PRODUCTIVITY TRAITS OF LOCAL MOUNTAIN GOAT AND SOME FACTORS AFFECTING THEM

Jalal E. Alkass  
Prof. 
Coll. Agric., Univ. Dohuk

Hani N. Hermiz 
Prof. 
Coll. Agric., Univ. Salahaddin

Mevan Ibrahim Baper  
Lecturer 
Akre Technical College

Imad A. Akreyi  
Senior Agricultural Engineer 
Directorate of Agriculture/Akre

Hani N. Hermiz  
Senior Agricultural Engineer 
Directorate of Agriculture/Akre

Mevan Ibrahim Baper  
Lecturer 
Duhok Polytechnic University

nljealkas2001@yahoo.com profdrhani59@gmail.com mevan.ibrahim@dpu.edu.krd

Imad.Ahmed.Ibrahim@gmail.com Fadeldiyar@gmail.com

ABSTRACT
The aim of the current investigation was to evaluate some reproductive aspects of local mountain goat raised in farm conditions. A total number of 498 does were mated during two successive years. Results revealed that fertility, conception, kidding, productivity and twinning rates averaged 80.72, 87.15, 84.94, 72.29 and 5.22 %, respectively. Litter size at birth and weaning were 1.05 and 0.9 respectively. Also, all above traits were significantly lower in does aged 2.5 years as compared with older does except those of litter size at birth and weaning. Effect of year of mating was found to be significant only on conception rate. Does mated in August resulted in a significant increase in the studied traits compared with that mated in September and October except those in twinning rate, litter size at birth and weaning. The regressions of litter size at birth and twinning rate on dam’s body weights were significant.

Key words: fertility, prolificacy, litter size, mountain goat.
INTRODUCTION
Goats are important animals for the provision of animal protein and as a source of income to small holders in the less developed parts of the world (20). Moreover, goats have an adaptive capacity in survive and produce in harsh environmental conditions especially in dry area (19). The goats population in Iraq are estimated at 1.5 million heads (12), and are considered an important livestock and has significant functions for meat and milk production especially under the agriculture systems prevailing in the country (4). The economic value of the goat depends upon its productive and reproductive efficiency which determine the producing ability up to marketing or to breeding age (13). In goats, reproductive efficiency is always considered to be the most vital factor especially when the major emphasis is on meat production to ensure replacement, to provide surplus stock for sale or build up numbers and finally to ensure as high selection differential as possible (3). However, this important genetic resource unlike in dairy cattle and sheep, very limited work has been attempted to investigate the various performance and economic traits of this local breed (16). Therefore, this study was undertaken to investigate some reproductive aspects of mountain goats in Kurdistan region of Iraq.

MATERIALS AND METHODS
This experiment was carried out in a herd of goats (498 does and 27 bucks) at private farm, Akre district, Duhok governorate, Kurdistan region of Iraq during two breeding seasons 2016/2017 and 2017/2018. Most of the details of this experiment were described by Baper and Hermiz (8) and Hermiz and Baper (14).

Mating system
During the first mating season, a total of 175 does were synchronized in August using intravaginal sponges impregnated with 40 mg FGA for 14 days. After 48 hours of sponges withdrawn, the does were randomly placed in pens with the bucks at a ratio of 1:6 for 72 hours. Whereas during the second mating season in mid-September, all does (323) were detected for estrus by teaser buck and mated naturally at a ratio of 1:10-15. About 4-5 days pre-kidding, the pregnant does were separated from the herd and placed into kidding pens, Age and weight of each doe at kidding, as well as sex, type of birth and birth weight of their kids was recorded within 24 hours post-kidding.

Feeding system
All animals were allowed to graze natured pasture for 8 hours daily during autumn and winter, whereas animals are grazed for 7 hours daily during spring and summer. Additionally, straw, barley and ground Oak acorn was provided in winter. Bucks were flushed pre-mating season for 4 weeks, and the does were flushed for 2 weeks prior to mating and extended for 2 weeks prior to kidding season and was continue post-kidding till weaning (3 months). The concentrate was offered daily at a rate of 0.5 kg, and contained 14.2% crude protein and 2772 kcal/kg energy.

Statistical analysis
The traits were analyzed as a threshold characters using method for all − or − non traits (0, 1) by the following model within the statistical program SAS (21):

\[ Y_{ijkl} = \mu + A_i + R_j + P_k + b_{(x_l-x)} + \epsilon_{ijkl} \]

Where:

- \( Y_{ijkl} \) = The values of the studied trait
- \( \mu \) = Overall mean
- \( A_i \) = Effect of \( i^{th} \) age of doe, \( i=2.5, 3.5, 4.5, 5.5 \)
- \( R_j \) = Effect of \( j^{th} \) year of mating, \( j=2016-2017, 2017-2018 \)
- \( P_k \) = Effect of \( k^{th} \) month of mating, \( k=8, 9, 10 \)
- \( b_{(x_l-x)} \) = Effect of the regression on body weight of doe at mating
- \( \epsilon_{ijkl} \) = Error term NID (0, \( \sigma^2e \)).

RESULTS AND DISCUSSION
Fertility, conception and kidding rates
In the current study, the fertility, conception and kidding rates averaged 80.72, 87.15 and 84.94%, respectively (Table 1). The fertility rate observed in this study was higher than those reported earlier in Iraqi goat raised on station conditions (67.6-78.3%) (17 and 24) or under farm conditions (77.27%) (2). However, it is lower than fertility rate (95.0%) recorded earlier by Alkass et al. (1) in Iraqi goats maintained on experimental state farm. Similarly, in semi-arid of Ethiopia, fertility rate of Adel local goats and their crosses with Saanen were 78 and 80%, respectively (18). Moreover, fertility is not often included as a
selection criterion in breeding programs as it is always subject to selection and has low heritability. However, to achieve high genetic potential for this trait, Bradford and Berger (9) suggested that systematic culling of unproductive animal may be the most important management practice to increase the number of lambs born in a flock of sheep. Although the conception rate was relatively high (87.15%), the reduction of fertility (80.72%) was due mainly to the losses caused by abortion (≈ 7%). Therefore, better health control is required to avoid such losses. In the present investigation, kidding rate averaged 84.94% (Table 1). This value is lower than those reported earlier (91.23-95.0%) by Alkass et al. (1), Alkass et al. (2) and Alkass and Mayi (5). Such lower kidding rate was mainly due to lower incidence of multiple births (Table 3).

**Productivity:** A productivity of 72.29% (Table 1) was achieved in the present work which could be considered as a moderate. However, since productivity is a product of fertility, prolificacy and survival rate up to weaning, therefore any improvement in any trait or more traits will lead to an improvement in the herd.

**Twinning rate and Prolificacy**

It is known that litter size at birth is a combination of ovulation rate and embryo survival. In the present investigation, twinning rate, litter size at birth and at weaning averaged respectively 5.22%, 1.05 and 0.9 (Table 3). This value is comparable to the values (1.15-1.19) reported earlier by Alkass et al. (2) and Alkass and Mayi (5) on goat maintained on commercial herds, but it is lower than the value 1.33 reported by Juma et al. (17) for goat raised on state farm. Moreover, since litter size is greatly influenced by environmental factors particularly nutrition, it would be possible to design a program aimed to improve this trait independent of genetic improvement (23).

**Factors affecting reproductive traits**

**Age of doe:** It appears from tables (1 and 3) that does aged 2.5 years had lower rates of fertility (67.95%), conception (75.64%), kidding (67.95%), productivity (56.41%), and twinning (0.02%) and the differences were significant as compared with does aged 3.5 years and older (tables 2 and 4). While the differences in both litter size at birth and weaning due to age of doe were not significant. Such results is expected and could be attributed to many factors including lower ovulation rate, shorter and less intense estrus and fewer and less regular estrus during breeding season than mature ewes (11). Similarly, Ince and Koker (15) noted that the effect of age of doe on fertility was significant in Turkish season goats. Also, Anwar and Ahmad (7) reported that in Teddy goats of Pakistan, mean ovulation rate increased as animal advanced in age.

**Year of mating:** It seems from tables 2 and 4 that the effect of year of mating was not significant in all studied traits except the conception rate which is lower (83.28%) in the second year as compared to the first year (94.29%) which could be due to higher incidence of abortion in this year (Table 1).

**Month of mating:** Some of the studied traits including fertility, conception, kidding, and productivity rates were affected significantly (p<0.01) by month of mating (Table 2) being highest in does mated on August, followed by September and the least were recorded in October (Table 1). It appears from table (4) that month of mating didn’t affect twinning rate, litters size at birth and weaning significantly, however with using Duncan test, the litter size at weaning for does mated at August was significantly higher than those mated at October (Table 3). Although no studies have been conducted on the effect of season on reproductive aspects of local Iraqi goat, but it seems that there is a trend of seasonality on this breed.

**Body weight of dam**

With regard to the effect of dam’s body weight on studied traits, it seems from Tables (2 & 4) that only the regression coefficients of twinning rate and litter size at birth on dam’s body weight were significant (p<0.01) being 1.43 and 0.015, respectively (Table 3). Similarly, several studies have demonstrated that increasing of does body weight at mating increased twinning rate (6, 10 and 22).

**CONCLUSION:** From the results presented in the text, it seems that fertility is considered moderate, while litter size is low. However, since reproduction traits have low heritability
therefore enhancing level of feeding prior breeding and / or using hormonal therapy is enough to improve the reproductive traits of goats.

Table 1. Means for the effects on some reproductive traits of Kurdish Mountain Goat

| Factors                      | No | Fertility (%) | Conception (%) | Kidding (%) | Productivity (%) |
|------------------------------|----|---------------|----------------|-------------|------------------|
| Overall mean                 | 498| 80.72         | 87.15          | 84.94       | 72.29            |
| Age of doe(years):           |    |               |                |             |                  |
| 2.5                          | 78 | 67.95 b       | 75.64 b        | 67.95 b     | 56.41 b          |
| 3.5                          | 157| 80.26 a       | 88.54 a        | 84.08 a     | 71.34 a          |
| 4.5                          | 180| 83.89 a       | 90.00 a        | 89.44 a     | 76.67 a          |
| 5.5                          | 83 | 86.75 a       | 89.16 a        | 92.77 a     | 79.52 a          |
| Year of mating:              |    |               |                |             |                  |
| 2016-2017                    | 175| 82.86 a       | 94.29 a        | 85.71 a     | 74.29 a          |
| 2017-2018                    | 323| 79.57 a       | 83.28 b        | 84.52 a     | 71.21 a          |
| Month of mating:             |    |               |                |             |                  |
| 8                            | 90 | 100.00 a      | 100.00 a       | 102.22 a    | 96.67 a          |
| 9                            | 309| 78.64 b       | 82.52 b        | 83.82 b     | 69.58 b          |
| 10                           | 99 | 69.70 b       | 89.90 b        | 72.73 b     | 58.59 b          |
| Regression on Doe weight at  | 498| -0.0025       | -0.0043        | 0.007       | -0.0015          |
| mating:                      |    |               |                |             |                  |

Means having different letters within each factor/column differ significantly (P<0.05) according to Duncan test

Table 2. Mean squares and test of significance for factors affecting some reproductive traits of Kurdish Mountain Goat.

| Factors                      | d.f. | Fertility | Conception | Kidding | Productivity |
|------------------------------|------|-----------|------------|---------|--------------|
| Age of doe(years):           | 3    | 0.586 **  | 0.414 **   | 1.046 **| 0.920 **     |
| Year of mating:              | 1    | 0.123     | 1.374 **   | 0.016   | 0.108        |
| Month of mating:             | 2    | 2.341 **  | 1.111 **   | 2.102 **| 3.717 **     |
| Regression on Doe weight at  | 1    | 0.059     | 0.172      | 0.464   | 0.022        |
| mating:                      | Residual | 490       | 0.143      | 0.104   | 0.198        | 0.240       |

** P<0.01  * P<0.05

Table 3. Means for the effects on some productive traits of Kurdish Mountain Goat.

| Factors                      | No | Twinning (%) | Litter size at birth | Litter size at weaning |
|------------------------------|----|--------------|----------------------|-----------------------|
| Overall mean                 | 402| 5.22         | 1.05                 | 0.90                  |
| Age of doe(years):           |    |              |                      |                       |
| 2.5                          | 53 | 0.02 b       | 1.00 a               | 0.83 a                |
| 3.5                          | 126| 4.76 a       | 1.05 a               | 0.89 a                |
| 4.5                          | 151| 6.62 a       | 1.07 a               | 0.91 a                |
| 5.5                          | 72 | 6.94 a       | 1.07 a               | 0.92 a                |
| Year of mating:              |    |              |                      |                       |
| 2016-2017                    | 145| 3.45 a       | 1.03 a               | 0.90 a                |
| 2017-2018                    | 257| 6.23 a       | 1.06 a               | 0.89 a                |
| Month of mating:             |    |              |                      |                       |
| 8                            | 90 | 2.22 a       | 1.02 a               | 0.97 a                |
| 9                            | 243| 6.58 a       | 1.07 a               | 0.88 ab               |
| 10                           | 69 | 4.35 a       | 1.04 a               | 0.84 b                |
| Regression on Doe weight at  | 402| 1.43        | 0.015                | 0.005                 |
| mating:                      | Residual | 394       | 0.054                | 0.049                 | 0.176       |

Means having different letters within each factor/column differ significantly (P<0.05) according to Duncan test

Table 4. Mean squares and test of significance for factors affecting some productive traits of Kurdish Mountain Goat.

| Factors                      | d.f. | Twinning | Litter size at birth | Litter size at weaning |
|------------------------------|------|----------|----------------------|-----------------------|
| Age of doe(years):           | 3    | 0.166 *  | 0.066                | 0.105                 |
| Year of mating:              | 1    | 0.072    | 0.072                | 0.001                 |
| Month of mating:             | 2    | 0.066    | 0.066                | 0.346                 |
| Regression on Doe weight at  | 1    | 1.842 ** | 2.161 **             | 0.203                 |
| mating:                      | Residual | 394       | 0.054                | 0.049                 | 0.176       |

** P<0.01  * P<0.05

REFERENCES
1. Alkass, J.E., M.K. Asofi and H.M. Ammar,. 2003. Effect of time of insemination on some reproductive performance in Iraqi local goats. Dirasat, Agric. Sci., 30: 79-83.
2. Alkass, J.E., M.S. Barwary and K.A. Derwesh. 2009. Observation on some reproductive traits of local goats maintained under farm conditions in Duhok province. J. Duhok Univ., 12: 81-89
3. Alkass, J. E., H. N. Hermiz M. I. and Baper, 2021. Some aspects of reproductive efficiency in Awassi ewes. Iraqi J. Agri. Sci., 52: In press
4. Alkass, J. E. and K.H. Juma. 2005. Small Ruminant Breeds of Iraq. In: Characterization of Small Ruminant Breeds in West Asia and North Africa (ed. L. Iniguez). ICARDA (International Center of Agriculture Research in the Dry Areas), Aleppo, Syria
5. Alkass, J. E. and V. J. Mayi. 2011. A survey study of sheep and goats raised under farm conditions. J. Duhok Univ., 14: 120-125
6. Amoah, E.A., S. Gelaye, P. Guthrie. and J.C/E/ Rexroad. 1996. Breeding season and aspects of reproduction in female goats. J. Anim. Sci., 74: 723-728
7. Anwar, M. and K.M. Ahmad. 1999. Ovulation rate and embryo loss in Teddy goats of Pakistan. Small Rumin. Res., 31: 281-283
8. Baper, M.I. and H.N. Hermiz. 2019. Non genetic parameters and repeatability for milk traits goat in Northern Iraq. Science Journal of University of Zakho. 7(3):70-74
9. Bradford, G.E. and Y.M. Berger. 1988. Breeding strategies for small ruminants in Arid and Semi-arid areas. In: Increasing Small Ruminants, Productivity in Semi-arid areas. (eds. Thomson, E.F. and F.S. Thomson). Klawer Academic Publisher. London, pp: 95-109
10. Downing, J.A. and R.J. Scaramuzzi. 1991. Nutrient effects on ovulation rate, ovarian function and the secretion of gonadotrophic and metabolic hormones in sheep. J. Reprod. Fert., Suppl, 43: 209-227
11. Dyrmundsson, O.R. 1987. Advancement of puberty in male and female sheep. In: New Techniques in Sheep Production. (eds. Marai, I.F.M. and J.B. Owen). Butterworth, London, pp: 95-109
12. FAO (Food and Agriculture Organization), 2014. Global information and early warning system on food and agriculture (GIEWS) Special Alert. http://www.fao.org. No. 332(3):1-45. Iraq
13. Hermiz, H.N. 2005. Genetic evaluation of Iraqi local goats and their crosses depending on their growth rates. Iraqi J. Agric. Sci., 36(6): 181-189
14. Hermiz, H.N. and M.I. Baper. 2019. Effect of fixed factors and estimation of genetic parameters of growth traits for Mountain kids. Iraqi J. Agric. Sci., 50(6):1542-1550
15. Ince, D. and A. Koker. 2011. The effect of estrus synchronization on the reproductive characteristics of Turkish Saanen goats and growth characteristics of kids under extensive conditions. Afr. J. Agric. Res., 6: 5715-5719
16. Juma, K.H. and J.E. Alkass. 2005. Native goats of Iraq. A review. Dirasat, Agric. Sci., 32: 180-188
17. Juma, K.H., K.M. Asofi and M.A.G. Alkirma. 2001. Study of fertility and prolificacy in goats and some factors affecting them. Dirasat, 28: 40-46
18. Kassahun, A., Y. Yibrah and I. Flecher 1989. Productivity of purebred Adel and quarter bred Saanen x Adel goat in Ethiopia. In: Wilson, R.T. and A. Azeb (eds). African Small Ruminant Research and Development, ILCA, Addis Ababa, Ethiopia
19. Labbie, S.H.B. 2004. Goats under household conditions. Small Rumin. Res., 51: 131-136
20. Mahgoub, O. and G. A.Lodge 1996. Growth and body composition in meat production in Omani Batina goat. Small Rumin. Res., 19: 233-246
21. SAS, 2005. SAS/STAT ®Usere’s Guide for Personal Computers, Release 8.00. SAS Institute Inc., Cary, NC, USA
22. Shahneh, Z., A. Sadeghipanah, H.J./, Barfourooshi, and M.A.Emami-Mibody. 2008. Effects of equine chorionic gonadotropin (eCG) administration and flushing on reproductive performance in Nadooshan goats of Iran. African Journal of Biotechnology, 7(18): 3373-3379
23. Shelton, A.S. 1978. Reproduction and breeding goat. J. Dairy Sci., 61:994-1010
24. Sultan, A.S. 2000. Increasing kidding rate in goats by the use new hormonal treatment and induction of the breeding season in the year. Ph.D. Thesis, College of Veterinary Medicine, University of Baghdad.