Effect of frequent kidding on reproductive and productive traits in Shami goats

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Received: 12/1/2017
Accepted: 12/9/2017

Summary

The present study was conducted to investigate the effects of frequent kidding on the reproductive and productive traits in Shami (Damascus) goats. The study was carried out in a commercial private farm at Qushtapa district in Erbil, Iraq. Sixty seven Shami goats were involved during the period from July/2013 to May /2016 for the three kidding seasons. The overall means of daily test milk production and seasonal milk production were 1.955 kg and 176.70, respectively. Frequent kidding significantly ($P<0.05$) affected daily test milk production and seasonal milk production. Total kids born in three kid crops system in two years (accelerating kidding) were 150 compared with75 kids in two kid crop (naturally annual mating system). The total milk production was 5.85 kg in the accelerating kidding system, compared with 4.056 kg achieved through the annual system. Month of test, age of does, sex and type of birth and weight of does at kidding had exhibited significant effects on daily test milk production and seasonal milk production. Daily milk production was higher during the third month (2.004kg) compared with those obtained from the second (1.957 kg) and first (1.903 kg) months of test. Daily test milk production produced by does at about 5 years old was higher (2.079 kg) than that produced from younger goats (1.634 kg). Daily test milk production of does which gave males were higher (1.943kg), recorded significant at the level ($P<0.01$) than does which gave females (1.777kg). Does weighting over 60 kg at kidding produced 1.933 kg of milk compared with does weighting less than 50 kg (1.819 kg). Repeatability estimate obtained for daily test milk production was 0.64. It can be concluded that the performance of animals in the three kidding in two years of Shami goat was more beneficial for farmers and provided more milk and meat.

Keywords: Shami goat, Frequent kidding, Milk production, Litter size, Repeatability.

Introduction

The accelerated kidding system is a technique that started to be used in some private farms. In accelerated kidding systems in which goats may kid more than once per year, the improvement in goat productivity can also be attained through increasing the frequency of kids (1). The Shami goat, also known as the Damascus goat is normally a dual purpose animal (meat and milk), it is milked, principally following weaning and during the suckling period, since a large quantity of milk remains in the udder without being utilized by the suckling kids (2). Accelerated kidding is defined as the method of obtaining three kidding in two years period or five kidding in three years period. The most significant advantages of an accelerated kidding in production programs are to fetch higher market prices during the off-season, premium prices for the smaller kids and to cash available market options, management conditions in which the animals were kept. Also it matters and acts as a tool to govern the success of accelerated kidding (3). This system does not mean without disadvantages, the necessity of administering exogenous hormones like progesterone hormone as uterine sponge or Controlled Intravaginal Drug Release with a conception rate 75-80% for the induction of estrus during the non-breeding period (4). Increasing kid production is of great interest to goat producers as prolificacy represents an economically important trait. The expression of fertility in frequent (or accelerated) lambing systems reflect an interaction of genetic and environmental factors that complicates a proper evaluation of the genetic differences among ewes in fertility (5). Frequency of kidding may be helpful in increasing the total number of kids produced during a particular periods of the year. However, a certain proportion of does have to be in estrus stage during any season .In

accelerated lambing systems in which ewes may lamb more than once per year, the improvement in ewe productivity can also be attained by increasing frequency of lambing (6 and 7). It has long been recognized that an increase in mutton production can be achieved either by increasing the number of lambs born per ewe or by increasing the number of lambing per ewe per year (8). The aim of the present study was to investigate the goats kidding more frequently than once a year and to compare between the current kidding and the accelerated kidding systems with respect to the total kids born, fertility percentages, litter size and the milk production traits.

Materials and Methods

This study was performed on the commercial Shami goat farm, Qushtapa district Erbil province. Sixty-seven Shami goats were used during the period from July/2013 to May /2016. Does were fed a concentrated ration 1.0 kg, twice a day (morning and evening) with alfalfa roughage to meet their nutritional requirements according to their level of production; after kidding, the amount of concentrates increased to a level of 1.5 kg. The concentrate diet was made of barley, wheat bran, salt, limestone and trace minerals. Wheat straw was available *ad libitum* for all goats' animals had free access to water at all the times. The first test date was on the second week after parturition. Kids were allowed to suckle their dams *ad libitum* from birth until weaning and were given free access to concentrates and roughages. All animals on the farm were regularly vaccinated against the major epidemic diseases in the Kurdistan region *Pese des Petits Ruminants* (P.P.R), and anthrax. After kidding in an individual kidding pens, kids were ear tagged, weighed and recorded within 24 hours after kidding. Goats were milked daily from the day of kidding until their milk yield dropped to approximately 100 g/d, or when they were dried off before kidding, while total milk yield was calculated by multiplying the test day milk yield by the month of test day's. The hormone Progesterone 0.3 mg was administered after 13 days. An injection with PMSG (400-500 IU) each vial of PMSG content 6000 IU; this means that after solving the hormone with solution (normal saline) and this is enough for 12 head /sheep according to the direction manufacturing company, was performed to induce fertile estrus at the planned breeding periods. CIDRs as a regular component to their breeding protocols. Estrus synchronization is one of the single best ways for producers to accomplish the goal of year-round supply. CIDRs were used for synchronization of estrus resulting in out-of-season breeding and larger groups of does that can be bred at the same time in order to narrow kidding periods. CIDRs deliver progesterone to does in response to the introduction of a buck.

Litter size (Prolificacy) was measured as=No. of kids born/No. of does kidding ×100. The SAS (9) programmed was used for the statistical analysis of the data. The Chi-square test was used to investigate the significance of differences between percentages in this study. Duncan multiple range test (10) was performed for testing the differences between the treatments means ($P<0.05$). The following linear model was performed for the description and analysis of milk yield according to the factors studied.

$$Yijklmn = \mu + A_i + B_j + C_k + W_{I+} S_m + eijklmn$$

Y_{ijklmn}= is the value of monthly milk yield.
μ= Overall mean,
A_i= Effect of the i^{th} Month of lactation, i = 1^{st}, 2^{nd} 3^{rd} month
B_j= Effect of the j^{th} Age of dam j= 2, 3, 4 and ≥5 years age of dam.
C_k= Effect of the k^{th} Sex and Type of birth, k = 1male, 2 female, 3 male- male, 4 female-female and 5 male-female.
W_l=Effect of l^{th} weight, l=1(< 50), 2 (50-60) and 3 (>60) kg
S_m = Effect of the m^{th} kidding sequence where m = 1^{st} kidding, 2^{nd} and 3^{rd} kidding.
e_{ijklmn}: Random error associated with the $_{ijklm}^{th}$ observation, assumed to be NID. (0, $\partial^2 e$).
Repeatability estimates for daily milk yield and birth weight were measured as follows:
$R = \delta^2 d / \delta^2 d + \delta^2 e$
$\delta^2 d$ = Variance component of doe's
$\delta^2 e$ = Residual error term.

Results and Discussion

The present study was carried out using 211 kids born (75, 72 and 64 kids born at first, second and third kidding respectively) as three kid crops in two consecutive years by accelerating kidding system where in an annual system was 150 total kids born (75×2)

by two kid crops, 75 kids from every natural annual mating system (Table, 1). Results from the two mating seasons showed higher kidding percentages (91.3%). The difference between the frequent kidding system and the one year kidding system (89.5%) was no significant (P>0.05). Likewise, litter size and kidding percentages differences between the two systems were found to be no significant (Table, 1). Similar findings were reported by (3) who worked with Betal goats and reported the birth weight of kids produced in three different seasons of March-April, 2010; October-November, 2010 and June-July, 2011 were as 2.85, 3.32 and 3.29 kg as compared with kid crop produced in annual kidding system showing birth weight as 3.09 kg and 3.08 kg, respectively. The total birth weight of kids produced by two kid crops of annual and three kid crops of accelerated system was 70.75 and 124.75 kg respectively. As far as the not difference was concerned the same number of goats in accelerated system proved better in terms of producing 19 kids more and 54 kg of birth weight than goats at the annual system during the experimental period of two years.

Table, 1: Comparisons between the first kidding and the total lambs born for the traits studied.

Traits	First kidding	Second kidding	Third kidding	Total lambs born	Level of Significant
Period of kidding	6 / 2013 3 / 2014	3 / 2014 12 / 2014	12 / 2014 9 / 2015		
No. of does exposed to bucks	67	60	56	183	23.772 **
No. of does kidding	60	56	51	167	19.863 **
kidding %	89.5	93.3	91.1	91.3	7.225 N.S
No. of kids born	75	72	64	211	31.407 **
Litter size %[a]	125	128.6	125.5	126.3	11.593 N.S
Litter size %[b]	111.9	120	114.3	115.3	9.336 N.S

[a] No. of kids born / does born [b] No. of kids born / does exposed ** (P<0.01) N.S: Non-Significant.

The overall mean of DTMP and SMP were 1.955±0.30 and 176.70±11.09 kg, respectively (Table, 2), these values were found to be lower than the finding of (1) who reported that milk yield of the Shami Cyprus goats was 3.16 kg. Kidding frequency significantly (P<0.05) affected DTMP and SMP. The total milk production was 5.85 kg in accelerating kidding system as compared with 4.056 kg (2.028×2) for the annual system. Similarly, the seasonal milk production was found to be significantly (P<0.05) higher in the accelerating kidding system 526.5 kg as compared with those recorded in the one year kidding system 182.52±10.98 kg. Seasonal milk production was higher at the first kidding 182.52±10.98 kg compared with the second and third kidding 177.57±10.97 and 166.41±10.00 kg, respectively. DTMP differed clearly between the months of testing. Goats produced more milk in the third month than in other lactation months. The results indicated that the DTMP in Shami does was attained before the third month of test. Values of milk production were higher during the third month (2.004±0.28 kg) compared to those obtained from the second 1.957±0.27 kg and the first 1.903±0.27kg months of lactation (Table, 2). The data showed that milk production of Shami does started at a low level during the first 2 weeks and then increased after the early lactation stage. These findings were in agreement with the results obtained by (11). However, the results were different from those reported by (12), working with Damascus does and found that milk production were higher during the early (2^{nd} - 9^{th}) week compared to those obtained for the mid (10^{th} - 17^{th} weeks) and late (18^{th} - 35^{th} weeks) stages of lactation being 1.337, 1.236 and 0.963 kg for the three stages of lactation, respectively. Higher DTMP 2.079±0.42 kg was significantly (P<0.05) produced from older ages goats compared with the DTMP produced from the younger goats 1.634±0.22 kg (Table, 2). Similar findings were reported by (13). Who worked with Shami goats at the ages of 3, 3-6 and >6 years presenting values of 1.620, 2.000 and 1.990 kg for the three aging groups, respectively. The superiority of older goats in DTMP could be attributed to increase the animal size (greater digestive capacity) and udder capacity, which reflects the development of the mammary glands (increase of the number of alveoli and muscle fibers in a limb) with advancing age.

Table, 2: The factors affecting total milk Production (kg).

Traits	No. of tests	Daily test milk production (kg) M ±S.E	No. of does kidding	Seasonal milk production (kg) M ±S.E
Overall mean	501	1.955±0.30	167	176.70±11.09
Kidding frequency		*		*
First	180	2.028± 0.28a	60	182.52±10.98a
Second	168	1.973±0.25 a	56	177.57±10.97ab
Third	153	1.849±0.26 b	51	166.41±10.00 b
Total milk production		5.85		526.5
Month of test		*		
First	167	1.903±0.27b		
Second	167	1.957±0.27 ab		
Third	167	2.004±0.28a		
Age of does (years)		*		*
2	45	1.634±0.22 c	15	147.06±10.90 b
3	198	1.966±0.34 b	66	176.94±10.95a
4	138	1.981±0.25 ab	46	178.29±11.00a
≥5	120	2.079± 0.42a	40	187.11±11.11 a
Sex and type of birth		*		*
Male	153	1.943±0.24 c	51	174.87±10.98b
Female	201	1.777±0.26 d	67	159.93± 10.99b
Male-male	60	2.372±0.34 a	20	213.48 ± 11.34a
Female- female	45	1.914±0.44 c	15	172.26± 10.95 b
Male-female	42	2.183±0.42 b	14	196.47±10.88 a
Weight of does (kg)		*		N.S
Less than 50	69	1.819±0.38b	23	163.71 ±11.77 a
50 - 60	285	1.999±0.16a	95	179.91 ±11.81 a
More than 60	147	1.933±0.37a	49	173.97 ± 11.84 a

Means with different letters within each kidding frequently, age of does (years), sex and type of birth and weight of does (kg) differ (P<0.05). N.S = Non Significant.

It is possible to justify this result considering that older goats present greater udder volume than primiparous with an increase of the proportion of the mammary alveoli developments in the previous lactations which did not regress completely, but it was added to those developments in the subsequent lactations, increasing the secretary parenchyma and the volume of the udder (14). This finding was in agreement with that obtained by (15). Does aged 5 years produced higher seasonal milk 187.11±11.11 kg than those aged 2 years 147.06±10.90 kg (P<0.05). Sex of kids significantly (P<0.05) influenced DTMP and SMP. Males were significantly heavier 1.943±0.24 kg than female kids 1.777±0.26 kg (Table, 2).The effect of sex is a result of the physiological functions that could be mainly attributed to sex hormones. Estrogen restricting the growth of long bones of the body, while androgens act as an anabolic hormone promoting muscle growth (16). This result was similar to those obtained by (11, 15 and 17). Does producing twins had higher DTMP than those producing singles (P<0.05). The increase in daily milk yield in twin producing goats could be attributed to the improvement in the udder and to the concomitant increase in its size during the trimester of pregnancy due to an increase in the hormonal activities (placenta lactogenic) with the increase in the size of the placenta in twin producing goat compared with the single producing ones. Sex and type of birth have had a significant effect (P<0.05) on seasonal milk production (Table, 2). Similar finding was reported by (1). Heavy body weight plus large size of the animal have been shown to exhibit a significant effect on the lactation of goats. Milk production in dairy goats is positively correlated with the weight of the lactating doe. Does weighing over than 60kg at kidding produced 1.933±0.37 kg of milk, compared with 1.819±0.38 kg of milk per day by does weighing less than 50 kg. Similar trend was recorded for does weighting more than 60 for their higher seasonal milk 173.97 ±11.84 kg (Table, 2). Many researchers confirmed a significant and positive relationship between milk productions at all does weight at kidding (1 and 15). Other studied described that milk yield of Zaraibi and Shami goats increased with increasing live body weight. (18) had found that Shami goats weighing 31-40 kg, 41-50 kg and 51-

60 kg produced 1.820 kg, 1.930 kg and 1.880 kg, respectively. (13 and 17) reported a highly significant effect of body weight on DTMY. The results of this study indicate that the frequency of kidding may be helpful in increasing the total number of kids produced during a particular period of the year. The role of an accelerated kidding system as used in the present investigation was to provide three kids from two years. Increasing the frequency of lambing or born per lambing, or both, without increasing the maintenance and labor costs would increase net return. Most of the accelerated kidding systems now are using an 8 month interval lambing which appears to be generally the most popular one. Most factors tested in the present study are very important: Sex and type of birth, age of does, and weight at kidding. It can conclude that more daily test milk yields recorded significantly by utilizing an artificial induction (estrus synchronization during breeding season) during three kidding in two years of shami goat, which it was more beneficial for farmers providing more milk and meat, also not to harm their animals (does) prating two kidding a year system.

Repeatability estimates obtained for DTMP which was higher than those reported by (15) in Shami goat (0.50) and the estimate obtained by (19) in local black goat for milk production (0.38).

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تأثير تكرار الولادة على الصفات التناسلية والإنتاجية في الماعز الشامي

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الخلاصة

أجريت الدراسة بهدف معرفة تأثير تكرار الولادة على الأداء التناسلي والإنتاجي للماعز الشامي وشملت 67 ماعز شامي للمدة من تموز٢٠١٣ لغاية مايس ٢٠١٦ ولثلاث مواسم ولادة والعائدة لأحد الحقول الأهلية لتربية الماعز الشامي في ناحية قوشتبة/ أربيل -العراق. بلغ المتوسط العام لإنتاج الحليب للفحص اليومي وموسم إنتاج الحليب 1.955 و 176.70 كغم على التوالي، وتبين أن هنالك تأثيراً معنوياً بمستوى (P<0.05) لتكرار الولادة على إنتاج الحليب للفحص اليومي وموسم انتاج الحليب. أظهرت الدراسة أن مجموع ثلاث ولادات للمعزى في سنتين تكرار الولادة بلغ 150 مقارنة 75 ولادة جدي لسنتين) ولادة اعتيادية. (في نظام تكرار الولادة بلغ مجموع انتاج الحليب 5.85 كغم مقارنة 4.056 كغم في نظام الأعتيادي). أظهرت نتائج الدراسة بأن لشهر الفحص، عمر المعزى، الجنس ونوع الولادة مع وزن المعزى تأثير معنوي (P< 0.05)على أنتاج الحليب للفحص اليومي وموسم انتاج الحليب. أرتفع انتاج الحليب اليومي في الشهر الثالث للفحص 2.004 كغم مقارنة لأنتاج الحليب للفحص اليومي للشهر الثاني 1.957كغم والشهر الأول 1.903 كغم. بلغ أعلى معدل لإنتاج الحليب للفحص اليومي للماعز بعمر 5 سنوات 2.079 كغم عن الماعز الأصغر عمراً 1.634 كغم. تفوقت الحيوانات ذات ولادة ذكرية 1.943 كغم عن الحيوانات ذات الولادة الأنثوية 1.777 كغم في إنتاج الحليب للفحص اليومي. كما أظهرت نتائج هذه الدراسة ان أوزان الماعزعند الولادة اكثر من 60 كغم اعطت 1.933 كغم من الحليب مقارنة مع انتاج الحليب 1.819 كغم الماعز ذات وزن اقل من 50 كغم. قدر قيمة المعامل التكراري لإنتاج الحليب للفحص اليومي 0.64، نستنتج من هذه الدراسة بان الماعز الشامي التي تلد ثلاث ولادات في سنتين أكثرفائدة للمربي لزيادة انتاج الحليب و اللحم.

الكلمات المفتاحية :الماعز الشامي، تكرار الولادة، انتاج الحليب، عدد الولادات في البطن، المعامل التكراري.