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Factors affecting the somatic cells count in milk of Murciano-granadina goat breed: Preliminary results

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Abstract. Somatic cell count (SCC) in milk is an indicator of the udder's health. The National Association of Murciano-granadina Goat Breeders (CAPRIGRAN) has developed a program in order to improve the quantity and the quality of milk, being the SCC an important milk quality aspect. The aim of this study is to identify the factors significantly affecting the SCC content in milk of Murcia-granadina goats. Data from 18 farms were collected, with a total of 5799 lactations. 10 variables have been analyzed, 7 quantitative (number of births, lactation period days, drying period days, milk production per day, fat contain, protein contain and SCC) and 3 qualitative (type of system, drying treatment and milking valorization). The most influencing quantitative variables in the SCC are: milk production per day and lactation period days and the drying period days. The most influencing qualitative variables are: type of system and milking valorization. Further studies are necessary for better understanding the influence of type of system on the SCC, especially on factors related to facilities and the feeding.

Keywords. Milk quality – Production system – Milk production - Lactation period – Drying period.

Facteurs affectant la concentration de cellules somatiques dans le lait des chèvres de la race Murciano-granadina: Résultats préliminaires

Résumé. La concentration de cellules somatiques (CCS) dans le lait est un indicateur de la santé des mamelles. L'Association d'Éleveurs de chèvres de la Race Murciano-granadina (CAPRIGRAN) a mis au point un programme pour améliorer la quantité et qualité du lait, étant la CCS un important aspect lié à la qualité. L'objet de ce travail est d'identifier les différents facteurs affectant le contenu en cellules somatiques du lait des chèvres de la race Murciano-granadina. On a utilisé les données de 18 fermes, avec un total de 5799 lactations et on a analysé 10 variables, 7 quantitatives (nombre de naissances, jours du période de lactation, jours du période de séchage, production par jour, contenu en graisse, contenu en protéine et CCS) et 3 qualitatives (type de système, traitement de séchage et valorisation de la traite). Les variables quantitatives plus influentes sur la CCS sont la production de lait par jour, la durée du période de lactation et la durée du période de séchage. Les variables quantitatives plus influentes sur la CCS sont le type de système de production et la valorisation du procès de traite. Plus d'études pour mieux comprendre l'influence du type de système de production sur le CCS seraient nécessaires, spécialement au sujet des aménagements et de l'alimentation des chèvres.

Mots-clés. Qualité du lait – Système de production – Production de lait – Période lactation – Période de séchage.

I – Introduction

In Spain, there are about 500 thousand animals of Murciano-granadina, these breed being the most important Spanish breed of dairy goats (Feagas, 2013). A genetic selection scheme for Murciano-granadina breed is working since 24 years. An annual control of the milk production for 57 thousand animals is used to verify the selection scheme. This control concerns the quantity and the quality of milk, the last one through indicators. One important quality indicator is the somatic cell count (SCC) which is used like measure of udder health.

According to different studies, the content of SCC in goat milk is related to several causes such as dam reproductive phase (Mehid *et al.*, 2010), milk quality (Jiménez-Granado *et al.*, 2012a), milk production (Jimenez-Granado *et al.*, 2012b), or udder drying method (Sánchez-Rodríguez *et al.*, 2008), among others.

At present, SCC in milk is also used as a criterion for milk payment by dairies to farmers (Pirisi *et al.*, 2008). So the deepening in the knowledge on factors influencing the milk SCC content is necessary.

The aim of this study is to identify the factors significantly affecting SCC content in milk of Murciano-granadina goats.

II – Methodology

Data from 18 dairy goat farms belonging to the Spanish Association of Murciano-granadina Goat Breeders (CAPRIGRAN) are used in this work. All these farms participate on the milk quality improvement program of this breed. All the productive goats of each farm have participated in the milk recording process. Only complete lactations for the period from January 2010 to December 2011 have been considered (a total of 5799 lactations).

From interviewing farmers and technical advisors, farms have been classed according to 3 qualitative variables: type of system (No grazing/Grazing), drying off treatment (Yes/No) and milking valorization (Low/High) (this refers to the good performance of the task of milking). 7 quantitative variables have been studied concerning the milk recording: number of births, lactation period days, drying period days, milk production per day (l/day), fat content (%), protein content (%) and SCC (1000 cells/ml). These 10 total analyzed variables are considered the most important according to the bibliography and to the experts working in the milk quality improvement program in de studied area.

First, descriptive statistic analyses (mean and standard deviation) were performed on quantitative variables. Then, a correlation analysis between the SCC and the other quantitative variables was performed. Finally, 3 variance analyses (ANOVA) were performed looking for significant differences of SCC (for total data and by considering each lactation order) according the 2 options of each of 3 qualitative variables. Statistical analyzes were performed using the SPSS v. 15.

III – Results and discussion

Table 1 shows results of the descriptive analysis (mean and standard deviation) on quantitative variables.

Table 1. Descriptive analysis (mean and standard deviation) on quantitative variables

Variables	Mean	Standard desv.
Number of births	1.64	0.67
Lactation period days	280.7	75.8
Drying period days	85.9	39.6
Milk production per day (kg)	1.84	0.62
Fat (%)	5.14	0.86
Protein (%)	3.51	0.42
Somatic cell count (1000 cells/ml)	1123.0	858.8

Table 2 shows results of the correlation analysis between the SCC and the quantitative variables.

Table 2. Correlation analysis between the somatic cell count and the other quantitative variables

Variables	Correlations	Variables	Correlations		
Milk production per day (kg)	Corr Pearson	-0.122**	Lactation period days	Corr Pearson	0.045**
	Sig.	0.000		Sig.	0.001
	N	5799		N	5799
Fat %	Corr Pearson	-0.095**	Drying period days	Corr Pearson	-0.039*
	Sig.	0.000		Sig.	0.020
	N	5781		N	5799

Significance levels: *P<0.05; **P<0.01; ***P<0.001.

Concerning the number of births has not been found any correlation with the SCC. The *milking production per day* has a negative correlation with the SCC. Jiménez-Granados *et al.* (2012a) obtained the same result in the Florida caprine breed (with animals producing more than 3 kg of milk per day). Similarly, Barron-Bravo *et al.* (2013) obtained this result in several goat breeds. Concerning the *protein content*, there has not been found any correlation with the SCC. Fekadu *et al.* (2005) obtained a similar result while Bernacka (2006) and Jiménez-Granados *et al.* (2012b) found positive correlations between the protein percentage and the SCC. Concerning the *fat content* a negative correlation with the SCC has been obtained.

Regarding the *lactation period days*, there is a positive correlation with the SCC. Gomes *et al.* (2005) conclude that the SCC increases as lactation progresses regardless of the presence of infection. Moreover, results showed that the *drying period days* are negatively correlated with the SCC in milk. It seems that a short drying period of the mammary gland after several months of production prevents its recovery; and that promotes an increase of the SCC in the next lactation.

Results of ANOVA of the SCC (for total data and for each lactation number) corresponding to the 3 qualitative variables of study are shown in Table 3.

ANOVA results of the SCC respect to the *type of system*, show a significative difference ($p < 0.001$) being lower the SCC in the grazing systems. The influence of this variable could be associated mainly to factors extrinsic to the animal, such as feeding and trauma affecting the mammary gland. Sturaro *et al.* (2013) compared traditional grazing systems with more intensified systems and obtained similar results. In relation to the variable *drying treatment*, the ANOVA results of total data show significant differences. Lower SCCs are found when the drying treatment is done for the total data and lactations 1, 2 and Lactations 5 to 9. However, the contrary occurs for the lactations 3 and 4, so results are not clear. Concerning the variable *milking valorisation*, the ANOVA

results show significative differences ($p < 0.001$) being lower the SCC when the valorization is high (the farmer has a good performance of milking process). A bad performance of milking process promotes intramammary infection that is the main cause of the increase in SCC in goat milk (Gonzalo *et al.*, 2002).

Table 3. Comparison of mean somatic cell counts of the categories of the variables *type of system, drying treatment and milking rating* and the levels of significance obtained in the corresponding ANOVA

Variable		Total	L1	L2	L3	L4	L5 to 9
Type of system***	NG	1576±24	1216±36	1572±58	1786±56	1767±82	1944±49
	G	990±12	701±16	927±26	1169±29	1251±33	1421±38
	Total	1122±11	817±15	1047±25	1309±27	1354±32	1588±32
Drying treatment***	Yes	1045,3±156	–	945±33	1327±42	1362±48	1430±50
	No	1.208±16,1	–	1191±37	1291±35	1345±42	1699±40
	Total	1.122,6±11,3	–	1047±25	1309±27	1353±32	1588±32
Milking valorisation***	Low	1.438±23	1098±31	1621±61	1679±57	1364±73	1869±48
	High	1.017±13	703±17	914±25	1186±30	1352±36	1452±39
	Total	1123±11	817±15	1047±25	1304±27	1354±32	1588±32

L1, L2, L3, L4, > L4: orders of lactations: 1, 2, 3, 4 and more than 4 respectively.

NG/G, no grazing/grazing; Low/High: this refers to the good performance of the task of milking.

Significance levels: *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$.

IV – Conclusions

The milk somatic cell accounts of goat herds belonging to the Association of Murciano-granadina Goat Breeders reflects an important variability.

The quantitative variables that influence the somatic cell count are mainly the following: milk production per day, lactation period days and drying period days. Concerning the qualitative variables, the type of system and the milking valorization have high influence in the somatic cell count while the influence of the drying treatment is not clear. It would be interesting to deepen in the influence of the variable *type of system* in de SCC, in order to establish how factors extrinsic to the animal, such as feeding and facility characteristics influence this variable.

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