

# Comparative Analysis of Milk Quality Collected from Holstein Cows and Sicilo-Sarde Sheep Breed in Tunisia

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## ABSTRACT

The objective of this study was to compare the quality of milk produced from Tunisian Holstein cows and Sicilo-Sarde ewes during their milking period. The experience concerned 80 Holstein (mean age 5.2 years; mean weight = 530 kg) and 54 of Sicilo-Sarde ewes (mean age = 6 years; mean weight = 45 kg). The milk samples were taken from the morning and the afternoon milking and added with potassium dichromate. Refrigerated samples were used to determine milk content in fat (MG) and protein (MP) using Milkoscan 4000 after 24 hours of conservation for both cows and ewes. ANOVA was carried using SAS software (version 1997). The results showed that for cows the mean rate of fat (MG) and protein (MP) was respectively  $3.3 \pm 0.5$  % and  $3.4 \pm 0.5$  %. However, for ewe MG and MP were respectively  $7.3 \pm 0.7$  % and  $6.3 \pm 1.1$  %. We found also that the milk component in MG and MP cow's varied during the milking period ( $p < 0.05$ ) compared to the milk ewe's which present only a variation in MG component during the milking period ( $p < 0.05$ ). Besides, the total milk production for ewes was affected by the sex of foetus and the rank of milking ( $p < 0.05$ ). We conclude that the milk quality of Tunisian Sicilo-Sarde ewe contains rates of fat and protein greater than those in Tunisian Holstein cows. The chemical quality of the two kinds of milks is also affected by the stage of lactation. Moreover, milk ewe production is also affected by the sex of foetus and the rank of milking.

**Keywords:** Quality of Milk, Holstein Cows, Sicilo-Sarde Ewes, Fat, Protein

## I. INTRODUCTION

Milk is the secretion result of mammary gland of the mammal animals. It is complex and possesses many chemical and physical components [1]. These later varied among species. In fact, some studies reported that cow milk contains 3.8% fat, 4.6% lactose, 3.1% proteins and 87.5% water [2]. However, milk sheep contains 6% fat, 5.2% proteins and 4.9% lactose [3]. The components of the two kinds of milks are important not only for the nourishment of young, but also for cheese processing [4]. That's why an analysis of milk quality of the dairy cows and sheep is allowed to determine differences in rate component and which factors influencing the yield production [5].

In this context, our paper aims to compare the milk quality of two Tunisian dairy species: cows and ewes.

## II. METHODS AND MATERIAL

### Animals

The study undertook on 80 Holstein cows (mean age = 5.2 years; mean height = 530 kg) and 54 Sicilo-Sarde ewes (mean age = 6 years; mean height = 45 kg) conducted respectively on intensive and semi-extensive system in the north region of Tunisia. The cows were in free stall housing.

### Milk Sample Collection

Milk sample (20 ml) was taken during the milking periods of cows and ewes. For dairy cows, milk samples were taken twice a day, from the morning and the afternoon milking. For dairy ewes, milk samples were taken once a day, from the afternoon milking. Both kind of samples were added with potassium dichromate and refrigerated until the quality analysis.

## Milk Quality Analysis

The milk quality analysis was performed in the laboratory of the office of livestock and pasture of Tunisia after 24 hours of conservation. Refrigerated samples of cows and ewes were used to determine milk content in fat (MG), protein (MP) using Milkoscan 4000.

## Statistical Analysis

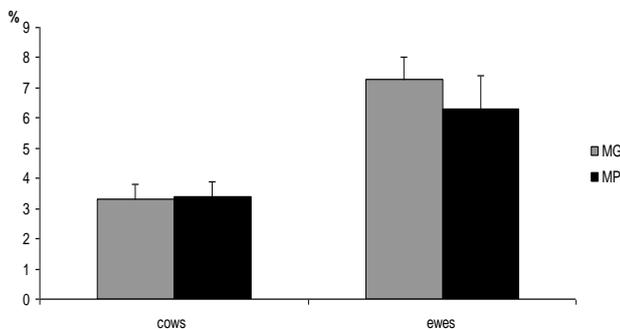
Statistical analysis was carried with SAS software. ANOVA was carried using the General Linear Model procedure (GLM) to determine variation factors on milk quality.

## III. RESULTS AND DISCUSSION

### Milk production and quality

The results showed that the mean daily milk production varied from  $0.4 \pm 0.07$  L for ewes to  $17 \pm 7.5$  L for cows. We found that the total milk production varied from  $108.5 \pm 17.6$  to  $115.7 \pm 24.4$  L respectively for primiparous and multiparous ewes ( $p < 0.05$ ).

Moreover, for cows the mean rate of fat (MG) and protein (MP) was respectively  $3.3 \pm 0.5$  and  $3.4 \pm 0.5$  %. However, for ewe MG and MP were respectively  $7.3 \pm 0.7$  and  $6.3 \pm 1.1$  % (Figure 1).

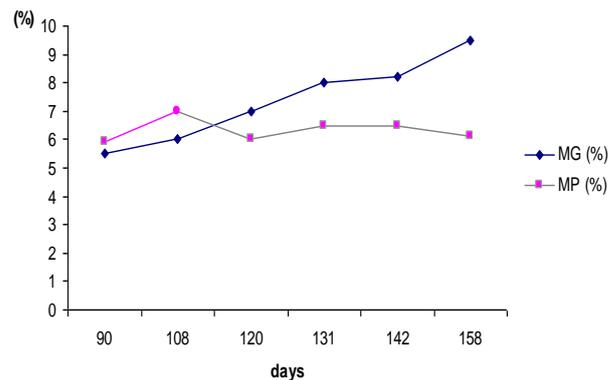


**Figure 1:** Variations of fat (MG) and protein (MP) in Tunisian Holstein cow and Sicilo-Sarde ewe milks.

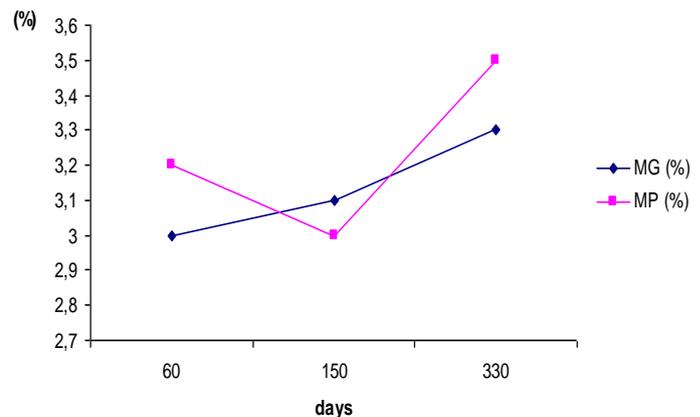
These findings showed that the milk of the Sicilo-Sarde ewe is richer in fat and protein component than the milk of the Hostein cows. Our results are in agreement with those of Boquier and Caja [6] and Coulon et al. [7]. In fact, thanks to their highly rates in fat and protein, the milk ewes is more appropriate to cheesemaking. They reported also that it having a high rate in lactose and solid component [6, 7].

## Milking Stage

Furthermore, the milk component in MG ewe's varied during the milking period ( $p < 0.05$ ). In fact, we found that only MG increased at the end of the milking stage compared to the beginning of the milking stage (Figure 2). However, the milk component in MG ( $p < 0.1$ ) and MP ( $p < 0.05$ ) cow's varied during the milking period. MP increased at the end of the milking stage compared to the beginning of the milking stage (Figure 3).



**Figure 2:** Variation of milk quality of Tunisian Sicilo-Sarde ewes during the milking period.



**Figure 3:** Variation of milk quality of Tunisian Holstein cows during the milking period.

It is clear that milks of cows and ewes are both important for human nutrition but their production and quality component are affected by several factors. In our study, we find that the production and the component in fat and protein of the two kinds of milks are affected by the milking stage. This result is agree with those reported by Coulon et al. [8], Bousslimi et al. [9]. These later have shown that mainly protein increased at the end of the milking period of cow [9,10]. However, there is

fat increasing at the end of the milking period of ewe [6]. This variation has an effect on milk coagulation and cheese yield [11].

#### Sex of the foetus and rang of lactation

Our statistical analysis showed that the total milk production for ewes was affected by the sex of foetus and the rank of milking ( $p < 0.05$ ).

In this way, Djemali et al. [12] found also that the month of lambing and sex lamb affected the milk production of the ewe.

#### IV. CONCLUSION

Our study reports that milk of Tunisian Sicilo-Sarde ewe contains rates of fat and protein greater than those in the milk of Tunisian Holstein cows. But the chemical quality of the two kinds of milks is affected by the stage of lactation. Moreover, we found that milk ewe production is also affected by the sex of foetus and the rank of milking.

#### V. REFERENCES

- [1] Athar IH., Shah MA., 1994. Dairying in Pakistan. Country report. National Agricultural Research Center, Pakistan Agricultural Research Council. Park road, P.O. NIH, Islamabad, Pakistan: 78-82.
- [2] Malcolm EC., Paul W., 1979. Modern milk products. 1<sup>st</sup> Edn, Magraw Hill Brok Company: 81-83.
- [3] Banda JW., 2000. Livestock Development Program. P.O. Box 30549, Lilongwe and H-P Zerfas 3.3 Malawi-Germany: 56-59.
- [4] Kanwal R., Tooqeer A., Mirza B., 2004. Comparative analysis of quality of milk collected from buffalo, cow, goat and sheep of Rawalpindi/Islamabad region in Pakistan. Asian Journal of Plant Sciences, 3 (3): 300-305.
- [5] Marnet PG., Komara M., 2008. Management systems with extended milking intervals in ruminants: regulation of production and quality of milk. J anim Sci 86 (13): 47-56.
- [6] Bocquier, F. et G. Caja, 2001. Production et composition du lait de brebis : effet de l'alimentation. INRA Prod. Anim., 14 (2), 129-140.
- [7] Coulon JL., Delacroix-Buchier A., Martin B., Prisi A., 2005. Facteurs de production et qualité sensorielle des fromages. INRA Prod. Anim., 18(1) : 49-62.
- [8] Coulon, JB., Chilliard, Y. et B. Rémond, 1991. Effet du stade physiologique et de la saison sur la composition chimique du lait de vache et ses caractéristiques technologiques. INRA Prod. Anim., 4, 219-228.
- [9] Bousslimi, K., Djemali, M., Ben Dhiarf, S. et A. Hamrouni, 2010. Facteurs de variation des taux de matière grasse et protéique du lait de vache de race Holstein en Tunisie. Ren. Rech. Ruminants, 17, 399.
- [10] Lovendah P., Chagunda MGG., 2011. Covariance among milking frequency, milk yield, and milk composition from automatically milked cows. J Dairy Sc, 94(11): 5381-5392.
- [11] Martin B., Chamba J.F., Coulon J.B., Perreard E., 1997. Effect of mil chemical composition and clotting characteristics on chemical and sensory properties of Roblochon de Savoie cheese. J Dairy Res, 64: 157-162.
- [12] Djemali, M., Ben Msalem, I. et R. Bouraoui, 1995. Effet du mois, mode et âge d'agnelage sur la production laitière des brebis Sicilo-Sarde en Tunisie. Options Méd., 6, 111-117.