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# A Study on Some Non-genetic Factors and Their Impact on Milk Yield and Lactation Length of Sudanese Nubian Goats

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**Abstract:** The objective of the current study was to estimate some productive parameters of Sudanese Nubian goat under extensive management system. The data eighty-six parities of Sudanese Nubian goats were used; these parities were occurred during the period between October 1998 to August 2000, to parent stock raised on traditional pastroralism. These parities were used in completely randomized design to investigate the effects of nutritional supplementation, season of kidding, parity order and litter size on milk yield and lactation length of Sudanese Nubian goats. The result revealed that average total lactation milk yield was 89.18 ± 38.60 kg. Nutritional supplementation had a highly significantly effect on average total lactation milk yield. However, season of kidding; parity order and litter size had non-significant effect on average total lactation milk yield. Total milk yield was highly correlated with the first month yield, r = 0.599. The overall mean of lactation length was 181.12 ± 51.36 days. Nutritional supplementation and parity order had non-significant effect on lactation length. However season of kidding had a significant effect on lactation length. The linear regression of the total milk yield on lactation length was highly significant. The study indicated that, by instituting adequate management improvement action, the productivity of goat could be improved.

**Key Words:** Nubian goat, non-genetic factors, milk yield, lactation length

## INTRODUCTION

The genetic of milk production in goats seem to be similar to that in cattle and sheep. But in term of live weight, the goat is believed to be more efficient in milk production than the other two species (Machenzie, 1967). Haas and Horst (1979) indicated that in spite of higher relative metabolism in goats, the expenditure of nutrients for production of milk was less in goat than in the cattle or buffallo as a result of the goat lower maintenance requirements; this could be of great nutritional and economical importance. Several factors had been reported in the literature to influence the efficiency of milk production and lactation length (Sangare and Pandey,2000 Greyling et al., 2004, Prasad et al., 2005, Guney et al., 2006 and Carnicella et al., 2008). The magnitude of each factor on milk yield and lactation length differs among different husbandry and management practices. The study of such factors will help the goat breeder to be more competent in minimizing his losses. Data investigating major productive traits of Nubian goats reared under range condition is scarce. Moreover studies dealing with non-genetic factors impacts on goat productive performance are juvenile. The present work was designed to evaluate the effect of supplementation, season of kidding, order of parity and litter size on milk yield and lactation length of Nubian goats.

## MATERIALS AND METHODS

Eighty-six parities of Sudanese Nubian goats were used; these parities were occurred during the period between October 1998 to August 2000, to parent stock raised on traditional pastroralism. The grazing zone of these animals was in the southern Butana plains of Sudan near Abu Deleig, 100 km north east of Khartoum. The metrological conditions of the grazing pasture and pasture composition are given in table 1 and 2 respectively. The year was divided into three seasons, summer (from March to June), autumn (from July to October) and winter (from November to February). The parent stock was divided into three groups ( A, B and C) of equal number and weight, during winter and summer goats were allowed day grazing and in the evening they were kept indoors in enclosures made of mud, to allow giving supplement. Group A was given sorghum

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grains at night, at a rate of 500 gram/head/day for 30 days before parturition and throughout the lactation period. For the remaining time of their physiological cycle this group was given sorghum at a rate of 170 gram/head/day. Group B was also given sorghum grains at night at a rate of 170 gram/head/day throughout their physiological cycle to simulate the traditional management in the area. Group C was given adlibitum a molasses based diet throughout its physiological cycle (table, 3). All groups were offered sorghum stalks at a rate of 500 gram/head/day and allowed access to fresh pore-hole water twice a day in dry summer and once in winter.

In autumn the goats were taken outside Abu Deleig area to its surrounding plains, where night grazing was also practiced in addition to day grazing. No dietary supplementation was offered during this period. Watering was once a day from running surface water (Khors) during the early wet season and from excavated ponds at the end of the season.

Milk yield was recorded daily, in first three days after parturition, kids were allowed to freely suckle colostrums and thereafter they were separated from their dams during the day. In the evening half of their dam milk was milked before kids were released to spend the night with their dams. Kids were weaned at three month of age. In the pre-weaning period milk yield was calculated by multiplying goat yield x 4. In the post-weaning period all goat milk yield was daily recorded till the end of lactation length.

***Meteorological Data:***

Meteorological information on temperature, relative humidity and rainfall at the time of investigation were collected from the nearest meteorological station (Shambat), (Table, 1)

***Statistical Analysis:***

Means, standard deviations and correlation coefficients of the different traits were computed. Analysis of variance was performed in accordance to general linear method. Duncan's multiple range test was used with factors that had significant effect on the traits studied. All techniques of the statistical analysis were conducted using computer program statistical package for social science (SPSS, 1998).

**Table 1:** Some meteorological data of the region during the experimental period of the study

| Year | 1998 | | | 1999 | | | 2000 | | |
|---|---|---|---|---|---|---|---|---|---|
| Month | R.H.% | Temp.°C | R.F.mm. | R.H.% | Temp.°C | R.F mm. | R.H.% | Temp.°C | R.F.mm. |
| January | 26 | 20.8 | - | 28 | 23.7 | - | 36 | 22.9 | - |
| February | 21 | 23.0 | - | 24 | 28.4 | - | 33 | 24.1 | - |
| Marsh | 17 | 26.1 | - | 15 | 27.1 | - | 21 | 26.2 | - |
| April | 15 | 31.7 | - | 14 | 31.2 | Trace | 18 | 31.7 | Trace |
| May | 18 | 34.1 | - | 22 | 35.2 | Trace | 26 | 34.3 | 0.1 |
| June | 22 | 34.5 | - | 25 | 34.8 | 4.7 | 26 | 35.7 | - |
| July | 39 | 33.9 | 1.4 | 44 | 31.5 | 42.2 | 36 | 32.8 | 2.5 |
| August | 50 | 30.7 | 34.7 | 51 | 30.3 | 51.3 | 39 | 32.5 | 2.0 |
| September | 52 | 31.3 | 87.6 | 44 | 31.1 | 20.4 | 39 | 31.7 | 16.3 |
| October | 37 | 32.0 | 7.2 | 36 | 31.5 | 4.2 | 30 | 30.2 | 24.1 |
| November | 25 | 32.9 | - | 26 | 28 | - | 27 | 26.7 | - |
| December | 28 | 25.5 | - | 33 | 25 | - | 29 | 22.5 | - |

R.H. relative humidity
R.F. rain fall

## RESULTS AND DISCUSSION

The data in Table (3) shows that the overall average total lactation milk yield of the experimental goats was 89.18 ± 38.60 kg. The data also highlighted the effect of nutritional supplementation on milk yield and demonstrated that there were highly significant differences ($P< 0.001$) between total milk yields of goats at different nutritional supplements. Goats of group (A) nutritional supplement having the highest yield (112.50 ± 30.63 kg), while goats of group (C) nutritional supplement with the lowest yield (46.15 ± 18.29 kg). Goats of group (B) nutritional supplement had the intermediate yield (75.35 ± 33.70 kg).The data in Table (3) also shows that there were differences between average milk yields of goats kidded in different seasons. Goats kidded in autumn being the highest yielder (108.80 ± 24.25 kg), followed by Goats that kidded in winter (94.63 ± 35.43 kg), while the lowest yield (83.00 ± 39.30 kg) was recorded by goats kidded in summer. The differences however did not attain a statistical significance. The data in Table (3) shows that the average milk yields of goats at 1st, 2nd and third parities were 93.89 ± 38.69, 90.66 ± 40.65 and 77.65 ± 35.17 kg

respectively. Analysis of variance shows that there were no significant differences between total milk yields of different parities. Results describing the effect of litter size on total milk production of the dams are shown in Table (3). Single-kidding goats yielded an average of 89.8 ± 39.41 kg, while twin-kidding goats yielded an average of 84.59 ± 38.78 kg. Differences between the two groups lack statistical significance (P> 0.05).

There was a significant positive correlation between total milk yield and yield during the first month of lactation period (r = 0.599).

**Table2:** Chemical composition of natural pastures in the study area

| Botanical Name | Local Name | Type DM% | C.P. % | C.F.% | E.E.% | Ash% |
|---|---|---|---|---|---|---|
| Acacia ehrenbergiana | Salam | Bark &Branch | 12.66 | 27.51 | 1.95 | 6.36 |
| Acacia ehrenbergiana fruit | Salam fruit | Fruit | 1.67 | 16 | 3 | 8.25 |
| Acacia ehrenbergiana flower | Salam flower | Flower | 0.71 | 16.5 | 1 | 9.75 |
| Acacia mellifera | Kitir | Tree | 16.3 | 30.3 | 1.80 | 8.7 |
| Acacia tortilis sub-sp. Radiana | Seyal | Tree | 12.14 | 28.55 | 2.12 | 4.14 |
| Schoenefeldia gracilis | Dembelab | Grass | 4.9 | 36.7 | 1.0 | 15.5 |
| Aristid spp. | Gau | Grass | 5.7 | 38.4 | 0.5 | 10.0 |
| Urochloa trichopus | Taffa | Grass | 8.3 | 34.3 | 0.9 | 13.9 |
| Cymbopogon nervatus | Nal | Grass | 6.4 | 31.9 | 1.4 | 8.4 |
| Tribulus terrestris | Dirasa | Grass | 26.17 | 33 | 4 | 24 |
| Targus berteronianus | Shara | Grass | 9.88 | 8.84 | 1.36 | 21 |
| Ipomoea cordofana | Hantoot | Grass | 18.38 | 17.5 | 1.5 | 22 |
| Aristida adscension | Humra | Grass | 2.98 | 43 | 2.22 | 8.75 |
| Sorghum straw | Gasab Feterita | Stem | 1.58 | 24.5 | 0.5 | 7 |

Date of collection: between end of September and beginning of November (1998). Stage of collection: Late bloom stage, dried aerial part for grasses and fresh twigs for trees.
C.F. Crude fiber
C.P. Crude protein
E.E. Ether exrtract

**Table 3:** Ingredients and proximate analysis of experimental diet(As fed basis)

| Components % | Ration A | Ration B | Ration C | Sorghum Stalks |
|---|---|---|---|---|
| Molasses | - | - | 50 | - |
| Sorghum grains | 100 | 100 | - | - |
| Wheat bran | - | - | 41 | - |
| Groundnut cake | - | - | 8 | - |
| Salt | - | - | 1 | - |
| Total | 100 | 100 | 100 | |
| Proximate analysis % | | | | |
| Dry matter | 94.5 | 94.5 | 91.8 | 93.00 |
| Crude protein | 12.75 | 12.75 | 12.15 | 4.14 |
| Crude fibre | 2.87 | 2.87 | 6.1 | 24.5 |
| Ether extract | 2.46 | 2.46 | 2.71 | .5 |
| NFE | 74.34 | 74.34 | 51.08 | 47.83 |
| Ash | 2.08 | 2.08 | 9.09 | 7.68 |
| ME (MJ/kg) | 12.84 | 12.84 | 9.51 | 6.22 |

The overall mean of lactation length of the experimental animals was 181.12 ± 51.36 days as shown in Table (4). The figures in the table highlighted the effect of nutritional supplementation on this trait – the data painted that group (B) have had the longest lactation length (189.61 ± 63 days). Group (C) the shortest lactation length (159.2 ± 30.41 days), while group (A) with an intermediate lactation length of 179.89 ± 43.43 days. The data in Table (4) also pointed the effect of season of kidding of the dam on lactation length. The data indicated that winter-born dams had the longest lactation length (204.19 ± 50.94 days), while the goats kidded in autumn had the shortest lactation length (145.00 ± 14.58 days). The differences in lactation length were significant (P< 0.05) between winter kidder and summer and autumn kidder, while there was no significant in lactation length between summer and autumn kidder.

The data in Table (4) shows the effect of parity order in lactation length. The longest lactation length was secured in first parity dams (204.31 ± 55.26 days), followed by third parity dams (163.47 ± 24.27 days) and the shortest lactation length was obtained in second parity dams (160.64 ± 46.83 days). The differences however did not attain a statistical significance

The results show that the linear regression of total milk yield on the lactation length was highly significant (p> 0.001)

**Table 3:** effects of some non-genetics factors on total milk yield of Sudanese Nubian goat

| Factors | Experimental supplement | | | | Season of kidding | | | Parity order | | | Litter size | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | Grand mean | winter | Summer | Autumn | 1 | 2 | 3 | 1 | 2 |
| Total lactation yield kg | 112.50a | 75.35 b | 46.15 c | 89.18 | 94.63 | 83.00 | 108.80 | 93.89 | 90.69 | 77.65 | 89.80 | 84.59 |
| | ± 30.63 | ± 33.70 | ± 18.29 | ±38.60 | ± 5.43 | ±39.30 | ± 24.75 | ±38.69 | ±40.65 | ±35.17 | ±39.41 | ± 8.78 |

a,b and c means in the same column followed by different superscript are significantly different (P< 0.05).

**Table 4:** effects of some non-genetics factors on lactation length of Sudanese Nubian goat

| Factors | Experimental supplement | | | | Season of kidding | | | Parity order | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | Grand mean | winter | Summer | Autumn | 1 | 2 | 3 |
| Total lactation yield kg | 179.89 | 189.61 | 159.20 | 181.12 | 204.19a | 150.22 b | 145.00 b | 204.31 | 160.64 | 163.47 |
| | ± 43.43 | ± 63.00 | ± 30.41 | ±51.36 | ± 50.94 | ± 29.45 | ± 14.58 | ±55.26 | ±46.83 | ±24.27 |

a and b means in the same column followed by different superscript are significantly different (P< 0.05).

***Discussion:***

The average total milk yield per doe calculated in this study was 89.18 ± 38.60 kg. This is equivalent to 0.49 kg per day in a lactation period of 181.12 days. This level of production was comparable to that reported by Greyling et al., (2004) and Berhane and Eik (2006) for Feral and Begait goats. However; higher levels of production were reported by Greyling et al., (2004) for Boer goats and Guney et al., (2006) for Damascus goats.

The present study indicated that there were highly significant differences in lactation milk yield between goats of different nutritional supplements. The superiority of the goats of group (A) supplement than the goats of group (B) supplement may be attributed to the higher level of energy and protein fed to group A as compared to group B. This was in agreement with Greyling et al., (2004) and Berhane and Eik (2006) The superiority the goats of group A and B nutritional supplements on the goats of group C nutritional supplement, may be attributed to the fact that application of a high molasses based feeding system for milk production required basic nutritional additives to improve it's utilization, namely, undegradable fat and starch, and these basic nutritional additives may not be available in pasture, which resulted in this low level of production.

The effect of season of kidding on total milk yield revealed variations in average total milk yield between different seasons of years, this was in agreement with the findings of Steine (1975), Crepaldi *et al.* (1999) and Prasad et al., (2005) in different tropical and temperate breeds. The present result does not agreed with the findings of Montaldo *et al.* (1981), Mukundan *et al.* (1983) and Mourad (1992).The difference in total yield between different seasons of the year reported in this study might be attributed to climatological conditions of different seasons and availability of pasture during them.

There were no significant differences in the average total milk yield between different parities. These results agreed with Mbayahaga *et al.* (1994). However, these results were contradicting the findings of Sangare and Pandey (2000) and Prasad et al., (2005). This might be due to variation of lactation lengths of different parities and variation of prevailing climatological conditions for each parity.

Single kidded dams were superior in milk yield compared to multiple kidded dams. A similar result was obtained by Al-Shaikh *et al.* (1999) for Saudi dairy goats and Mourad (1992) found that the effect of litter size on milk yield was confined to the pre-weaning milk yield and did not extended to the post-weaning milk yield.

The present study revealed a significant positive correlation between total milk yield and the first month milk yield this result agreed with finding of Kominakis et al., (2000) who reported significant correlation between 90 days milk yield and total milk yield for Skopelos dairy goats.

The average lactation length calculated in this study was 181.12 ± 51.36 days. This length of lactation was comparable to that reported by Mishra (1976) for Beetal goats and Mazumder and Mazumder (1983) for Pashmina goats.The present study indicated that there were no significant differences in lactation length between goats of different nutritional supplements. This was in agreement with Berhane and Eik (2006) for Begait and Abergelle Ethiopian goats. The significant effect reported in this study for season of kidding on lactation length was comparable to the findings of Khan and Sahri (1983) for Jamnapari goats and Crepaldi *et al.* (1999) for Alpine goats.

The present study indicated that there were slight differences in lactation length of goats of different parities. This was in agreement with Bhatnagar *et al.* (1976) for Alpine x Beetal, Alpine and Beetal goats and Singh and Acharya (1980) or Beetal goats. However this result disagreed with the finding of Kominakis *et al.* (2000) who reported significant effect of parity order on lactation length of Skopelos dairy goats. The insignificant effect of parity order on lactation length reported here might partly be attributed to the wide variation in lactation length of goats of the same parity, indicated by large standard deviations

The linear regression of lactation milk yield on the lactation length was highly significant (P< 0.001). This indicated that the total lactation yield was influenced to a large extent by the lactation length. This was in

agreement with the findings of Singh *et al*. (1970) for Beetal goats and Carnicella et al., (2008) for Maltese goats. It can be concluded that lactation length was among the major factor affecting milk yield.

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