RESEARCH PAPER

Perceived quality of and satisfaction from sweet cherries (*Prunus avium* L.) in China: Confirming relationships through structural equations

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Abstract

A. Chiang, B. Schnettler, M. Mora, and M. Aguilera. 2018. Perceived quality and satisfaction with sweet cherries (Prunus Avium L.) in China: Confirming relationships through structural equations. Cien. Inv. Agr. 45(3): 210-219. In recent years, Chile has been the Chinese market's main supplier of fresh sweet cherries. The aim of this study was to develop a relational model with two working hypotheses to model Chinese consumer satisfaction with sweet cherries as a result of the quality perceived by intrinsic and extrinsic attributes. One hundred and ninety-three buyers in the Sanyuanli Market in the Chaoyang District, Beijing, were surveyed using closed-ended questions on a Likert scale. To develop a model that fulfilled the indicated objective, an exploratory factor analysis and a subsequent system of structural equations were used to confirm the relationships, presenting an adequate goodness-of-fit test to accept the model according to the literature. Among the main results, it was determined that consumer satisfaction with sweet cherries is explained by the perceived intrinsic quality, where medium size and color are the determining attributes, and the product price, Chilean origin and delivery time explain the perceived extrinsic quality (critical ratio of 2.937 and p-value of 0.003). Finally, the intrinsic quality positively and significantly influences Chinese consumer satisfaction with sweet cherries, in contrast to the results for perceived extrinsic quality, which are not statistically significant.

Key words: Perceived quality, satisfaction, structural equations modeling, sweet cherries.

Introduction

Chile has become the main supplier of fresh sweet cherries to the Chinese market in recent

years (ProChile, 2012), and the tonnage of sweet cherries exported in 2016 tripled over 2012 (ODEPA, 2017). Chile's strategy seems to not use knowledge of the Chinese consumer but rather market opportunities. Since the behavior of Chinese consumers is not considered in food issues, information regarding this behavior con-

tinues to be scarce. One of the reasons for this lack of information is that the food consumption patterns in East Asia do not seem to be easily analyzed using Western cultural models (Grunert *et al*., 2011, Lee *et al*., 2015). The imported fresh fruit market in China has undergone rapid growth since opening in 1993, despite a great price difference between imported and local fruit. Part of the Chinese population prefers expensive fruit over domestic fruit, although the population has a relatively low income and has access to an abundant supply of local fruit at a better price (Sun and Collins, 2007). One explanation is that Chinese consumers, who generally consume raw fruit as a snack (Du *et al*., 2017), perceives the quality of imported fruit as being better than that of domestic products (Sun and Collins, 2007). Fruit consumption is also related to health, with the focus on products that confer benefits such as improved nutrition (Sun and Collins, 2007) and lack of chemical components (Ergönül, 2013). Therefore, the motivations behind the purchase of imported fruit for personal consumption could be driven by health concerns and Confucius' principle: what a person eats and wears expresses his income level and social status (Cheng *et al*., 2008). Cherries and other fruits, such as peaches and apples, are used preferably as gifts, especially at the Chinese New Year, with bright wrapping that includes symbols of wealth, health or happiness (Sun, 2010).

An online auction study of cherries from Chile and New Zealand shows the importance of the perception of quality attributes, such as the size of the fruit, origin of the cherry, packaging format, reputation of the seller and price paid (Sun, 2010). There are currently four main approaches to explain perceived quality: the economics of information approach, hierarchical approaches, integrative approaches and multiattribute approaches (Ness *et al*., 2010; Martínez-Carrasco *et al*., 2012). The latter approach is used in this study. The multiattribute approach understands quality as a dichotomous phenomenon divided between intrinsic and extrinsic signals (Olson and Jacoby, 1972; Zeithaml, 1988; Verbeke *et al*., 2010; Mora *et al*., 2011; Grunert *et al*., 2015; Lee *et al*., 2015). Several authors differentiate these quality signals into two types of attributes: extrinsic and intrinsic. The so-called extrinsic attributes bear a closer relationship to the product but are, by definition, beyond its substance (Olson and Jacoby, 1972; Cheng *et al*., 2008; Akdeniz *et al*., 2013). The intrinsic attributes are properties or qualities derived from the physical composition of the product, such as the ingredients and sensory attributes, which cannot be manipulated without altering the physical properties of the product itself (Lee *et al*., 2015). In references to such attributes in consumer goods, a distinction is made between those products whose quality can be determined prior to the purchase (search goods) and those whose attributes can be determined only after the purchase or during consumption (Mora *et al*., 2011; Martínez-Carrasco *et al*., 2012).

Satisfaction is the consumer's response to the level of a product's or service's compliance (Oliver, 2010). Satisfaction of the consumer's needs has been defined as an overall assessment of the purchase and consumption experience (Olsen *et al*., 2005) and the level of compliance with the need, desire, goal or other pleasant end (Olsen, 2002). Satisfaction is considered a reflection of the degree to which the purchase of a product evokes positive feelings in terms of emotive or evaluative elements (Cronin *et al*., 2000). One of the most frequently studied approaches in the literature is the expectation disconfirmation theory. This theory indicates that disconfirmation is a post-purchase process in which the consumer establishes a comparison between the results obtained and previously created expectations, and it is the difference between these two principles that leads the consumer to form judgments about a product or service (Olsen, 2002; Tuu *et al*., 2011). Perceived quality and food satisfaction are highly correlated (Churchill and Surprenant, 1982;

Olsen, 2002; Sanzo *et al*., 2003; Espejel *et al*., 2009; Espejel and Fandos, 2009; Ness *et al*., 2010). In this area, the literature has proven that perceptions of a quality product exert positive effects on satisfaction (Ness *et al*., 2010). If the perceived quality is greater than or equal to the expected quality, the customer will be satisfied; otherwise, if the perceived quality is less than expected, the customer will be dissatisfied (Espejel *et al*., 2009; Ness *et al.,* 2010). However, most of these studies have been conducted on foods with some degree of processing, brand development or distinctive seals, such as designations of origin. In this respect, there has been a paucity of studies on primary products (Martínez-Carrasco *et al*., 2012). In studies conducted on the primary products of fruits and vegetables, such as peaches and tomatoes, the existence of positive and significant relationships between attributes and perceived quality have been proven (Mora *et al*., 2011; Martínez-Carrasco *et al*., 2012). No studies, however, have demonstrated the relationship between perceived quality and satisfaction in fruits such as sweet cherries, for example, which is why this study is a contribution to knowledge in this regard.

Therefore, the main aim of this study is to determine the relationship between the perceived quality of sweet cherries and Chinese consumer satisfaction. The following hypotheses were tested:

H_1: There is a positive and significant relationship between the perceived extrinsic quality of sweet cherries and Chinese consumer satisfaction.

H_2: There is a positive and significant relationship between the perceived intrinsic quality of sweet cherries and Chinese consumer satisfaction.

Both hypotheses are part of the proposed model, which endeavors to measure Chinese consumer satisfaction with sweet cherries in terms of the product's extrinsic and intrinsic qualities (Figure 1).
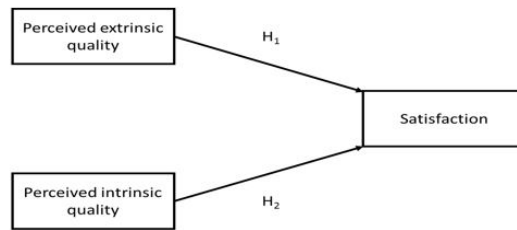
Figure 1. Causal model of Chinese consumer satisfaction with sweet cherries.

Materials and methods

Sample and questionnaire

A survey was applied to a nonprobability convenience sample (Mora *et al*., 2011; Martínez-Carrasco *et al*., 2012; Schnettler *et al.,* 2017) that comprised 193 people with Chinese nationality. The survey was developed in Chile in Spanish and then translated to Chinese. It was sent to China, where it was corrected and back-translated to Spanish. The two versions were compared, ensuring their consistency.

The field work was conducted in two phases. The first phase consisted of applying a pretest, where 20 individuals were surveyed in a food market in Beijing, and through this, errors were detected that might affect the result; as a result, these surveys were excluded from the analysis. The second phase consisted of applying the survey on a large scale. To do this, the buyers in the Sanyuanli market, Chaoyang District, Beijing, were considered a sampling unit. This market is large, has a good infrastructure and location, and has a wide range of fruits of various origins and qualities.

The evaluation instrument included questions about perceived extrinsic quality, perceived intrinsic quality and satisfaction. A quantitative method was used to collect data based on a structured survey of 21 questions on a Likert scale (1: not important at all; 5: very important) for perceived quality and five questions on a Likert scale for satisfaction (1: strongly disagree; 5: strongly agree).

For the perceived intrinsic quality construct, the attributes used were color (Zeithmal, 1988; Schnettler *et al*., 2010; Mora *et al*., 2011; Grunert *et al*., 2015), size (Mora *et al*., 2011; Martinez-Carrasco *et al*., 2012), aroma (Ragaert *et al*., 2004; Mora *et al*., 2011), juiciness (Martínez-Carrasco *et al*., 2012), flavor (Ragaert *et al*., 2004; Sun and Collins, 2007; Schnettler *et al*., 2010; Matinez-Carrasco *et al*., 2012), texture (Ragaert *et al*., 2004; Ness *et al*., 2010; Matinez-Carrasco *et al*., 2012) and freshness (Ragaert *et al*., 2004; Sun and Collins, 2007; Schnettler *et al*., 2010; Grunert *et al*., 2015). The attributes of perceived extrinsic quality considered here were price (Schnettler *et al*., 2010; Mora *et al*., 2011, Lee *et al*., 2015), region of origin (Schnettler *et al*., 2010; Martinez-Carrasco *et al*., 2012; Grunert *et al*., 2015), seller's recommendation (Mora *et al*., 2011), availability (Mora *et al*., 2011), quality seals (Verbeke *et al*., 2010; Grunert *et al*., 2015) and label type(Martínez-Carrasco *et al*., 2012). Finally, for satisfaction, the aspects used included the preference of the latest sweet cherries, being satisfied with the product, being satisfied with the seller, and the fulfillment of expectations with regard to the sweet cherries of this country of origin (Sanzo *et al*., 2003; Espejel *et al*., 2009; Espejel and Fandos, 2009).

To perform the exploratory factor and confirmatory factor analyses and the structural equations model, the software SPSS Statistics v. 21 was used with Amos, employing maximum likelihood extraction (Loan *et al*., 2017).

Exploratory factor analysis

The exploratory analysis of the study involved determining the individual reliability of the indicators obtained from the reduction of dimensions, the Kaiser-Meyer-Olkin (KMO) index and Bartlett's test of sphericity (BTS), which must be significant, i.e., less than 0.05 (Williams *et al*., 2010).

Confirmatory factor analysis

In the confirmatory analysis, two construct reliability tests were carried out: the first was Cronbach's alpha, which measures the internal consistency of the constructs individually and must be greater than 0.7 (Loan *et al*., 2017); however, Cronbach's alpha for each separate factor does not consider the influence of the remaining latent variables. Therefore, the composite reliability (CR) was calculated, which considers the interrelations of the constructs and has a minimum accepted value of 0.7 (Bellini *et al*., 2017). To obtain the validity of the latent variables, two fundamental analyses were performed: convergent validity and discriminant validity. The convergent validity is verified through the average variance extracted (AVE) of the constructs, with the recommended minimum being 0.5, which may indicate that the variables explain more than 50% of the variance of their constructs (Sholekar and Shoghi, 2017). On the other hand, the discriminant validity between constructs was evaluated using the criterion that the square root of the AVE for each construct should be greater than its correlations with all other constructs (Fornell and Larcker, 1981).

Structural equations model

Once these tests were complete, the goodness-of-fit of the model was estimated. For this study, the following was determined: a) X^2/d.f., which according to Schreiber (2017) must be greater than 2 and less than 3, b) the root mean square error of approximation (RMSEA), with the maximum accepted value being less than 0.08 (Browne and Cudeck, 1992), c) the goodness-of-fit index (GFI), which must be greater than 0.9 (Hoyle, 1995), d) the comparative fit index (CFI), which according to Schreiber (2017) must be greater than 0.95, e) the adjusted goodness-of-fit index (AGFI), which must have values over 0.85 (Saba and Vasallo, 2002), and f) the PRatio, which measures the parsimony of the model and must be close to 1.

Finally, to test the hypothesis, the critical ratio must be considered, which must a value greater than 1.96 and a P-value less than 0.05 (Sholekar and Shoghi, 2017).

Result and discussion

The sample presented three important characteristics: most respondents were women over 24 years of age who had high purchasing power (Table 1). Sabbe *et al*. (2007) conclude that women have a higher degree of acceptance of fresh fruits. In terms of monthly family income, Liu and Niyongira (2017) describe the Chinese consumers with greater purchasing power as tending to choose higher quality products. On the other hand, young people consume the least fresh fruit, and Duan *et al*. (2017) state that young Chinese adults between 18 and 24 years of age consume fewer than the five of the daily recommended portions of fruits and vegetables.

For the model to be developed correctly, two fundamental phases must be completed in the structural equations: exploratory factor analysis and confirmatory factor analysis. The KMO index obtained for the first analysis was 0.745, exceeding the minimum of 0.5 established by Williams *et al*. (2010); therefore, it was feasible to perform a factor analysis with the data. At the same time, the BTS was 0.00, meaning that the correlation matrix was not an identity matrix. Accordingly, the study determined that the observable variables of medium size (ATRI13) and color (ATRI14) are significant for the construct perceived intrinsic quality and the variables of Chilean origin (ATRI01), delivery time (ATRI08) and price (ATRI09) are significant for the construct perceived extrinsic quality. All variables showed statistical reliability represented by the critical ratio greater than 1.96 and p-value less than 0.005 (Table 2). This result confirms that obtained by Grunert *et al*. (2015), who concluded that Chinese consumers use color as the determinant of

Table 1. Sociodemographic profile of the sample

Variable	Item	Frequency	Percentage
Gender	Male	76	39.4
	Female	117	60.6
Age	From 18 to 24	47	24.4
	From 25 to 34	71	36.8
	From 35 to 50	57	29.5
	Over 50	18	9.3
Monthly income	Less than ¥5000	66	34.2
	From ¥5000 to ¥7000	75	38.9
	More than ¥7000	52	26.9
Education level	Primary	14	7.3
	Secondary	18	9.3
	Technical	57	29.5
	University	104	53.9

perceived intrinsic quality. The univariate data in this study reveal that color garnered 92% of the importance placed by consumers and is also the indicator that had the highest average score (4.60). Sun (2010) determined that the buyers of cherries at online auctions preferred the Chilean product for its medium size and accessible price. In this respect, Lee *et al*. (2015) report that variable price affects the extrinsic quality of the product, i.e., the higher the price, the better the quality as perceived by Chinese consumers. Chinese consumer preference for imported products over domestic ones can be explained by the current food safety problems that China is experiencing; considerable evidence has been gathered suggesting that food in China is less safe (Sun and Collins 2007; Grunert *et al*., 2015). Finally, for Chinese consumer satisfaction, the variables belonging to the construct are *I prefer the latest sweet cherries* (ATRI22), *I am satisfied with the product* (ATRI23) and *I am satisfied with the seller who sold it to me* (ATRI24), confirming the food studies conducted by Sanzo *et al*. (2003), Espejel *et al*. (2009) and Espejel and Fandos (2009) (Figure 2). With regard to the confirmatory analysis,

the reliability of the constructs was determined (Table 3). Cronbach's alpha was above 0.7 for the three constructs, verifying that they can be reliably measured individually. At the same time, the composite reliability determined that the constructs are reliable for measurement as a whole. The convergent validity of the construct indicated that the attributes of the latent variables shared more than 50% of the explained variance, whereas it is deduced from the discriminant validity (Table 4) that the constructs are indeed different from each other.

The goodness of fit of the model is sound and meets the literature guidelines: the discrepancy indicator X^2/d.f. = 2.114, RMSEA=0.076, GFI=0.956, AGFI=0.907, CFI=0.958 and PRatio=0.607.

In testing the hypothesis (Table 4), it was determined with 95% confidence ($p<0.05$) that the perceived intrinsic quality of fresh sweet cherries positively and significantly influences Chinese consumer satisfaction. With this result, hypothesis 2 can be accepted, which confirms what has been reported in other food stud-

Table 2. Reliability of the indicators

Proposed construct	Attribute	Code	Critical ratio
Perceived extrinsic quality (PEQ)	Chilean origin	ATRI01	nd
	Bulk	ATRI02	ni
	Label	ATRI03	ni
	Parking availability	ATRI04	ni
	Seller recommendation	ATRI05	ni
	Available in supermarkets	ATRI06	ni
	Available in greengrocers	ATRI07	ni
	Delivery time	ATRI08	7.265***
	Price	ATRI09	7.176***
	American origin	ATRI10	ni
	Chinese origin	ATRI11	ni
	Quality seal	ATRI12	ni
Perceived intrinsic quality (PIQ)	Medium size	ATRI13	nd
	Color	ATRI14	3.444***
	Large size	ATRI15	ni
	Small Size	ATRI16	ni
	Aroma	ATRI17	ni
	Juiciness	ATRI18	ni
	Flavor	ATRI19	ni
	Freshness	ATRI20	ni
	Texture	ATRI21	ni
Satisfaction (ST)	I prefer the latest sweet cherries	ATRI22	nd
	I am satisfied with the product	ATRI23	9.108***
	I am satisfied with the seller who sold it to me	ATRI24	8.672***
	I recommend the product to other people	ATRI25	ni
	My expectations have been fulfilled with regard to the sweet cherries of this country of origin	ATRI26	ni

***Significant below 0.005. nd: not determined because this regression coefficient was adjusted to 1 to identify the model. ni: not incorporated as a variable to the model because it is nonsignificant.
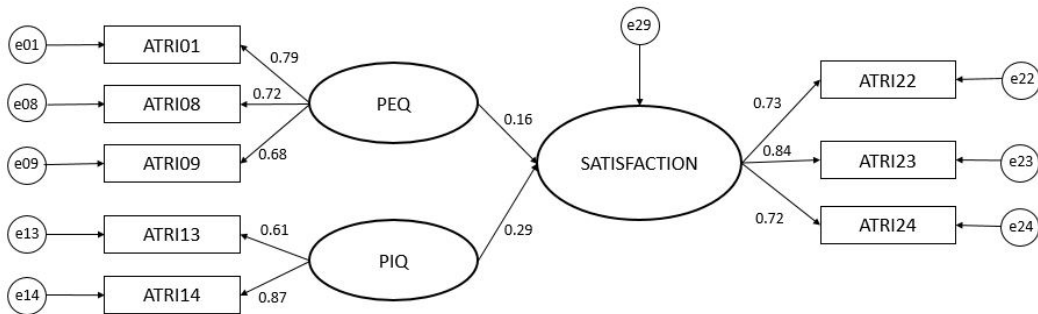
Figure 2. Structural equations model that explains consumer satisfaction with sweet cherries based on perceived extrinsic and intrinsic quality.

Table 3. Reliability and convergent validity of the constructs

Proposed construct	Cronbach's α	Composite reliability	Average variance extracted
Perceived intrinsic quality	0.712	0.732	0.601
Perceived extrinsic quality	0.769	0.774	0.535
Satisfaction	0.804	0.808	0.585

ies by Espejel *et al.* (2009) on ham and by Grunert *et al.* (2015) on pork ribs. By contrast, no evidence was obtained to support the link between extrinsic attributes and the consumer satisfaction of fresh sweet cherries. This result makes it possible to reject hypothesis 1. In this respect, other studies, such as those conducted by Espejel and Fandos (2009) on wine, have concluded that there is no positive and significant relation between the perceived extrinsic quality and satisfaction; however, Grunert *et al.* (2015) determined that extrinsic attributes achieve significance in Chinese consumer satisfaction only in a small age group. On the

other hand, the coefficient of determination of the endogenous or dependent variables (R^2) was 0.15; that is, the structural model of satisfaction is explained as 15%, an indicator that, according to Falk and Miller (1992), must be higher than 0.1 (10%) to be acceptable.

The limitations of this study, considering the nonprobabilistic nature of the sample, are that the results cannot be generalized and the sample is not representative according to population distribution. Another limitation is the small sample size. Therefore, future studies must include larger samples that permit the differentiation of possible market segments. Nevertheless, this study does provide knowledge of the behavior of Chinese consumers with respect to sweet fruit, an area where there is still little information.

By virtue of the results presented, it may be concluded that consumer satisfaction is positively and significantly influenced by only the quality perceived based on intrinsic attributes.

Table 4. Discriminant validity and hypothesis testing

Proposed construct	Perceived intrinsic quality	Perceived extrinsic quality	Satisfaction
Perceived intrinsic quality	0.775		
Perceived extrinsic quality	0.410	0.731	
Satisfaction	0.216	0.252	0.765
Hypothesis		Critical ratio	p-value
Perceived intrinsic quality → Satisfaction		2.937	0.003
Perceived extrinsic quality → Satisfaction		1.511	0.131

A model based on structural equations was identified: it exhibited validity and reliability in its indicators and had a goodness of fit accepted by the literature. Thus, this model could be applied to other studies to examine consumer behavior with certain foods.

The fruit price, product delivery time and Chilean origin are attributes that determine the extrinsic quality as perceived by Chinese consumers; however, these attributes do not significantly affect Chinese consumer satisfaction.

The observable variables color and medium size determine the intrinsic quality as perceived by Chinese consumers, and they also influence satisfaction when consuming sweet cherries positively and significantly.

Chilean exporters should focus their strategies on the intrinsic attributes of the product that satisfy the Chinese consumer, such as color and size, seeking to ensure that these attributes are associated with fruits of Chilean origin. Additionally, postharvest strategies must be strengthened to provide a product with attributes that will satisfy the consumer of this market.

In future investigations, to delve more deeply into the knowledge and impact of the external variables on satisfaction, postharvest product variables such as purchase intention and consumer loyalty could be integrated into the model.

Resumen

A. Chiang, B. Schnettler, M. Mora, y M. Aguilera. 2018. Calidad percibida y satisfacción con cerezas dulces (*Prunus Avium* L.) en China: Confirmando relaciones a través de ecuaciones estructurales. Cien. Inv. Agr. 45(3): 210-219. En los últimos años Chile se ha constituido en el principal proveedor de cerezas frescas del mercado chino. El objetivo de este trabajo es modelar la satisfacción de consumidores chinos por cerezas frescas, como consecuencia de la calidad percibida a través de atributos intrínsecos y extrínsecos, desarrollando un modelo relacional con dos hipótesis de trabajo. Se aplicaron encuestas a 193 compradores del mercado de Sanyuanli, distrito de Chaoyang, ciudad de Beijing, considerando preguntas cerradas medidas en escala de Likert. Para desarrollar un modelo que cumpla con el objetivo señalado se empleó un análisis factorial exploratorio y posteriormente para confirmar las relaciones un sistema de ecuaciones estructurales, presentando un análisis de bondad de ajuste adecuado para aceptar el modelo según literatura. Entre los resultados principales, se determinó con un ratio crítico de 2.937 y un P-value de 0.003 que la satisfacción de los consumidores de cerezas frescas se explica a partir de la calidad percibida intrínseca, donde el tamaño mediano y el color corresponden a los atributos determinantes de ésta y el precio, el origen chileno y el tiempo de entrega del producto explican la calidad percibida extrínseca. Finalmente, se concluye que la calidad intrínseca influye de forma positiva y significativa en la satisfacción de los consumidores chinos de cerezas frescas en contraste con la calidad percibida extrínseca, la que no logra ser estadísticamente significativa.

Palabras clave: Calidad percibida, cerezas dulces, modelos de ecuaciones estructurales, satisfacción.

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