

Role of sex chromatin on performance in the local (black) goats دور الكروماتين الجنسي على الأداء الإنتاجي للماعز (الأسود) المحلي

Salim Omar Raof Sirod Sami Yahya Dlpak Birkhader Younis Ahmad SheakhMohamad*

Agriculture College/ Salahaddin University/ Erbil

*Veterinary College/ Salahaddin University/ Erbil

يونس احمد شيخ محمد * سالم عمر رؤوف سرود سامي يحيى دلباك بيرخدر

كلية الزراعة / جامعة صلاح الدين / أربيل

*كلية الطب البيطري / جامعة صلاح الدين / أربيل

E-mail: salmomarraoof@yahoo.com

Abstract

This study was conducted on local black goats belongs to private flock in Erbil plain from period July/ 2014 to April/ 2015. The study included 116 local black goats to study role of sex chromatin on the daily milk production (DMP), total milk production (TMP), lactation period (LP), Fertility rate, Prolificacy, birth weight (BW), fertilize estrous sequences and correlation coefficients between the studied traits and repeatability of (DMP). The ratio of sex chromatin shapes drum stick, sessile nodule, tear drop and small club were %32.05, %52.97, %8.52 and %6.46 respectively. The overall means of DMP, TMP, LP, Fertility rate, Prolificacy, BW and fertilize estrous sequences were 577.78g, 49.21kg, 85.70days, %75.74, 1.35, 3.01 kg and 1.50 respectively. Sex chromatin shapes had significant effect on all of the characterize studied. The results showed that there is significant ($P < 0.05$) in relation to (DMY), the highest rate of (DMY) was shown among the goats. The highest level of (DMP) was in animals which raised drum stick sex chromatin (681.03g), while the lowest level was among sheep which raised sex chromatin small club (514.77g), also, there are significant effect of sex chromatin shapes on fertility rate, prolificacy, BW, and fertilize estrus sequences. Correlation coefficient value between (DMP) correlated positively 0.88, 0.54, 0.33, and 0.31 for drum stick, sessile nodule, tear drop and small club respectively. Repeatability estimates for (DMP) 0.38. The conclusion of this study is the prediction of production (milk production and BW) and reproduction (Fertility rate, Prolificacy and fertilize estrous sequences) performance for local black goats from shapes and percentage of sex chromatin distribution and measurements. The sex chromatin shapes helped in doing early selection to elite goats on the linkage between sex chromatin shapes and performance production.

Key words: Black goat, Sex chromatin, Milk production, Correlation coefficient and Repeatability

الملخص

أجريت هذه الدراسة على الماعز المحلي الأسود في إحدى القطعان الأهلية في قرية قبه كيان/ أربيل-أقليم كوردستان العراق لـ 116 معزة للفترة من تموز / 2014 لغاية نيسان / 2015. بهدف دراسة دور الكروماتين الجنسي على إنتاج الحليب اليومي و الكلي وطول موسم الحليب والخصوبة و وزن الميلاد و تسلسل دورة الشبق مع أيجاد معاملات الارتباط ما بين الصفات المدروسة والمعامل التكراري في الماعز المحلي الأسود. بلغت النسب المنوية لعصا الطبل و برون بدون ساق ودمعة العين والشكل الهرابي %32.05 و %52.97 و %8.52 و %6.46 على التوالي. أما قيمها لإنتاج الحليب اليومي و الكلي وطول موسم الحليب ونسبة الخصوبة و وزن الجدي عند الميلاد و تسلسل دورة الشبق فقد بلغت 577.78 غم، 49.21 كغم و 85.70 يوم و %75.10 و 1.35 و 3.01 كغم و 1.50 على التوالي. تبين أن هنالك تأثير معنوي لأشكال الكروماتين الجنسي في جميع الصفات المدروسة. وظهرت نتائج الدراسة الحالية وجود فروقات معنوية ($P \leq 0.05$) في معدل إنتاج الحليب اليومي، وبلغ أعلى معدل لإنتاج الحليب اليومي لدى الماعز التي ظهر فيها شكل الكروماتين الجنسي من نوع عصا الطبل (681.03غم)، في حين كان معدل إنتاج الحليب اليومي في أدناه لدى مثيلاتها التي ظهر فيها شكل الكروماتين الجنسي من نوع الهرابي (514.77غم). تبين أن هنالك تأثير معنوي لأشكال الكروماتين الجنسي في نسبة الخصوبة، و وزن الجدي عند الميلاد، تسلسل دورة الشبق. كان معامل الارتباط موجبا إذ بلغ 0.88 و 0.54 و 0.33 و 0.31 بين إنتاج الحليب اليومي وأشكال الكروماتين الجنسي (عصا الطبل و برون بدون ساق ودمعة العين والشكل الهرابي) على التوالي كما تم تقدير المعامل التكراري لإنتاج الحليب اليومي 0.38. إذ أن معرفة أشكال الكروماتين الجنسي لها دور في الانتخاب المبكر للمعزات المتميزة من خلال الربط ما بين أشكال الكروماتين الجنسي والأداء الإنتاجي و التناسلي في الماعز المحلي الأسود.

الكلمات المفتاحية: الماعز الأسود، الكروماتين الجنسي، إنتاج الحليب، المعامل التكراري و معامل الارتباط.

Introduction

Black goat is the main native breed in Iraq, although their productive ability is low. The black mountain goat in Kurdistan region is generally smaller in size than those in other parts of Iraq [1]. Among domestic animals, goat regards the first species was raised by human being. It was raised by the tribes depending on the traditional method in the very beginning era, and then it has been developed to become complicated in specialized farms. Goat specialized by the ability of multiple parturition productivity, the mean value of boring numbers about 1.5

for each season [2]. For this reason, breeders seek programs that involve improving certain selected characters with limited time, one of which genetically selected properties. In this aspect, early- aged animals among the examined group were selected for a certain character depending on their production value such as sex chromatin shapes [3]. Sex chromatin in neutrophils of sheep and goat are four shapes drum stick, sessile nodule, tear drop and small club [4]. The sex chromatin body presented on the nucleus jutting slightly from the tip of the main nucleus, the shape of the head is round or oval with average size of 1.77 x 1.0 micron in goat. The sex chromatin is used in the diagnosing of the major X-related reproductive abnormality and stunted growth [5]. In goat, the highest decrease in drum stick ratio was seen in animal suffering from sexual abnormalities and prolificacy defect [6]. Studied that, the abnormal morphology of sex chromatin into early life of animals can be used in culling process of individual and lead to decrease the cost of production. Repeatability estimate is considered as the upper limit of heritability because it contains the permanent environment effects in addition to genetic and phenotypic variances [7].

The purpose of this paper was to study the role of sex chromatin in the local black goats affecting on the daily milk production, total milk production, lactation period, fertility rate, prolificacy, birth weight (kg) and fertilize estrous sequences, also to study the correlation coefficients between the studied traits and repeatability of the daily milk production of local black goats.

Materials and Methods

One hundred sixteen local goats were assigned at the prevent flocks at Erbil plain from period July/2014to April /2015. Each of the goats were fedwith500g/day of concentrated food (barley seeds and wheat bran)during mating and pregnancy period, and then increased to 750g/goat/day, the ration ground, mixed and fed ad libitum. Alfalfa and wheat stubbles were fed free choice, salt, limestone and vitamins, after lambing with a usual daily grazing. The neonatal goats were weighted after 24 hours of birth, and then, milk yield measurements commenced in the 4th week after kidding. Blood collection and preparation of blood samples, blood samples were collected by using heparinized vacationer tube to avoid coagulation and properly tagged for proper identification. A drop of the whole blood was dropped in a clean glass slide by using a Pasteur pipette and a smear prepared. Two slides were made from each sample and allowed to dry. The slides were stained with Leishman stain for 3-5 minute after that washed with distilled water and then dried by air. The slides were examined under the microscope at a magnification of 100 x objective using oil immersion. The polymorph nuclear neutrophils and four shapes of sex chromatin were, founded as for sex chromatin of different shapes (drum stick, sessile nodule, tear drop, small club). Were counted in 100 polymorph nuclear Leucocytes animals.

$$\text{Fertility} = \frac{\text{No. of does kidding}}{\text{No. of does exposed to bucks}} \times 100.$$

$$\text{Prolificacy} = \frac{\text{No. of kids born or weaned}}{\text{No. of does kidding}} \times 100.$$

As the increase in the fertility and prolificacy is the main ways to increase meat production in sheep and goats, and is a guarantee for renewing the herd, in addition to genetic improvement to enduring species.

$$\text{Repeatability estimate was obtained as follows } \delta^2d / \delta^2d + \delta^2e$$

Repeatability was estimated for daily milk yield.

δ^2d = Variance component of does

δ^2e = Residual error term.

A (General Linear Model) GLM used for the statistical analysis of the data Duncan multiple range test [8] was performed for the mean differences comparisons. A procedure of the statistical analysis system [9] was used according to the following linear additive model:

$$Y_{ijk} = \mu + S_i + e_{ijk}$$

y_{ijk} : is the value of any observation in the study.

μ : Overall mean

S_i : Effect of i^{th} sex chromatin i =drum stick, sessile nodule, tear drop and small club.

e_{ijk} : Random error associated with the ijk^{th} observation ,assumed to be NID. (0, δ^2e), Chi-square test was used to significant compare between percentages in this study.

Results and Discussion

Table (1) indicates the present of four different shapes of sex chromatin in the neutrophils of the local goat. The overall mean of these shapes of sex chromatin were drum stick 32.05%, sessile nodule 52.97%, tear drops 8.52% and small club 6.46%.The same results obtained in a study by [10] that referred to the present of four

different shapes of sex chromatin in local Awassi sheep as drum sticks, sessile nodule, tear drop and small club in 24.37%, 64.49%, 9.25% and 1.89% respectively. Figures (1-4) shows the sex chromatin shapes in poly morph nuclear leucocyte of goats. The highest number of goats appeared with sex chromatin sessile nodule shapes, this result agree with the result obtained by [11] in shammi (Damascus) and local does in which the ratio of sessile nodule shape of sex chromatin were 30.6% and 32.00% respectively.

Table (1): Numbers and ratio of sex chromatin shapes distributed in the studied trait.

| | Type of sex chromatin | No. animals | No. observation | % |
|-------|-----------------------|-------------|-----------------|-------|
| 1 | Drum stick | 41 | 124 | 32.05 |
| 2 | Sessile nodule | 58 | 205 | 52.97 |
| 3 | Tear drop | 24 | 33 | 8.52 |
| 4 | Small club | 21 | 25 | 6.46 |
| Total | ----- | 144 | 387 | %100 |

While the lowest numbers of goats were seen with small club shapes of sex chromatin, this result is in contrast with the result of [11] who indicated that the lowest sex chromatin shapes is tear drop in shammi and local does about 14.30% and 13.0% respectively. The overall mean of daily milk production (DMP), total milk production (TMP) and lactation period (LP) were about 577.78g, 49.21kg and 85.70 days respectively Table (2). Sex chromatin shapes was significantly ($P \leq 0.01$) effect on DMP, the highly amount of DMP was in goats with drum stick shape of sex chromatin 681.03g while the lowest amount of DMP was in animals with small club sex chromatin about 514.77g, this result is agree with the result obtained by [12] Turkish Awassi sheep proved that the highest level of DMP is in animals with drum stick shape of sex chromatin about 1.21 kg and the lowest DMP was seen in sheep with small club sex chromatin shape 1.08kg.

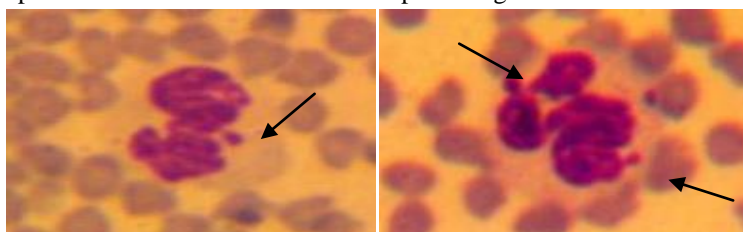


Fig. (1): Drum stick (1000x)

Fig. (2): Sessile nodule (1000 x)

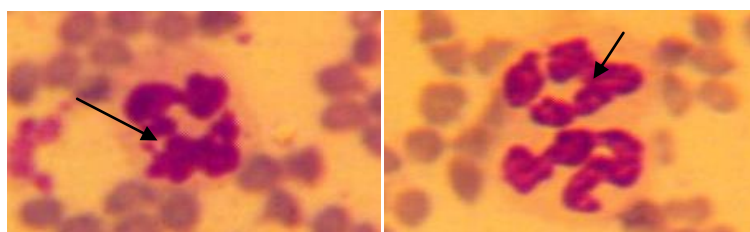


Fig. (3): Small club shape (1000 x)

Fig. (4): Tears drop shape (1000 x)

Figures (1-4) Sex chromatin shapes in poly morph nuclear leucocyte of goats.

Also the same result was obtained by [13] in Erbil local sheep. TMP and LP were also significantly ($P \leq 0.05$) affected by sex chromatin shapes. The highest TMP and longest LP were appeared in goat with drum stick shape about 59.09kg and 87.41 days respectively. In other hand the lowest level of TMP 42.96kg and shorter LP 83.18 days were seen in animals with small club sex chromatin. This result is in agreement with the result obtained by [12] who indicated that drum stick induced significant highly amount of TMP about 139.36kg while small club shape induced lowest amount of TMP about 113.46 kg in local Awaasi sheep.

Table (2): Effect of sex chromatin shapes on milk production.

| Source of variation | No. animal | No. observation | Daily milk production (g) | Total milk production (kg) | Lactation period (day) |
|-----------------------|------------|-----------------|---------------------------|----------------------------|------------------------|
| Overall mean | 144 | 387 | 577.78±2.06 | 49.21±0.10 | 85.70±0.16 |
| Type of sex chromatin | | | ** | * | * |
| Drum stick | 41 | 124 | 681.03±2.30a | 59.09± 0.12 a | 87.41± 0.09a |
| Sessile nodule | 58 | 205 | 590.70±2.10b | 50.76±0.12b | 86.16±0.19ab |
| Tear drop | 24 | 33 | 550.00±1.48bc | 46.43±0.09bc | 83.93±0.33ab |
| Small club | 21 | 25 | 514.77±1.19c | 42.96±0.07c | 83.18± 0.19b |

All means within a particular subclass differ significantly except those follow with the same letter. *($P \leq 0.05$), **($P \leq 0.01$).

Table (3) showed the overall mean of fertility and prolificacy affected by sex chromatin shape about 75.74% for fertility and 1.35% for prolificacy. The sex chromatin shapes affected significantly ($P \leq 0.05$), on fertility rate and prolificacy. The fertility is highly raised in goat with drum stick and sessile nodule 77.69% and 78.67% respectively while the lowest fertility was seen in small club by 73.64% and tear drop 72.96% sex chromatin shapes. Other results were obtained by [10,12] whom indicated that animals with sessile nodule sex chromatin had the highest fertility rate 89.55%. In compare with the other shapes of sex chromatin in Turkish Awassi sheep, also [6] reported that does with less than 1% drumsticks appendages per 200 PMNS polymorph nuclear will display impaired fertility. The same results obtained in prolificacy, drum stick and sessile nodule highly increase the prolificacy by 1.54 and 1.49 respectively and significantly decreased in sex chromatin shape of tear drop 1.25% and small club by

Table (3): Effect of sex chromatin shapes on fertility and prolificacy

| Source of variation | No. Animal | No. Observation | Fertility | Prolificacy |
|-----------------------|------------|-----------------|--------------|--------------|
| Overall mean | 144 | 387 | 75.74±1.12 | 1.35± 0.02 |
| Type of sex chromatin | | | * | * |
| Drum stick | 41 | 124 | 77.69± 1.11a | 1.54 ± 0.02a |
| Sessile nodule | 58 | 205 | 78.67± 1.14a | 1.49± 0.01a |
| Tear drop | 24 | 33 | 72.96± 1.10b | 1.25 ± 0.03b |
| Small club | 21 | 25 | 73.64 ±1.12b | 1.17± 0.02b |

All means within a particular subclass differ significant except those follow by the same letter. *($P \leq 0.05$)

1.17 %. In a study by [10] indicated that sessile nodule sex chromatin shape increased the ratio of prolificacy significantly in Turkish Awassi sheep while the other three shapes drum stick, tear drop and small club were not caused significant changes. Table (4) explain the overall influence of sex chromatin shapes on birth weight and fertilize estrous sequences about 3.01 kg and 1.50 times/ season respectively. Sex chromatin shape affected significantly ($P \leq 0.05$) on birth weight and at ($P \leq 0.01$) on fertilize estrous sequences. Drum stick and sessile nodule sex chromatin showed a significant positive birth weight about 3.27kg and 3.22 kg respectively, but conversely tear drop and small club caused significant negative birth weight in goat with 2.80 kg and 2.81 kg respectively.

Table (4): Effect of sex chromatin shapes on birth weight (kg) and fertilize estrous sequences.

| Source of variation | No. of animals | No. of Observations | Birth weight (kg) | fertilize estrous sequences (times/season) |
|-----------------------|----------------|---------------------|-------------------|--|
| Overall mean | 144 | 387 | 3.01±0.72 | 1.50± 0.00 |
| Type of sex chromatin | | | * | ** |
| Drum stick | 41 | 124 | 3.27± 0.77a | 1.00 ± 0.00b |
| Sessile nodule | 58 | 205 | 3.22 ± 0.78a | 1.00 ±0.00 b |
| Tear drop | 24 | 33 | 2.80± 0.65b | 2.00± 0.00a |
| Small club | 21 | 25 | 2.81 ± 0.68b | 2.00± 0.00a |

All means within a particular subclass differ significantly except those follow with the same letter. *($P \leq 0.05$)

This result is not agreed with the result obtained by [12] who indicated that sex chromatin shapes did not caused significant changes in sheep weight and the heaviest birth weight was in sheep with small club sex chromatin shape about 4.44 kg. In the same table, the fertilizes estrous sequences traits increased in goat with tear drop and small club sex chromatin by 2.00 fertilize estrous sequences, while the negative effect appeared in animal with drum stick and sessile nodule sex chromatin in only 1.0 fertilize estrous sequence. The results Table (5) shows that sex chromatin shapes correlated positively with daily milk production, fertility rate and prolificacy, daily milk production correlated positively 0.74, 0.62, 0.39, and 0.43 with drum stick, sessile nodule, tear drop and small club respectively, also daily milk production correlated positively with fertility rate and prolificacy 0.33 and 0.60 respectively.

Repeatability

Repeatability of a trait is the proportion of the phenotypic variance that is due to all genetic effects and permanent environmental effects. It is an indicator of effectiveness of selection on early lactations. The estimate of repeatability for daily milk yield 0.38 which was lower than those obtained 0.50 by [14]. While a high repeatability coefficient does not mean that the animal will demonstrate the same performance in the next productive seasons, it can predict the subsequent performance of the animal under stable environmental conditions [15].

In conclusion Sex chromatin shapes had significant effect on all of the characters studied in this study we got a result that the sex chromatin in black goat's blood is not the same, and have a great role and effect statistically in some of blood characters and fertility rate. Coefficient of correlation value between daily milk productions correlated positively

Table (5): Correlation coefficient between factors for traits.

| | Drum stick | Sessile nodule | Tear drop | Small club | Daily milk production | Fertility rate | Prolificacy |
|-----------------------|------------|----------------|-----------|------------|-----------------------|----------------|-------------|
| Drum stick | 1 | | | | | | |
| Sessile nodule | 0.03 | 1 | | | | | |
| Tear drop | 0.02 | 0.01 | 1 | | | | |
| Small club | 0.02 | 0.03 | 0.02 | 1 | | | |
| Daily milk production | 0.88 | 0.54 | 0.33 | 0.31 | 1 | | |
| Fertility rate | 0.76 | 0.74 | 0.55 | 0.43 | 0.54 | 1 | |
| Prolificacy | 0.80 | 0.68 | 0.50 | 0.51 | 0.64 | 0.33 | 1 |

with drum stick, sessile nodule, tear drop and small club respectively. The high estimates of repeatability means that one could cull poor producing individuals on the basis of their first record. It was concluded from this study prediction of production (milk production and BW) and reproduction (fertility rate, prolificacy and fertilize estrous sequences) performance for local black goats from shapes and percentage of sex chromatin distribution and measurements. The sex chromatin shapes helped in doing early selection the elite individuals on the linkage between sex chromatin shapes and performance production.

Acknowledgment

We would like to thanks Mr. Snjawi Arab and Mr. Dana. Internal laboratory Erbil teaching hospital-Kurdistan region / Iraq.

References

- Salih, N.G. and Maarof, N.N. (2004). Studies of some milk production and body weight traits of black mountainous goat in Sulaima nigovernorate, Iraqi, Kurdistanregion. Kurdistan Academicians Journal. 3(1):51-57.
- Kamel, Y.M.(2006). Iraqi country report: Goats. Regional workshop on recent advances in goat production under arid condition proceedings April 10-13, Cairo-Egypt: 295-298.
- Okonkwo, J.C., Omeje, I. S. and Egu, U. N. (2010). Identification of X-chromatin and determination of its incidencein Nigerian goat breeds. Livestock Research for Rural Development 22. (12):1-9.
- Zakko, R. B. (1997). The shapes of sex chromatin in ewes and local sheep. MSc. thesis. College of Veterinary Medicine, University of Baghdad.(Arabic).
- Berepubo, N.A., Pinherio, L.E. and Basrur, P.K. (1993). Biological significance of X-chromosomes in activation pattern in sub fertile cows carrying an x-auto some translocation. Discov. Innov. 5: 57–62.
- Bhatia, S.K., Shanker, V. and Mishra, R.R. (1982). Sex chromatin studies in Polymorpho-nuclear leucocytes of exotic cattle (Boss Taurus). World Rev. of Anim. Prod. 18 (3): 65-70.
- Lush, J.L. (1945). Animal Breeding plans, Iowa state college press, Ames, Iowa.
- Duncan, D. B. (1955). Multiple range and Multiply F.tests. Biometrics.11: 1-42.
- SAS. (2012). Statistical Analysis System, User's Guide.Statistical.Version9.1th ed. SAS. Inst. Inc. Cary. N.C. USA.
- Al-Rubaeae, H.M., Al-Anbari, N.N. and Al-Aisawi, A.A. (2013). Study of sex chromatin traits and it's relation with production and reproduction performance in local Awassi sheep. Journal of Babylon University, 21(4). (Arabic).
- Al-Jabury, A.R. and Al-Rabeay, H.M. (2013).The role of sex chromatin in some blood parameters and prolificacy in Damascus goats. Karbala scientific journals.3 :(1):57-68.(Arabic).
- Al-Anbari, N.N. and Al-Khazragi, W. J. M. (2012). The Role of Sex chromatin in Performance of Turkish Awassi sheep. Anbar Journal of Veterinary Science. 5 (1):173-180. (Arabic).
- Ameen, N.A. and Raoof, S.O. (2015). The effect of sex chromatin on some reproductive traits of local sheep in Erbel Biotechnology Research Center. Al Nahrain Univ. Baghdad. Iraq. 9(2):6-10.
- Jawasreh, K.I., Al-Barakeh, F.S. and Awawdeh, F.T. (2006). Heritability estimates for some growth traits of Damascus goats in Jordan. Regional workshop on recent advances in goat production under arid condition proceedings. April 10-13. Cairo. Egypt.
- Mourad, M. (2001). Estimation of repeatability of milk yield and reproductive traits of Alpine goats under an intensive system of production in Egypt. Small Rumin. Res. 42.1-4.