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An Italian Explorative Study of Willingness to Pay for a New Functional Pasta Featuring *Opuntia ficus indica*

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Abstract: *Opuntia ficus indica* is a source of vitamins and minerals, and recently, it has been used as ingredient to make a new functional pasta. Italy produces the highest amount of pasta in the world and it is also the second-highest producer of opuntia globally. This study sought to identify the consumer willingness to pay for pasta featuring *Opuntia ficus indica* and to understand what factors influence their choice. This study is the first in food research to analyze consumers' willingness to pay for a new functional pasta featuring *Opuntia ficus indica*. Data were collected by using a web-based survey; the sample was composed of 342 consumers and an ordered logistic regression model was applied. The findings showed that the educational and higher income levels of respondents play important roles in the willingness to pay for functional pasta. Moreover, the healthy and nutritional features of functional pasta together with the respondents' willingness to eat it, their curiosity towards this new food and their need to get more information about functional pasta should improve consumers' willingness to pay for it. The findings should be useful for firms to draw marketing strategies considering the positive consumers' attitude toward the use of *Opuntia ficus indica* in pasta production.

Keywords: consumers attitude; *Opuntia ficus indica* (L.); functional pasta; willingness to pay (WTP); Italy



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1. Introduction

Functional food has been defined as a kind of food with a similar exterior aspect to traditional food but with particular features benefiting human health [1,2].

The functional components of several conventional aliments have been investigated by several authors [3–5] seeking to develop new foods [6,7]. Conversely, other researchers focused on consumer's acceptance of food and the related perception of functional aliments; they found [8–12] that consumers' acceptance of functional food is mainly linked to the idea of a direct relation between diet and health [12]. In fact, consumers are becoming increasingly more conscious that some aliments could have a positive influence on human health, for instance preventing diseases and improving general wellbeing [13]. Considering what was previously reported during the last decade, there has been a substantial increase in the market of functional aliments in Europe [14,15]. In other terms, the production of functional aliments could represent an interesting chance for European firms [16,17]. This can be even more important taking into account that the introduction on the market of new products can develop new opportunities, which can lead to satisfy the consumers' needs as well as increase the competitiveness of the firms in the agri-food sector [12].

In this framework, *Opuntia ficus indica* can represent an important source of vitamins and minerals [18], with beneficial proprieties for human health [12]. Furthermore, *Opuntia* can help to prevent some diseases, such as hypercholesterolemia, diabetes, obesity, arteriosclerosis and cardiovascular disorders [19,20].

Globally, Mexico is the largest cultivator of *Opuntia*, followed by Italy and South Africa [21]. In Italy, 7400 ha is cultivated with *Opuntia*, and Sicily is the most productive region. The average domestic production of prickly pears reaches 78,000 t of fresh fruits per year [21–23].

Due to the high nutritional and organoleptic characteristics of prickly pears, fruits can be eaten fresh [18] or processed for the production of juice, jam, bread, nachos [24] and biscuits [25]. Furthermore, some researchers [26] used processed prickly pears as ingredient to develop a functional pasta, and they demonstrated that it is possible to produce a healthier food without changing the organoleptic features [26]. On the other hand, Aiello et al. [27] studied the possibility of enriching durum wheat pasta with 3% of *Opuntia*, finding that the obtained pasta can be considered as a good functional food, particularly for contrasting obesity and for the prevention of age-related metabolic disorders [27].

There is growing interest in *Opuntia* as a food-enriching ingredient (see, e.g., [12,18,25,26]), because of its beneficial effects on human health [12,18,26], and since the Mediterranean Diet has a high use of pasta [28,29], particularly among Italians [30], the Italian consumers' preferences towards functional pasta enriched with *Opuntia* is an interesting matter to investigate. According to some authors [31], health benefits and the nutritional as well as environmental features of *Opuntia* pasta would drive consumers' acceptance and consumption of this new functional food. However, according to [32], it is important for firms to know their potential consumers' willingness to pay (WTP) and, if they are willing to pay, who is willing to do so and how much could they spend.

In the current literature, no study has been conducted regarding consumers' willingness to pay for pasta from flour enriched with *Opuntia*. However, this is the second paper dealing with consumer behavior towards functional pasta in Italy (the pioneering paper being Palmieri et al. [31]), and the present study is the first paper investigating the consumers' willingness to pay for it. Thus, this study aimed to fill this gap by analyzing consumers' willingness to pay for functional pasta featuring *Opuntia*, of a sample of Italian consumers. In particular, the study aimed to both know, according to an Italian sample, the consumer willingness to pay for pasta featuring *Opuntia Ficus Indica* and to understand what factors influence their choice.

2. Data Collection and Methods

Data were collected via an online survey administered from September to December 2020. The survey was spread via social media and e-mail. Moreover, to reach a larger number of participants, a snowball sampling recruitment was carried out. Although this method did not supply a representative sample of the whole Italian population, the online survey method was used because it is an efficient means of collecting a wide variety of information in a short period of time [33]. It is important to underline that the survey was conducted involving adult people, over 18 years old, responsible for the grocery shopping in their family. From a starting sample of 350 respondents, 8 consumers were excluded from the study due to observations with missing; therefore, the final sample accounted for 342 consumers.

A questionnaire was structured according to the current literature regarding consumer behavior (see, e.g., [28,30]) and used to carry out the survey. The questionnaire was structured in four sections: (1) and (2) usual habits of consumers to choose food and pasta; (3) consumers' behavior towards functional pasta enriched with *Opuntia*; and (4) respondents' socioeconomic and demographic information. Sections 1–3 were surveyed using a 10-point Likert scales with rising level of assessment (1: totally disagree, to 10: totally agree), following some studies [31].

The first and the second section of the questionnaire aimed to investigate respondents' consumption characteristics, as well as preferences for pasta in general [30]. Along with the attention paid to the environment and health, respondents were also questioned about neophobia and food technology neophobia [31].

The third part of the questionnaire specifically analyzed consumers' behavior towards functional pasta with *Opuntia*. Following some authors [31,34], respondents were informed of both the method applied to produce functional pasta featuring *Opuntia* and the fact that this product is a good functional food with benefits for human health [12,27]. In particular, we investigated the willingness of people to consume *Opuntia* pasta by asking respondents to give their feedback about their willingness to consume *Opuntia* functional pasta. We also asked the respondents to specify their familiarity with eating functional pasta. In detail, we asked if they had ever heard about this product and if they had ever eaten functional pasta featuring *Opuntia* in the past [31]. Moreover, the willingness of consumers to pay for functional pasta featuring *Opuntia* (WTP) has been investigated by giving an array of ordered price percentages in comparison with that of 1 kg of conventional pasta. In particular, the participants' willingness to pay a premium price for functional pasta was divided into three different categories: none (0%), moderate ($\leq 50\%$) and high ($>50\%$). It is important to underline that if the respondents were not willing to eat it, their WTP was considered equal to 0. In addition, following previous studies [31,35], consumers' perceptions of functional pasta featuring *Opuntia* (among others, curiosity, disgust, and environmental issues) and their judgment regarding the nutritional content of functional pasta were explored.

Finally, both the socioeconomic and demographic characteristics of respondents were addressed in the fourth section of the questionnaire, retrievable from Supplementary Materials.

In order to investigate the respondents' willingness to pay for functional pasta featuring *Opuntia Ficus Indica* and to understand what factors influence their choice, an ordered logistic regression model was applied [36–38]. In general, an ordered logistic regression model allows ordered categories of a dependent variable to be used as a sequence of latent variables through increasing threshold levels. In particular, the dependent variable (i.e., WTP) was constructed as the levels of participants' willingness to pay for functional pasta and was divided into three different groups: none, moderate and high (Table 1). The category "none" indicated the respondents' unwillingness to pay a premium price for functional pasta, while for the categories "moderate" and "high," the WTP indicated that respondents were willing to pay a premium price for functional pasta (until 50% and $>50\%$, respectively) compared with the price of conventional pasta. Moreover, the correlation index among explanatory variables was calculated to reduce variables to use in the regression model, and explicative variables with a high correlation index ($>50\%$) were removed. The variables implemented in the model were shown in the Table 2.

Table 1. Distribution of the three levels of the dependent variable (N = 342).

| WTP a Premium Price for Functional Pasta (%) Compared with the Price of Conventional Pasta | % |
|--|--------|
| 0 | 12.50 |
| $\leq 50\%$ | 73.17 |
| $>50\%$ | 14.33 |
| Total | 100.00 |

Source: Our elaboration on the survey data.

The odds ratios were calculated by measuring the changes in the probability of the dependent variable following a unit change in the explanatory variable. In particular, holding the values of the other explanatory variables constant, the larger the deviation from the unit value, the greater the effect on the dependent variable.

All statistical elaborations were carried out using R, Version 3.6.2 [39].

Table 2. Variables used in the model.

| Variable | Mean | Standard Deviation |
|---|------|--------------------|
| Willingness to pay for functional pasta (WTP) | 1.02 | 0.62 |
| <i>Aspects respondents pay attention to when they consume food</i> | | |
| Health effects | 7.25 | 2.00 |
| Proteic_aspects | 5.91 | 2.79 |
| <i>Food neophobia</i> | | |
| Respondents do not trust new food (do_not_trust) | 3.96 | 2.44 |
| If the respondents do not know what is in a food, they will not try it (do_not_try) | 5.75 | 2.99 |
| <i>Food technology neophobia</i> | | |
| New food technologies decrease the natural quality of food (low_quality) | 4.44 | 2.81 |
| New food technologies are unnecessary (no_tecnology) | 3.78 | 2.72 |
| <i>Agreement or disagreement with some statements</i> | | |
| Italian pasta is produced only with Italian durum wheat (Italy) | 3.09 | 2.60 |
| <i>Respondents' behavior towards functional pasta</i> | | |
| People's willingness to consume functional pasta (willing) | 0.88 | 0.1 |
| <i>Functional pasta characteristics could affect respondents' decision to eat it</i> | | |
| People's curiosity towards functional food (curiosity) | 6.65 | 3.20 |
| If functional pasta production is less environmentally impactful than conventional pasta, consumers would eat it (low_env_impact) | 6.24 | 3.14 |
| If the respondents get more information about functional pasta comprising Opuntia, they would eat it (more_info) | 6.38 | 3.01 |
| <i>Respondents' sociodemographic information</i> | | |
| Education (edu) | 0.77 | 0.20 |
| Annual income (income) | 2.50 | 1.20 |

Source: Our elaboration on the survey data.

3. Results

Respondents' features are given in Table 3. The majority of the respondents were female (61% of the sample), 50 years old on average and 89% of respondents were well-educated. About 35% of the respondents reported a yearly income ranging between €20,001–30,000, followed by 28% of participants with an annual income between €30,001–40,000. Furthermore, about 96% of respondents were willing to consume functional pasta containing Opuntia.

Noticeably, 35% of the sample claimed to consume pasta more than twice a week and about 59% of the respondents stated that they ate pasta at home.

Table 3. Socioeconomic characteristics of the sample (N = 342).

| Variables | % |
|--|---------------|
| Gender | |
| male | 39.00 |
| female | 61.00 |
| Total | 100.00 |
| Education | |
| low education (primary or secondary school) | 11.00 |
| high education (degree, master and/or PhD) | 89.00 |
| Total | 100.00 |
| Annual Income | |
| <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: authors' elaboration based on survey data.

Respondents' willingness to pay a premium price for a 1 kg of functional pasta was, on average, up to 50% more (moderate level) than the price of conventional pasta. The explanatory variables in the model estimate the factors that drive consumers' WTP for functional pasta (Table 4).

In ordered logistic estimation, positive coefficients indicate that as the explanatory variable increases, so does the probability of falling in the category with the highest WTP for 1 kg of functional pasta (i.e., a premium price >50% of price of conventional pasta). In Table 4, all of the signs for the estimated coefficients were consistent with the expected signs. The dependent variable WTP for functional pasta featuring *Opuntia Ficus Indica* increased with the rise in the explanatory variables (significant), except for reported food neophobia and food technology neophobia variables, which showed a negative relation with the latent variable.

The willingness to pay for functional pasta increased with the growing importance attributed to attention towards the effects of food on human health, nutritional characteristics of food, consumers' willingness to eat the functional pasta, respondents' curiosity towards this new food and respondents' need to get more information about functional pasta. Moreover, the WTP of functional pasta increases with the decrement of variables about food neophobia and food technology neophobia items. Among the sociodemographic variables, only education and income were statistically significant. The positive sign for education and income suggested that the probability of having a higher willingness to pay for functional pasta increases among well-educated consumers with a high annual income.

Table 4. Results of the ordered logistic regression model.

| | Coef. | Std.Err | | |
|--|---------|---------|------------------------------|---------|
| Dept variable: Willingness to pay for functional pasta (WTP) | | | Number of observations = 342 | |
| | | | LR chi2 = 96.55 | |
| | | | Prob > chi2 = 0.0001 | |
| | | | PseudoR ² = 0.41 | |
| | | | Wald z | P > Z |
| health_effects | 0.2743 | 0.0790 | 3.47 | 0.0005 |
| proteic_aspects | 0.3812 | 0.0773 | 4.93 | <0.0001 |
| The respondent does not trust new food (do_not_trust) | −0.2083 | 0.0835 | −2.49 | 0.0126 |
| If the respondent does not know what is in a food, they will not try the new food (do_not_try) | −0.1786 | 0.0673 | −2.65 | 0.8002 |
| New food technologies decrease the natural quality of food (low_quality) | −0.1762 | 0.0680 | −2.59 | 0.0010 |
| New food technologies are unnecessary (no_tecnology) | 0.0166 | 0.0703 | 0.24 | 0.8134 |
| The respondent believes Italian pasta is produced only with Italian durum wheat (Italy) | −0.0968 | 0.0609 | −1.59 | 0.1117 |
| The respondent's willingness to consume functional pasta featuring <i>Opuntia Ficus Indica</i> (willing) | 1.5178 | 0.4614 | 3.29 | 0.0010 |
| The respondent's curiosity towards functional food (curiosity) | 0.1467 | 0.0701 | 2.09 | 0.0003 |
| If functional pasta production is less environmentally impactful than conventional pasta one, the respondent would eat it (low_env_impact) | 0.0589 | 0.0779 | 0.76 | 0.4496 |
| If the respondent gets more information about functional pasta comprising <i>Opuntia</i> , they would eat it (more_info) | 0.0767 | 0.0742 | 1.03 | 0.001 |
| The respondent's education (edu) | 0.1515 | 0.2491 | 0.61 | 0.001 |
| The respondent's annual income (income) | 0.1648 | 0.1255 | 1.31 | 0.001 |
| Threshold 1 | 0.1248 | 0.6743 | | |
| Threshold 2 | 4.2120 | 0.7570 | | |

Source: Our elaboration on the survey data.

Table 5 showed the odds ratios calculated based on the results of ordered logistic regression model. The odds ratios (ORs) indicate that, holding the values of the other explanatory variables constant, the explanatory variable with the greatest effect on the willingness to pay for functional pasta was the nutritional aspect of food (OR = 1.524), followed by respondents' willingness to consume functional pasta featuring *Opuntia Ficus Indica* (OR = 1.517), and consumers' attention towards effects of food on health (OR = 1.097).

These findings indicate that nutritional characteristics and effects of food on human health together with willingness to eat it have a great effect on the probability of having a higher WTP for functional pasta.

Table 5. Odds ratio of the ordered logistic regression model.

| | Odds Ratio | Std. Err | Number of observations = 342 | | | |
|--|------------|----------|------------------------------|---------|----------|----------|
| Dept variable: Willingness to pay for functional pasta (WTP) | | | LR chi2 = 96.55 | | | |
| | | | Prob > chi2 = 0.0001 | | | |
| | | | PseudoR ² = 0.41 | | | |
| | | | Wald z | P > Z | 95% Conf | Interval |
| health_effects | 1.097 | 0.31587 | 3.47 | 0.0005 | 0.478 | 1.716 |
| proteic_aspects | 1.524 | 0.30930 | 4.93 | <0.0001 | 0.918 | 2.131 |
| The respondent does not trust new food (do_not_trust) | −0.833 | 0.33395 | −2.49 | 0.0126 | −0.178 | 1.487 |
| If the respondent does not know what is in a food, they will not try the new food (do_not_try) | −0.892 | 0.336 | −2.65 | 0.8002 | −1.552 | 0.233 |
| New food technologies decrease the natural quality of food (low_quality) | −0.704 | 0.271 | −2.59 | 0.0010 | −1.237 | 0.171 |
| New food technologies are unnecessary (no_tecnology) | 0.066 | 0.281 | 0.24 | 0.8134 | −0.484 | 0.617 |
| The respondent believes Italian pasta is produced only with Italian durum wheat (Italy) | −0.387 | 0.243 | −1.59 | 0.1117 | −0.864 | 0.089 |
| The respondent's willingness to consume functional pasta featuring Opuntia Ficus Indica (willing) | 1.517 | 0.461 | 3.29 | 0.0010 | 0.613 | 2.422 |
| The respondent's curiosity towards functional food (curiosity) | 0.880 | 0.420 | 2.09 | 0.0003 | 0.056 | 1.704 |
| If functional pasta production is less environmentally impactful than conventional pasta one, respondent would eat it (low_env_impact) | 0.353 | 0.467 | 0.76 | 0.4496 | −0.562 | 1.269 |
| If the respondent gets more information about functional pasta comprising Opuntia, they would eat it (more_info) | 0.383 | 0.371 | 1.03 | 0.001 | −0.343 | 1.110 |
| The respondent's education (edu) | 0.302 | 0.498 | 0.61 | 0.001 | 0.006 | 1.279 |
| The respondent's annual income (income) | 0.164 | 0.125 | 1.31 | 0.001 | 0.081 | 0.410 |

Source: Our elaboration on the survey data.

4. Discussion

The paper aimed to both know, according to an Italian sample, consumer willingness to pay for pasta featuring *Opuntia Ficus Indica* and to understand what factors influence their choice.

The study was carried out in Italy, since this is a reference country for the Mediterranean diet, it is the highest global producer of pasta and it is also the second-highest world producer of *Opuntia* [21,30,35].

The results are consistent with the current literature and provide interesting information regarding both the willingness of respondents to pay for functional pasta and the main driving factors of their choice.

A sample of 342 consumers was used, of which the majority was female (61%), 50 years old on average and with a high education level (89% of respondents). About 96% of the sample was willing to eat pasta containing *Opuntia*. Moreover, about 62% of respondents claimed to be willing to pay a premium price up to 50% more than the price of conventional pasta, followed by about 21% of respondents who were willing to pay a premium price of more than 50% than conventional pasta.

According to Szakály et al. [32], the development of functional foods is a risky process for firms due to consumer behavior. In fact, consumers are slow to adopt technological innovations such as functional foods [40,41] due to issues of food neophobia and food technology neophobia, and they are often skeptical of the positive health effects [42] of functional food. In our case, in fact, food neophobia and food technology neophobia items showed a negative relationship, suggesting that the probability of having a higher willingness to pay for functional pasta decreases among neophobic and technophobic consumers. However, according to some authors [31], neophobic and technophobic consumers may feel positively to functional food if they did not perceive it as a new food. In fact, according to Palmieri et al. [31], perhaps functional pasta featuring *Opuntia* is not perceived as a new food by Italian consumers [31] due to *Opuntia* being used as an ingredient in [43] some southern Italian recipes [44].

According to other researchers [32], the WTP for functional foods is influenced by consumers' attitudes towards them. These attitudes are influenced by consumers' beliefs about the attributes of functional foods [45]. According to Szakály et al. [32], the most important factor in functional food purchase decisions is the belief in the products' health benefits [32,46–48]. Additionally, in our case, respondents' propensity to pay attention to the healthy aspects of food is an important factor that drive the respondents' willingness to pay for functional pasta. The study confirmed that the consumers are looking not only for the healthy aspect of food but also for new characteristics, such as the nutritional features of pasta [29]. In fact, people's attention towards the effects of food on human health and its nutritional characteristics positively influence the respondents' WTP a premium price for functional pasta.

Moreover, some researchers [32] found that the direction of the relationship between WTP for functional food and consumers' attitudes is positive. Additionally, in our case, the WTP for functional pasta increased with the growing importance attributed to the attention towards the effects of food on human health and the nutritional characteristics of food together with people's willingness to consume the functional pasta, consumers' curiosity and respondents' need to get more information about functional pasta. According to Palmieri et al. [31], the abovementioned factors also drive people's acceptance towards functional pasta. The consistency of our data with those reported in similar studies concerning the behavior of Italian consumers towards new food [41] highlight that the awareness of the production method together with curiosity towards new foods could drive people's attitude in regard of new products.

In addition, the results showed, in agreement with the current literature in the field [49,50], the positive relationship between the WTP for functional food and sociodemographic information, specifically being more highly educated and wealthier. In addition, the coefficients for education and annual income were significantly positive, indicating

that people with a degree and a high income were more likely to pay additional amounts for functional food. Similar results were reached also by Ali and Ali [51], who found that the willingness to pay for health and wellness food products were positively influenced both by educational and income levels of buyers.

Finally, as one may expect, supplying the market with unusual food (such as functional pasta featuring *Opuntia*) implies the need to previously investigate the market with regards to consumers' preferences and their expectations against the new products [52]. In that case, the consumers' expectations turn out to be important factors for new product acceptance [53]. The findings showed a high interest among the respondents in the health benefits and nutritional aspects of functional pasta, and these aspects should increase consumers' willingness to pay for functional food and eat it. Moreover, the higher educational and income levels of people play important roles in the WTP. However, more information about its production should be supplied. These results are confirmed by other studies about new food (see, e.g., [41,51]) reporting that socioeconomic aspects of consumers and information about organoleptic and nutritional characteristics of a new food are important parameters when attempting to increase market acceptance.

5. Conclusions

Consumers' attitude towards new food is an important aspect to consider for favoring innovations. Moreover, involving consumers in the process of new product development is a crucial aspect to be taken into consideration for the design of new food, and new products are also a chance of revenues for food companies. For these reasons, it is important for firms seeking to market these foods that they know their potential consumers' willingness to pay.

Our results reported interesting clues to help understand the process of consumer decision making. However, further studies should be carried out regarding the consumers' propensity towards functional pasta with *Opuntia* acceptance, in terms of their attitudes and (un)willingness to pay for it.

With the present study, the authors wanted to provide a deeper understanding of the attitude of Italian consumers to pick functional pasta enriched with locally cultivated *Opuntia* over regular pasta. The main results showed that the education level and wealth of consumers play important roles in the willingness to pay for functional pasta. Moreover, factors such as the healthy and nutritional aspects associated with functional pasta, people's willingness to consume it, consumers' curiosity and people's need to get more information about functional pasta should encourage people's attitude towards this new functional food in terms of improving the WTP.

In conclusion, the present study offers the possibility to design new marketing strategies in the food sector by considering the positive consumers' attitude regarding the use of *Opuntia Ficus Indica* for pasta production.

Supplementary Materials: The following are available online at <https://www.mdpi.com/article/10.3390/agriculture11080701/s1>, Table S1: Variables used in the questionnaire.

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