

Effect of Breed of Ram on Reproductive Performance of Barki Ewes and Their Lambs

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ABSTRACT

The study was carried out at the faculty of agriculture (Saba Basha), Alexandria University at Abis. Forty mature Barki ewes weighed 43 Kg were divided into two similar groups each of twenty ewes. The first group was mated with Awassi ram and the other group was mated with Barki ram. The animals of two groups were fed hay or fresh berseem and wheat straw in addition to concentrate mixture. The concentrate mixture consists of: 37% crushed corn, 30% crushed barley, 20% wheat bran, 10% soybean meal, 2% lime stone and 1% salt. The results showed that ewes mated to Barki ram had higher fertility traits {number of ewes conceived per ewe joined (EC/EJ), number of ewes lambed per ewes joined (EL/EJ), number of lambs born per ewes joined (LB/EJ), number of lambs weaned per ewes joined (LW/EJ)} except for kilograms born or weaned per ewe joined {(KGB/EJ), (KGW/EJ)}. The heavier weights of lambs born or weaned may be due heavier weights of Awassi ram in addition to Awassi breed is considered as improved breed. Ewes mated to Barki ram had higher values of Lambs born/Ewe lambing (LB/EL) and Lambs weaned /Ewe lambing (LW/EL) and lower values of kilograms born/ ewe lambing (KGB/EL) and kilograms weaned /ewe lambed (KGW/EL) than those of ewes mated to Awassi ram. The (½ Awassi X ½ Barki) ewe lambs - which born from Awassi ram with Barki ewes - reached puberty at younger ages (270 days) and heavier weights (31.23 kg) than Barki ewe-lambs (293.9 days and 29.87 kg, respectively). The breed of ram had highly significant effect on age at maturity of it's ewe-lambs where (½ Awassi X ½ Barki) ewe-lambs reached maturity at younger age than did the Barki ewe-lambs (329.0 vs. 352.4 day). Breed of ram had insignificant effect on weight of ewe-lambs at maturity but the ewe-lambs produced from Awassi ram were heavier at maturity than the Barki ewe-lambs which produced from mating Barki rams to Barki ewes (34.58 kg vs. 33.36 kg). The (½ Awassi X ½ Barki) ewe-lambs lambed for the first one at younger ages (477 day) than did Barki ewe-lambs (501 day). The breed of ram had insignificant effect on productive traits of ram-lambs in term of age at first ejaculation and weight at first ejaculation. The Barki ram-lambs reached puberty at 328.5 days and weighed 35 kg while the crossbred ram-lambs reached puberty at shorter age and heavier weights (319.4 days and 36.3 kg, respectively).

Data obtained from this study indicated that mating Barki ewes by Awassi rams resulted in a significant improvement in the reproductive performance of Barki

ewes in term of kilograms born or weaned per each ewe joined or lambed, while their ewe-lambs and ram-lambs showed higher reproductive performance.

INTRODUCTION

Number of lambs born or weaned per ewe is one of the most important factors determining the efficiency of meat production from sheep. It is a complex trait controlled by both genetic and environmental factors, and responds slowly to genetic selection within breeds (Smith *et al.*, 1979). Increasing mutton production is influenced by litter size and growth rate of lambs from birth to weaning to rapidly achieve slaughter weight. One possible method for improving the productivity of Barki sheep is to cross it with another breed known for superiority in one or more of the production characteristics and should sought the prevailing environmental conditions. The Awassi breed is widespread in the Middle East, raised for meat, milk and wool. The breed is run under variable production systems range from nomadic systems with reliance on pasture in semi-arid arts, to dairy system where the improved Awassi type is kept indoor (Epstein, 1985 and Momani Shaker *et al.*, 2002). Therefore, some Syrian Awassi sheep were arranged for evaluating the breed under the local environment of the western coast of Egypt. The effect of rams' breed on the reproductive performance of ewes has not been very well documented. Also the attainment of puberty in the ram lamb has been much less well studied than in the ewe lamb. Therefore, the present study was carried out to evaluate the effect of ram breed on the reproductive performance of local Barki ewes and their lambs.

MATERIALS AND METHODS

Flock management

Forty mature Barki ewes weighing 43 Kg were divided into two similar groups each of twenty ewes. The first group was mated with Awassi ram and the other group was mated with Barki ram.

All animals were fed hay or fresh berseem and wheat straw in addition to concentrate mixture (37% crushed corn, 30% crushed barley, 20% wheat bran, 10% soybean meal, 2% lime stone and 1% salt). The lambs were weighed within 24 hours after birth and biweekly

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Received December 20, 2012, Accepted June 24, 2013

thereafter. The lambs were left free to suckle their dams until weaned at 12 weeks of age. Lambs started feeding on berseem either green or hay from the 2nd week of age. Barley grains were also offered until weaning time.

Data of reproductive performance of ewes were collected for one lambing season while data of the reproductive performance of ewe-lambs was taken till they lambed. Data of ram-lambs was collected till puberty.

Data collection

1-The Reproductive Performance of the Ewe

The reproductive traits were estimated in two main categories; fertility and prolificacy.

A- Fertility traits are included:

- 1- EC/EJ: Number of ewe conceived per ewe joined.
- 2- EL/EJ: Number of ewe lambed per ewe joined.
- 3- LB/EJ: Number of lambs born per ewe joined.
- 4- LW/EJ: Number of lambs weaned per ewe joined.
- 5- KGB/EJ : Number of kg born per ewe joined.
- 6- KGW/EJ: Number of kg weaned per ewe joined.

B- Prolificacy traits are included:

- 1- LB/EL : Number of lambs born per ewe lambed.
- 2- LW/EL : Number of lambs weaned per ewe lambed.
- 3- KGB/EL : Number of kg born per ewe lambed.
- 4- KGW/EL: Number of kg weaned per ewe lambed.

All traits were based on number of ewes entered the breeding season. A score 1 was given to the ewe that conceived whether it gave birth to dead or alive lamb or had aborted. A score zero was given to any ewe failed to conceive.

Likewise in calculating EL/EJ a score 1 was given to the ewe which had at least one viable lamb to full term otherwise a score zero was given.

KGB/EJ or KGW/EJ was considered good indices for ewe productivity.

2- The Reproductive performance of lambs

Data of reproductive performance collected in ewe-lambs were: age at puberty, weight at puberty, age at maturity, age at maturity, oestrus cycle length, gestation length and age at first lambing. Puberty is generally defined as the point of sexual development at which the animal becomes capable of reproduction (first ovulation in the female and first spermatozoa in the ejaculate of the male), but animals are not yet fully sexually mature at this stage. Sexual maturity is the time when the animal expresses its full reproductive capacity. In both the male and female sheep and goat, puberty may often be reached without adequate physical growth to support reproduction, and in females the first ovulation may not

necessarily coincide with first estrus. In males, puberty is the time when complete separation of the prepuce and the penis occurs and motile spermatozoa are first detected in the ejaculate. In immature rams and bucks, the penis has adhesions that prevent it from being fully extended. At puberty, these adhesions dissolve under the influence of testosterone and the penis can be fully extended. This may occur as early as 5 months. However, full reproductive competence may not occur until 15 months of age. Spermatogenesis has been found to begin as early as 84 days of age, with spermatozoa present in the epididymis at 140 days of age. Data of reproductive performance collected in ram-lambs were: age and weight at first ejaculation

Statistical analysis:

Data were statistically analyzed using GLM procedure according to SAS (1998). The model used was as follows:

$$Y_{ij} = \mu + B_i + e_{ij}$$

Where:

Y_{ij} = An observation on individual j

μ = overall mean

B_i = Fixed effect of ram breed ($i=2$)

e_{ij} = random error normally distributed with mean = zero and variance = σ^2_e Significance differences between means were detected using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

1- Reproductive performance of ewes.

The reproductive traits of ewes were estimated in two main categories; fertility and prolificacy.

A- Fertility traits

Least-square means and standard errors of the fertility traits, i.e. ewe conceived per ewe joined (EC/EJ) or conception rate (CR), ewe lambed per ewe joined (EL/EJ), number of lambs born per ewe joined (LB/EJ), number of lambs weaned per ewe joined (LW/EJ), kilograms born per ewe joined (KGB/EJ) and kilograms weaned per ewe joined (KGW/EJ) are presented in Table (1).

Breed of sire had significant effect on all fertility traits of ewes. Ewes mated to Barki ram had higher fertility traits except for kilograms born or weaned per ewe joined. The heavier weights of lambs born or weaned may be due heavier weights of Awassi ram where Awassi breed is considered as improved breed. These results confirm with those obtained by Younis and Aboul Ela (1990) who found that ewes mated to Awassi rams had heavier kilograms born or weaned than

those mated to Barki rams (2.55 kg and 9.6 kg vs. 2.2 kg and 8.2 kg, respectively).

Data in table (1) showed that the EC/EJ or (CR), (EL/EJ), (LB/EJ), (LW/EJ) for Barki ewes that mated to Barki rams were higher than those mated to Awassi ram. This may be due to the adaptation of Barki breed to the prevailing condition at this region.

The present results are similar those of Younis and Aboul Ela (1990) and were higher than the results found by Mahrem (1996), Said *et al.* (2000) and Momani Shaker *et al.* (2002). Also, Esmailzadeh *et al.* (2011) found that breed ram had significant effect ($p < 0.05$) on fertility traits. Mohajer *et al.* (2012) found that Zel ewes mated to Shal rams had higher fertility compared to Zel ewes mated to Zel rams. On the other hand Leeds *et al.* (2012) observed that breeds of ram had insignificant effect on fertility traits studied.

B- Prolificacy traits

Least-squares means and standard errors of prolificacy parameters in terms of: lambs born alive per ewe lambled (LB/EL), lambs weaned per ewe lambled (LW/EL), kilograms born per ewe lambled (KGB/EL) and kilograms weaned per ewe lambled (KGW/EL) for Barki ewes as affected by ram breed are presented in (Table 2).

The present results in Table (2) showed that breed of ram had significant effect ($p < 0.05$) on prolificacy traits of Barki ewes. It could be noticed that Barki ewes that mated to Barki rams born and weaned higher number of lambs than did Barki ewes that mated to Awassi ram (1.20 and 0.95 vs. 1.13 and 0.90 for LB/EL and LW/EL, respectively). These results reflect high ovulation rate in

Barki ewes which mated to ram from the same breed while Barki ewes which mated to Awassi ram have been reported to have low lamb survival till weaning. The above result meant that the cross lambs produced from mating Awassi ram with Barki ewes were heavier in their weights and they need more suckling milk which was low in their dams. These results agreement with Gaafar *et al.* (2011) who noted that Finn ewes which mated with Finn rams recorded the highest number of lamb born and weaned per ewe lambing (LB/EL and LW/EL) but Rahmani ewes which mated with Finn had the lowest values. On the other hand Mohajer *et al.*, (2012) showed that Zel ewes mated to Shal rams had higher lambs born alive per ewe lambled (LB/EL) and lambs weaned per ewe lambled (LW/EL) compared to Zel ewes mated to Zel rams

Barki ewes mated to Awassi ram tended to born and weaned heavier lambs than did Barki ewes that mated to Barki ram. The heavier litter weight may be due to hybrid vigour which found in the first cross. However, Boujenane (2012) noticed that breed of sire had a significant effect on lamb weight at 30 days, but a non-significant effect ($P > 0.05$) on lamb weight at birth and 60 days and survival prior day 60. Lambs sired by Ile-france (IF) rams were 0.62 kg heavier at 30 days than those sired by Merinos(M) rams.

Younis and Aboul Ela. (1990) found that the values of the same prolificacy traits of ewes mated to Awassi rams or to Bakri rams were 1.2%, 75.0%, 3.3 kg, and 12.6 kg vs. 1.0%, 65.0%, 2.3 kg and 10.2 kg, respectively for LB/EL, LW/EL, KGB/EL and KGW/EL.

Table 1. Least-square means and standard errors of fertility traits

| Breed of ram | Barki | Awassi |
|-------------------------|------------------------|------------------------|
| Fertility traits | | |
| EC/EJ (CR) | 0.89±0.05 ^a | 0.78±0.06 ^b |
| EL/EJ | 0.88±0.05 ^a | 0.70±0.04 ^b |
| LB/EJ | 0.83±0.06 ^a | 0.75±0.03 ^b |
| LW/EJ | 0.78±0.06 ^a | 0.70±0.04 ^b |
| KGB/EJ | 2.75±0.32 ^b | 3.02±0.14 ^a |
| KGW/EJ | 8.85±1.06 ^b | 11.55±0.6 ^a |

Means in the same row with different superscript are significantly differ ($P < 0.05$).

Table 2. Least-square means and standard errors of prolificacy traits

| Breed of ram | Barki | Awassi |
|-------------------------|-------------------------|-------------------------|
| Fertility traits | | |
| LB/EL | 1.20±0.06 | 1.13±0.06 |
| LW/EL | 0.95±0.06 ^a | 0.90±0.06 ^b |
| KGB/EL | 3.80±0.06 ^b | 4.53±0.06 ^a |
| KGW/EL | 15.20±0.06 ^b | 16.51±0.06 ^a |

Means in the same row with different superscript are significantly differ ($P < 0.05$).

The values of prolificacy traits obtained by Maharem (1996), Said *et al.* (2000) and Momani Shaker *et al* (2002) were lower than the present results.

Bunge *et al.* (1995) and afolayan *et al* (2008) found that breed of ram had significant effect on prolificacy traits of ewes. Esmailzadeh *et al* (2011) found that Crossbreeding of four Iranian fat-tailed sheep breeds, namely Kurdi (K), Chaal (C), Afshari (A) and Sanjabi (S) was carried out to determine the ram breed effects on productivity of Kurdi fat-tailed ewes (K) under extensive production system. Ram breed had a significant influence on early growth traits of the lambs. Lambs sired by C rams were heavier than the other lambs ($P < 0.05$) at birth and weaning. In general, ewes mated to Chaal ram had higher productivity than those mated to other ram breeds. Also, Leeds *et al* (2012) on a 3-yr study was conducted to comprehensively evaluate Columbia, Suffolk, USMARC-Composite (Composite), and Texel breeds as terminal sires in an extensive rangeland production system found that Suffolk-sired lambs were heavier ($P = 0.02$) at birth (5.5 kg) and weaning (40.3 kg) than lambs sired by the other breeds, which did not differ ($P = 0.34$) for birth weight (mean= 5.3 kg). Texel-sired lambs (37.4 kg) were lighter ($P = 0.02$) at weaning than Columbia- (38.8 kg) and Composite-sired (38.4 kg) lambs, which did not differ ($P = 0.40$) for weaning weight

2- Reproductive performance of lambs

A- ewe lambs

The breed of ram had a significant effect on age ($P < 0.01$) and weight ($P < 0.05$) at puberty of ewe-lambs. The results of ewe-lambs reproductive traits were tabulated in Table (3). It is clear to note that the ($\frac{1}{2}$ Awassi X $\frac{1}{2}$ Barki) ewe lambs- which born from Awassi ram with Barki ewes- reached puberty at younger ages (270 days) and heavier weights (31.23 kg) than Barki ewe-lambs (293.9 days and 29.87 kg, respectively). These results conformed to those reported by Mousa (1991) and Hassan, *et al.* (2002) who found that Chios lambs reached puberty at younger ages than Awassi and Ossimi ewe lambs. Such differences may be attributed to flock differences, location, as well as nutrition. However, Rami *et al* (2006) found that Weight at puberty in ewe lambs were not significantly different among the three genotypes [Awassi(A), Charollais x Awassi (CA), and Romanov x Awassi (RA) F1 crosses]. and ranged around 35 kg and 42 kg, respectively. In ewe lambs, age at puberty was significantly higher ($P < 0.01$) in A (280 ± 11.5 d) than in RA (232 ± 11 d) and CA (255 ± 11.5 d).

The breed of ram had highly significant effect on age at maturity of it's ewe-lambs where ($\frac{1}{2}$ Awassi X $\frac{1}{2}$ Barki) ewe-lambs reached maturity at younger age than did the Barki ewe-lambs (329.0 vs. 352.4 day). Breed of ram had insignificant effect on weight of ewe-lambs at maturity but the ewe-lambs produced from Awassi ram were heavier at maturity than the Barki ewe-lambs which produced from mating Barki rams to Barki ewes (34.58 kg vs. 33.36 kg). Fahmy (1990) reported that breed had a significant effect on maturity in Finnsheep, Suffolk and Booroola ewe lambs. However, Attallah (1993) reported that breed of lambs had no significant effect on age at maturity, while the effect of breed on body weight at maturity was significant ($P < 0.05$).

Estrus cycle length was significantly affected by ram breed ($P < 0.05$), where the crossbred ewe-lambs ($\frac{1}{2}$ Awassi X $\frac{1}{2}$ Barki) showed shorter estrus cycle length than did the purebred Barki ewe-lambs (16.98 days vs. 18.13 days, respectively). These results were agreement with Abd Allah *et al* (2012) who noted that ewe lambs ($\frac{1}{2}$ Chios $\frac{1}{2}$ Rahmani) had shorter estrus cycle length than did the purebred Rahmani ewe lambs by 1.17 days. The $\frac{1}{2}$ Awassi X $\frac{1}{2}$ Barki ewe-lambs lambed for the first one at younger ages (477 day) than did Barki ewe-lambs (501 day). The differences were highly significant. This result is related to heavier weights and earlier age at maturity. These results are agreement with (Gbangboche *et al*, 2006) who found that age at first lambing in Djallonke sheep breed was estimated 622.4 ± 55.6 days and in Djallonke x Sahelian crossbred ewe was 506.2 days.

Differences in gestation period were insignificant and averaged 148.2 days and 149.1 days for the crossbred and purebred ewe-lambs. This result is expected

B- ram-lambs

Table 4 illustrated that the breed of ram had insignificant effect on productive traits of ram-lambs in term of age at first ejaculation and weight at first ejaculation. The Barki ram-lambs reached puberty at 328.5 days and weighed 35 kg while the crossbred ram-lambs reached puberty at shorter age and heavier weights (319.4 days and 36.3 kg, respectively). Aboul-Ela and Chemineau (1988) pointed out that crossbred male lambs gave the first ejaculate at older age and heavier weights and they reported that their results may be due to slower growth rates. On the other hand Rami *et al* (2006) found that Age at puberty of ram lambs was also significantly different ($P < 0.01$)

Table 3. Least-square means and standard errors of reproductive performance of ewe-lambs

| Breed of ram | Barki ¹ | Awassi ² | significance |
|-----------------------------|--------------------|---------------------|--------------|
| Fertility traits | | | |
| Age at puberty (day) | 293.9±3.83 | 270.0±3.26 | ** |
| Weight at puberty (kg) | 29.87±0.57 | 31.23±0.48 | * |
| Age at maturity (day) | 352.4±3.83 | 329.0±3.26 | ** |
| Weight at maturity (kg) | 33.36±0.56 | 34.58±0.58 | NS |
| Gestation length (day) | 149.1±1.14 | 148.2±1.03 | NS |
| Age at first lambing (days) | 501.0±4.72 | 477.0±4.26 | ** |
| Oestrus cycle length (day) | 18.13±0.39 | 16.98±0.33 | * |

Means in the same row with different superscript are significantly differ (P< 0.05).

1= genotype of ewe-lamb is Barki

2= genotype of ewe-lamb is 1/2 Awassi X 1/2 Barki

** (P< 0.01) * (P<0.05) NS not significant (P>0.05)

Table 4. Least-square means and standard errors of reproductive performance of ram-lambs

| Item | Age at first ejaculation (day) | Weight at first ejaculation (kg) |
|---------------------|--------------------------------|----------------------------------|
| Breed of ram | NS | NS |
| Barki ¹ | 328.5±7.78 | 35.0±0.76 |
| Awassi ² | 319.4±12.1 | 36.3±1.04 |

1= genotype of ewe-lamb is Barki

2= genotype of ewe-lamb is 1/2 Awassi X 1/2 Barki

NS not significant (P>0.05)

among the three genotypes [Awassi(A), Charollais x Awassi (CA), and Romanov x Awassi (RA) F1 crosses]. being higher in A (243±5 d) than in CA (223±5 d) and RA (226±5 d) ram lambs.

CONCLUSIONS

The present results indicated that crossing the local Barki sheep with the Awassi rams significantly improved reproductive performance of Barki ewes that concerning kilograms born or weaned per each ewe joined or lambed. Data obtained pointed out that the breed of ram had significant effect on reproductive performance of ewe-lambs and ram-lambs where ½ Awassi X ½ Barki ewe-lambs reached puberty in shorter age and heavier weight and have shorter estrus cycle length than did the Barki ewe-lambs. Also, the crossbred ewe-lambs lambed early than the purebred Barki ewe-lambs.

From the point of view, the crossbred ram lambs had early puberty with heavier weights while the Barki ram-lambs reached puberty at older ages with lighter weights.

These results indicated that high litter size may not necessarily result in higher ewe productivity but other traits may also have a significant importance on the

sheep industry projects, such as early puberty of either ewe-lambs or ram lambs.

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الملخص العربي

تأثير سلالة الكباش علي الأداء التناسلي للنعاج البرقي ونتاجها

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-تفوقت النعاج البرقي الملقحة بكبش عواسي في صفة عدد الكيلوجرامات المولودة والمقطومة لكل نعجة والدة.

-وصلت حملان الإناث الخليطة الناتجة من تلقيح الامهات البرقي بالكباش العواسي للبلوغ في عمر مبكر وبوزن اثقل معنويا عن تلك المولودة من امهات برقي ملقحة بكبش برقي. وبالتالي انعكست النتائج على الوصول لأول ولادة في عمر مبكر للحملان الإناث الخليط. أما بالنسبة للحملان الخليط الذكور فقد وصلت مبكرا لعمر أول قذفة وفي وزن أثقل من تلك الحملان البرقي.

ونستنتج من هذه الدراسة ان زيادة وزن الخلفة أو عدد الخلفة يجب أن يتبعه قياس الاداء التناسلي وخصوصا البلوغ في الحملان المولودة سواء الذكور أو الإناث لما لها من تأثير على مشاريع صناعة الأغنام.

اجريت هذه الدراسة في مزرعة كلية الزراعة (سابا باشا)-جامعة الاسكندرية حيث تم استخدام 40 نعجة برقي ناضجة وزن 43 كجم في المتوسط حيث قسمت إلى مجموعتين متشاهمتين (بكل مجموعة 20 نعجة) ولقحت المجموعة الأولى بكبش عواسي والمجموعة الأخرى بكبش برقي وكان الهدف من التجربة هو دراسة تأثير سلالة الكباش على الأداء التناسلي للنعاج البرقي وعلى الأداء التناسلي للمواليد الذكور والإناث. وكانت اهم النتائج المتحصل عليها كالتالي:

-تفوقت النعاج البرقي التي لقحت بكبش برقي عن نظيراتها التي لقحت بكبش عواسي في بعض مقاييس الخصوبة (عدد النعاج المخصبة/عدد النعاج الملقحة- عدد النعاج الوالدة/ عدد النعاج الملقحة- عدد الحملان المولودة/عدد النعاج الملقحة-عدد الحملان الفطومة/ عدد النعاج الملقحة). ولكن تفوقت النعاج البرقي الملقحة بكبش عواسي عن نظيراتها الملقحة بكبش برقي في عدد الكيلوجرامات المولودة/نعجة ملقحة وفي عدد الكيلوجرامات الملقحة/نعجة ملقحة.