

BEEF ACCEPTABILITY AND CONSUMER'S EXPECTATIONS ASSOCIATED WITH PRODUCTION SYSTEMS AND BEEF MARBLING

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Abstract – Beef acceptability and consumers' expectations associated with production systems and beef marbling were evaluated in two major Chilean cities. A panel of 204 consumers from Osorno and Santiago rated beef acceptability from four treatments (low or high marbling level x grazing or feedlot production system) in a blind test first, and then with information about marbling level and type of production system. In addition, consumer expectations induced by the information were evaluated. Blind tests resulted in higher acceptability of highly marbled beef with no sensory differences between beef from grass-fed or feedlot animals. However, information about marbling level and production system generated positive expectations and increased acceptability of beef with lower marbling levels and beef from grazing animals. Results from this study have important implications for the development of beef marketing strategies in the Chilean market.

Key Words – Consumer acceptability, Expectations, Production system, Marbling, Chilean beef.

I. INTRODUCTION

Food perception and selection is a complex process where our five senses, physiological and psychological aspects and extrinsic factors participate. All these factors may influence consumer preferences and lead to the acceptance or rejection of food [1].

Expectations appear frequently in people's daily life, affecting their reactions and decisions. Expectations can be created by advertising, talking to friends, previous experiences, peers, family, etc. In this context, expectations can improve or degrade the perception of a product, even before it is tasted [2]. Visual impressions based on perceived intrinsic and extrinsic cues, as labelling information, are important inputs that may generate beef quality expectations [3]. In this sense, the information about production

system type and level of marbling can modify expectations about beef, influencing consumers' purchase decisions.

In general, consumers' responses in surveys indicate a preference for beef produced on pasture [4], however, in many acceptability studies, consumers tend to prefer beef produced locally refusing the beef produced in other's systems [5,6]. In addition, beef marbling is an important positive expectation generator in several markets. Conversely, in Chile, consumers tend to reject beef with high levels of marbling [7]. However, consumer sensory studies have not previously been carried out in Chile.

The aim of the present study was to evaluate the effect of production systems and marbling of beef on consumer acceptability and expectations in two major Chilean cities: Osorno and Santiago.

II. MATERIALS AND METHODS

2.1. Beef selection and sample preparation

Thirty-two left *longissimus thoracis* (LT) muscles from a batch of 64 commercial loins were selected for this study. The LT muscles were obtained from Holstein-Friesian steers slaughtered between 485-550 kg live weight and were kept frozen at $-18^{\circ}\text{C} \pm 2^{\circ}\text{C}$ until consumer testing. Sixteen LT muscles were obtained from animals finished on pasture only (last 120 days) whereas the other 16 LT muscles were collected from steers finished on feedlot (pasture silage: 1.8 % Dry Matter (DM) of Live Weight (LW) and wheat or oats 1.0 % DM of LW). LT muscles from each group were divided according to Intramuscular Fat (IMF) levels into high and low IMF (Table 1). A total of four treatments (PL: pasture/low marbling, PH: pasture/high marbling, FL: feedlot/low marbling,

FH: feedlot/high marbling) were used for consumer testing. LT were thawed and cut in steaks of 2.54 cm thickness and each steak was covered with aluminium foil and cooked in a pre-heated oven (EKA®, KF 620) at 170 °C for approximately 20 min until reaching an internal temperature of 71°C. Afterwards, the slices were cut in dices of 20 mm × 20 mm × 25 mm (length × width × height), placed in coded trays and served to consumers for testing.

Table 1. Moisture, pH and Intramuscular Fat of beef of each treatment (n= 8 by treatment)

Treatment	pH	Intramuscular Fat
PL	5.67 ± 0.066	2.9 ± 0.61
PH	5.64 ± 0.060	4.0 ± 0.23
FL	5.74 ± 0.233	4.6 ± 0.24
FH	5.63 ± 0.015	6.5 ± 2.75

PL: Steers finished on pasture with low level of IMF
 PH: Steers finished on pasture with high level of IMF
 FL: Steers finished on feedlot with low level of IMF
 FH: Steers finished on feedlot with high level of IMF

2.2. Consumer test

Two-hundred and four consumers were recruited from the cities of Osorno and Santiago. Osorno is located in the Los Lagos Region and this region is the main producer of Chilean beef [8]. Santiago is the Chilean capital, with a population of five million people, and it has the highest beef consumption. The socio-demographic composition of consumers is shown in Table 2. The study was carried out between October and November 2011.

Table 2. Socio-Demographic characteristics of consumers

Characteristic of the consumers	n	Percentage (%)
1. Age		
18-39	141	69.1
40-59	54	26.5
> 60	9	4.4
2. Gender		
Male	96	47.1
Female	108	52.9
3. City		
Osorno	104	50.9
Santiago	100	49.1

Sessions of about 25 consumers were carried out in a room prepared for the study. The consumer

test was divided into three consecutive evaluations: blind, expected and informed acceptability. Finally, consumers completed a survey on personal data.

At the beginning of each evaluation, oral instructions were given to consumers about how to conduct the test. In all tests, samples were coded with three-digit random numbers so that consumers could not recognize or memorize the codes of the samples among evaluations. Also, the samples were provided according to a balanced block design to avoid position and carry-over effects [9].

Blind acceptability: Each consumer received four samples monodically, and consumers were asked to evaluate the acceptability of each sample using a seven-point hedonic hybrid scale [10] from “I dislike extremely” (score 1) to “I like extremely” (score 7). The blind acceptability is the result of the sensory evaluation of the sample without external cues.

Expected acceptability: In order to generate expectation, four cards were prepared representing the four treatments arranged in a 2×2 design. Each card was composed of two images: A central image of a LT raw steak representing the marbling level and a lateral image representing a production system. A code was included at the top of each card. The production systems were represented by one of two images: (1) a steer grazing on pasture or (2) confined steers feeding in a feedlot. The two marbling levels were denoted by an image of a LT steak with a marbling score of 200 (MSA marbling AUS-MEAT) for the low marbling level and a score of 400 MSA marbling for the high marbling level. The two images were similar in colour and size of the steak differing in the marbling level only. The marbling image in each card did not represent exactly the IMF level of the samples because the aim was to generate the consumers’ expectation using two contrasting marbling levels. Consumers received four cards in a randomized order and were asked to carefully study the cards and score them using a seven-point hedonic scale from “I will dislike extremely” (score 1) to “I will like extremely” (score 7). Expected acceptability is the result from the information about perceived sensory attributes of beef.

Informed acceptability: each consumer was

given a card together with its corresponding meat sample. Consumers were asked to associate the card information to the sensory assessment of the meat sample using the same scale of the previous blind acceptability test.

2.3 Statistical analysis:

The analysis of variance was carried out using the General Linear Model (GLM) procedure of the SAS system for blind, expected, and informed acceptability. Marbling level and production system and interaction were used as fixed effects. Differences among effects were tested using the Tukey test.

III. RESULTS AND DISCUSSION

The results from the consumer tests are shown in Table 3. The interaction between marbling level and production system was not significant. Samples with higher IMF showed a higher acceptability score than samples with the lower marbling level in the blind acceptability test. It is well documented that high IMF content contributes increased flavour, juiciness and tenderness of beef, and it is positively related to the overall palatability of meat [11]. In contrast, the samples with high marbling presented the lowest expected acceptability. Schnettler et al., [7] found in a survey that Chilean consumers tend to reject beef with high marbling levels. This kind of consumers considered leanness as an important selection criterion, so they viewed marbling as a negative factor [11].

Table 3. Acceptability scores ordered by treatment factors

	Marbling level		Production system	
	Low	High	Grazing	Feedlot
B	4.8 ^{bz}	5.0 ^{ay}	4.9 ^z	4.9
E	5.6 ^{ax}	5.1 ^{by}	5.6 ^{ax}	4.8 ^b
I	5.2 ^y	5.3 ^x	5.3 ^{ay}	5.1 ^b

B = Blind acceptability; E = Expected acceptability; I = Informed acceptability.

^{abc} Within factor and row, means with a common superscript letter are not significantly different ($P > 0.05$).

^{xy} Within factor and column, means with a common superscript letter are not significantly different ($P > 0.05$).

The discrepancy between the results from the blind and expected acceptability tests may be due to the fact that Chilean consumers do not relate marbling to beef sensory quality. This

could be due to a lack of knowledge about the relationship between beef attributes. This consumer behaviour could easily lead to dissatisfaction when consumer expectations at purchase does not match the sensory experience at the moment of consumption.

In the blind test, the consumers did not perceive differences between samples from the two production systems. However, when the images were presented to consumers, both the expected and informed acceptabilities were higher for steers grazing on pasture than animals fed on a feedlot. In this sense, Chilean consumers appreciate beef produced on pasture [4]. Luo et al. [12] indicated that consumers from Latin-American countries perceived significant differences between pasture-fed and grain-fed beef taste, because flavor of pasture-fed beef is more intense and different from beef produced from grain [13]. In addition, the majority of consumers that prefer pasture-fed beef are willing to pay a premium price for this product [12,14].

Marbling and production system information modified consumers' preferences resulting in higher scores for lower marbling and beef from grazing animals in the informed test as compared to the blind test. Information positively changed the sensory consumer perception of the samples.

Results from this study have important implications for the development of beef marketing strategies in the Chilean market. Thus, beef with higher intramuscular fat levels could be offered in restaurants where consumers cannot appreciate the visual appearance of raw beef, while expecting high quality and looking for an enjoyable beef eating experience. On the other hand, beef with lower marbling could be offered in supermarkets, where the visual assessment of raw beef is the key for consumers' purchase decisions and lean beef is preferred. However, consumers may have a disappointing eating experience if beef marbling levels are low, subject also to the cooking method and the beef cut. An optimum level of IMF in fresh beef should be established in further studies to define a visually acceptable marbling level that does not compromise sensory quality for the Chilean market.

Beef produced on pasture had similar sensory

acceptability to beef produced on feedlots. In addition, expected and informed acceptability were higher for beef from grazing animals indicating that production system should be an important extrinsic cue to be included in labelling to encourage beef purchasing from grass-fed animals.

IV. CONCLUSION

Blind tests resulted in higher acceptability of highly marbled beef with no sensory differences between beef from grass-fed or feedlot animals. However, information about marbling level and production system generated positive expectations and increased acceptability of beef with lower marbling levels and beef from grazing animals. Results from this study have important implications for the development of beef marketing strategies in the Chilean market.

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