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# *Short communication*: Sensory profile of raw goat milk cheeses made with artisan kid rennet pastes from commercial-weight animals: Alternative to farmhouse goat cheeses

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## ABSTRACT

The loss of traditional kid rennet pastes in the Canary Islands (Spain), as in many other regions, is most likely due to the custom of using abomasa from very young animals killed below desirable commercial weight. In addition, the reasonable price of commercial rennets (CR) has resulted in the loss of typical sensory characteristics for most farmhouse raw goat milk cheeses, placing them at a disadvantage when local and international markets are full of different cheeses, often with aggressive marketing strategies. This paper analyzes the sensory characteristics of raw goat milk cheeses made with rennet pastes prepared from commercial kid abomasa in 2 ways: dried while full of ingested milk [full, commercial, artisan kid rennet (FCKR)], or dried after being emptied of ingested milk and refilled with raw goat milk [empty, commercial, artisan kid rennet (ECKR)]. This latter practice allows the use of empty abomasa, or abomasa with grass, soil, and so on. Sensory profiles of cheeses made with FCKR and ECKR rennets were compared with those made with CR by an expert panel (n = 7). The FCKR and ECKR cheeses had similar sensory profiles. Although scores for FCKR cheeses were somewhat higher than for ECKR cheeses, they were in the range found for traditional cheeses made with rennet prepared with abomasa from very young animals. The sensory profile of CR cheeses was very different. Almost 90% of consumer panelists (n = 90) preferred cheeses made with the experimental rennet pastes. These results demonstrate the possibility to prepare artisan rennet pastes from commercial-weight kids in an easy way for farmhouse cheese makers using local resources that would otherwise be destroyed in abattoirs.

**Key words:** raw goat milk cheese, artisan kid rennet paste, Canarian goat cheese, sensory characteristic

## Short Communication

Cheese is one of the agricultural products of the Canary Islands with a good future; it is not only in demand today but expected to be in high demand in the coming years. During 2010, goat cheese production was 12,250 t, with raw milk cheeses comprising 52.4%. In the Canary Islands, there are about 400 cheese factories, about 89% of which are small farmhouses, each one producing less than 150 t/yr (Fresno et al., 2012). In the past, all Canarian goat cheese makers traditionally used their own rennets prepared with abomasa from very young animals (killed below commercial weight) according to various local recipes. However, the use of traditional rennets has decreased dramatically in the last 2 decades, probably due to 2 different factors: (1) serious difficulties with reproducing both cutting time and the sensory characteristics of the resulting cheeses and (2) the economic loss of having to kill the animals before reaching commercial weight. Thus, as an example of this situation in the Canary Islands, in 1992, artisan rennets were used in 96% of Palmero protected designation of origin (**PDO**) cheeses, 56% of Majorero PDO cheeses, and 100% of Gomero cheeses. Another inquiry in 2010 revealed that only 14% of Palmero, 0% of Majorero, and 20% of Gomero farmhouse cheeses still used artisan rennets (Fresno and Álvarez, 2011). Genetically engineered chymosin has now become the rennet of choice (mostly due to its lower price), causing the loss of typical sensory profiles of these traditional cheeses.

Lamb rennet paste from abomasa full of suckling milk contains higher levels of lipase activity than others obtained from empty stomachs (Bustamante et al., 2000; Addis et al., 2008) and cheeses made with these pastes showed higher concentration of short-chain FFA (Virto et al., 2003; Ferrandini et al., 2012) that are correlated with strong sensory attributes described as "pungent," "pecorino," or goat odor or flavor, and intense odor and flavor (Virto et al., 2003). Studies about enzymatic activities of rennet pastes showed that they correlate well with specific quality attributes of tradi-

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tional autochthonous cheeses (Jacob et al., 2011). Thus, harmonizing complex and time-consuming preparation protocols for artisan rennets to be used in farmhouse cheeses is highly desirable to preserve their traditional characteristics. To the best of our knowledge, the sensory characteristics and consumer preferences of raw goat milk cheeses made with artisan kid rennet pastes prepared from commercial-weight kids have not been previously investigated and organoleptic properties are one of the most important criteria in purchasing decisions. Thus, the objectives of this research were to (1) study the sensory characteristics of goat cheeses manufactured with artisan rennets from commercial-weight animals and (2) provide cheese makers with easy-to-use methodology to prepare their own rennets.

Majorera goat kid abomasa (23) were collected from an authorized abattoir from kids with commercial weight at slaughter (6–8 kg of liveweight after 45 to 60 d of age). Kids were separated from their mothers for 12 h and were then allowed to suckle ad libitum before sacrifice for a maximum of 3 h. All 23 collected abomasa were full of milk. After collection, previsceral fat was removed. Ten abomasa that had a darker color were emptied and refilled with raw goat milk [empty commercial artisan kid rennet (**ECKR**)]. The 13 remaining abomasa were left full of milk [full commercial artisan kid rennet (**FCKR**)]. All abomasa were placed in a 5% NaCl solution at 4 to 6°C for 1 wk and hung to dry to constant weight for approximately 1.5 mo in a dry and dark place at 10 to 15°C. Empty commercial artisan kids rennet and FCKR dried abomasa were ground separately to a fine paste. Each batch of either type of paste was divided into 2 lots that were stored in screw-capped glass jars at 4 to 6°C. Microbiological analyses of cheeses were performed as specified in European Union (EU) Regulation (CE) 1441/2007 (EU, 2007). Coagulation time was determined as described by Berridge (1952).

Before cheesemaking, milk samples were taken in triplicate, and their composition and pH was analyzed (Álvarez et al., 2007). All cheeses were made in the traditional manner (Fresno and Álvarez, 2007; Sánchez-Macías et al., 2010) by the same cheese master in the pilot plant located at the Instituto Canario de Investigaciones Agrarias (La Laguna, Tenerife, Spain). Immediately before cheesemaking, a given amount of each rennet paste was diluted in water so that clotting would be completed in 30 to 35 min at 30 ± 1°C in all cases. Experimental cheese fabrications with ECKR, FCKR, and control commercial CHY-MAX rennets (**CR**; Chr. Hansen SL, Tres Cantos, Spain) were done in triplicate on 2 different days, resulting in a total of 36 cheeses (3 types of rennet × 2 different days × 2 cheeses per batch). The only variation factor was the type of rennet, as in all fabrications the amount of rennet was adjusted to give the same coagulation strength.

Proximal cheese chemical composition, pH, and sensory analyses were determined in triplicate (Álvarez et al., 2007). With the same sensory methodology and panel, 4 training sessions were conducted with 14 commercial farmhouse cheeses of about 150 ripening days made with traditional kid rennet (**TKR**) from very young animals (less than 10 d of age). These cheeses were a representative sample of all Canarian cheeses made with TKR rennet.

Preference tests were done according to the Spanish Association for Standardisation and Certification standard UNE 87-005-92 (AENOR, 1992), as described by Fresno and Álvarez (2007) with 2 panels: (A) a consumer panel comprising 50 individuals who consume Canarian farmhouse cheese several times a week and (B) a panel composed of 40 farmhouse cheese makers and their families. One sample of each cheese was presented to the panelists for them to choose the sample they preferred by odor and taste, as this overall parameter coordinated well with consumer preference (Caspia et al., 2006). Samples were presented in coded, odorless plastic boxes of the same size and shape. Consumer preference tests were conducted individually. A collaborator presented the 3 samples of the different cheeses to each panelist, who selected the one he or she preferred. Panelists could remove any aftertaste with unsalted crackers, sections of Granny Smith apples, or water with very low level of mineralization. The SPSS software (version 15.0; SPSS Inc., Chicago, IL) was used for statistical processing of the results. A general lineal model was used to establish statistically significant differences among sensory parameters according to the factor "type of rennet" and post hoc multiple analyses by the Tukey test were done. Chi-squared tests were also performed to determine the significance of differences among subjects' consumption preferences and pairwise comparison between artisan kid rennet (FCKR and ECKR) and CR were performed according to tables from UNE 87-005-92.

No statistically significant differences were observed in milk samples. As reported by other authors (Pirisi et al., 2007), no statistically significant differences in proximal composition ($P > 0.05$) were observed among cheeses (n = 36): fat = 34.87 ± 1.17%, fat in DM = 51.23 ± 1.52%, protein = 21.30 ± 1.6%, moisture = 31.96 ± 3.19%, and pH = 5.17 ± 0.15. Microbiological analyses indicated absence of *Listeria* spp., *Salmonella* spp., and *Staphylococcus aureus* for all cheeses [Regulation (CE) 1441/2007]. From a hygienic point of view, all cheeses were fit for human consumption, as reported by Gil et al. (2007) and Moschopoulou (2011), and for cheeses made with artisan rennet pastes.