Impact of The Sensory Experience On Consumers' Preference Toward the Origin of Honey: A Case Study in Mar Del Plata -Argentina

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Abstract

This study analysed consumers' expected preference toward local honey with different colour and texture. We analysed the impact of the sensory experience on consumers' expectation and their willingness to pay for the honey products. We carried out two Non-Hypothetical Discrete Choice Experiments (DCE) by creating a real shopping scenario before and after the hedonic sensory test for a sample of 145 consumers from Mar del Plata, Argentina. Data used in this analysis were obtained from questionnaires completed in a controlled environment and estimated using the random parameters Logit model (MIXL). Results showed both high preference and acceptance for local honey with solid texture and light colour and also revealed a high rejection for dark honeys. Consumers also declared their willingness to pay a premium for their most preferred honey type if it is produced from local place. The sensory experience has had impact on expectation. Consumers were not willing to compromise their perceived quality and their eating experience with other descriptors of the honey product.

1. Introduction

Food origin is an indicator of the proximity from the production to the consumption place (Feldmann and Hamm, 2015; Ridley *et al.*, 2015). The relative importance of "local food" attributes increased significantly as determinant factor to purchase food products (Sims, 2009; Hu *et al.*, 2012). It can be also an indicator of quality, specifically for those products associated to certain geographical areas (Van der Lans *et al.*, 2001) and also a descriptor of consumers' ethnocentrism, especially when related to the culture and the local history (Bryła, 2015). In this context, local food products are relevant to be analysed, in particular to how the

sensory experience may impact the relative importance of these cues in regard to other quality cues.

The honey product was taken as a case study in Mar de Plata Argentina. Several studies have analysed the consumers' preferences toward honey. Cosmina *et al.* (2016) analysed using the choice experiment the Italian preference toward honey. They identified the origin, the price, the organic production, the landscape, the level of crystallization as the main driving factor to purchase honey. Wu *et al.* (2014) analysed consumers' choice for honey using the experimental auction and focusing on the local attribute. Yeow *et al.*, (2013) analysed the consumers purchase intention and verified that the price, the brand, the health claims are relevant determinant factor to consume honey. Roman *et al.* (2013) studied the factors influencing consumer behaviour relating to the purchase of honey. They highlight the importance of the honey type and flower variety, price and convenience packaging. Sanzo *et al.* (2001) showed the importance of the perceived quality associated to commercial brands in determining the honey choice.

In this context, literature showed that consumers are not willing to compromise the sensory cues by other credence attributes such as health claims (Realini *et al.*, 2014) or ethical cues such as animal welfare (Kallas *et al.*, 2016). Therefore, the main objective of this paper is twofold: fist to analyse how important is the local attribute in the honey products and second to analyse if the sensory experience for such a product play a relevant role in defending consumer willingness to pay.

2. Material and Method

2.1 Consumers' panel

The impact of sensory experience on the expected preferences was analysed on a sample of 145 consumers selected from Mar de Plata (MDP) city in Argentina. Participants were consumers over 18 years of age who regularly purchase honey and having purchased and consumed honey at least one time in the last three months. Data used in this analysis were obtained from questionnaires completed in a controlled environment. A quota sampling procedure was used to guarantee a representative sample in terms of gender and age. Consumers were recruited and economically compensated to participate in an experiment of about 1 hour. Table 1 summarize the main socio-demographic variables of the sample components.

Table 1: Summary of the socio-demographic variable of the sample.

Education	**n**	**%**	**Gender**	**n**	**%**
Primary	7	4.9	Women	104	72.2
Secondary	56	39.2	Men	39	27.1
Higher/University	80	55.9			
Employment	**n**	**%**	**Have children**	**n**	**%**
Inactive	2	1.5	Yes	76	53.9
Unemployed	43	28.7	No	65	46.1
Employees	82	62.1			
Family income	**n**	**%**	**Number of children**	**Mean**	
Far below average	7	5.0		2.2 ± 1.19	
Below average	19	13.5	**Age**	**n**	**%**
On average	32	22.7	18-30 years	45	31.5
Above average	62	44.0	30-45 years	33	23.1
Far Above average	16	11.3	45-65 years	48	33.6
I don't know	5	3.5	>65 years	17	11.9

2.2 Experiment performance

We followed Kallas *et al.* (2016) hat analysed the impact of sensory experience on consumers' preferences for pork products. The applied methodological approach can be summarized into five main subsequent steps:

i. First, participants were asked to answer in a short questionnaire about their attitudes and consumption behaviour towards honey. Socioeconomic and life-style variables were also collected.

ii. Second, participants were unexpectedly rewarded and asked to select their preferred honey product to purchase from a set of competing honey products at different prices built following a Non-Hypothetical Discrete Choice Experiment method (NH-DCE). Consumers were warned that their selection will have a consequence as a real purchasing scenario will be created at the end of the experiment to exchange real money and real products. Consumers who agree to participate were asked to purchase their selected product. No additional information about the products was given, except what appears in each choice set label. In this step we aimed to analyse the expected preferences of consumers on the basis of their past experiences and available information related to the characteristics of the product or to a similar one (Deliza & MacFie, 1996).

iii. Third, a hedonic evaluation test was carried out. Participants tasted six different honeys that are characterized by different attributes and were the same products posted on the choice sets at different price levels.

iv. Fourth, consumers were informed about which type of honey they tasted in order to associate their sensory experience with the specific products and characteristics. Then, the same NH-DCE was repeated and consumers turned to reselect their preferred products from the same choice sets. In this step they were asked explicitly to take into consideration their sensory experience. This phase allows analysing if the sensory experience has resulted in agreement or disagreement with what they expected. These changes play an important role in the final acceptance or rejection of the product and may affect the final choice decision of the consumers.

v. Fifth, a real purchasing scenario was created to exchange real product and money. Consumers who accepted to participate were obliged to purchase their chosen product from a randomly selected choice set.

2.3 The hedonic test

For consumer sensory analysis, we analysed different commercials honeys differentiated by colour (light and dark), consistency (solid and liquid) and origin (local and other region). The products were purchased from shops and supermarkets in Mar de Plata city ensuring the presence of all descriptors. However, sine not all the combinations were realistic and available (from Mar de Plata only Light honeys are produced) we finally selected six honeys as described in Table 2

Table 2: the six honeys type selected for the hedonic test

Honey type	Colour	Consistency	Origin
Honey 1 (J)	Light	Solid	Local from Mar de Plata
Honey 2 (F)	Light	Liquid	Local from Mar de Plata
Honey 3 (U)	Light	Solid	Other origins
Honey 4 (T)	Light	Liquid	Other origins
Honey 5 (N)	Dark	Solid	Other origins
Honey 6 (G)	Dark	Liquid	Other origins

The honeys were carefully chosen on the basis of the main attributes that differentiate the honey products from the markets (Sanzo *et al.*, 2001; Ványi *et al.*, 2011; Arango and Restrepo, 2013; Roman *et al.*, 2013) and also ensuring their availability because "real"

shopping scenario will be created at the end of the experiment in laboratory conditions as previously mentioned. Each honey was codified by a random letter and a random number with three digits.

Consumers' acceptance was measured by evaluating their spontaneous liking using a 9-points hedonic scale from "I extremely dislike" to "I extremely Like". Consumers evaluated the colour, consistency, the odour, the flavour and the Global acceptance in line of the honey sensory studies (Arrabal and Ciappini, 2000; Piana *et al.*, 2004). The samples were prepared in an approximate amount of 5 g and placed in transparent plastic cups of 110 cm^3 capacity. Consumers were also provided with a white plastic spoon. They were told to drink water between each tasting and toasted bread.

2.4 The Non-Hypothetical Discrete Choice Experiments

2.4.1 The empirical application of the Discrete choice experiment

The first step is to identify the most relevant attributes and levels that represent the main descriptors of the products. On the basis of the previously commented literature, we finally selected the following attributes with interest to our study were: Origin (local, other origin), consistency (liquid and solid), colour (light and dark) and price for 500 grams ($35, $40, $45, $50, $55, $60[1]).

These attributes were later combined in a D-efficient experimental design with zero priors using the Ngene software. In this design we included 6 products in a choice sets, thereby representing all the possible realistic combination of honey alternatives and the none of the option as an opt out option. (i.e. do no purchase any). This decision was taken in order to ensure the same number of the products presented in the hedonic test and the choice experiment. In this context, we followed Lusk and Schroder (2004) approach to construct the different choice sets. We obtained 6 choice sets with the same honey products in each (the previously identified 6 products). The only difference is they have different price combinations that are selected from the D-efficient design.

2.4.2 Theoretical framework and econometric modelling

The Discrete Choice Experiments aims to identify the individual's indirect utility function associated with attributes of products by examining the trade-offs they make when making choice decisions. Thus, several alternatives (products) that are described by several attributes with varying levels are presented to respondents in an array of choice sets. The respondent is then asked to select his/her preferred product within each choice set, thereby

[1] $= Argentine Pesos (ARS); 100$ (ARS)=6,24USD

revealing his/her preference for certain attributes and levels. Subsequently, the willingness to pay of the products and their attributes can be indirectly recovered from respondents' choices.

The DCE can be carried out in two different approaches; as hypothetical or non-hypothetical experiment. In the former, consumers are asked to select their preferred product to purchase in a hypothetical scenario where no real consequence occurs. Literature showed that hypothetical surveys in general, tend to be biased as respondent are not committed to reveal their real behaviour and are used to answer questionnaire as they would prefer to be and not as they act in real life. The latter approach is incentive compatible and induces respondents to be committed with their answers by creating real and tangible consequence of their actions. One of the commitments is to create a real shopping scenario (Kallas *et al*., 2016) where consumers are asked to purchase the product they selected as preferred to purchase in real market. The use of this mechanism as a method to mitigate hypothetical bias is referred to as 'incentive alignment' in the literature (Harrison, 2007, Loomis, 2014). This approach was the one followed in this study.

The DCE rely on Lancaster's Theory of Value (Lancaster, 1966) which proposes that utility of a product is decomposed into separable utilities for their characteristics or attributes. It is also based on the Random Utility Theory (RUT) laid out by Thurstone (1927). This theory proposes that subjects choose among alternatives according to a utility function with two main components: a systematic (observable) component and a random error term (non-observable):

$$U_{jn} = V_{jn}(X_j, S_n) + \varepsilon_{jn} \tag{1}$$

where U_{jn} is the utility of alternative j to subject n, V_{jn} is the systematic component of the utility, X_j is the vector of attributes of alternative j, S_n is the vector of socio-economic characteristics of the subject n and ε_{jn} is the random term.

The "probability of choice" that an individual *n* chooses the alternative *i* rather than the alternative j (for any i and j) within choice sets, T was identified by McFadden (1974) who developed an econometric model that formalized respondents' decision making process. This model is often referred to as the multinomial logit (MNL) model, which is considered the base model for DCE.

According to MNL model the utility to person *n* from choosing alternative *j* on choice scenario *t* is given by:

$$U_{njt} = \beta x_{njt} + \varepsilon_{njt} / \sigma_n \qquad n = 1, \ldots, N \quad j = 1, \ldots, J \quad t = 1, \ldots, T \tag{2}$$

Where, x_{njt} is a *K*-vector of observed attributes of alternative *j*, β is a vector of mean attribute utilities (utility weights) and ε_{njt} is the "idiosyncratic" error term that follows independent and identically distributed (i.i.d.) Type 1 extreme value distribution with scale parameter σ_n.

The probability $(P_j | X_{nt})$ that an individual *n* will choose alternative j among other alternative of an array of choice set T is formulated as follows:

$$(P_j | X_{nt}) = \frac{\exp(\beta x_{njt})}{\sum_{j=1}^{J} \exp(\beta x_{njt})} \qquad \forall j \in T \tag{3}$$

Where X_{nt} is the vector of attributes of all alternatives $j = 1, \ldots, J$.

However, the MNL imposes homogeneity in preferences for observed attribute, thus, only average attributes' utilities are estimated. Therefore, the mixed logit models (MIXL) were introduced due to the capacity to analyse the unobserved heterogeneity. The MIXL extend the MNL by allowing random coefficients on attributes (Ben-Akiva et al., 1997). In MIXL the utility to person n from choosing alternative j in choice set t is given by:

$$U_{njt} = \beta_n x_{njt} + \varepsilon_{njt} / \sigma_n \quad n = 1, \ldots, N \;\; j = 1, \ldots, J \;\; t = 1, \ldots, T \tag{4}$$

Where, $\beta_n = \beta + \eta_n$ and where (η_n) is the vector of person n specific deviations from the mean value of the β s. The η_n is described by an underlying continuous distribution for the attributes defined by the researcher. In most applications the multivariate normal distribution is the most used, MVN (0, Σ).

In this study, we considered the honey products presented in the choice sets as generic products, which mean that the utility of each honey product is a function of an alternative specific constant (that represent all the utility associated to the product and not related to a specific attribute) and its price. In this case the utility function is defined as follow (Lusk and Schroeder, 2004):

$$U_{njt} = \beta_j + \alpha_j P_{nj} + \varepsilon_{njt} / \sigma_n \qquad n = 1, \ldots, N \quad j = 1, \ldots, J \quad t = 1, \ldots, T \tag{5}$$

Where j represents the six honey products identified in each choice set, P_{ij} is the price of alternative j for consumers n, β_j are coefficients representing alternative specific constants for each of the honey alternatives relative to none of them and α_j is are coefficients representing the effect of the *j*th honey price on the utility of the *j*th honey product

Finally, the willingness to pay (WTP) can be derived from model estimates. Total WTP to obtain honey alternative j versus "none of them" is simply calculated as the ratio of the alternative specific constant to the price coeeficinet: $\frac{-\beta_j}{\alpha_j}$. The confidence interval of the WTP are derived by generating a distribution of 1000 WTP estimates using the Krinsky and Robb procedure.

3. Results

3.1 Hedonic scores for the different honey tasted

Table 3 reports the marginal utilities of the honey resulting from the MIXL models s for the pre and post sensory experiment. As can be seen, in both models at 99% confidence level, we can reject the null hypothesis that all coefficients are jointly equal to zero with a Log-Likelihood ratio test highly significant. The goodness of fit is assessed through the McFadden's pseudo-R^2 (0.40 and 0.42 for pre and post sensory respectively) which is highly acceptable range for the discrete choice models.

The positive/negative sign of the coefficient implies higher/lower levels of utility associated with the products. In this context, the model estimates showed that almost all the coefficients are statistically significant except for the honey G both before and after the sensory experience. In this line, as expected, the negative sign of the price implies that an increase in the levels of the price attribute, will decrease the utility of the products presented to consumers.

For the interpretation of the models estimates the WTP for each honey product was estimated. Results are shown in Table 4. However, before analysing the impact of the sensory experience on expected preferences, results of consumers' acceptability for the different honey types are first reported. Sensory parameters score for honey are shown in the bottom of the Table 4. Comparing the overall acceptability of the six types of honey, results showed significant differences. The local honey, light and solid had the highest acceptability scores

than the remaining type of honeys. These results may confirm the perceived quality of local products is higher than the other honey types. Results also showed high acceptance toward light honey with solid consistency. Results also highlight the low acceptance level of dark honeys whatever the consistency is. Results regrind the different sensory parametric also confirmed this tendency. The honey with highest average of flavour was the local one with higher acceptance toward the solid texture.

Table 3: Results of the MIXL model

Honey types	β_s	Pre	Post
		Random β_s	
Light, Solid, Local	Alternative specific constant of Honey 1 (J), β_1	8.31***	9.57***
Light, Liquid, Local	Alternative specific constant Honey 2 (F), β_2	4.28***	6.20***
Light, Solid, Other regions	Alternative specific constant Honey 3 (U), β_3	8.56***	7.85***
Light, Liquid, Other regions	Alternative specific constant Honey 4 (T), β_4	1.26	4.73***
Dark, Solid, Other regions	Alternative specific constant Honey 5 (N), β_5	3.23***	1.68
Dark, Liquid, Other regions	Alternative specific constant Honey 6 (G) β_6	0.89	0.81
		Non- Random β_s	
Light, Solid, Local	Price of Honey 1 (J), β_1	-0.15***	-0.19***
Light, Liquid, Local	Price of Honey 2 (F), β_2	-0.09***	-0.17***
Light, Solid, Other regions	Price of Honey 3 (U), β_3	-0.18***	-0.21***
Light, Liquid, Other regions	Price of Honey 4 (T), β_4	-0.07***	-0.13***
Dark, Solid, Other regions	Price of Honey 5 (N), β_5	-0.09***	-0.11***
Dark, Liquid, Other regions	Price of Honey 6 (G) β_6	-0.10***	-0.10***
		S.D. of random β_s	
	Alternative specific constant of Honey 1 (J), η_1	3.27***	4.12***
	Alternative specific constant Honey 2 (F), η_2	3.72***	6.36***
	Alternative specific constant Honey 3 (U), η_3	2.40***	4.61***
	Alternative specific constant Honey 4 (T), η_4	4.0***	3.59***
	Alternative specific constant Honey 5 (N), η_5	3.48***	5.13***
	Alternative specific constant Honey 6 (G) η_6	3.68***	5.73***
	Log-Likelihood (θ)	-1,013.6	-974.8
	Log-Likelihood (0)	-1,692.9	-1,692.9
	Pseudo R^2	0.40	0.42

Table 4 The willingness to pay and the Least square means of the sensory parameters valuated

Willingness to pay and their differences between honeys	Honey J Light MDP Solid		Honey F Light MDP Liquid		**Honey U Light Other Origin Solid**		**Honey T Light Other Origin Liquid**		**Honey N Dark Other Origin Solid**		**Honey G Dark Other Origin Liquid**	
	Pre	*Post*	*Pre*	*Post*	***Pre***	***Post***	***Pre***	***Post***	***Pre***	***Post***	***Pre***	***Post***
Honey J Light MDP Solid	53.69*** (47.8 , 56.7)	49.70*** (39.9 , 54.1)										
Honey F Light MDP Liquid	7.95 (-2.5 , 18.4)	14.51*** (8.89 , 20.1)	45.73*** (32.1 , 49.5)	35.18*** (34.9 , 45.1)								
Honey U Light Other origin Solid	6.43*** (1.7 , 11.3)	13.08*** (8.59 , 17.56)	-1.52 (-11.7 , 8.7)	-1.43 (7.64 , 4.78)	**47.25*** ** (39.1 , 52.4)	**36.61*** ** (34.2 , 42.1)						
Honey T Light Other origin Liquid	36.82*** (10.6 , 62.9)	14.69*** (8.23 , 21.1)	28.86** (5.01 , 52.7)	0.17 (--6.58 , 6.94)	30.38** (4.20 , 56.5)	-1.61 (-5.51 , 8.73)	**16.87** (-9.13 , 40.1)	**35.00*** ** (28.2 , 39.9)				
Honey N Dark Other origin Solid	20.73*** (8.6 , 32.8)	35.48*** (15.1 , 55.8)	12.77 (-2.80 , 28.3)	20.967** (0.44 , 41.48)	14.29** (2.51 , 26.08)	20.78* (-0.03 , 41.6)	-16.08 (-44.6 , 12.47)	-20.78* (-41.61 , 0.03)	**32.95*** ** (23.3 , 42.1)	**14.21** (-6.03 , 34.4)		
Honey G Dark Other origin Liquid	45.35*** (20.4 , 70.3)	42.07*** (18.8 , 65.3)	37.40*** (11.0 , 63.7)	27.55** (3.83 , 51.27)	38.92*** (14.1 , 63.7)	27.37** (3.19 , 51.56)	8.53 (-28.09 , 45.1)	6.58 (-24.68 , 37.85)	24.62* (-3.20 , 52.4)	-6.58 (-37.8 , 24.68)	**8.33** (-15.3, 35.03)	**7.62** (-6.40, 31.99)
Hedonic evaluation of honey taste	Honey J Light MDP Solid		Honey F Light MDP Liquid		**Honey U Light Other Origin Solid**		**Honey T Light Other Origin Liquid**		**Honey N Dark Other Origin Solid**		**Honey G Dark Other Origin Liquid**	
COLOUR	6.81 (±1.70)		6.73 (±1.62)		**6.42** (±1.83)		**6.54** (±1.71)		**5.91** (±1.86)		**6.40** (±1.60)	
CONSISTENCY	6.90 (±1.97)		6.18 (±1.95)		**6.37** (±2.00)		**6.16** (±1.98)		**5.42** (±2.12)		**5.91** (±1.92)	
ODOUR	6.46 (±1.71)		6.24 (±1.57)		**6.15** (±1.74)		**6.01** (±1.83)		**5.17** (±2.10)		**5.79** (±1.89)	
FLAVOUR	6.86 (±2.00)		6.59 (±1.85)		**6.17** (±1.99)		**6.51** (±2.03)		**4.49** (±2.43)		**5.31** (±2.34)	
GLOBAL	6.54[a] (±2.12)		6.30[a,b] (±1.99)		**6.11[b]** (±2.01)		**6.21[b]** (±2.08)		**4.68[c]** (±2.27)		**5.54[c]** (±1.97)	

***, **, *: Significance at 1%, 5%, 10% level. MDP: Mar de Plata

Results of the WTP confirm the model estimates. However, these value can be interpreted directly as $ by 500 g of the honey product. Before analysing the impact of the sensory experience on the WTP, results showed that on average that consumers are willing to pay 53.69$ and 49.70$ for the most preferred honey which has light colour, produced locally with solid texture. However, consumers were not willing to pay any amount of money for honey with dark colour, liquid texture and produced in other regions.

Analysing the impact of the sensory experience on the expected preferences, results showed that the most preferred honey after tasting was confirmed with a slight decrease but non-significant of the WTP. The sensory experience for the first honey was positive and did not affect consumers' preferences. Thus experience confirmed the consumers' expectation. However, for the second and third honey products, consumers' expectation decreased significantly after tasting the product. In this context, it is highly relevant to see that the eating experience played a homogenizing role in unifying the value of the WTP for the second (35.18$/500g), third (36.61 $/500g) and fourth (35.00$/500g) honey products.

Another important result is that expected preferences was not significant for the fourth honey (light, other origin and liquid). However, after tasting the product, the WTP increased significantly showing a clear preference of this product. The opposite behaviour occurs with the fifth honey type (dark, other origin and solid). Results showed the expected preferences decreased significantly showing that consumers are not willing to compromise taste with other product attributes as this product received the lowest global acceptance score. Finally, the last honey product was not preferred in both before and after the eating experience confirming again the consumers' expectations.

4. Conclusions

Results showed the importance of the local attribute both for the expected preferences as well for the eating experience. Local products showed the highest WTP and the highest sensory acceptance for sensory parameters. This preference is followed by light colour and solid consistency. Consumers showed their wiliness to accept non-local products if the sensory perceived quality and the eating experience are positive but at lower price. Dark honey was not preferred nor accepted. While consumers showed their willing to accept dark honey if it consistency is solid, after tasting this combination, consumers demonstrated a total rejection for dark honeys.

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