Correlation and Regression Analysis of Body Weight and Milk Characteristics of Cypriot and Local Goats

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Abstract

Introduction: The regression coefficient plays an important role in raising and improving goats. It serves as a quantitative measure of the relationship between the age and weight dam to the birth weights This study was conducted Females weighing 40-50 kg on 53 Cypriot goats and 30 iraqi goats, aged 2-5 years, at the Livestock Research Station - Abu Ghraib affiliated to the Ministry of Agriculture iraq.

Materials and methods: The study aimed to analyze the correlation and regression The age and weight of dam at birth of the productive characteristics (dam birth weight, dam body damensions, birth weight, weaning weight, total weight gain, total milk production, peak production, number of milking days and milk components) and calculae the straight-line equation.

Results: The results show that there is a highly significant correlation between the weight of dam at birth with the damensions of the body, newborn's weight, the peak of production and the number of milking days, and a non-significant correlation of the weight of the newborn with the production of milk and its components, and a highly significant correlation of the peak of production and the number of milking days with of milk components. There was a significant regression posetive of dam birth weight on birth weight in Cypriot 0.018 and local 0.039 and highly significant on milk production in Cypriot 0.054.

Conclusion: We conclude that there is a correlation between dam weight at birth with body damensions, newborn weight and milk production, and a regression of dam weight and age on birth weight and milk production in Cypriot and local goats.

Keywords*: Cypriot goat, milk production, regression, correlation*

تحليل الارتباط والانحدار لوزن الجسم وانتاج الحليب للماعز القبرصية والمحلية

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الملخص

المقدمة: يلعب معامل الانحدار دورا هاما في تربية وتحسين الماعز فهو بمثابة مقياس كمي للعلاقة بين العمر ووزن الام الى اوزان الولادة. اجريت هذه الدراسة على اناث بوزن 40–50 كغم على 53 ماعز قبرصي و 30 ماعز عراقي بعمر 2–5 سنوات في محطة ابحاث الثروة الحيوانية – ابو غريب التابعة لوزارة الزراعة العراقية.

المواد وطرائق العمل: هدفت الدراسة إلى تحليل الارتباط والانحدار لعمر ووزن الأم عند الولادة للخصائص الإنتاجية (وزن الأم عند الولادة، إناث جسم الأم، وزن الميلاد، وزن الفطام، الزيادة الوزنية الكلية، إنتاج الحليب الكلي، قمة الإنتاج، عدد أيام الحلب ومكونات الحليب) وحساب معادلة الخط المستقيم.

النتائج: أظهرت النتائج أن هناك ارتباطاً عالي المعنوية بين وزن الأم عند الولادة مع ابعاد الجسم، وزن المولود، قمة الإنتاج وعدد أيام الحلب، وارتباط غير معنوي لوزن المولود مع إنتاج الحليب ومكوناته، وارتباط عالي المعنوية لقمة الإنتاج وعدد أيام الحلب مع مكونات الحليب. كان هناك انحدار معنوي موجب لوزن الأم عند الولادة على وزن الميلاد في الماعز القبرص 0.018 والمحلي 0.039 وعالي المعنوية على إنتاج الحليب في القبرص 0.054.

الاستنتاج: نستنتج أن هناك علاقة بين وزن الأم عند الولادة وابعاد الجسم ووزن المولود وإنتاج الحليب، وانحدار وزن الأم وعمرها على وزن الولادة وإنتاج الحليب في الماعز القبرصي والمحلي.

الكلمات المفتاحية: الماعز القبرصي، إنتاج الحليب، الانحدار، الارتباط

Introduction

Goats are among the animals that have not been given attention to their breeding in most Arab countries and are still raised on the sidelines of agriculture. It has been used efficiently in many Asian and African countries due to its productivity of twins, which is a source of meat and its high productivity of milk compared to sheep [1]. Local goats are

essential genetic resources that adapt to local conditions. Local goat breeds can be used for cross-crossing with foreign breeds to produce goats that can withstand harsh environmental conditions and have high productivity [2]. New molecular genetic techniques can use genes of high economic importance present in a particular breed to transfer them to another breed [3]. There is a decline in performance when animals are transferred from one environment to another, so the productive characteristics depend greatly on the environment in which the goat is raised, and there are complications that impede the genetic improvement of milk production and the length of the milking season, including genetic and non-genetic factors[4]. The growth of newborns in the pre-weaning phase is affected by a number of genetic and non-genetic factors, as well as the characteristic of milk production from the quantitative characteristics, which are also affected by genetic and non-genetic factors[5]. The age of the dam at birth is an important factor for estimating genetic parameters in selection programs and for improving the breeding of sheep and goats. Important economic traits such as reproductive efficiency, viability, milk production and offspring growth must be taken into considered[6]. found that the correlation between total milk production and daily milk production was positive and high (0.74), and between total milk production and length of the milking season was negative (-0.44), while the phenotypic correlation value was positive between total milk production and daily milk production (0.58) and between total milk production and length of the milking season was high and positive (0.63).[7]

The study aimed to calculate the multiple correlation between the characteristics of body damensions , weight, milk production and its components, regression for dam weight and dam age on birth and weaning weight, newborn weight gain and milk production.

Materials and Methods

The study was carried out on female Cypriot goats (53) and female iraqi goats (30) at the age of 1- 5years at the government ruminant research station / Baghdad Governorate affiliated to the Agricultural Research Department / Ministry of Agriculture iraq for the period from March to June 2023, The herd was raised in semi-closed designated for sheltering, represented by pens dam and males, and pens for birth, in which newborns remain with their dam for three days after birth, and others closed for raising newborns, in which good ventilation and lighting are available .The quality and quantity of fodder varies according to the seasons and according to its availability at the station. Green fodder (alfalfa, barley) is provided in two meals, one in the morning and the second in the evening. This quantity is increased before

and during the reproductive season, as well as during the milk production stage. Periodic grazing of the herd is also carried out according to the station program, As for the newborns, they remain with the mother who is breastfed for 4 months, until weaning . the body damensions of dam were measured after birth by means of a ruler and a measuring tape, and they include measurement (chest circumference, body length, front height, abdominal circumference, buttock height) according to the method [8]. The weight at birth was measured approximately 12 hours after birth using a special scale to measure the weights of the newborns. The dam were also weighed after birth and cleaned with a scale with a capacity of 120 kg. After 120 days, the weight was taken at weaning for the newborns, and the rate of weight gain was calculated according to the following equation:

Weight gain rate = weaning weight - birth weight

The data were analyzed statistically using the statistical program SAS [9] **.**

Multiple linear regression model

$Y=b0+b1x1+b2x2+e$

Y is the dependent variable

x1 Independent variable 1 (dam age)

x2 Independent variable 2 (month of birth)

b0 The constant term or parameter of the intersection of the regression line with the y-axis

b1 is the slope parameter for the first factor (dam age)

b2 Slope parameter for the second factor (month of birth)

e Random error, which is the difference between the true value Y and the estimated value $\hat{Y}$

$$(x_2 * b_2)$$

$$b1 = \frac{r\,y\,x_1 - [r\,y\,x_2 * r\,x_1\,x_2]}{[1 - (r\,x_1\,x_2)^2]} * \frac{Sy}{Sx_1}$$

$$b2 = \frac{r\,y\,x_2 - [r\,y\,x_1 * r\,x_1\,x_2]}{[1 - (r\,x_1\,x_2)^2]} * \frac{Sy}{Sx_2}$$

Results and discussion

Table 1 shows the highly significant ($p \leq 0.01$) correlation between dam weight at birth and body damensions, chest circumference 0.886, body length 0.807, frontal height 0.681, rear height 0.665, body mass index 0.817, birth weight 0.272, peak production 0.387, and number of milking days 0.278. highly significant ($p \leq 0.01$) correlation was found between body damensions and high correlation. Significance($p \leq 0.05$) between birth weight and weaning weight 0.497, total weight gain 0.301, number of

milking days 0.242, and highly significant correlation between weaning weight and total weight gain 0.977 and the percentage of protein 0.234 and the percentage of lactose 0.301. as for the number of milking days, a highly significant correlation was found with the percentage of lactose 0.136 [10] [11]. Composite characteristic that includes fecundity, fecundity, viability of lambs, and weaning weight, which represents the true productive efficiency (total weaning weights / goats) in terms of its meat productivity and evidence of its ability to produce milk [12] [13].

From Table 2, we note that a highly significant difference as increasing dam age leads to an increase in dam weight and body damensions. Increasing the dam age by one year increases the chest circumference by 2.892. cm/year, body length increases by 2.057 cm/year of dam age, back height by 1.073 cm/year, body mass index increases by 3.003 cm/year of dam age, and total milk production increases by 23.552 liters/year. The decline in maternal age did not significantly affect In the characteristics of birth weights, peak production, number of milking days, and milk components [14] [15].

As for the regression of the month of birth on the studied characteristics, it did not significantly affect the weight and body damensions of the mother, the birth weights from birth until weaning, and the production of milk and its components, except for the number of days of milking, as there was a highly significant decline with the change in the months of birth by 0.008 days/month.

We note from the coefficient of determination that it ranged between the highest value of 0.284 in chest circumference and the lowest value of 0.002 in the percentage of fat in milk. From the coefficient of determination we found that the variances resulting from the linear relationship of the regression coefficient of the studied traits are low and that the variances resulting from random factors are high . Studying the regression coefficient between mother age and milk production and its effect on offspring is important when designing breeding and improvement programs for productive traits [16] .

Table 1: The multiple correlation between body weight traits and milk production and its components for Cypriot and local goats

	chest circumference cm	body length cm	front height cm	back height cm	Body mass index	Birth weight /	Weaning weight /	Total weight gain /	Total milk production	Peak output	No. milking days	% fat	% protein	% lactose	non- % fat solids
dam weight at birth	0.886**	0.807**	0.681**	0.665**	0.817**	0.272**	0.176	0.127	-0.122	0.387**	0.278**	0.021	0.041	0.040	0.024
chest circumference		0.853**	0.655**	0.667**	0.601**	0.208*	0.030	-0.017	-0.071	0.0276*	0.200	-0.006	0.026	0.067	0.033
body length			0.605**	0.625**	0.335**	0.227*	0.168	0.129	-0.078	0.289**	0.287**	-0.037	0.008	0.014	-0.008
front height				0.973**	0.510**	0.192	0.103	0.067	-0.188	0.266*	0.241*	-0.070	-0.056	-0.135	-0.118
back height					0.453**	0.204	0.095	0.054	-0.184	0.139	0.192	-0.084	-0.070	-0.146	-0.115
Body mass index						0.227*	0.156	0.115	-0.118	0.367	0.181	0.092	0.058	0.058	0.053
Birth weight							0.497**	0.301**	0.202	0.121	0.242*	-0.011	0.175	0.172	0.211
Weaning weight								0.977**	-0.020	0.137	0.083	0.058	0.027	0.049	0.135
Total weight gain									-0.070	0.121	0.031	0.067	-0.012	0.012	0.097
Total milk production										-0.011	0.040	0.111	0.131	0.211	0.204
Peak output											0.689**	0.235*	0.234*	0.301**	0.198
No. milking days												0.133	0.192	0.136**	0.226*
% fat													0.0319 **	0.367**	0.429**
% protein														0.727**	0.722**
% lactose															0.872**

Table 2. Multiple regression of dam age and the month of birth on the studied characteristics

dependent variable	Significance of the first regression coefficient P-value(b1)	Significance of the second regression b2) coefficient P-value(	Expectation equation	(R^2)
weight	0.000	0.263	Y= 29.587+4.338 X1 +1.188 X2	0.261
chest circumference	0.000	0.060	Y= 72.927+2.892 X1 +1.267 X2	0.284
body length	0.000	0.489	Y= 75.056+ 2.057 X1 +0.445 X2	0.178
front height	0.005	0.130	Y= 74.536+1.003 X1 -0.675 X2	0.154
back height	0.004	0.217	Y= 76.278+1.073 X1 -0.579 X2	0.144
Body mass index	0.000	0.252	Y= 54.596+3.003 X1 +1.160 X2	0.157
Birth weight	0.852	0.187	Y= 2.574+0.013 X1 -0.085 X2	0.015
Weaning weight	0.381	0.146	Y= 16.522-0.273 X1 -0.579 X2	0.030
Total weight gain	0.315	0.173	Y= 13.948-0.285 X1 -0.494 X2	0.029
Total milk production	0.019	0.159	Y=174.383+23.552 X1-18.080 X2	0.118
Peak output	0.579	0.283	Y= 36.047-0.448 X1 +1.107 X2	0.024
No. milking days	0.517	0.008	Y= 216.384+2.830 X1 -15.044 X2	0.108
% fat	0.916	0.698	Y= 2.961+0.011 X1 +0.051 X2	0.002
% protein	0.853	0.232	Y= 2.960-0.04X1 +0.030 X2	0.022
% lactose	0.790	0.083	Y= 4.363-0.007 X1 +0.055 X2	0.045
non-fat % solids	0.312	0.137	Y= 8.146-0.039 X1 +0.073 X2	0.054

The first independent variable is dam age X1
The second independent variable is the month of birth X2

conclusions

We conclude that there is a correlation between dam weight at birth with body damensions, newborn weight and milk production, and a regression of dam weight and age on birth weight and milk production in Cypriot and local goats Best equation to predict chest

circumferenceY= 72.927+2.892 X1 +1.267 X2 .

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