CIHEAM
Options Méditerranéennes

Milk production and composition of “Beni Arouss” North Moroccan local goat

El Otmani S., Hilal B., Chentouf M.

in

Chentouf M. (ed.), López-Francos A. (ed.), Bengoumi M. (ed.), Gabiña D. (ed.). Technology creation and transfer in small ruminants: roles of research, development services and farmer associations

Zaragoza : CIHEAM / INRAM / FAO
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 108

2014
pages 457-461

Article available on line / Article disponible en ligne à l’adresse :

---

http://om.ciheam.org/article.php?IDPDF=00007667

To cite this article / Pour citer cet article

El Otmani S., Hilal B., Chentouf M. **Milk production and composition of “Beni Arouss” North Moroccan local goat.** In : Chentouf M. (ed.), López-Francos A. (ed.), Bengoumi M. (ed.), Gabiña D. (ed.). *Technology creation and transfer in small ruminants: roles of research, development services and farmer associations.* Zaragoza : CIHEAM / INRAM / FAO, 2014. p. 457-461 (Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 108)

CIHEAM

http://www.ciheam.org/
http://om.ciheam.org/

Milk production and composition of "Beni Arouss" North Moroccan local goat

S. El Otmani[1], B. Hilal[1,2] and M. Chentouf[1]

[1]INRA – Centre Régional de Tanger (Morocco)
[2]Institut Agronomique et Vétérinaire Hassan II (Morocco)

Abstract. The aim of the study was to investigate the milk potential of 'Beni Arouss' North Moroccan local goat, under intensive and extensive nutritional regimes. During two years (2011-2012), milk yield was measured once per month and milk samples were collected during the lactation period. Solid non-fat content, fat, protein, and lactose were analysed by infrared method. Does produced more ($P < 0.01$) milk under the intensive, compared to the extensive nutritional regime (597.9 ± 264.35 g per day *versus* 504.2 ± 189.59 g per day). Milk from intensive production system was higher protein 4.32% and fat 5.87% content ($P < 0.001$) than extensive production system, which had 3.9% in protein and 3.36% in fat. In contrast lactose content was significantly higher in extensively reared (4.61% *vs* 4.42%, $P < 0.01$). No differences were observed for defatted dry extract between production systems. In conclusion, the local goat "Beni Arouss" produces more milk in the intensive system that is richer in fat and protein compared to extensive system.

Keywords. Local goat – Milk yield – Milk composition – Production system.

La production et la composition du lait de la chèvre locale du nord du Maroc «Beni Arouss»

Résumé. *L'objectif de ce travail est d'étudier le potentiel du lait de la chèvre locale du nord du Maroc «Beni Arouss», sous les régimes nutritionnels intensifs et extensifs. Durant deux années (2011-2012), la production laitière est mesurée une fois par mois et des échantillons du lait ont été prélevés au cours de la période de lactation. La teneur en extrait sec dégraissé, en matières grasses, protéiques et en lactose ont été analysés par la méthode infrarouge. La production laitière en intensif est supérieure à la production en extensif ($P < 0,01$) avec 597,9 ± 264,35 g/jour* vs *504,2 ± 189,59 g/jour respectivement. Le lait en système intensif contient plus de matières protéiques 4,32% et de matières grasses 5,87% ($P < 0,001$) comparativement au système extensif qui contient 3,9% de matières protéiques et 3,36% de matières grasses. Cependant, la teneur en lactose est significativement plus élevée en extensif (4,61%* vs *4,42%, $P < 0,01$). Aucune différence n'est observée pour l'extrait sec dégraissé entre les systèmes de production. En conclusion, la chèvre locale "Beni Arouss" produit plus de lait dans le système intensif qui est plus riche en matières grasses et en matières protéiques par rapport au système extensif.*

Mots-clés. *Chèvre locale – Production laitière – Composition du lait – Système de production.*

I – Introduction

In the north of Morocco, goat livestock is estimated at 665,000 head, 40% of livestock in the region and 12% of national goat population (Jout and Karimi, 2004). Currently, there are two production systems in the region, an extensive system based exclusively on sylvo-pastoral resources which dominates the sector and semi extensive system with dairy production. Actually, northern goat farmers privilege import foreign races or crossing local goats with imported, because these races are characterized by high milk production. But unfortunately, these crossings are uncontrolled which may cause genetic erosion and extinction of local goat population (Nsoso and Morake, 1999). These local breeds are characterized by a good adaptation to harsh climatic conditions and resistance to local pests and diseases. Therefore, the development of

characterization, preservation and improvement program of local goats is necessary. In this context, the aim of the study was to investigate the potential of milk 'Beni Arouss' North Moroccan local goat, under intensive and extensive nutritional regimes.

II – Materials and methods

During two years (2011-2012), measurements of milk production were performed once per month in intensive and extensive farms during lactation period in the north of Morocco. Extensive system was followed in four farms with local goat population of northern Morocco "Beni Arouss" and located in rural commune of Beni Arouss and Tazrout (Province of Larache). Feed of this livestock was based on forest resources. Intensive farming system was monitored in experimental field of INRA Centre of Tangier located at Bougdour. Livestock of goat "Beni Arouss" in this farm received in complementation of basic diet (forage "barley or bersim" and oat hay) a commercial compound fed *ad-libitum* for lactating goats. Monthly measurements of milk performance were to weigh 24 hours milk production during lactation period estimated at 120 days and to take samples of milk for laboratory analysis. Studied lactation number was in order of 176 in extensive and 38 in intensive farming system. Milk samples collected were analyzed by infrared using MilkoScan™ Minor to determine fat, protein, lactose and defatted dry extract content. 133 samples of milk in extensive system and 38 in intensive were analyzed. Data processing was carried out using table of Excel 2007 and ANOVA with single factor (Anova1) and averages comparison were performed using SAS software 2001 (SAS, 2001).

III – Results and discussion

1. Milk production

Daily milk production of north Moroccan local goat "Beni Arouss" was estimated at 597.94 ± 264.35 g/day in intensive farming system and 504.19 ± 189.59 g/day in extensive with significant intra-individual significant variability (Table 1). This variability of production potential is favorable for realization of selection program that can significantly improve herds production average. Milk production obtained was similar to that cited by Abader *et al*. (1985) in extensive system with northern local population in Chefchaouen which was 530 g/day, while it was lower than in Hassani (1997) with 630 g/day in extensive system with western Rif local population in Beni Idder. Milk production was about 71.75 ± 31.72 kg / lactation in intensive and 60.50 ± 22.75 kg/lactation in extensive farming system. The estimated milk production per lactation was higher than that recorded by Hassani (1997) with 59 kg/lactation at western rif local population. However, Abader *et al.* (1985), Balafrej (1999) with northern local population in Chefchaouen and Naji (2010) with "Beni Arouss" goats recorded 96 kg, 100 kg and 130 kg respectively that superior to milk production obtained with "Beni Arouss" goat in intensive and extensive systems. Milk production of Draa goat in southern Morocco was estimated at 142 liters/150 day of lactation that is greater than our results (Hossaini-Hilali and Mouslih, 2002). Milk production per day and per lactation recorded in intensive system were slightly but significantly higher than extensive system (Table 1). This superiority can be explained by the satisfaction of dietary requirements in intensive system compared to extensive.

Table 1. Mean values of milk production per day and per lactation period in intensive and extensive systems ($n_{extensive}$ = 176, $n_{intensive}$=38)

	Milk production (kg/lactation)	Daily milk production (g/day)
Extensive	60.50^{b} ± 22.75	504.19^{b} ± 189.59
Intensive	71.75^{a} ± 31.72	597.94^{a} ± 264.35
Probability	0.011	0.011
Signification	S	S

^{a,b} : values followed by different letters are statistically different at 5%.

S : significant. (P<0.05).

2. Milk composition

Fat and protein content in milk produced in intensive system were significantly higher than milk produced in extensive system respectively 5.87% *vs* 3.36% (P<0.000) and 4.32% *vs* 3.87% (P<0.000) (Tables 2 and 3). These differences allow a higher fat and protein production in intensive system respectively 4.22 vs. 2.05 kg (P<0.000) and 3.15 kg *vs* 2.51 kg (P<0.05). This significant difference between fat and protein content was result of feeding livestock. Protein content is favored by energy level from quickly fermentable sugars presence (Fabry, 2006) which explained the high content in goats receiving compound feed in intensive system. While fat is favored by cellulose content (Fabry, 2006). Despite extensive feed was richer in cellulose, fat was less compared to intensive receiving oat hay and forage. Fat content obtained in intensive and extensive system was higher than that reported for Saanen race (2.7%, Bouloc, 1992). However, fat in Alpine milk and average of goat milk respectively [3,43% (Marnet *et al.,* 2005) and 3,8% (Park *et al.,* 2007)] were similar to Beni Arouss in extensive and lower than in intensive. Protein content obtained was higher than those reported for Saanen [2.8% (Weppert and Heyes, 2004)], Alpine (2.4%, Zeng *et al.,* 1997; 3,06%, Marnet *et al.,* 2005) and average of goat (3,4%, Park *et al.,* 2007).

Table 2. Mean values of composition of intensive and extensive systems milk ($n_{extensive}$ = 133, $n_{intensive}$=38)

	Fat (%)	Protein (%)	Lactose (%)	Defatted dry extract (%)
Extensive	3.36^{b} ± 1.42	3.87^{b} ± 0.71	4.61^{a} ± 0.43	9.29 ± 0.43
Intensive	5.87^{a} ± 1.30	4.32^{a} ± 0.68	4.42^{b} ± 0.19	9.40 ± 0.19
Probability	0.000	0.000	0.009	0.45
Signification	VHS	VHS	HS	NS

^{a,b} : values followed by different letters are statistically different at 5%.

NS : not significant (P>0.05).

HS : highly significant (P<0.01).

VHS : very highly significant (P<0.001).

In contrast, lactose content in milk produced by extensive system was higher than intensive system (4.42% *vs* 4.61%; P<0.01) but no difference was observed for total production during lactation (9.29 *vs* 9.40; P>0.05).

The lactose content in extensive was higher than that reported by Naji (2010) which was 3% while it was lower than Kouniba *et al.* (2007) which was 5% with northern local population in extensive system. The obtained lactose content in “Beni Arouss“ goat milk was higher than the Al-

pine race (4.16%; Zeng *et al.*, 1997), Saanen (4.15%. Trujillo *et al.*, 1997) and average of goat (4,1%, Park *et al.,* 2007) while it was similar to that reported in the local population of Tenerife island (4.47% Puerto *et al.*, 2004).

No difference was observed regarding defatted dry extract content and production (Tables 2 and 3). But it was higher than that reported by Park *et al.,* (2007) as average of goat milk (8,9%).

Table 3. Mean values of fat, protein, lactose and defatted dry extract production per lactation period in intensive and extensive systems ($n_{extensive}$ = 133, $n_{intensive}$=38)

	Fat/lactation (kg)	Protein/lactation (kg)	Lactose/lactation (kg)	Defatted dry extract/lactation (kg/lactation)
Extensive	2.05^{b} ± 1.13	2.51^{b} ± 1.11	2.95 ± 1.04	5.98 ± 2.2
Intensive	4.22^{a} ± 2.27	3.15^{a} ± 1.68	3.03 ± 1.36	6.66 ± 3.3
Probability	0.000	0.02	0.75	0.19
Signification	VHS	S	NS	NS

^{a,b} : values followed by different letters are statistically different at 5%.

NS : not significant (P>0.05).

S : significant (P<0.05).

VHS : very highly significant (P<0.001).

IV – Conclusion

Local goat of northern Morocco “Beni Arouss” produces slightly more milk in the intensive farming system that is richer in fat and protein content. Dairy performance recorded high variability. An economic study of the two systems is necessary. Program selection and genetic improvement of performance should be established to improve the productivity of goat livestock in northern Morocco “Beni Arouss”.

Acknowledgments

The authors are grateful to farmers who helped to achieve this work.

References

Abader M., 1985. Caractérisation de l’élevage caprin dans la province de Chefchaouen performances et système de production, Memory 3th cycle in agronomy, option: animal production, ENA Meknès.

Balafrej M., 1999. Conduite et productivité des élevages caprins dans la région de chefchaouen, Memory 3th cycle in agronomy, option: animal production, ENA Meknès.

Bouloc N., 1992. Courbes de lactation des chèvres : quelque élément sur leur forme, *La chèvre,* n° 193, pp. 15-17.

Fabry L. 2006. Alimentation du bétail et qualité du lait, 3 p.

Hassani A., 1997. Impact de l’élevage et des populations sur les ressources naturelles dans le Rif Occidental : Cas de la commune rurale de Béni Idder, Memory 3th cycle in agronomy, option: animal production, ENA Meknès.

Hossaini-Hilali J. et Mouslih Y., 2002. La chèvre Draa, Potentiel de production et caractéristiques d’adaptation aux contraintes de l’environnement aride. In: *Animal Genetic Resources*, Food and Agriculture Organization of the United Nations, vol. 32, pp 49-56.

Jout J. and Karimi A., 2004. Etat des lieux et problèmes de développement de la chèvre dans la zone nord. Dans : Elevage caprin : Quelle stratégie de développement, 7ème édition de la foire caprine de Chefchaouen, Chriqi A. (ed.), Chefchaouen, Maroc, pp. 13-20.

Kouniba A., Berrada M. and El Marakchi A., 2007. Étude comparative de la composition chimique du lait de chèvre de la race locale Marocaine et la race alpine et évaluation de leur aptitude fromagère. In: *Revue Méd. Vét.,* 158, 03, pp. 152-160.

Marnet P.-G., Gomis B., Guinard-Flament J., Boutinaud M. and Lollivier V., 2005. Effet d'une seule traite par jour (monotraite) sur les performances zootechniques et les caractéristiques physico-chimiques du lait chez les chèvres Alpine à haut potentiel. In: *12ème Renc. Rech, Ruminants,* pp. 225-228.

Naji M., 2010. Caractérisation génétique de la population caprine «Beni Arouss» de la région Tanger-Tétouan, Memory 3th cycle in agronomy, option: animal production, ENA Meknès.

Nsoso S.J. and Morake G.T., 1999. A critical look at the use of exotic bulls and a proposed breeding strategy under traditional farming in Botswana. In: *South African Journal of Animal Science*, 29, pp. 100-104.

Park Y.W., Juarez M., Ramosc M., Haenlein G.F.W., 2007. Physico-chemical characteristics of goat and sheep milk. In: *Small Rum. Res.,* 68, pp. 88-113.

SAS, 2001. SAS user's guide, *Statistics (Version 8.01), Cary, NC: SAS Institute, Inc. SAS.*

Trujillo A., Guamis B. and Carretero C., 1997. Las proteinas mayoritarias de la leche de cabra. In: *Alimentaria,* 285, pp. 19-27.

Weppert M. and Hayes J., 2004. Direct genetic and maternal genetic influences on first lactation production in four breeds of dairy goats. In: *Small Rum. Res.*, 52, pp. 173-178.

Zeng S., Escobar E. and Popham T., 1997. Daily variations in somatic cell count, composition, and production of Alpine goat milk. In: *Small Rum. Res.*, 26, pp. 253-260.