale, R.; Giallanza, A.; Enea, M.; La Scalia, G. Economic assessment based on scenario analysis for the production of a new functional pasta. *J. Food Eng.* **2018**, *237*, 171–176. [[CrossRef](#)]
14. Hasler, C.M.; Brown, A.C. Position of the American Dietetic Association: Functional foods. *J. Am. Diet. Assoc.* **2009**, *109*, 735–746.
15. Bech-Larsen, T.; Scholderer, J. Functional foods in Europe: Consumer research, market experiences and regulatory aspects. *Trends Food Sci. Technol.* **2007**, *18*, 231–234. [[CrossRef](#)]
16. Kahl, J.; Załęcka, A.; Ploeger, A.; Bügel, S.; Huber, M. Functional food and organic food are competing rather than supporting concepts in Europe. *Agriculture*. **2012**, *2*, 316–324. [[CrossRef](#)]
17. Menrad, K. Market and marketing of functional food in Europe. *J. Food Eng.* **2003**, *56*, 181–188. [[CrossRef](#)]
18. Arias-Aranda, D.; Romerosa-Martínez, M.M. Innovation in the functional foods industry in a peripheral region of the European Union: Andalusia (Spain). *Food Policy* **2010**, *35*, 240–246. [[CrossRef](#)]
19. Oniszczyk, A.; Wójtowicz, A.; Oniszczyk, T.; Matwijczuk, A.; Dib, A.; Markut-Miołła, E. Opuntia fruits as food enriching ingredient, the first step towards new functional food products. *Molecules* **2020**, *25*, 916. [[CrossRef](#)]
20. Décordé, K.; Teissèdre, P.; Auger, C.; Cristol, J.; Rouanet, J. Phenolics from purple grape, apple, purple grape juice and apple juice prevent early atherosclerosis induced by an atherogenic diet in hamsters. *Mol. Nutr. Food Res.* **2008**, *52*, 400–407. [[CrossRef](#)]
21. Galati, E.M.; Tripodo, M.M.; Trovato, A.; d'Aquino, A.; Monforte, M.T. Biological activity of *Opuntia ficus indica* cladodes II: Effect on experimental hypercholesterolemia in rats. *Pharm. Biol.* **2003**, *41*, 175–179. [[CrossRef](#)]
22. El-Mostafa, K.; El Kharrassi, Y.; Badreddine, A.; Andreoletti, P.; Vamecq, J.; El Kebbij, M.S.; Latruffe, N.; Lizard, G.; Nasser, B.; Cherkaoui-Malki, M. Nopal cactus (*Opuntia ficus-indica*) as a source of bioactive compounds for nutrition, health and disease. *Molecules* **2014**, *19*, 14879–14901. [[CrossRef](#)]
23. Andreu-Coll, L.; Cano-Lamadrid, M.; Noguera-Artiaga, L.; Lipan, L.; Carbonell-Barrachina, Á.A.; Rocamora-Montiel, B.; Legua, P.; Hernández, F.; López-Lluch, D. Economic estimation of cactus pear production and its feasibility in Spain. *Trends Food Sci. Technol.* **2020**, *103*, 379–385. [[CrossRef](#)]
24. Reis, C.M.G.; Gazarini, L.C.; Ribeiro, M.M. Fruit production from *Opuntia ficus-indica* ecotypes in comparison to commercial Italian clones. *Hortic. Sci.* **2018**, *45*, 92–100. [[CrossRef](#)]
25. Albano, C.; Negro, C.; Tommasi, N.; Gerardi, C.; Mita, G.; Miceli, A.; De Bellis, L.; Blando, F. Betalains, phenols and antioxidant capacity in cactus pear [*Opuntia ficus-indica* (L.) Mill.] fruits from Apulia (South Italy) genotypes. *Antioxidants* **2015**, *4*, 269–280. [[CrossRef](#)]
26. López, R.; De Ita, A.; Vaca, M. Drying of prickly pear cactus cladodes (*Opuntia ficus indica*) in a forced convection tunnel. *Energy Convers. Manag.* **2009**, *50*, 2119–2126. [[CrossRef](#)]
27. Bouazizi, S.; Montevecchi, G.; Antonelli, A.; Hamdi, M. Effects of prickly pear (*Opuntia ficus-indica* L.) peel flour as an innovative ingredient in biscuits formulation. *LWT* **2020**, *124*, 109155. [[CrossRef](#)]
28. Micale, R.; Giallanza, A.; Russo, G.; La Scalia, G. Selection of a sustainable functional pasta enriched with *Opuntia* using ELECTRE III methodology. *Sustainability* **2017**, *9*, 885. [[CrossRef](#)]
29. Aiello, A.; Di Bona, D.; Candore, G.; Carru, C.; Zinellu, A.; Di Miceli, G.; Nicosia, A.; Gambino, C.M.; Ruisi, P.; Caruso, C. Targeting aging with functional food: Pasta with *Opuntia* single-arm pilot study. *Rejuvenation Res.* **2018**, *21*, 249–256. [[CrossRef](#)]
30. Altamore, L.; Bacarella, S.; Columba, P.; Chironi, S. The Italian Consumers' Preferences for Pasta: Does Environment Matter? *Chem. Eng. Trans.* **2017**, *58*, 859–864.
31. Defrancesco, E.; Perito, M.A.; Bozzolan, I.; Cei, L.; Stefani, G. Testing consumers' preferences for environmental attributes of pasta. Insights from an ABR approach. *Sustainability* **2017**, *9*, 1701. [[CrossRef](#)]

32. Altamore, L.; Ingrassia, M.; Columba, P.; Chironi, S.; Bacarella, S. Italian Consumers' Preferences for Pasta and Consumption Trends: Tradition or Innovation? *J. Int. Food Agribus. Mark.* **2019**, *32*, 337–360. [[CrossRef](#)]
33. Palmieri, N.; Simeone, M.; Russo, C.; Angela, M. Profiling young consumers' perceptions of GMO products: A case study on Italian undergraduate students. *Int. J. Gastron. Food Sci.* **2020**, *21*, 100224. [[CrossRef](#)]
34. Palmieri, N.; Perito, M.A.; Lupi, C. Consumer acceptance of cultured meat: Some hints from Italy. *Br. Food J.* **2020**, *123*, 109–123. [[CrossRef](#)]
35. Palmieri, N.; Perito, M.A.; Macrì, M.C.; Lupi, C. Exploring consumers' willingness to eat insects in Italy. *Br. Food J.* **2019**, *121*, 2937–2950. [[CrossRef](#)]
36. Palmieri, N.; Forleo, M.B. The potential of edible seaweed within the western diet. A segmentation of Italian consumers. *Int. J. Gastron. Food Sci.* **2020**, *20*, 100202. [[CrossRef](#)]
37. Palmieri, N.; Suardi, A.; Latterini, F.; Pari, L. The eucalyptus firewood: Understanding consumers' behaviour and motivations. *Agriculture* **2020**, *10*, 512. [[CrossRef](#)]
38. Palmieri, N.; Suardi, A.; Pari, L. Italian consumers' willingness to pay for eucalyptus firewood. *Sustainability* **2020**, *12*, 2629. [[CrossRef](#)]
39. Palmieri, N.; Perito, M.A. Consumers' Willingness to Consume Sustainable and Local Wine in Italy. *Ital. J. Food Sci.* **2020**, *32*, 222–233.
40. Palmieri, N.; Pesce, A.; Verrascina, M. Market Opportunities for Hay Milk: Factors Influencing Perceptions among Italian Consumers. *Animals* **2021**, *11*, 431. [[CrossRef](#)]
41. Verbeke, W. Profiling consumers who are ready to adopt insects as a meat substitute in a Western society. *Food Qual. Prefer.* **2015**, *39*, 147–155. [[CrossRef](#)]
42. Chironi, S.; Bacarella, S.; Altamore, L.; Columba, P.; Ingrassia, M. Study of product repositioning for the Marsala Vergine DOC wine. *Int. J. Entrep. Small Bus.* **2017**, *32*, 118–138. [[CrossRef](#)]
43. Gaur, A.S.; Gaur, S.S. *Statistical Methods for Practice and Research: A Guide to Data Analysis Using SPSS*; Sage: New Delhi, India, 2006; ISBN 0761935029.
44. De Lillo, A. *Analisi Multivariata per le Scienze Sociali*; Pearson Italia Spa: Milano, Italy, 2007; ISBN 8871923766.
45. Team, R.C. *Development Core Team. R: A Language and Environment for Statistical Computing*; R Foundation for Statistical Computing: Vienna, Austria, 2019.
46. Arsham, H.; Lovric, M. *Bartlett's Test*; Miodrag Lovric; Springer-Verlag: Berlin/Heidelberg, Germany, 2011.
47. Macdiarmid, J.I. Seasonality and dietary requirements: Will eating seasonal food contribute to health and environmental sustainability? *Proc. Nutr. Soc.* **2014**, *73*, 368–375. [[CrossRef](#)]
48. Coderoni, S.; Perito, M.A.; Cardillo, C. Consumer behaviour in Italy. Who spends more to buy a Mediterranean Diet? *New Medit* **2017**, *16*, 38–46.
49. ISTAT Statbase: L'accesso ai Principali Dati. Available online: www.istat.it (accessed on 5 February 2021).
50. Conto, F.; Antonazzo, A.P.; Conte, A.; Cafarelli, B. Consumers perception of traditional sustainable food: An exploratory study on pasta made from native ancient durum wheat varieties. *Ital. Rev. Agric. Econ.* **2016**, *71*, 325–337.
51. Ellison, B.; Brooks, K.; Mieno, T. Which livestock production claims matter most to consumers? *Agric. Hum. Values* **2017**, *34*, 819–831. [[CrossRef](#)]
52. Darby, M.R.; Karni, E. Free competition and the optimal amount of fraud. *J. Law Econ.* **1973**, *16*, 67–88. [[CrossRef](#)]
53. Childs, N.M. Foods that help prevent disease: Consumer attitudes and public policy implications. *J. Consum. Mark.* **1997**, *14*, 433–447. [[CrossRef](#)]
54. Annunziata, A.; Vecchio, R. Functional foods development in the European market: A consumer perspective. *J. Funct. Foods* **2011**, *3*, 223–228. [[CrossRef](#)]
55. Grahl, S.; Strack, M.; Mensching, A.; Mörlein, D. Alternative protein sources in Western diets: Food product development and consumer acceptance of spirulina-filled pasta. *Food Qual. Prefer.* **2020**, *84*, 103933. [[CrossRef](#)]
56. Sessa L Il Giornale del Cibo Conoscere, Scoprire, Gustare. Available online: <https://www.ilgiornaledelcibo.it/fico-d-india-ricette-piatti/> (accessed on 5 February 2021).
57. Giraitalia Sagre in Italia. Available online: <https://www.giraitalia.it/sagre/> (accessed on 5 February 2021).
58. Van Trijp, J.C.M.; Steenkamp, J. Consumer-oriented new product development: Principles and practice. *Innov. Agri Food Syst.* **2005**, 87–124.
59. De Albuquerque, J.G.; de Souza Aquino, J.; de Albuquerque, J.G.; de Farias, T.G.S.; Escalona-Buendía, H.B.; Bosquez-Molina, E.; Azoubel, P.M. Consumer perception and use of nopal (*Opuntia ficus-indica*): A cross-cultural study between Mexico and Brazil. *Food Res. Int.* **2019**, *124*, 101–108. [[CrossRef](#)]