

GOAT PRODUCTION IN LIBYA: CURRENT STATE AND PRODUCTION CONSTRAINTS

PROIZVODNJA KOZA U LIBIJI: SADAŠNJE STANJE I PROIZVODNA OGRANIČENJA

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Professional paper - Stručni članak
Received - Primljeno: 28. September – listopad 2012

SUMMARY

Libya has 2.5 million heads of goat. Libyan local goats (Mahali) represent more than 90% of total goat population. Mahali goat breed is kept mainly for meat production. Goats are medium in size of different colors, black, brown, red, grey, white or mixture of these colors. Horns are quite large extending sideward in bucks and short in does. Other breeds - like Targhai and Tibawi breeds- are concentrated mainly in the southern region. Production systems are based on rain-fed rangeland and crop residues. Small scale of forage production is practiced especially in southern region. The precarity of these production systems leads to dependence on supplements with imported concentrates. Goats graze together in flocks of different sheep-to-goat ratios but usually with more sheep than goats. Flocks composed of only goats are common in mountainous region of Jabal Al-Akhdar in the east or Nafusa in the west of Libya. Damascus, Murciano-Grandina, French Alpine and Saanen goats were imported (mainly to research stations) in order to study the productivity of their crossings with Mahali goat. Productivity, crossing results and production constraints of Mahali goats are reviewed and discussed.

Key words: Libyan goat breeds, crossing, productivity.

INTRODUCTION

Libya extends over about 2000 km on the southern Mediterranean coast and the desert weather prevails approximately 100 km south from the coast. The earliest appearance of domestic caprines in Africa was reported in Haula Fteah (eastern Libya) dated about 6800 bp (Klein and Scott, 1986). Water shortage and the frequent occurrence of drought is one of the principal limiting factors affecting animal production sector. Dairy cattle production projects require large quantities of water for roughage production. Scarcity and low quality of feed affect cattle because of their greater maintenance requirements, goat and sheep with lower maintenance requirements can thrive in those conditions.

Goats have greater apparent digestibility of fiber of low quality roughages than sheep (Domingue

et al., 1991) and possess unique physiological characteristics which make them better adapted than sheep to survive in heat stress conditions (Lu, 1989). The goat is clearly not synonymous with under-development and poverty as goat farming in Europe also has a more positive outlook after nearly a century of a negative reputation (Boyazoglu et al., 2005).

The Mediterranean area produces 18% of goat milk and goat cheese and Australia produces 60% of world goat meat (Dubeuf et al., 2004). This paper intends to present a general description of goat production situation in Libya.

LIBYAN GOAT POPULATION

Libya has 2.5 million heads of goat (AOAD 2009).

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Libyan local goat (Mahali) represents more than 90% of goat population and is concentrated along the coastal area. Other breeds like Targhai, Kardi, and Tibawi are limited to the southern region of the country; they are small in number and probably have their origin in Chad and Niger (FAO, 2003). In spite of uncertainty of data based largely on estimations, according to FAO (2010), goat population is thought to have increased in numbers during the period of 2000 to 2006. Mahali goat is medium in size with somewhat long neck and very short tail that is twisted backward. It is different in colors: black, brown, red, grey, white or a mixture of these colors. Horns are quite large, extending sideward in bucks and short extending straight backward in does (FAO 2003).

Goat breeds were introduced from Malta and Italy long time ago, but these breeds were intermixed with Mahali goat breed and no longer exist. In 1998, the Ministry of Animal Wealth imported about 20 thousand goats (Shami) from Cyprus and 5 thousand Murcaino-Granadina from Spain (FAO, 2003; Hermas et al., 2010). The Libyan biotechnology research center imported a limited number of French alpine and Saanen goats in order to study the improvement of crossing. Data on the improvement

in milk production from crossing with Saanen and Alpine goats were absent or are inaccessible.

PRODUCTION SYSTEMS AND MANAGEMENT

Goats and sheep usually graze together in flocks of different numbers with different sheep-to-goat ratios, with more sheep than goats (mostly 80% sheep) (FAO 2003). Flocks composed of only goats are common in the mountainous region of Al-Jabal Al-Akhdar in the east or Nafusa in the west of Libya. Goats are kept on pasture with supplemental feeding during summer or drought periods.

Production system in western, middle and eastern areas of the country is based on rain-fed rangeland and crop residues, while in western and southern area limited forage production is practiced. In southern area (with limited number of goats), production system is based on forage production and crop residues. Morand-Fehr et al. (1983) stated that systems based essentially on ranges are very precarious and their maintenance requires specific techniques and administrative assistance.

Table 1. Growth measurements, reproductive and productive performance of Libyan and imported goat breeds.

Tablica 1. Mjere rasta, reproduktivni i proizvodni pokazatelji libijskih i uvezenih pasmina koza

Breed - Pasma	Mahali	Targhai	Tebawi	Cyprus Damascus	Murciano Granadina
Growth measures – Mjere rasta, (kg) (Hermas et al., 2010)					
Birth weight – Porodna masa	2.4- (2.16) ^a	2	2.1	3.6	2.6
4 months weight – Tjelesna masa s 4 mjeseca	(11.99) ^a	-	-	-	-
Weaning weight – Tjelesna masa kod odbića	11.2	9.8	10.2	20.3	13.3
Daily gain – Dnevni prirast	(0.08) ^a - 0.098	0.087	0.099	0.158	0.118
Yearling weight – Tjelesna masa u dobi od 1 godine	21.2	22.6	25.2	26.1	18.5
Reproductive performance – Reproductivni pokazatelji (Akraim et al. 2010).					
Fertility rate – Oplodjenost, %	71	-	-	-	-
Abortion rate – Pobačaj, %	9	-	-	-	-
Prolificacy rate – Plodnost, %	128	-	-	-	-
Pre-weaning mortality rate – Mortalitet prije odbića, %	5	-	-	-	-

a- (Akraim et al 2010)

The main constraints in goat production in Libya are insufficient and fluctuating feed supply, poor flock management and health care. Goat milk does not play a significant role in goat raising economy; kids are usually left with their mothers in most flocks until market age. Assistance in implantation of small scale goat milk processing could add value to goat milk and increase the farmer income.

PERFORMANCE OF LOCAL GOAT BREEDS

A- Growth performance

According to FAO (2003), Mahali average adult weight is 34 kg for bucks and 25 kg for does. Average birth weight is 2.16 kg (Akraim et al. 2010). The daily weight gain in male kids is 83.4 ± 4.1 g/day (Madani and Rahal, 1989), 80 g/day for both male and female kids (Akraim et al. 2010).

Birth weight, weaning weight, daily gain and yearling weight of Mahali, Tebawi and Targhai breeds are summed in Table 1. (Hermas et al., 2010).

The growth measurements of Libyan goat breeds are similar. Marhoun (2007) reported that dressing percentage of Mahali goat (based on empty weight) was $52.38 \pm 1.2\%$ and rib eye area was 14.37 ± 1.5 cm².

B- Reproductive performance

Akraim et al., (2010) studied (for one season) some productive and reproductive performance characteristics in two flocks of Mahali goats and their results are summed in Table 1. The following formulas were used:

$$\text{Fertility rate} = \frac{\text{N. goats (aborted and kidded)}}{\text{total mated}} * 100;$$

$$\text{Abortion rate} = \frac{\text{N. goats aborted}}{\text{N. goats (aborted and kidded)}} * 100;$$

$$\text{Prolificacy rate} = \frac{\text{N. births}}{\text{N. kidding females}}$$

Post-partum ovarian activity in Mahali goats begins in general after 60 days of kidding (Azaga 1991; Isa, 2002). Male kids reach sexual maturity at 192.1 ± 7.0 days and 22.0 ± 1.0 kg and breeding maturity is reached at 239.4 ± 6.7 days and 25.7 ± 1.0 kg (Madani and Rahal, 1989).

In a study of reproductive traits of Mahali goats, Isa (2002) showed that females attained sexual maturity (based on progesterone concentration) at average age of 5-8 months and 18.65 ± 0.45 kg of average body weight. Average age at first kidding was 369.7 ± 4.8 days, while only 30% of females exhibited ovarian activity before 10 weeks post-partum.

Scarce resources and harsh environmental conditions are similar between Tunisian and Mahali goat breeds habitats. Tunisian local goat seemed to be superior to Libyan Mahali goat. Gaddour et al. (2007) reported that fertility; prolificacy and abortion rates of Tunisian local goat were 93%, 153% and 3% respectively. Gaddour and coworkers had been collecting their data during 16 years.

C- Milk production performance

Economically, Mahali goat breed kept mainly for meat production, milk left to kids and occasionally consumed by household. Reports that goat milk made up >40% of all domestic milk production in Libya (Haenlein, 2001) were not -to my knowledge- supported by solid national data. Studies conducted at Bier-Alghanem Experiment Station, 80 km south west of Tripoli, showed that average milk production of Mahali goat was 0.33 kg/day, pre-weaning milk production (21 weeks) was 0.363 kg/day and post-weaning milk production (8 weeks) was 0.193 kg/day (Abosag, 2004). Milk fat and milk protein values reported by the same author were 2.28% and 3.20% respectively. Mahali daily milk production was inferior to local Tunisian goat (0.76 l) (Gaddour and Najari, 2009a) and superior to South African indigenous goat (0.25 l) (Donkin and Boyazoglu, 2000). However, data on farmer flocks showed that average first month of milk production in Mahali goats was 0.76 l/day (Akraim et al., 2010).

PERFORMANCE OF IMPORTED BREEDS UNDER LIBYAN CONDITIONS

The importation of exotic breed's decision was based on reported performance of those breeds. The performance of those breeds can be masked by some of the environmental and management factors prevailing under Libyan conditions.

Hermas et al., (2010) studied the growth measurements of Cyprus Damascus and Morciano

Granadina under Libyan conditions, their results were summed in Table 1. The majority of growth parameters measured was in favor of Cyprus Damascus in comparison with other breeds.

Under Tunisian conditions, Gaddour et al. (2009b) reported that kid's weight was 3.66 and 2.38 kg at birth; 14.51 and 11.07 at 90 days for Damascus and Morciano goats respectively. Weights reported for those two breeds at 90 days under Libyan conditions were superior.

In Cyprus, Birth weights of Damascus goats range from 3.5 kg to 5.5 kg (Mavrogenis et al., 2006), Male kids were heavier and grew faster than female kids from birth to 140 days of age (4.7 and 4.2 at birth, and 29.2 and 24.6 kg at 140 days, respectively) (Mavrogenis et al., 1984). Average milk production of Cyprus Damascus and Morciano Granadina under Libyan conditions was 0.43 and 0.67, pre-weaning milk production (21 weeks) was 0.49 and 0.78 and post-weaning milk production (8 weeks) was 0.20 and 0.35 kg/day respectively (Abosag, 2004). Milk fat and milk protein values reported by the same author were 3.51 and 3.22%, 2.98 and 2.75% for Cyprus Damascus and Morciano Granadina respectively. Güney et al., (2006) reported that average daily milk yield, lactation milk yield and lactation length of Damascus does in northern Cyprus were 1.900 ± 0.042 , 489.4 ± 12.784 kg and 254.7 ± 2.359 days, respectively. Mean milk yield of Murciano Granadina goats at over 210 d of lactation in Spain range from 1.40 to 1.76 L/d (Peris et al., 1997). This great decline of milk production of imported breeds apparently due to poor management is more than merely the effect of environmental factors. The Damascus goat requires an improved management and feeding environment to express its full genetic potential (Abdullah et al., 2012).

Abosag (2004) concluded that Morciano Granadina goats produced more milk than Cyprus Damascus contrary to performance of these breeds in their country of origin (Peris et al., 1997; Güney et al., 2006) or under Tunisian conditions (Gaddour and Najari, 2009a).

PERFORMANCE OF CROSSING

Adequate data are needed on Mahali goat population performance before decisions on crossing with exotic breeds can be made. Data on the po-

tential performance of Mahali goat are scarce and insufficient. The import of very productive but not adapted to local conditions animals and the crossing with local breeds make these populations often lose the characteristics of adaptability (Dubeuf and Boyazoglu, 2009).

A- Growth performance

Ahtash et al. (2008) showed significant superiority of $\frac{3}{4}$ Damascus $\frac{1}{4}$ local in birth weight (3.42 kg), weaning weight (19.75 kg), weight 8 months of age (30.3 kg), daily gain before weaning (129.2 g/day) and daily gain from weaning until 8 months of age (92.2g/day) over the crossbred $\frac{3}{4}$ local $\frac{1}{4}$ Damascus and $\frac{3}{4}$ local $\frac{1}{4}$ Morciano Granadina. Hermas et al., (2010) conclude that Cyprus Damascus breed indicates a potential to improve growth of Mahali local breed. Attempts have been made to cross Mahali and other local goat breeds (Tebawi and Targhai) at Bier- Alghanem Experiment Station, and the results reveal that only yearling weight has been improved (Herms et al., 2010).

B- Milk production performance

Damascus and Morciano Granadina goat breeds were imported for crossing with local goats in order to improve their productivity. Part of these imported breeds has been sold in local market and intermixed in an unmanaged way with local goats. A report showed that average first month milk production in these mixed goats was 1.5 l/day (Akraim et al., 2010). Data are insufficient on the percentage of imported breed blood in local goats which lead to such improvement in milk production.

Average daily milk production (29 weeks) of Damascus x Mahali and Morciano Granadina x Mahali was 0.35 and 0.53 kg/day (Abosag 2004). Abosag, (2004) concluded that Morciano Granadina breed indicated a potential to improve milk production of Mahali goats.

Milk production registered of farmer flocks of Mahali goats (Akraim et al., 2010) was superior to milk production of crosses of Mahali with imported breeds (Abosag, 2004). However, in the study conducted by Akraim et al., (2010), a small number of goats used and a short measuring period may affect conclusion on the entire goat population.

Based on (Abosag, 2004) data, improvement of Damascus x Mahali and Morciano Granadina x Mahali crossing over Mahali in daily milk production was 6% and 60.1% respectively. However, there was a discrepancy between results obtained at Bier-Alghanem Experiment Station flock; Abdelkareem, (2006) reported in two consecutive production seasons (at the same station) that improvement of Damascus x Mahali and Morciano Granadina x Mahali crossing over Mahali in daily milk production was 11% and 39% respectively. In comparison, data presented by Gaddour and Najari (2009) indicated that improvement of Damascus x Local and Morciano Granadina x Local crossing over Local in daily milk production was 53.9% and 47.4% respectively.

In view of improvement resulted of crossing and scarcity of field production data, more studies are needed on milk production performance of Mahali goats in smallholder flocks before the choice can be made between selection in local population or crossing with superior imported breeds.

CONCLUSION

Mahali goat breed is threatened by chaotic mixing with imported exotic breeds. Controlled improvement programs mentioned in this paper carried out only with experiment stations and farmer flocks were neglected in studies, selection or special extension programs. Among imported breeds, Cyprus Damascus breed indicates a potential to improve growth and Morciano Granadina breed indicates a potential to improve milk production of Mahali goats. More studies are needed on milk production performance of Mahali goats in smallholder flocks before the choice can be made between selection within local population or crossing with superior imported breeds.

REFERENCES

1. Abdelkareem, S. H. (2006): Improvement of Mahali goats milk production and milk constituents performance. M. Sc. Thesis. Tripoli university, Faculty of agriculture, Animal production department, Tripoli, Libya. (In Arabic).
2. Abosag, F. M. (2004): Crossing Mahali goats with Damascus and Morciano Granadina goats : comparison of milk production and milk constituents. M. Sc. Thesis. Tripoli university, Faculty of agriculture, Animal production department, Tripoli, Libya. (In Arabic).
3. Ahtash, A.E., A. F. Magid and H. M. Marhoun (2008): Growth performance in crossbred of Local goats with Damascus and Morcia Grinada goats. Egyptian J. of Sheep and Goat Sciences, (Special Issue, 2nd Inter. Sci. Conf. on SR Production) 3: 7- 14.
4. Akraim, F., H. Mohammed and A. M. Ali. (2010): Libyan local goat performance under green mountains region conditions. 1st veterinary medical conference, Omar Al-Mukhtar University, Faculty of Veterinary Medicine, Al-Baida, Libya, 3-5 July. Abstract book, page : 27.
5. AOAD (Arab organization for agriculture development)(2009): Arab agricultural statistics yearbook. Vol. No. (29) : <http://www.aoad.org>
6. Azaga, I. (1991): A study about the reproductive performance of female goats in Libya. M.Sc thesis. Faculty of agriculture, animal production department, Tripoli university. Tripoli, Libya.
7. Boyazoglu, J., I. Hatziminaoglou and P. Morand-Fehr. (2005): The role of the goat in society: Past, present and perspectives for the future. Small Ruminant Research, 60: 13-23.
8. Domingue, B. M. F., D. W. Dellow and T. N. Barry. (1991): Voluntary feed intake and rumen digestion of low quality roughage by goats and sheep. Journal of agriculture science, 117: 111-120.
9. Donkin, E.F. and P.A. Boyazoglu. (2000): Milk production from goats for households and small-scale farmers in South Africa. Proc. Seventh Int. Conf. on Goats, Tours, France, May 2000. 324-326.
10. Dubeuf, J. P., P. Morand Fehr and R. Rubino.(2004): Situation, changes and future of goat industry around the world. Small Ruminant Research, 51: 165-173.
11. FAO. (2003): A report on the state of animal genetic resources in Libya. ftp://ftp.fao.org/docrep/fao/011/a1250f/annexes/CountryReports/Libya_E.pdf. Consulted in 21-12-2011.
12. FAO. 2010 .FAOSTAT database. <http://faostat.fao.org/site/573/DesktopDefault.aspx?PageID=573#ancor>. Consulted in 21-12-2011.
13. Gaddour, A., S. Najari, M. Abdennebi and M. Ouni. (2007): Reproductive performance and kid's mortality of pure breeds and crossing genotypes in the coastal oases of southern Tunisia. Pakistan journal of biological science, 10: 2314-2319.
14. Gaddour, A. and S. Najari.(2009): Pure breeds and crossed caprine genotypes effect in the oases of southern Tunisia. African Journal of Agricultural Research 4:1203-1207.
15. Gaddour, A. and S. Najari. (2009): Milk Production of Caprine Genotypes in Arid Land of Southern Tunisia. Res.J. Dairy Sci., 3: 1-2.

16. Güney, O., O. Torun, O. Özuyanık and N. Darcan. (2006): Milk production, reproductive and growth performances of Damascus goats under northern Cyprus conditions. *Small Ruminant Research*, 65: 176-179.
17. Haenlein, G. F. W. (2001): Past, Present, and Future Perspectives of Small Ruminant Dairy Research. *J. Dairy Sci.* 84:2097–2115.
18. Hermas, S. A., A. Ahtash and A. Majid. (2010): Growth measures of Libyan goat breeds and their crosses. *Egyptian J. of Sheep and Goat Sciences*, 5 : 93-100.
19. Isa, F. M. (2002): A study of some characteristics of reproductive traits in Mahali and Shami goats. M. Sc. Thesis. Tripoli university, Faculty of agriculture, Animal production department, Tripoli, Libya. (In Arabic).
20. Klein, R. G. and K. Scott. (1986): Re-analysis of faunal assemblages from the Haua Fteah and other late quaternary archaeological sites in Cyrenaican Libya. *Journal of archeological science*, 13: 515–542.
21. Lu, C.D. (1989): Effects of heat stress on goat production. *Small Ruminant Research*, 2: 151-162.
22. Madani, M. O. K. and M. S. Rahal. (1989): Puberty in Libyan male goats. *Animal Reproduction Science*, 17: 207-216.
23. Marhoun, H. M. (2007): Improvement of Mahali goat : growth rate before and after weaning and carcass characteristics. M. Sc. Thesis. Tripoli university, Faculty of agriculture, Animal production department, Tripoli, Libya. (In Arabic).
24. Mavrogenis, A.P., A. Constantinou and A. Louca. (1984):. Environmental and genetic causes of variation in production traits of Damascus goats. 1. Pre-weaning and post-weaning growth. *Animal Production*, 38 : 91-97.
25. Mavrogenis, A.P., N.Y. Antoniadou and R.W. Hooper. (2006): The Damascus (Shami) goat of Cyprus. *Animal Genetic Resources Information*, 38: 57-65.
26. Morand-Fehr, P., A. Bourbouze, H. N. Le Houerou, C. Gall and J. G. Boyazoglu. (1983): The role of goats in Mediterranean area. *Livestock production science*, 10: 569-587.
27. Peris, S., G. Caja, X. Such, R. Casals, A. Ferret, and C. Torre. (1997): Influence of kid rearing systems on milk composition and yield of Murciano-Granadina dairy goat. *J Dairy Sci* 80:3249–3255.

SAŽETAK

Libija ima 2,5 milijuna koza. Libijske domaće koze (Mahali) čine više od 90% ukupne populacije koza. Mahali pasmina koza uzgaja se uglavnom radi mesa. Koze su srednje veličine u više boja: crne, smeđe, crvene, sive, bijele ili mješavine tih boja. Rogovi su prilično veliki i šire se bočno kod jarčeva, a kratki su kod koza. Druge pasmine, poput pasmina Targhai i Tibawi, uglavnom su koncentrirane o južnom dijelu. Proizvodni sustavi temelje se na kišnom području i ostacima usjeva. Skromna proizvodnja krmiva postoji osobito na jugu. Nesigurnost tih proizvodnih sustava dovodi do ovisnosti o dodavanju uvoznih koncentrata. Koze pasu u stadima različitog omjera ovca-koza, ali obično više ovaca nego koza. Stada sastavljena samo od koza česta su u planinskom području Jabal Al-Akbdar na istoku ili Nafusa na zapadu Libije. Koze Damascus, Murciano-Grandina, Alpina i Sanska koza uvezene su (uglavnom u istraživačke stanice) radi proučavanja proizvodnosti njihovih križanaca s Mahali kozom. Proizvodnost i proizvodna ograničenja Mahali koza predmet su izlaganja i rasprave.

Ključne riječi: Libijske pasmine koza, križanje, proizvodnost