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Abstract. In Lebanon, Shami goats which are raised and bred randomly by farmers have a large variation in their performance. As a result, many farmers are turning toward famous dairy European breeds. The performance (i.e. milk production, twinning and growth rate) of Shami and Saanen goats was studied for 3 years under local environmental conditions. Average milk yield (from 0-300 days of lactation) was slightly higher ($P > 0.05$) in Shami goats (450 ± 102.7 kg) compared to Saanen (445 ± 110 kg). Average twinning rate was also higher in Shami goats (1.75 kid/goat) compared to Saanen (1.08 kid/goat). Body weight of Shami goats ranged from 67.4 ± 14.1 kg at parturition to 64.8 ± 10.4 kg after 270 days whereas that of Saanen goats ranged from 51.5 ± 9.3 kg to 51.2 ± 6.6 kg. Average daily growth (g/day) of kids after 270 days was higher ($P < 0.05$) for Shami kids (males 132.8 ± 31.2; females 108.6 ± 26.5) as compared to Saanen kids (males 117.5 ± 27.2; females 98.6 ± 25.2). Overall, Shami goats have a milk production potential similar to that of Saanen. Shami goats have a higher twinning rate and kid growth rate than Saanen goats, so they can be considered as a dual purpose breed. Apparently, Shami goats seem to adapt well to the environmental conditions (climate, diseases and nutrition) of Lebanese and Mediterranean climate. Thus there is a potential to exploit the genetic productive traits of this breed to enhance milk and meat production in Mediterranean countries.

Keywords. Damascus goat – Shami – Saanen – Milk production – Twinning – Growth rate.

Comparaison des performances des chèvres de races Shami (Damascus) et Saanen élevées sous des conditions environnementales similaires au Liban

Résumé. *Au Liban, les chèvres Shami sont élevées et croisées d'une façon aléatoire par des petits groupes d'éleveurs avec une grande variabilité. En conséquence, plusieurs éleveurs se sont orientés vers les élevages laitiers européens. Les performances des chèvres Shami et Saanen sont étudiées durant trois années consécutives. Le rendement moyen de lait (lactation de 0-300 jours) est légèrement supérieur ($P > 0,05$) pour Shami (450 ± 102,7 kg) par comparaison à Saanen (445 ± 110 kg). Le taux moyen des naissance doubles chez la chèvre Shami (1,75 petits/chèvre) est aussi plus élevé que chez la chèvre Saanen (1,08 petits/chèvre). Le poids vif moyen de la chèvre Shami varie entre 67,4 ± 14,1 kg lors de la parturition et 64,8 ± 10,4 kg après 270 jours, tandis que pour la race Saanen, ce paramètre est de, respectivement, 51,5 ± 9,3 kg et 51,2 ± 6,6 kg. La croissance journalière (g/jour) des petits après 270 jours est plus importante ($P < 0,05$) pour Shami (mâles 132,8 ± 31,2 ; femelles 108,6 ± 26,5) que pour Saanen (mâles 117,5 ± 27,2 ; femelles 98,6 ± 25,2). Globalement, les chèvres Shami et Saanen ont un potentiel de production laitière similaire. Mais comme les chèvres Shami présentent une meilleure aptitude aux naissances doubles et une meilleure croissance des agneaux, cette race peut donc être considérée comme une race à double fin. Apparemment, les chèvres Shami sont mieux adaptées aux conditions environnementales du Liban. Il y a un potentiel pour exploiter les caractères génétiques de productivité de cette race afin d'améliorer la production de lait et de viande dans les pays méditerranéens.*

Mots-clés. *Chèvres Damascus – Shami – Saanen – Production laitière – Naissances doubles – Croissance.*

I – Introduction

Breeding and selection programs of goats are widely carried out in many countries and have lead to the development of several specialized breeds (Dubeuf *et al*., 2004; Morand-Fehr and Lebbie,

2004). However, in West Asia and North Africa, less research is carried out on goat as compared to sheep (Iñiguez, 2005).

After India, the Mediterranean area is the main goat milk and goat cheese producer (Dubeuf *et al*., 2004). In the eastern Mediterranean region (Lebanon, Syria, Cyprus) the Shami or Damascus goat is well appreciated by farmers for its high performance (milk yield and twinning). Several breeding programs were applied on this breed in Syria, Cyprus and Lebanon. However, in a review on goat breeding comparing the performance of many of the world breeds there was little reference to the Shami (Damascus) goat (Shrestha and Fahmy, 2005, 2007a,b).

In Lebanon, there are lines of the Shami breed raised and bred by farmers in small groups (1-15 heads). However, its appearance (i.e. colour, shape of head, ears, body weight) as well as the production performance (milk yield, twinning) reported by farmers is quite variable. Therefore, the Lebanese Agricultural Research Institute (LARI) started in 1998 a nucleus breeding project using Shami goats that originated from Lebanese farmers, Cyprus or the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD). The results (1998-2002) showed that average milk production of the herd was 523 kg (60-240 days, i.e. excluding the first 60 days) (Khazaal, 2005, 2006). The highest recorded milk yield by one of the goats was 798 kg within the period of 60-240 days post kidding.

However, some goat farmers and due to the random breeding and variation in performance observed in their "Shami" goats, consider that European breeds would perform better than local Shami or other goats. As a result, European breeds (mainly Saanen and Alpine) are being imported at a high price (500-600 US $) compared to a price of local Shami of 200-300 US $.

The present study aims to compare the performance (reproduction, milk yield and growth rate) of Shami and Saanen goats raised under the same environmental conditions (climate, nutrition and management) of Lebanon.

II – Materials and methods

The number of goats used during the study is shown in Table 1. The Shami goats originated from LARI. Saanen goats were imported by "Centre Agricole du Nord, Liban" from CAPRIGÈNE in France. The study started in 2004 and was completed at the end of 2006. At the start of the study, goats were in their first, second and third lactation. Goats were excluded from the experiment after their fourth lactation and replaced with heifer at their first lactation.

Table 1. Type and number of animals used during the study

Breed	Parity	No. of animals used		
		2004	2005	2006
Shami	Fourth		2	1
	Third	2	1	2
	Second	3	2	5
	First	4	5	5
	Total	9	10	13
Saanen	Fourth			3
	Third		3	4
	Second	3	4	
	First	4		5
	Total	7	7	12

The animals were kept in one barn under a semi-intensive system of management and were allowed for a total of 6-8 hours (morning and afternoon) to graze in the fields of the station on

forage crops (barley, rye-grass, maize, alfalfa) or natural pasture and cereals by-products. Depending on age and physiological stage, the animals were also offered 0.5-1.5 kg of concentrate (16% CP; 11 MJ/kg DM). All animals were vaccinated for FMD, enterotoxaemia, internal and external parasites. Water was freely available.

Within the first 60 days of lactation, kids suckled at will and milking was carried out once a day. From 60-90 days, kids were partially weaned (separated from dams at night) and goats were milked twice daily. Every 2 weeks, milk production, weight of goats and kids were recorded. When milk was recorded at 60 or 90 days, kids were separated from their dams for 24 hours. Full weaning of kids was applied after 90 days of age.

Data on the performance of the animals was accumulated over 3 years. The data was then statistically analysed (Independent t-test or ANOVA) including breed as a factor and presented as average of the 3 years.

III – Results

1. Milk production

The average milk yield (from 60-240 days or from 0-300 days of lactation) was similar (P > 0.05) in Shami goats and Saanen (Table 2). If the data is presented as average of each year, milk yield of Saanen improved in the 2nd and third year of the study.

Table 2. Overall average of the years 2004-2006 for milk yield (kg) or daily milk yield of Shami and Saanen goats from 60-240 days or from 0-300 days of lactation

Breed		60-240 days†	Average (kg/day†)	0-300 days††	Average (kg/day††)
Shami	Average	361	2.01	450	1.50
N = 28	Std. dev.	81.5	0.45	100.0	0.33
Saanen	Average	350	1.95	446	1.49
N = 21	Std. dev.	87.1	0.48	109.8	0.37

†180 days, i.e. from day 60 until day 240.
††Including residual milk during the first 60 days.

2. Body weight

The changes in body weight of Shami and Saanen goats from parturition until 270 days are shown in Table 3. Shami goats were heavier (P < 0.05) than Saanen goats. The maximum reduction in body weight occurred 3-4 months after parturition reaching 17.2% in Shami while it was 9.4% for Saanen goats.

Table 3. Average bodyweight (kg) of Shami and Saanen goats from parturition until 270 days of lactation

Breed		At birth	30 days	60 days	120 days	180 days	240 days	270 days
Shami	Average†	67.4	60.7	59.1	55.9	57.7	62.1	64.8
N = 28	Std. dev.	14.1	12.6	12.3	10.2	10.7	10.7	10.4
Saanen	Average†	51.5	47.0	46.6	46.3	46.0	48.8	51.2
N = 21	Std. dev.	9.3	9.6	9.2	7.5	7.6	7.2	6.6

†Average of goats for the 3 years.

3. Growth of kids

From birth until 60-90 days of age bodyweight of female and male kids were similar (P > 0.05) (Table 4). However, from 120 days onwards the difference in bodyweight between Shami and Saanen female and male kids was growing and became significantly higher (P < 0.05) after 240 days. The average daily growth (ADG, g/day) of kids after 270 days was higher for Shami kids (males 132.8 ± 31.2; females 108.6 ± 26.5) compared to Saanen kids (males 117.5 ± 27.2; females 98.6 ± 25.2).

Table 4. Average (±SD) body weight (kg) of Shami and Saanen kids from birth until 300 days of age

Breed	Sex	No. of animals	At birth	30 days	60 days	120 days	180 days	240 days	300 days
Shami	Male	26	4.3 (±0.8)	10.7 (±2.1)	16.2 (±3.9)	23.6 (±7.2)	30.4 (±8.7)	38.0 (±9.8)	45.4 (±7.9)
	Female	15	4.1 (±0.8)	10.0 (±1.9)	14.3 (±2.7)	19.5 (±3.8)	24.9 (±6.0)	29.6 (±6.6)	37.2 (±5.7)
Saanen	Male	17	4.1 (±0.7)	10.0 (±3.0)	14.6 (±3.8)	21.3 (±6.1)	26.4 (±6.9)	32.1 (±6.1)	40.6 (±8.7)
	Female	15	3.9 (±0.6)	8.8 (±2.1)	13.2 (±2.1)	20.9 (±4.3)	24.2 (±5.5)	28.2 (±6.2)	35.2 (±7.5)

4. Reproductive performance

The litter size of Shami and Saanen goats during the 3 years of the experiment is presented in Table 5. The kidding rate for the 3 years was higher in Shami goats (1.75 kids/goat) compared to Saanen (1.08 kids/goat). The low kidding rate for Saanen goats (1.08 kid/goat) resulted from a high abortion rate (23.1%), as compared to 3.1% for Shami goats. If aborted kids were included in the calculation of kidding rate it would have been 1.46 kids/goat for Saanen and 1.81 kids/goat for Shami.

Table 5. Litter size of Shami and Saanen goats during 3 years

Breed	No. of goats	Triplet	Twin	Single	Abortion	No. birth	Aborted kids	Total kids
Shami	32	5	16	9	1	1	2	56
Saanen	26	1	8	9	6	2	10	28

IV – Discussion

1. Milk production

For most developed countries, recorded milk yield includes milk produced during the first 60 days as kids are fed milk replacers. However, in the present study, milk yield included only residual milk left as excess of the kids needs during the first 60 days. Furthermore, the average milk yield at 60 days was 2.8 for Shami and 2.7 kg for Saanen. Thus, in order to simplify the comparison of milk yield with other studies, milk yield during the first 60 days could roughly be estimated at around 120 kg which, if added to the average will bring overall milk yield to around 570 kg (1.9 kg/day) for Shami and 566 kg (1.8 kg/day) for Saanen.

Milk yield of Shami goats in the present study was much higher than that reported for Iranian (Monem *et al*., 2005), Turkish (Gursoy, 2005) and many native goat breeds of West Asia (Hailat,

2005; Kassem, 2005; Mavrogenis, 2005). It was also better than the milk yield of Shami goats recorded by ACSAD in Syria (Khoury, 1996). Performance of Shami goats in other studies was similar or lower than the present study (Hadjipanayiotou, 1992, 2004; Guney *et al*., 2006). Similarly, milk yield of 17 crossed Anglo-Nubian × Damascus goats (separated from their kids 2 days post-partum) from 30-150 days of lactation on intensive (1500 g concentrate HC) or semi-intensive (750 g concentrate LC) produced 2.23 *vs* 1.81 kg/day (Landau *et al*., 1993).

In the literature there are contradicting reports on the performance of many continental breeds. For instance, in 2004 milk yield for 305 days lactation were reported at 1156 kg for Saanen, 1043 kg for Alpine, 975 kg for Toggenburg and 843 kg for Nubian goat (ADGA, 2007). In France, milk yield during 273-275 days was 786 kg for Saanen and 756 kg for Alpine (Sopexa, 2000). Furthermore, records of the dams of Saanen goats (from CAPRIGÈNE) in the present study varied from 775 kg in 287 days (i.e. 2.7 kg/d) to 1447 kg in 308 days (i.e. 4.69 kg/d). However, in a review by Shrestha and Fahmy (2007a), records for total milk yield of high grade European goats including Saanen, Alpine, Toggenburg, Nubian, and Granadina ranged from 339 to 513 kg. In other study the Spanish Granadina breed produced 513 kg (Falagan *et al.*, 1993; Falagan and Mateos, 1996) while milk yield of 72 Saanen dairy goats from 3 to 15 weeks of lactation ranged between 2.38 *vs* 2.08 kg/day (Stella *et al*., 2007). Thus, in the present study, milk yield of the Shami and Saanen goats under the local environmental conditions of Lebanon were also similar or better than the above European breeds.

On the other hand, western breeds of goats have been continuously selected for more than 50 years and have led to the development of dairy and meat breeds. Based on these records, Saanen goats were expected to perform better than Shami goats. However, milk yields of Saanen were similar to Shami goats but much lower than milk yields reported by Sopexa (2000) and ADGA (2007) and their dams from CAPRIGÈNE. This unexpected milk yield of Saanen goats may be attributed to their low initial body weight at the start of the study (35-40 kg) or the fact that they were in their first or second parturition. Actually, milk yield of Saanen goats improved in 2005 and was highest during 2006. Residual milk after suckling was also higher for Saanen goats during the first 60 days of lactation (Table 2). This may have been due to the higher twinning rate in Shami goats and also higher abortion rate in Saanen (Table 5). Therefore, it would be difficult to conclude that Saanen goats were becoming more adapted to environmental conditions of Lebanon and if their production could improve further in the next few years.

2. Body weight of goats and kids

In the present study post kidding body weight of Shami goats was heavier ($P < 0.05$) than Saanen goats. In fact, none of the reviewed continental breeds (Shrestha and Fahmy, 2007a) was close to the average post kidding body weight observed for Shami goats and even for Saanen.

Furthermore, mobilization of body reserves for Saanen goats occurred within 30-60 days from parturition reaching 9.4% around 60-90 days. However, mobilization of body reserves in Shami goats continued until about 4 months after parturition and reached 17.2% of its body weight at parturition. This might be an important feature in Shami goats that contributed to the high milk yield required for the multiple kids during the first 4 months of lactation.

As for birth weight of kids, data of several South Asian, European, American and African breeds and their crosses have shown that it was lower (Shrestha and Fahmy, 2007a). In another study of Egyptian (Barki and Zaraybi) and Damascus breeds and their crosses showed that Damascus kids had the highest weight at birth (3.1 kg). In the present study birth weight of Shami kids was on average higher than Saanen kids and was higher than the observed birth weight of Shami kids in the previous studies.

The present ADG of kids was similar between Shami and Saanen kids during the first 90 day of age (suckling period). This may have been due to the fact that Shami goats had more kids to suckle than Saanen goats. As a result, Saanen kids had more access to milk than Shami kids. However, at the age of 240-270 days, the ADG was higher ($P < 0.05$) for Shami kids as compared to Saanen.

The ADG achieved in the present study were close to the values observed by Titi (2003) when Shami goat kids were fattened on 3 different diets and were also higher than those observed from birth to weaning for crosses of Damascus × Baladi male kids (Abdel-Rahman and El Kaschab, 1998). Furthermore, the body weight of Shami kids in the present study was higher than that reported by Freitas *et al*. (2004) for Anglo Nubian and for Saanen (17.4 kg) after 90 days.

3. Litter size

The economic importance of fecundity has long been acknowledged as an important trait when selecting to improve performance associated with improving meat production. In the present study, litter size excluding or including aborted kids was higher for Shami goats as compared to Saanen (Table 5) and they were also higher than those reported by Guney *et al*. (2006) in Cyprus for Damascus goat (1.62 kids/goat) and many of the reviewed continental (i.e. Alpine, Saanen, Anglo-nubian, Toggenburg) and Asian breeds (Beetal and the Malabari) (Shrestha and Fahmy, 2007a).

V – Conclusions

The larger body weight of the Shami goats will require higher nutritious needs and higher feed consumption for body maintenance. This means a higher production cost. However, due to the similarity in milk yield, observed in this and other studies, the Shami breed can still be considered to be more efficient and adapted than the Saanen breed under the environmental conditions of Lebanon and the Mediterranean. The larger body weight of the Shami breed and the higher twinning rate gives it an added advantage as a dual purpose breed that can be used to produce milk and meat.

The genetic potential of the Shami breed with regards to milk and meat production are promising. Therefore, before rushing into the introduction of exotic breeds without a proper study on their ability to adapt to local conditions, the Shami goat must be considered as the base for any future work aiming to enhance regional goat production.

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