

## Physicochemical and Sensory Characteristics of Yoghurt Produced from Goat Milk

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**Abstract:** The objective of this study is to determine the physicochemical composition quality of goat milk for its turn in flavored yogurt. Indeed, goat's milk is a food interesting nutritional and dietary values. This study shows that the pH of goat milk is similar to that of cow's milk, they are average respectively 6.70 and 6.75, therefore, they have different acidity 19.05°D to goat milk and 17°D to cow's milk. The latter is less dense 1,031 than goat milk 1.029 Cp. For the viscosity, 3.1 for the cow and 3.63 for the goat. On the ash content, there is a higher average in the cow (8.27 g L<sup>-1</sup>) than in goats (7.8 g L<sup>-1</sup>). For the yogurt, manufacture of four types of yogurt (goat yogurt, goat yogurt flavored with strawberry yogurt and cow with the aroma and flavor without (control)) then the assessment of the physical characteristics and sensory, shows that the aromatization yogurt by the strawberry retain the physical status. On the other hand, monitoring of yoghurt analyzed after a few days of its manufacture and storage at 4°C, shows that there is an increase in contaminant flora which can be concluded that the expiry date not >7 days. In addition, the study shows that sensory-flavored is most appreciated by the consumer.

**Key words:** Milk, goat, cow, yogurt, physicochemical, manufacture, consumer

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### INTRODUCTION

The milk of small ruminants such as goats is of particular economic interest in the developing countries. The production of this type of milk has to be a useful strategy to tackle the problems of undernutrition (Haenlein, 2004). Although, the world production of goat milk has been relatively minor compared to that of bovine milk (2.1 versus 84.6% of the total milk production, respectively), the worldwide goat population has reached 758 million heads with 55% increase during the last 20 years and goat milk production has reached 12.2 million tones with 58% increase during the same period (Haenlein and Abdellatif, 2004). Goats' milk has special nutritional properties that make it attractive to some consumers. It is easier to digest than cows' milk and may have certain therapeutic value (Park, 1994a; Haenlein, 2004).

The use of goat becomes an opportunity to diversify the dairy market since it allows us to develop added value to the fermented products with particular characteristics compared to cow's milk. The major differences between goat's and cow's milk are related to the different proportions of the different kinds of casein and also to the different structure and size of fat globules and protein micelles (Tziboula-Clarke, 2003). All these differences could lead to the milk behaving differently during processing that could affect the final quality of goat's milk dairy products (Vargas *et al.*, 2008). The special

characteristics concerning the composition of goat milk mean that its nutritional utilization is markedly higher than is the case with cow's milk. Thus, the protein of goat milk is more digestible (Park, 1994b; Lopez-Aliaga *et al.*, 2003; Haenlein, 2004) and less allergenic (Lara-Villoslada *et al.*, 2004). Similarly, the fat of goat milk is more digestible (Alferez *et al.*, 2001; Haenlein, 1996) and it may be considered an excellent source of energy for use in various metabolic processes and even for combating metabolic diseases (Sanz-Sampelayo *et al.*, 2007).

However, studies on yogurt from milk of the local breed goats were scanty. Therefore, in this study, researchers would like to evaluate the nutritional and sensory quality before and after storage of goat milk yogurt with reference to cow milk yogurt.

### MATERIALS AND METHODS

Goat and cow milk were obtained from Arid Land Institute Medenine in Tunisia. Milk was collected from number of lactating animals. Then, samples stored in a refrigerator for subsequent processing. All chemicals and media used in this study were of reagent grade.

**Yogurt making:** The step of preparation yogurt is given:

- Standardization: in manufacture of yogurt, milk powder is mixed with 40 g of milk for cow yogurt and 60 g for goat yogurt and sugar

- Seeding close: the close is used because natural yogurt contains lactic acid bacteria. During their growth the bacteria degrade both the lactose into lactic acid, causing a lowering of pH and gelling of the medium with an irreversible structural change
- Packaging: the mixture ferments milk is packaged in jars
- Aromatization: adding flavor, purified strawberry at the bottom of each pot
- Incubation: this is the storage of yogurt in the oven at temperatures 43°C for 4 h
- Cooling: when the acidity reaches a certain threshold (70-80°D), it is necessary to block acidification by inhibiting the growth of lactic acid bacteria which is why it will significantly lower the temperature

**Gross composition:** Total nitrogen was measured by Micro-Kjeldahl Method (AOAC, 1990). Protein was calculated as N×5.38. Fat was determined by the Gerber Method (Bradley *et al.*, 1992). Ash content was determined by dry ashing of the samples for 24 h at 550°C. Moisture content was determined by drying samples overnight at 105°C (AOAC, 1990). Total solids content was determined by Gravimetric Method by drying the samples in an oven at 105°C for 24 h (AOAC, 1990). Total titratable acidity was determined by AOAC (1990) Method. The pH was measured using a pH-meter (HANNA-pH 210, Germany) and the viscosity was measured by a viscometer (Brookfield DV-E).

**Sensory analysis:** Sensory profiling of the yogurt samples was conducted using conventional profiling by a trained panel. Ten judges were selected among the faculty, staff and students of livestock and wildlife laboratory (IRA Medenine) and High Institute of Biology (ISBAM) who had successfully passed standardized tests for olfactory and taste sensitivities as well as verbal abilities and creativity. The panellists were given a hedonic questionnaire to test taste, texture, color, flavor and overall acceptability of coded samples of cow milk yogurt as a control and goat milk yogurt. Both fresh samples and those stored for different period of time (5, 10 and 15 days) of both yogurt types were tested. They were scored on a scale of 1-5 (1 = poor, 2 = fair, 3 = good, 4 = very good and 5 = excellent). Each attribute was evaluated in triplicate and the values were then averaged.

## RESULTS AND DISCUSSION

**Gross composition of fresh milk:** Table 1 shows changes in pH, total acidity, density, viscosity, protein, fat and

**Table 1: Gross composition of goat and cow milk**

Gross composition	Milk goat	Milk cow
pH	6.700	6.750
Acidity (°D)	19.050	17.000
Density	1.029	1.031
Viscosity (Cp)	3.630	3.100
Fat (g L <sup>-1</sup> )	39.630	19.000
Ash (g L <sup>-1</sup> )	7.800	8.270
Protein (g L <sup>-1</sup> )	31.300	27.900

**Table 2: The pH, acidity and viscosity of goat and cow yogurt**

Parameters	Yogurt goat		Yogurt cow	
	Yogurt goat	with aroma	Yogurt cow	with aroma
pH	4.78	4.75	4.7	4.64
Acidity (°D)	73.80	76.50	65.7	67.70
Viscosity (Cp)	1160.00	1496.00	1260.0	1544.00

ash of two types of milk (milk goat and milk cow). Compared to the composition of fresh cow milk, goat milk had higher pH, total acidity, density, viscosity, protein, fat and ash. Moreover, the total protein content was found higher than values reported for goats' milk of different worldwide breeds (Guo *et al.*, 2001; Hadjipanayiotou, 2004; Stelios and Emmanuel, 2004; Guler, 2007; Pirisi *et al.*, 2007) while fat was comparable to goat milk from Turkish breed (Guler, 2007). In general, goat's milk reported to provide higher proportion of total solids, protein and fat than cow milk (Haenlein, 1996). The nutrient compositions of goat milk can be greatly influenced by several factors such as season, stages of lactation, breed, diet, individual animal and environmental management conditions (Haenlein, 2004). Preparation of yogurt slightly changed the level of protein, fat, ash, total solids and moisture for both goat and cow milk products, suggesting the effect of the indigenous micro flora on such constituents. The pH, density and ash of milk goat was remarkably decreased relative by milk of cow but the acidity, viscosity, fat and the protein of milk goat increased relative by milk of cow.

**Gross composition of yogurt:** Table 2 shows changes in pH, total acidity and the viscosity of four types of yogurt (yogurt goat, yogurt of goat with aroma, yogurt of cow and yogurt of cow with aroma). The pH, total acidity and viscosity of four yogurt types (yogurt goat, yogurt goat with aroma, yogurt cow and yogurt cow with aroma) were 4.78, 4.75, 4.7 and 4.64 for pH, 73.8, 76.5, 65.7 and 67.7 for total acidity, 1160, 1496, 1260 and 1544 for viscosity, respectively.

A faster acidification and lower pH values in goat milk yogurt was reported by Bozanic *et al.* (1998). Different behaviour could be explained by the enhancement of the microbial growth, acidity progress and peptidase activity of Lactic acid bacteria in goats' milk (Tamime and Robinson, 1999). Moreover, the activity and growth rate of the starter cultures are strain

Table 3: Colour, flavour, texture and taste of yogurt samples during storage

Parameters	Yogurt goat (preferences)					Yogurt cow (preferences)				
	1	2	3	4	5	1	2	3	4	5
Colour	0	0	3	12	25	0	0	2	7	27
Flavour	0	2	8	12	18	3	0	2	15	30
Taste	0	4	5	14	16	0	3	4	12	25
Texture	0	2	8	14	21	0	4	3	13	23

dependent. Hence, the acidification rate of lactic acid bacteria varied with the type of milk (Vargas *et al.*, 2008).

**Sensory evaluation:** Colour, flavour, texture and taste of yogurt samples during storage are shown in Table 3. The scores of all sensory attributes of goat milk yogurt are significantly lower ( $p \leq 0.05$ ) than those of cow milk yogurt. Goat milk yogurt was evaluated as less consistent and more acid with a non-typical yogurt taste and flavor. Similar sensory characteristics were reported by many researchers (Abrahamsen and Rysstad, 1991; Alichanidis and Polychroniadou, 1996; Duboc and Mollet, 2001; Vargas *et al.*, 2008) of yoghurt manufactured from goat milk.

### CONCLUSION

This study, undertaken in order to contribute to a better understanding of goat milk collected in the Institute of Arid Regions Medenine, focuses on the physicochemical characteristics of this type of milk and to a better use of it in yogurt industry. In terms of physicochemical analyzes, it marks a difference between goat milk and cow's milk. The latter being taken as reference milk, there is a significant difference in fat.

Simple technology has been implemented for the manufacture of yoghurt and the creation of a new product that is the goat yogurt flavored strawberry. Physical analysis showed that the yogurt composition is not significantly modified by the addition of flavor to the above pH parameter. Thus, this analysis shows that the viscosity of the product is about 1160 for natural yogurt Cp 1496 Cp for flavored yogurt that is consistent with the Tunisian standard. After all, researchers notice an improvement in the bacterial quality and organoleptic quality.

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