

EFFECT OF WEANING AGE ON PRODUCTIVE AND REPRODUCTIVE PERFORMANCE AND BIOLOGICAL PRODUCTIVITY INDICES OF DOE KIDS

Abdelsalam, M.M.¹ and M. Eissa²

1- Animal Production Dept., Faculty of Agric., Alexandria University

2- Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Dokki, Giza, Egypt.

ABSTRACT

The present study was carried out on 1172 records of Damascus (D), Barki (B) and DB cross female kids reared at Borg El-Arab Experimental Farm over 22 years to estimate the effect of weaning age of female kids (8, 12 and 16 weeks) on its productive and reproductive traits and biological productivity indices (I_1 : weight of weaned kid produced per doe per year, kg; I_2 : weight of kid per kg post partum weight of doe per year; I_3 : weight of kid per kg metabolic post partum weight of doe per year; I_4 : additional kid weight produced/dam per year, kg; I_5 : additional kid weight produced/ kg live weight of dam per year and I_6 : additional kid weight produced/metabolic weight of dam per year).

The results indicated that female kids that weaned at 12 weeks of age had the highest number of kids born or weaned, the longest lifetime and the longest days in milk. The heaviest total weight of born or weaned kids was produced from female weaned either at 12 weeks (for Barki and Damascus) or at 16 weeks (for the DB). The highest milk conversion ratio (gain per one kilogram suckled milk) was observed in kids produced by doe that weaned at 16 weeks in Barki and crossbred while for Damascus was found in kids from does weaned at 12 weeks.

In Barki, weaning age had significant effect on total kilograms born and lifetime length as well as values of I_1 , I_2 , I_3 and I_5 indices. In Damascus, weaning age had significant effect on total kilograms weaned, total milk yield, days in milk, milk conversion ratio as well as values of I_1 and I_4 indices. In DB genotype, weaning age had highly significant effect on total milk yield and milk conversion ratio as well as all productive indices.

Damascus breed showed higher lifetime production traits followed by the DB while the Barki was the poorest in productivity. Breed had significant effect on all productive indices.

Keywords: Goats, Lifetime production traits, productivity indices,

INTRODUCTION

It is well known that the programs of improving does' productivity depends on its long productive life in addition to high number of kids born and weaned with heavier weights (Eissa *et al.*, 2001), in the same time the heavier weaning weights will be related to the amount of milk produced by does or the amount of suckled milk (Banda, 2004). The suckled milk is known to be related to the time that kids remained with their dams, which reflect strong bond between doe and her offspring. This bond had great valued from breeding side of view. Thus, it is considered the main source of variation in goat production improving.

The suckling period lasts from birth until weaning; it can be last for as little as three weeks, or as long as 5 to 6 months, depending on the productive system. This case create weaning concept to be a stressful period

in the young goats' life, thus, the time of weaning seemed to be critical to the productivity of goats (A'Kos Bodnar *et al.*, 2006).

Consequently, from the breeders side of view, the lifetime production traits can be combined into indices to give effective measure of productivity (Abdelsalam, 1994 and Gipson, 2005). Therefore, the present study was planned to estimate the effect of weaning age on productivity of doe kids and its biological productivity indices.

MATERIALS AND METHODS

Data were collected from the year 1983 till 2004 on 1172 records of parturition from 217 doe kids throughout their lifetime production (117 Barki (B), 91 Damascus (D) and 109 DB). All females were born and reared at Bourg El-Arab Experimental Farm, belonging to Animal Production Research Institute, Ministry of Agriculture.

Management and weaning time:

The flock management regimes were detailed previously by Eissa *et al.* (2001). Animals were fed berseem (*Trifolium alexandrinum*) and straw plus pelleted concentrate (during winter and spring), berseem hay and the same pelleted concentrate (during summer and autumn). Water was offered twice a day. Animals were vaccinated as scheduled by the protocol of the farm. Animals were in confinement all the year round.

Does were mixed with fertile bucks for the first time when they reached 1.5 years of age. Mating season started in September and lasted for 45 days. The breeding does were divided into mating groups of 20-30 does joined with one fertile buck.

The traditional routine of weaning age in the experimental farm, were at three different ages. The first age was at 8 weeks from 1983 till 1989, second age was at 12 weeks from 1990 till 1997 and the third age was at 16 weeks from 1998 till the end of studied period. Does and their kids were weighed 24 hours after kidding, thereafter kids were weighed biweekly till weaning time. Kids suckled their dams throughout suckling period. Milk yield was determined using kid suckling technique till weaning age and the does were hand milked twice a day to estimate their milk yield till the end of lactation when daily milk yield reached 100 grams.

Breeding plan

The Barki does were divided into two groups, the first was mated with Barki bucks to produce replacement and the second group was mated with Damascus bucks to produce the ½D.½B crossbred. The Damascus does were mated with the Damascus bucks to produce replacement.

Traits studied and productivity indices

The lifetime production traits measured per doe during its productive life were total number born, total number weaned, total kilograms born and weaned, productive life length, total milk yield, days in milk and milk conversion rate (kg gain per kg milk).

The lifetime production traits were used to calculate the productivity indices according to Abdelsalam (1994) and Banda (2004) as follows:

- Index 1 (I_1) : Weight of kid weaned per female joined per year (kg).
= litter weight at weaning x 365 / number of days between two successive kidding
- Index 2 (I_2) : Weight of kid weaned per kg post-partum weight of the dam per year (kg).
= I_1 / dam post-partum weight
- Index 3 (I_3) : Weight of kid weaned per metabolic post-partum weight of the dam per year (kg).
= I_1 / dam post-partum weight^{0.75}
- Index 4 (I_4) : Additional kid weight per female per year (kg)
= milk yield x milk conversion rate x litter size
- Index 5 (I_5) : Additional kid weight per kg post-partum weight of the dam per year (kg).
= I_4 / dam post-partum weight
- Index 6 (I_6) : Additional kid weight per metabolic post-partum weight of the dam per year (kg).
= I_4 / dam post-partum weight^{0.75}

Statistical analysis

General linear model procedures (SAS, 2000) were used to the repeated measures. Each genotype was analyzed separately to study the effect of weaning age on lifetime production traits and productivity indices. Also, all breeds were analyzed together to study the effect of breed and weaning age and the interaction.

RESULTS AND DISCUSSION

Table (1) showed that the Barki (B) and Damascus (D) female that weaned at 12 weeks of age gave the highest number of kids at birth and at weaning and the heaviest litters at born and at weaning throughout its lifetime. However, the crossbred (DB) female weaned at 12 weeks gave higher number of kids with intermediate weight. On the other side, the heavier litters were produced with those weaned at 16 weeks. These results reflected the condition of doe which related to the amount of suckled milk during suckling period, where female weaned at 12 weeks suckled more milk than those weaned at 8 weeks (they got about 89 % of total milk) and they suckled approximately equal amount of milk such those weaned at 16 weeks (Abdelsalam *et al.*, 2000 and Eissa, 2001). Generally, the results showed that all does which weaned at 12 weeks of age had the longest productive life.

It is worthy to note that Barki and DB does weaned at 12 weeks of age milked more milk and have longer days in milk than those weaned at 8 or 16 weeks, while Damascus does weaned at 16 weeks had the greatest milk yield and longest days in milk followed by those weaned at 12 weeks and then by those weaned at 8 weeks. The favour of Damascus may be due to the well developed mammary gland than in Barki breed or DB crossbred which reflected in milk production (Saber, 2005).

Milk conversion rate as kg gain per kg milk was better for Damascus and crossbreed does weaned at 8 weeks of age while the Barki does weaned at 12 weeks of age showed the best rate (0.111) followed by those weaned at 16 or 8 weeks of age without significant difference.

In general, statistically weaning age had significant effect on total kilograms born, productive life length for Barki breed, while weaning age showed significant effect on total kilograms weaned, total milk yield, days in milk and milk conversion ratio in case of Damascus breed. Only total milk yield and milk conversion ratio as productive traits of crossbred were significantly affected by weaning age.

Table 1: Least squares means and SEM of lifetime production traits for the studied three genotypes according to weaning age.

Item	8 weeks	12 weeks	16 weeks	SEM
Barki (B)				
Total number born	5.10	5.75	4.20	0.26
Total number weaned	4.31	4.90	3.70	0.25
Total kilograms born	11.82 ^{ab}	14.54 ^a	10.16 ^b	0.66
Total kilograms weaned	37.8	47.61	44.88	2.41
Productive life length (yrs)	4.31 ^a	4.39 ^a	3.25 ^b	0.16
Total milk yield	315.06	370.26	325.81	15.38
Days in milk	509.74	583.75	477.75	17.69
Milk conversion rate	0.125	0.111	0.124	0.004
Damascus (D)				
Total number born	3.53	3.96	3.95	0.19
Total number weaned	2.48	3.48	3.27	0.17
Total kilograms born	12.83	14.44	14.25	0.73
Total kilograms weaned	50.71 ^b	73.41 ^a	72.62 ^a	3.76
Productive life length (yrs)	3.31	3.52	3.11	0.15
Total milk yield	423.26 ^b	556.63 ^{ab}	606.16 ^a	22.81
Days in milk	432.38 ^b	580.69 ^a	565.67 ^a	21.48
Milk conversion rate	0.147 ^b	0.177 ^a	0.146 ^b	0.005
DB crossbred				
Total number born	4.87	5.34	5.16	0.31
Total number weaned	3.75	4.88	4.56	0.27
Total kilograms born	14.25	16.84	17.1	1.03
Total kilograms weaned	51.13	73.11	79.86	4.57
Productive life length (yrs)	3.56	4.42	4.00	0.20
Total milk yield	367.41 ^b	520.88 ^a	495.78 ^{ab}	15.25
Days in milk	507.5	680.07	657.62	13.13
Milk conversion rate	0.142 ^c	0.163 ^b	0.195 ^a	0.006

a, b and c = means in the same row with different superscripts were differ significantly

Data of productivity indices based on total weight of offspring at weaning per female (indices 1, 2 & 3) or based on milk yield and milk conversion efficiency (indices 4, 5 & 6) are presented in Table (2). The indices values indicated that does weaned at 16 weeks of age had the highest productivity followed by those weaned at 12 weeks and then by those weaned at 8 weeks of age. The above result reflect the high litter weight and high milk yield that increased as dams remained in milk for long period.

The productivity indices of crossbred genotype weaned at different ages were significantly affected by age of weaning, while only the first biological index and the fourth index (additional productivity index) of Damascus breed were affected by age of weaning. All biological indices and the additional index (I₅) of Barki breed were affected by age at weaning. Damascus breed was higher productivity than the local breed (Barki) or the crossbred (DB), it is expected because the D breed is more improved than the other breeds.

Table 2: Least squares means and SEM of productive indices for the three genotypes studied.

Item	8 weeks	12 weeks	16 weeks	SEM
Barki (B)				
I ₁	9.07 ^b	10.35 ^b	13.469 ^a	0.41
I ₂	0.349 ^c	0.457 ^b	0.603 ^a	0.02
I ₃	0.787 ^c	0.994 ^b	1.309 ^a	0.04
I ₄	11.738	12.336	14.274	0.71
I ₅	0.447 ^b	0.537 ^{ab}	0.637 ^a	0.03
I ₆	1.009	1.173	1.384	0.06
Damascus (D)				
I ₁	20.79 ^b	23.59 ^{ab}	24.43 ^a	0.76
I ₂	0.567	0.611	0.575	0.02
I ₃	1.389	1.519	1.462	0.05
I ₄	25.57 ^b	29.95 ^{ab}	34.73 ^a	1.59
I ₅	0.697	0.778	0.805	0.04
I ₆	1.707	1.933	2.056	0.09
DB crossbred				
I ₁	14.94 ^c	19.13 ^b	24.08 ^a	0.77
I ₂	0.527 ^b	0.635 ^b	0.736 ^a	0.02
I ₃	1.213 ^b	1.487 ^b	1.759 ^a	0.05
I ₄	18.649 ^b	25.614 ^{ab}	33.198 ^a	1.82
I ₅	0.639 ^b	0.849 ^{ab}	1.005 ^a	0.06
I ₆	1.481 ^b	1.989 ^{ab}	2.407 ^a	0.13

a, b means in the same row with different superscripts were differ significantly

Breed had significant effect on all productivity indices (Table 3) in favour of Damascus goats at any age of weaning. Regards to does that weaned at 8 weeks of their ages, it could be noticed that breed significantly

affected total number born or weaned, total weight of litter weaned, length of productive life and total milk yield. While the examined breeds differ significantly on total kilograms weaned, milk yield and milk conversion rate when they weaned at 12 weeks of age. Productivity indices of total number born and days in milk for female that weaned at 16 weeks of age failed to show any significant difference between studied breeds.

Table 3. Effect of breed (Analysis of variance) on lifetime production traits and productivity indices.

Item	8 weeks	12 weeks	16 weeks
Total number born	**	NS	NS
Total number weaned	**	NS	*
Total kilograms born	NS	NS	*
Total kilograms weaned	*	*	**
Productive life length (yrs)	**	NS	*
Total milk yield	**	*	**
Days in milk	NS	NS	NS
Milk conversion rate	NS	**	**
I ₁	**	**	**
I ₂	**	**	**
I ₃	**	**	**
I ₄	**	**	**
I ₅	**	*	**
I ₆	**	*	**

NS : not significant * significant (P< 0.05) ** highly significant (P< 0.01).

It could be concluded that female does weaned at 12 weeks showed higher lifetime production traits. However, from the view of biological and additional productivity indices based on weight of litter at weaning or milk yield per female, it could be noticed that weaning at 16 weeks showed the best results. However, it could be recommended to bathe importance of combining the productivity indices and relative importance or economic value into economic indices to evaluate weaning time.

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تأثير عمر الفطام على الأداء الإنتاجي والتناسلي والأدلة الإنتاجية لإناث الجداء

مجدى عبد السلام^١ و محمد عيسى^٢

١- قسم الإنتاج الحيواني كلية الزراعة - جامعة الإسكندرية

٢- معهد بحوث الإنتاج الحيواني - وزارة الزراعة - الدقى - الجيزة

تمت الدراسة على ١١٧٢ سجل إنتاجي للماعز الدمشقية والبرقى وخليطهما المرباة بمحطة برج العرب لأكثر من ٢٢ سنة وقد تم الفطام على عمر ٨ ، ١٢ ، ١٦ أسبوع وذلك لدراسة تأثير عمر فطام إناث الجداء على صفاتها الإنتاجية والتناسلية وأدائها الإنتاجية (الدليل الأول: وزن الجداء المفطومة / عنزة/ سنة ، والثانى = الدليل الأول / وزن العنزة عند الولادة ، والثالث = الدليل الأول / وزن العنزة الميتابوليزمى ، الدليل الرابع = كمية اللبن X معدل التحويل X حجم الخلفة لكل عنزة / سنة ، الدليل الخامس = الدليل الأول / وزن العنزة عند الولادة ، الدليل السادس = الدليل الأول / وزن العنزة الميتابوليزمى).

أوضحت نتائج الدراسة أن الجداء المفطومة على عمر ١٢ أسبوع أعطت أعلى عدد من الخلفة عند الميلاد والفطام وكان لهذه الإناث أطول حياة إنتاجية وعدد أيام أكبر فى إنتاج اللبن. أعطت العنزات البرقى والدمشقى والمفطومة على عمر ١٢ أسبوع أقل مواليد مفطومة أو مولودة خلال حياتها الإنتاجية، وكان أفضل معدل تحويل (نمو / كجم لبن مرضوع) لجداء الماعز التى فطمت أمهاتها على عمر ١٦ أسبوع فى كل من الماعز البرقى والخليط أو للماعز الدمشقى التى فطمت أمهاتها على عمر ١٦ أسبوع.

أثر عمر الفطام معنويا على ما أنتجته الأمهات من عدد الكيلوجرامات المولودة وطول الحياة الإنتاجية والدلائل ١، ٢، ٣، ٥ للماعز البرقى وأثر معنويا على عدد الكيلوجرامات المفطومة وكمية اللبن الكلية وعدد الأيام فى الحليب ومعدل التحويل والأدلة الأولى والرابعة للماعز الدمشقى. وبالنسبة للماعز الخليط فقد أثر عمر الفطام معنويا على كمية اللبن الكلية المنتجة ومعدل التحويل وجميع الأدلة الإنتاجية.

أظهرت الماعز الدمشقية تفوقا فى جميع أدائها الإنتاجية يليها الماعز الخليط وكان أقلها الماعز البرقى تحت أى عمر فطام ، وقد أثرت السلالة معنويا على جميع الأدلة الإنتاجية.