Effect of goat weight in productive performance of local goats

Sahar Rashid Halil Bashar Adham Ahmed
College of Agriculture, University of Diyala, Iraq
basharadham@uodiyala.edu.iq

abstract

The experiment was conducted in the animal field of the Animal Production Department / College of Agriculture / University of Diyala for a period of 5 months from 10/1/2024 to 1/3/2025 on 39 local female goats purchased from animal sales places in Diyala Governorate. This study aims to evaluate the relationship between weight coat and number of productive traits in local goats, by dividing a sample of mothers into three weight categories (25–34, 35–40, 41–50 kg) Data collected included weekly milk production during the first eight weeks, milk composition for the first and second months, colostrum composition, maternal body dimensions, and the birth and weaning weights and dimensions of her offspring. Results showed that most of the studied traits were not significantly affected by weight coat. Except for the coat chest and abdominal circumference, where significant differences were observed in favor of heavier groups.

Keywords: Local goats, milk production, milk components .

introduction

Improving the productive performance of small ruminants, especially local goats, is one of the main pillars of supporting food security and achieving sustainable rural development, especially in developing countries such as Iraq (1). The Iraqi local goat has a high capacity to adapt to harsh environmental conditions and scarce feed and pasture resources, in addition to its simple nutritional requirements, early sexual maturity, and high efficiency in exploiting low-quality forage such as shrubs compared to other animals such as cows and sheep (2) (3). Birth weight is an important physiological and genetic indicator for assessing the genetic and functional efficiency of mothers in animal breeding and genetic improvement programs. Recent studies indicate that this trait is influenced by direct genetic factors, in addition to maternal and environmental influences, making it an important early indicator for predicting future productive performance, Especially in small ruminants such as goats. Birth weight is also a trait with a medium to high heritability coefficient, which enhances its value in genetic selection programs to improve growth, survival, and production traits (4) (5). Numerous studies have shown that mothers with higher birth weights have greater physical and functional efficiency, which positively impacts their productivity. It has also been observed that offspring born to mothers with higher birth weights achieve higher weaning weights and higher daily growth rates, This supports the hypothesis that the coat physical characteristics, including her birth weight, directly influence the productive performance of offspring in later stages of development (6) (7) indicated a positive correlation between lamb birth weight and the

ISSN 2072-3857

amount of milk produced by the mothers. This is attributed to the influence of maternal physical characteristics, such as body mass and udder measurements. Which is one of the important factors determining milking efficiency and productivity, as larger females often show higher production performance. Also, body dimensions such as body length, chest circumference, and shoulder height are closely related to milk production, as these measurements are indirect indicators of the animal's digestive efficiency and metabolic capacity (8). From this standpoint, the importance of studying the environmental and physiological factors influencing production traits emerges, with the aim of harnessing available resources to improve the efficiency of animal production. Despite the importance of these traits, studies related to them in Iraq, particularly with regard to milk production, quality, and components, are lacking In addition to the physical dimensions of local goats, they are still limited compared to those available in improved global breeds. However, a recent comparative study between local and Cypriot goats in Iraq showed significant differences in milk production and its components, such as fat, protein, and lactose, reflecting the importance of the breed and its impact on production efficiency (9). This study aims to evaluate the effect of weight on the productive traits of local Iraqi goats, including milk production, milk components, and body dimensions, in order to build a comprehensive scientific understanding of the factors influencing the improvement of local goat performance.

Materials and methods

This experiment was conducted in the animal field of the College of Agriculture, University of Diyala, for a period of five months (from October 1, 2024 to March 1, 2025). Thirty-nine local goats were used. These animals were raised and managed according to a program that included care during pregnancy, vaccinations and special treatments, and preparation for the birthing season, The animals were fed concentrated fodder materials such as barley, bran, fodder dates, and straw, with continuous grazing on grasses so that the animals could get their needs from nature, With continuous provision of drinking water throughout the experimental period, the animals were subjected to health and preventive follow-up against diseases during pregnancy for pregnant mothers, at birth, and until the weaning period for newborns according to the animals' needs. The goats were divided into three groups (treatments) based on the weight of the mothers at birth (the first group 25-34 kg, the second group 35-40 kg, the third group 41-50 kg). The weight of the mother goats at birth was measured and recorded for distribution into groups. Milk production was measured weekly for each group of goats for two months. The quality of the milk produced during the trial period was analyzed, as well as the components of milk and colostrum (protein, lactose, fat, non-fat solids, density, and minerals) Using the Milk Analyzer Master Pro device, milk production, quality, and components were compared between different groups of goats to determine the effect. Weight and body dimensions were measured according to the method (10) Data were statistically analyzed using a

ISSN 2072-3857

cross-reference randomized design (CRD) and the (11) statistical software, according to the following equation :

$Yij = \mu + Ai + \varepsilon ij$

Yij = milk characteristics and components

μ = overall mean

Ai = goat weight

εij = residual random error

(12) was used to determine significant differences between the means of the factors affecting the studied characteristics.

Results and discussion :

The effect of weight coat on weekly milk production of local goats

The results of Table (1) indicate that there were no significant differences in weekly milk production in local goats between the different categories of weight coat (25–34, 35–40, and 41–50 kg). This indicates that weight is not the sole determining factor in determining milk production. This is consistent with the findings of (13), In their study on local and Cypriot goats, weight coat was not significantly associated with total milk production or its chemical components, although it was associated with some body dimensions such as chest circumference and body length. This is not consistent with the study by (14), which indicated that ewes born to mothers with high birth weights produced larger quantities of milk, with higher protein and lactose content, compared to mothers with lower birth weights

.

Table 1: Effect of weight goat on weekly milk production of local goats (ml/animal)

Scnefecant level	Goat weight 41 – 50 Kg	Goat weight 35 – 40 Kg	Goat weight 25-34 Kg	Traits
	5	18	16	Number
N. S	1274.0 ± 418.48	1208.06 ± 102.47	1176.88 ± 93.08	First week
N. S	1028.0 ± 333.81	1027.06 ± 129.67	844.37 ± 59.76	The second week
N. S	880.0 ± 259.01	843.88 ± 98.90	745.62 ± 46.13	The third week
N. S	832.0 ± 247.11	845.83 ± 98.84	701.25 ± 49.83	The Fourth week
N. S	700.0 ± 189.12	805.27 ± 124.58	668.12 ± 45.94	The Fifth week
N. S	592.0 ± 149.11	755.0 ± 95.87	595.31 ± 32.42	Sixth week
N. S	688.0 ± 154.96	685.0 ± 88.27	493.75 ± 33.08	The Seventh week
N. S	499.0 ± 58.95	509.16 ± 62.37	448.43 ± 31.50	The eighth

ISSN 2072-3857

week

2-The effect of weight goat on milk components during the first month of production for local goats

Table (2) The results indicate that there is no statistically significant difference, indicating that the coat weight coat not have a clear significant effect on the chemical composition of local goat milk during the first month of lactation. These results are consistent with what (15) indicated that genetic and physiological factors such as weight may have a limited effect on milk components compared to environmental and nutritional factors (16) study also supported the notion that goat milk composition exhibits natural variation among individuals without being strongly related to weight. These findings are inconsistent with those of (14). Ewes born to mothers with higher birth weights produced larger quantities of milk, which contained higher levels of protein and lactose, than mothers with lower birth weights

.

Table 2: Effect of weight goat on milk components during the first month of production for local goats

Scnefecant level	Goat weight 41 – 50 Kg	Goat weight 35 – 40 Kg	Goat weight 25-34 Kg	Traits
	5	18	16	Number
N. S	3.90 ± 0.08	4.08 ± 0.15	4.06 ± 0.08	Protein %
N. S	4.05 ± 0.59	4.47 ± 0.37	4.91 ± 0.42	Fat %
N. S	5.61 ± 0.34	6.10 ± 0.22	6.16 ± 0.11	Lactose %
N. S	37.03 ± 1.22	38.43 ± 1.34	37.85 ± 0.53	Density g/cm3
N. S	10.86 ± 0.21	11.20 ± 0.40	11.15 ± 0.17	Non-fat solids
N. S	0.88 ± 0.03	0.88 ± 0.02	0.87 ± 0.01	Minerals

3-The effect of weight goat on milk components during the second month of production for local goats

the results of Table (3) showed that there were no significant differences in the components of milk during the second month of production in Iraqi local goats according to the coat weight coat(25-34, 35-40, 41-50) kg. Based on this, it is concluded that the coat weight coatis not a strong indicator that can be relied upon to predict the quality of milk later on This is not consistent with what (14) found, which indicated that ewes born to mothers with higher birth weights produced larger quantities of milk

.

Table 3: Effect of weight goat on milk components during the second month of production for local goats.

ISSN 2072-3857

Scnefecant level	Goat weight 41 – 50 Kg	Goat weight 35 – 40 Kg	Goat weight 25-34 Kg	Traits
	5	18	16	Number
N. S	3.70 ± 0.10	3.67 ± 0.10	3.81 ± 0.10	Protein %
N. S	4.26 ± 0.55	4.33 ± 0.23	4.46 ± 0.35	Fat %
N. S	5.52 ± 0.12	5.43 ± 0.14	5.86 ± 0.13	Lactose %
N. S	35.02 ± 1.27	34.11 ± 0.83	35.50 ± 1.19	Density g/cm3
N. S	9.98 ± 0.24	9.84 ± 0.24	10.69 ± 0.23	Non-fat solids
N. S	0.82 ± 0.02	0.76 ± 0.04	0.80 ± 0.05	Minerals

-Effect of weight goat on colostrum components of local goats

The results of the statistical analysis of the colostrum components data showed no significant differences between the different categories of weight coat in all the studied characteristics, which included protein, fat, lactose, specific gravity, non-fat solids, and minerals . This indicates that weight coat does not significantly affect the colostrum composition of local goats within the studied weight range (25–50 kg) The results of this study are consistent with (17) who found that weight does not affect colostrum components.

Table 4: Effect of weight goat on colostrum components of local goats

Scnefecant level	Goat weight 41 – 50 Kg	Goat weight 35 – 40 Kg	Goat weight 25-34 Kg	Traits
	5	18	16	Number
N. S	5.66 ± 0.78	5.95 ± 0.31	6.03 ± 0.39	Protein%
N. S	6.06 ± 1.0	5.75 ± 0.43	5.73 ± 0.45	Fat%
N. S	8.08 ± 0.99	8.76 ± 0.46	9.11 ± 0.62	Lactose%
N. S	50.36 ± 7.34	52.08 ± 3.26	53.18 ± 3.98	Density g/cm3
N. S	15.98 ± 2.39	15.47 ± 0.90	15.36 ± 1.03	Non-fat solids
N. S	1.30 ± 0.20	1.31 ± 0.06	1.29 ± 0.08	Minerals

5-The effect of weight goat on the body dimensions of the mother at birth in local goats

Table (5) shows that the coat weight coat(25-34 kg, 35-40 kg, 41-50 kg) affects some of the coat physical

ISSN 2072-3857

dimensions at birth, such that older mothers (41-50 kg category) show higher values in most variables compared to lighter categories, with clear statistical significance for abdominal and chest circumference (P<0.01). These results are consistent with what (18) indicated, indicating that the conditions a fetus experiences during pregnancy such as nutrition and fetal growth—may later influence its physical characteristics, such as growth or milk production. A coat birth weight is considered an indicator of these conditions in the womb. (19) reported a significant effect of birth weight on linear anthropometric measurements, such as lateral tibia length and head size, in Nigerian crossbred goats, indicating a direct correlation between birth mass and body dimensions of these animals A study by (20) in sheep showed that individuals with higher birth weights had superior growth rates and achieved greater final body mass compared to those with lower birth weights. These findings suggest that birth weight is a predictive factor with a long-term impact on an individual's body composition, reflecting its importance in genetic improvement programs and early nutritional management . It is partially inconsistent with what (13) concluded in their study conducted on local and Cypriot goats in Iraq, that the coat weight coat was not significantly related to the total milk production or its chemical components, despite its association with some body dimensions such as chest circumference and body length.

Table 5: Effect of weight goat on the coat body dimensions at birth for local goats (cm)

Scnefecant level	Goat weight 41 – 50 Kg	Goat weight 35 – 40 Kg	Goat weight 25-34 Kg	Traits
	6	18	16	Number
N. S	64.0 ± 4.33	61.47 ± 2.03	64.35 ± 3.93	Body length
N. S	66.0 ± 4.59	67.11 ± 0.90	66.50 ± 1.08	Front rise
N. S	74.0 ± 3.07	71.82 ± 1.18	70.14 ± 1.17	Buttock height
**	84.50 ± 5.16 a	82.0 ± 0.94 a	75.92 ± 0.86 b	Chest circumference
**	89.0 ± 7.09 a	90.17 ± 1.52 a	79.78 ± 1.02 b	Abdominal circumference

6-The effect of weight goat on the weight and body dimensions of the newborn goats

The results of the table indicate no significant differences, which means that weight alone is not a significant factor influencing these traits. These results are partially consistent with those reported in the study by (21), Which indicated that improving maternal nutrition did not lead to significant differences in birth weight, reflecting the limited impact of the coat physical condition. In another

ISSN 2072-3857

study,(22) found n Tunisian goats, there was a clear effect of weight coat on offspring weight, which in turn may affect colostrum consumption and growth rate, thus affecting overall performance Including milk components in later stages. In the same context, the results of (23) in Jordan indicated that weight affects the weight of the newborn, but it was not directly or statistically significantly linked to milk production or its components, which supports the current table results within the limits of the studied variable . In the study by (24), a positive association was observed between weight and birth weight with milk production, although this association was not significant for all milk components such as protein, indicating that the relationship between weight and production is not always linear or constant.

Table 6: Effect of weight goat on the weight and body dimensions of the newborn at birth for local goats (cm)

Scnefecant level	Goat weight 41 – 50 Kg	Goat weight 35 – 40 Kg	Goat weight 25-34 Kg	Traits
	6	19	16	Number
N. S	3.20 ± 0.13	3.11 ± 0.18	3.08 ± 0.15	Birth weight
N. S	33.33 ± 1.76	29.59 ± 1.90	29.56 ± 1.16	Body length
N. S	33.33 ± 1.28	31.68 ± 1.14	32.02 ± 0.48	Buttock height
N. S	35.50 ± 2.04	32.31 ± 0.96	32.12 ± 0.67	Buttock height
N. S	36.83 ± 1.57	36.21 ± 0.66	35.62 ± 1.0	Chest circumference
N. S	37.83 ± 1.70	37.31 ± 0.74	37.0 ± 1.26	Abdominal circumference

6-The effect of weight goat on the weight and body dimensions of the newborn at weaning in local goats

The results of Table (7) showed that all the studied traits showed no statistically significant differences between the three categories of weight, indicating that the coat birth weight had no significant effect on the weight of the kid at weaning or on its physical dimensions. It is assumed that other factors such as nutrition, the coat health status, and the number of births may have a greater impact and warrant further study .

The results of (23) in Jordan indicated that weight affects the birth weight of the offspring, but it was not directly or statistically significantly linked to milk production or its components. The results of the study by (25) concluded that weight significantly affects some early growth traits (birth weight and some pre-weaning traits), but it loses its significance in later stages of the offspring's growth (after weaning).

ISSN 2072-3857

Table 7: Effect of weight goat on the weight and body dimensions of the newborn at weaning for local goats (cm)

Scnefecant level	Goat weight 41 – 50 Kg	Goat weight 35 – 40 Kg	Goat weight 25-34 Kg	Traits
	4	17	16	Number
N. S	8.82 ± 0.99	8.48 ± 0.62	8.09 ± 0.40	Weaning weight
N. S	4.57 ± 0.22	5.76 ± 0.48	4.86 ± 0.37	Total weight gain
N. S	43.50 ± 2.21	44.81 ± 0.96	43.14 ± 0.72	Body length
N. S	39.45 ± 1.62	41.81 ± 0.97	41.85 ± 0.86	Front rise
N. S	42.75 ± 2.05	44.18 ± 1.34	44.21 ± 0.92	Buttock height
N. S	50.75 ± 1.49	48.81 ± 1.10	48.57 ± 0.93	Chest circumference
N. S	53.0 ± 1.77	52.81 ± 1.11	52.14 ± 0.89	Abdominal circumference

References :

(1) Alkass, J., & Mustafa, K. (2023). Performance of native goats in Kurdistan region of Iraq: A review. *Mesopotamia Journal of Agriculture*, *51*(3), 11-0.

(2) Ibtisham, Fahar, Li, Z., X., Lilong, A., Muhammad, B.R., Aamir, N., Yi, Z., Guanghui, L., and Yong, M. X. (2017). Genomic selection and its application in animal breeding. Thai J Vet Med. 47(3): 301-310

(3) Al-Dabbagh, S. A., Al-Anbari, N. N., Hadi, F. H. & Shekhw, L. S. (2011). The effect of type of birth and stage of lactation on milk production and composition of Coatascus goats in Iraq. Iraq journal of agricultural research, 16(6), 173-180.

(4) Salem A. H. (2017). Some necessary and genetic factors affecting a number of body dimensions in local and Shami goats: Abdullah Hamid Salem, University of Thi Qar / College of Agriculture. Karbala Journal of Agricultural Sciences, 3 (2), 12-21. https://doi.org/10.59658/jkas.v3i2.17

(5) Gul, S., Arzik, Y., Kizilaslan, M., Behrem, S., & Keskin, M. (2023). Heritability and environmental influence on pre-weaning traits in Kilis goats. *Tropical Animal Health and Production*, *55*(2), 85.

(6) Traoré, A., Álvarez, I., Fernández, I., Pérez-Pardal, L., Kaboré, A., Ouédraogo-Sanou, G. M., ... & Goyache, F. (2012). Ascertaining gene flow patterns in livestock populations of developing countries: a case study in Burkina Faso goat. *BMC genetics*, *13*(1), 35.

(7) Muthanna Fathi Abd H. (2023). A study of milk production, some of its chemical components, and its relationship to the growth of Awassi

ISSN 2072-3857

sheep lambs. Journal of Agricultural, Environmental & Veterinary Sciences, 7(1).

(8) Tilki, H. Y., & Keskin, M. (2021). Relationships between different body characteristics and milk yield traits in Kilis goats. *Mustafa Kemal Üniversitesi Tarım Bilimleri Dergisi*, *26*(2), 272-277.

(9) Jameel, D. S., & Salim, A. H. (2024). Study Effect of Breed on Milk Production Traits and their Regression on Weight in Local and Cypriot Goats. *University of Thi-Qar Journal of agricultural research*, *13*(2), 153-158.

(10) Cam, M. A. Olfaz, M. and Soydan, E. (2010). Body Measurements Reflect Body Weight and Carcass Yields in Kara Yaka Sheep .Asian J.Anim .Vet.Adv, (5):120-127.

(11) SAS .(2010). SAS/STAT User's Guide for Personal Computers . Release 9.1 SAS Institute Inc. , Cary , N. C. , USA

(12) Duncan, D.D. 1955. Multiple range and multiple F-test Biometrics , 11: 1-42.

(13) Ahmed, B. A., & Obaid, M. R. (2024). Correlation and Regression Analysis of Body Weight and Milk Characteristics of Cypriot and Local Goats. AL-Yarmouk Journal, 22(2), 83-91.

(14) Miller, R. et al. (2017). Effect of coat weight and pregnancy nutrition on average lactation performance of ewe offspring. Journal of Animal Science, 95(3), 1022-1031.

(15) Park, Y. W., Juárez, M., Ramos, M., & Haenlein, G. F. W. (2007). Physico-chemical characteristics of goat and sheep milk. Small Ruminant Research, 68(1–2), 88–113. https://doi.org/10.1016/j.smallrumres.2006.09.013

(16) Haenlein, G. F. W. (2004). Goat milk in human nutrition. *Small Ruminant Research, 51(2), 155–163. https://doi.org/10.1016/j.smallrumres.2003.08.010

(17) Agradi, S., González-Cabrera, M., Argüello, A., Hernández-Castellano, LE, Castro, N., Menchetti, L., ... & Curone, G. (2023). Colostrum quality in different goat breeds raised in Northern Italy. Animals, 13 (19), 3146.

(18) Gluckman, P.,&Hanson, M. (2004). The developmental origins of the health and disease paradigm. Pediatric Research, 56(3), 311–317

(19) Otuma, M. O. (2007). The effect of genotype and birth type on gestation length and linear body measurements of crossbred Nigerian goats. Agro-Science, 6(2.(

(20) Andrés, S., Valdés, C., Santos, A., Mateo, J., & Giráldez, F. J. (2020). Effects of birth weight on animal performance, fattening traits and meat quality of lambs. Animals, 10 (12), 2364

(21) Madibela, O. R., & Segwagwe, B. V. E. (2008). Effect of supplementary feeding on the performance of lactating Tswana goats. Livestock Research for Rural Development, 20 (4). Retrieved from(https://www.lrrd.org/lrrd20/4/madi20064.htm

(22) Ben Salem, H. et al. (2021). Environmental factors affecting birth weight of Tunisian local goat population kids. Journal of New Sciences, Agriculture and Biotechnology, 38, 114-122.

(23) Radea, R. (2022). The effects of doe weight, litter size and sex on kids' birth weight of three goat breeds. Livestock Research for Rural Development, 32(10).

ISSN 2072-3857

(24) González-Ronquillo, M. (2021). Milk yield and composition of mixed-breed goats on rangeland. Biology, 10(3), 220.

(25) Magotra, A., Bangar, Y. C., Chauhan, A., Malik, B. S., & Malik, Z. S. (2021). Influence of maternal and additive genetic effects on offspring growth traits in Beetal goat. *Reproduction in domestic animals*, *56*(7), 983-991.

ISSN 2072-3857