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Short communication: Sensory profile and acceptability of a cow milk cheese manufactured by adding jenny milk

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ABSTRACT

The addition of jenny milk during cheesemaking has been recommended as a viable alternative to egg lysozyme for controlling late blowing defects. However, little is known on the sensory properties of the cheeses made with jenny milk. In this study, the effect of the addition of jenny milk during cheesemaking on sensory properties and consumer acceptability of cheese was evaluated. A sensory profile was carried out by 10 trained panelists on 4 cow milk cheese types. Two types of cheeses were made by adding jenny milk to cow milk during cheesemaking; the cheeses were then left to ripen for 45 and 120 d. The remaining 2 cheese types were made with only cow milk and were also left to ripen for 45 and 120 d. The attributes generated by a quantitative descriptive analysis sensory panel were effective for discriminating the 4 products. Among them, added jenny milk samples aged for 45 d had the highest intensity of some appearance descriptors (structure and color uniformity), as well as the highest intensity of sweetness. The analysis of acceptability data obtained from 89 consumers showed that added jenny milk aged for 45 d was the most preferred type of cheese, whereas no significant differences were found among the other products, which had higher intensity of bitter, salty, acid milk, and so on.

Key words: sensory analysis, consumer acceptability, jenny milk, cheese

Short Communication

In recent decades there has been a renewed interest and research in jenny milk (Guo et al., 2007; Cosentino et al., 2012, 2013, 2015; Fantuz et al., 2012; Martemucci and D'Alessandro, 2012). This interest is first motivated by the chemical composition and nutrient contents of jenny milk, which have made it very similar to human milk (Guo et al., 2007). Besides, jenny milk is considered as a good replacer for cow milk in feeding children with severe IgE-mediated cow milk protein allergies (Guo et al., 2007; Nazzaro et al., 2010; Galassi et al., 2012). Due to its low lipid content, it is also capable of providing benefits for a low-fat diet plan (Guo et al., 2007; Nazzaro et al., 2010), as well as for the treatment of human immune-related diseases and in the prevention of atherosclerosis (Tafaro et al., 2007).

Another aspect of growing interest is related to the possible use of some components of jenny milk. Among them, the lysozyme contained in jenny milk is of special interest. This bacteriolytic protein is a nonspecific immunoprotective factor, whose powerful antibacterial activity is due to its capacity to catalyze the hydrolysis of the β(1–4) glycosidic links between N-acetylmuramic acid and N-acetylglucosamine in the bacterial cell wall polysaccharides, working in synergy with lactoferrin and immunoglobulins (Marseglia et al., 2013). The lysozyme content in jenny milk ranges from 1.0 to 3.7 mg/mL (Zhang et al., 2008; Galassi et al., 2012) and is much higher than in cow (0.18 μg/mL), buffalo (0.15 μg/mL), ewe (0.20 μg/mL), or goat milk (0.25 μg/mL; Kumari and Mathur, 1981; Fratini et al., 2006; Scharfen et al., 2007).

Previous studies have shown that donkey lysozyme can be successfully employed for controlling the growth of the bacteria responsible of late blowing in cheese (Galassi et al., 2012; Cosentino et al., 2013, 2015). For instance, Galassi et al. (2012) compared 2 groups of hard cheeses, one obtained by adding jenny milk (10 L/500 kg) and the other by adding lysozyme from hen egg white (1.6 g/100 kg). Overall, their results showed no significant differences between the groups in terms of technological and sensorial aspects. The effectiveness of jenny milk lysozyme as a substitute of egg lysozyme has been recently confirmed by Cosentino et al. (2013, 2015). In these studies, jenny milk was added to ewe and cow milk during cheesemaking. In both cases, the authors found jenny milk to be an important inhibitor of late blowing in cheese. Moreover, a consumer evaluation found no significant differences between semihard cow cheeses obtained with and without jenny milk (Cosentino et al., 2015).

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Table 1. Experimental design for cheese made with (CJ) and without (CC) jenny milk

Code	Cow milk, L	Jenny milk, L	Ripening time, d	Cheeses, n
CJ-45	40	3.2	45	8
CC-45	40	0	45	8
CJ-120	40	3.2	120	8
CC-120	40	0	120	8

The results of previous studies are important not only from a microbiological point of view, but also from a technological one, as they led to the creation of new dairy products made with jenny milk. However, to date, a comprehensive study on the characterization of sensory properties of these products is still not available. In the food industry, sensory analysis is recognized as a standard tool for both the development of new products and in checking and improving their quality. A sensory analysis by an expert panel may be very useful for identifying sensory attributes characterizing the cheese made with jenny milk. By using descriptive profiling techniques, such as quantitative flavor profiling (Stampanoni, 1993), the Spectrum method (Meilgaard et al., 2006), and quantitative descriptive analysis (**QDA**; Stone et al., 2004), several specific sensory profile have been developed for different types of cheeses, such as Scamorza (Braghieri et al., 2015), Caciottina (Papetti and Carelli, 2013), Cheddar (Young et al., 2004), Swiss cheese (Liggett et al., 2008), etc..

The relationship between sensory profile and consumer acceptability is another crucial factor affecting the success of foods and drinks. Concerning cheese, several studies have been carried out to understand what sensory properties drive consumer liking (Pagliarini et al., 1997; Ritvanen et al., 2005; Ryffel et al., 2008). In the present study, QDA was applied to establish the sensory attributes that characterize the profile of a cow milk cheese manufactured by adding jenny milk and with 2 different ripening times (45 and 120 d). The relationship between sensory attributes and consumer acceptability was investigated to identify those attributes that most affect the liking of this kind of cheese.

Fresh raw cow milk and jenny milk were collected the same day from 2 different farms by a mechanical milking apparatus. After collection, milk samples were immediately refrigerated at 4°C and transported to the laboratory to determine protein, fat, and lactose content according to the International Dairy Federation standard (ISO, 2013), as well as DM and ash content according to AOAC (1990). Cow milk contained, on average, 3.29% protein, 3.69% fat, 4.05% lactose, 11.67% DM, and 0.49% ash content. Jenny milk had the following composition: 1.69% protein, 1.31% fat, 6.43% lactose, 9.62% DM, and 0.42% ash content.

Cow and jenny milk were used to produce cheese according to procedures described by Cosentino et al. (2015). Cow milk was first pasteurized (65°C for 30 min) and then cooled to 37°C. Subsequently, a fixed amount (40 L) of pasteurized cow milk poured into 4 vats. A group of vats was created by adding 3.2 L of raw jenny milk to 2 vats (**CJ**). The remaining 2 vats contained only cow milk and were used as control group (**CC**). Kid rennet (0.2 g/L; activity 1:10,000; Caglio Camoscio CSC 95/75, DMS, Segrate, Italy) was added to the vats of each group. After 50 min, the curds of each vat were cut (diameter of particles = 0.5 cm) and pressed into cylindrical molds (diameter = 14 cm, height = 8 cm). After 24 h of draining, cheeses were salted in containers with sterile brine (200 g/L of NaCl, pH 5.40) for 2 h and then stored at 20°C for 4 d. Finally, both cheese groups were divided into 2 subgroups, each composed of 4 cheeses, which were left in a ripening room (13–15°C, air humidity = 80–85%) for 2 different time periods: 45 and 120 d (Table 1). The whole experiment was repeated twice.

The QDA of the cheeses was carried out by a panel of 10 members (5 male and 5 female, age 22–53 yr) who evaluated the cheeses under the supervision of a leader to generate and agree upon sensory descriptors of odor, flavor, taste, and texture. After training, the panelists developed a final descriptor list composed of 13 descriptive attributes, whose definitions, along with the reference material used to anchor the panel scores, are shown in Table 2. An unstructured line scale was used for rating attribute intensity. The left side of the scale corresponded to the lowest intensity of each attribute (value 0), whereas the right side to the highest intensity (value 100). Triplicate sessions were performed in separate booths equipped with a computerized system and sensory software (FIZZ ver.1.3.1, Biosystèmes, Couternon, France), where the sensory data were recorded directly. Samples were assigned 3-digit codes and their serving orders were randomized by the software. Evaluations took place under red fluorescent lights to mask color differences in the samples, except during the evaluation of cheese appearance, when only fluorescent lighting was used. Pieces of cracker and water were provided for cleansing the palate between samples.