



Effects of Some Factors on Reproduction Performance of Akkaraman Sheep in Breeder Flocks in Konya Province, Turkey**

Mustafa BÜYÜKTEKİN^{1*}, Ayhan ÖZTÜRK¹

¹Selçuk University, Faculty of Agriculture, Department of Animal Science, Konya, Turkey

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ABSTRACT

The aim of this study was to determine the effects of ewe age on conception rates, prolificacy, productivity, and viability using 1,408 Akkaraman ewes from the Yarma neighborhood in Konya City, Turkey. The least-squares means for these parameters of all flocks were 91.27 ± 0.11 , 135 ± 0.30 , 86.38 ± 0.01 , and $94.63 \pm 0.01\%$, respectively. In addition, the effects of the sex of the offspring and the birth type (i.e., single, twin) on viability were included in the study. Except for viability, the effect of ewe age on these parameters was statistically significant ($P < .01$). Two-year-old ewes exhibited the maximum productivity. The year factor (i.e., time of year, weather, etc.) had a significant effect on all parameters ($P < .01$ and $P < .05$). Sex and birth type effects on viability were not statistically significant.

1. Introduction

Sheep breeding has an important place in Turkey's livestock management. An estimation of % 57 of the farm animals are constituted by sheep. The importance of sheep management depends on country conditions or people's interest toward sheep products. More than 95% of domestic sheep breeds are indigenous races, and these are usually primitive races. The Akkaraman is a breed native to Turkey and comprises nearly one-half of the country's present sheep population (Anonymous, 2016). The breed has coarse wool and fat tails, and their reproductive yields are low, it is very hardy and strives well under poor feeding and extreme climatic conditions

In this study, the effects of some environmental and biological factors on reproductive success was investigated in Akkaraman sheep in a breeding population in Konya Province, Turkey.

2. Material and Methods

Data were collected from the Yarma neighborhood in Konya City, Turkey, from 2013 through 2016. The records of 1,408 Akkaraman ewes were used to determine the effects of age and time of year on conception rates (pregnant ewes/ewes put into breeding), prolificacy (lambs born/ewes lambing x 100), productivity (live lambs at weaning/ewes put into breeding), and viability (live lambs at weaning/lambs born). In addition, the effects of the sex of the lamb and birth type (i.e., single, twin) on viability were also studied.

On large sheep farms, the farmer and the family members are responsible for the feeding, care, and management of the sheep. The sheep are usually grazed from April to November and kept in shelters from December through March. During this period, an average of 400–500 g crushed barley per animal, 500–600 g sugar beet pulp, and unlimited wheat straw are fed to the sheep in the shelters. Clean water is available to them at all times. The sheep in this study were fed between 06:00 and 07:00 and between 17:00 and 18:00 each day.

The flocks were hand mated in September and October. No supplementary feed was provided for the ewes or rams before or during mating. Lambs were born from February through the end of March. Within

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* Corresponding author e-mail: mbuyuktekin42@hotmail.com

next 24 h after birth, the live weights of the lambs were determined within 100 g, and their sex and birth type were recorded. The lambs were weaned at 4 months.

The data were analyzed using mixed models with a least-squares and maximum likelihood computer program developed by Harvey (1987). The least-squares analysis was used to calculate the means and standard errors, and to test for significance of conception rate, prolificacy, productivity, and viability of the Akkaraman sheep. These results are provided in Table 1. For conception rate, prolificacy and productivity, the following equation was used:

$$Y_{ijl} = \mu + a_i + b_j + e_{ijl}$$

To analyze viability and the effects of sex and type of birth, the following equation was added to the model:

$$Y_{ijlmn} = \mu + a_i + b_j + d_l + s_m + e_{ijl(mn)}$$

where μ is the overall mean, a_i is the effect of the dam, $i = 1, \dots, 7$ (2–7 ages), b_j is the effect of year, $j = 1, \dots, 3$ (2013–2016), d_l is the effect of type of lamb birth, $l = 1, 2$ (single, twin), s_m is the effect of the sex of the lamb, $m = 1, 2$ (male, female), and $e_{ijl(mn)}$ = random error.

Duncan's multiple range test using MSTAT-C Range Program (1989) was used to make comparisons among the subclass means.

3. Results and Discussion

The least-squares mean for conception rate was $91.27 \pm 0.11\%$, which was similar to that reported for Akkaraman sheep by Öztürk and Pembeci (2016) (91.44%); however, this conception rate was higher than that reported by Esen and Özbey (2002) for Akkaraman, Yalçın, and Aktaş (1976) breeds, and Vanlı et al. (1990) for Merino, Morkaraman, Awassi, Karakul, and Tuj breeds (respectively, 88.8, 87.33 and 84.77 %) and was lower than that obtained by Özbey and Akcan (2000) for Akkaraman (93.0%) and by Mohammadi et al. (2013) for Makoei (93.0%). The reason for these differences are both genetic and environmental, and are related to interaction between genotype and environmental factors.

The average prolificacy for the flock of Akkaraman sheep was $135.0 \pm 0.30\%$. This value was similar to that for Awassi sheep (135.0%) reported by Özbey and Akcan (2000), lower than that of Akkaraman (Özbey and Akcan, 2000) and Chios x Akkaraman crossbred ewes (Esen and Özbey, 2002), 139.0 and 140.0%, respectively, and higher than that reported by Demiral and İşcan (2012) for Akkaraman (125.0%) and by Ülker et al. (2004) for Karakaş (118.0%), a variant of the Akkaraman breed.

3.1. Measures of performance

Productivity was $86.38 \pm 0.01\%$ in the present study. This value is lower than the findings of Öztürk

and Pembeci, (2016) (110.06%), Çolakoğlu and Özbeyaz, (1999) (113.3–124.3%), and Esen and Özbey (2002) (90.0%) for Akkaraman sheep. Lower values of herd productivity were not found in the literature; however, those found in this study can be related to the breeding conditions under which this research was conducted. The lambs were weaned 120 d after birth, and average viability was $94.63 \pm 0.01\%$. This rate was similar to that reported by Öztürk and Pembeci (2016) (95.14%) for Akkaraman sheep raised in Konya Province. Aktaş and Doğan (2004), Aktaş et al. (2014), and Thieme et al. (1999) reported the viabilities of Akkaraman lambs as 88.8, 91.4, and 93.5%, respectively, in breeder flocks in Konya Province. These rates were lower than those of our present study. On the other hand, our findings on viability were lower than those reported by Çolakoğlu and Özbeyaz (1999) for Akkaraman lambs (96.1–97.6%). The differences in viability are related to the length of time before weaning and breeding (or growing) conditions.

3.2. The Effect of the Studied Factors

Effects of ewe age

The results of the present study indicated that the age of the dam (ewe) had a significant effect on conception rates, prolificacy, and productivity ($P < .01$) but did not affect lamb viability. The averages and standard errors of the age groups and the differences among the groups are presented in Table 1. The findings on conception rates were in agreement with the reports of Notter and Copenhaver (1980) and El-Karim and Owen (1987). In contrast, the findings of Baş et al. (1989) and Öztürk and Pembeci (2016) on conception rates among age groups were reported to be insignificant. Dam age also affected prolificacy, and Eliçin (1985), El-Karim and Owen (1987), Gates (1990), and Öztürk and Pembeci (2016) have reported similar findings. According to Öztürk and Pembeci (2016), the effect of dam age on productivity was significant. This finding was similar to the results of the present study; however, Vanlı and Özsoy (1988) reported no significant effect on productivity in Awassi sheep. The effect of the dam's age on viability was reported as significant (Vanlı and Özsoy 1988; Ünal et al. 2003; Koncagül et al. 2013; Öztürk and Pembeci 2016); however, these reports are incompatible with the results on viability in the present study, and Thieme et al. (1999), Koç (2004), and Ceyhan et al. (2009) reported that the effect of dam age on viability was negligible.

Year

The year variable includes climatic, management, nutrition, and husbandry elements, and affected all four measures (conception rate, prolificacy, productivity, and viability) in the present study (for conception rate,

P < .05, and for the others, P < .01). Similar findings have been reported by Köprücü (1975), Gates (1990), and Öztürk and Pembeci (2016); however, there are

also some reports on viability that show findings that are contrary to these (Thieme et al. 1999; Koç 2004).

Table 1

Least-squares mean and standard error (SE) for conception rate, prolificacy, productivity, and viability of Akkaraman sheep in Yarma, Konya Province, Turkey.

Trait Effect	Conception Rate (%)		Prolificacy (%)		Productivity (%)		N	
Viability, (%)								
N	$\bar{X} \pm S_{\bar{x}}$	N	$\bar{X} \pm S_{\bar{x}}$	N	$\bar{X} \pm S_{\bar{x}}$	$\bar{X} \pm S_{\bar{x}}$		
Overall mean	1408	91.27±0.11	1333	135±0.30	1408	86.38±0.01	1333	
94.63±0.01								
Age of ewe's dam (a _i)		**		**		**	NS	
2	252	97.75±0.01 ^a	245	123.02±0.03 ^c	252	94.99±0.18	245	97.45±0.01
3	324	94.32±0.01 ^a	301	123.17±0.03 ^c	324	88.89±0.02	301	95.65±0.01
4	463	96.53±0.01 ^a	447	131.97±0.02 ^{bc}	463	91.33±0.01	447	95.14±0.01
5	274	93.31±0.01 ^a	252	142.87±0.03 ^{ab}	274	89.32±0.02	252	96.77±0.01
6	83	97.88±0.02 ^a	80	139.07±0.05 ^{ab}	83	93.85±0.03	80	95.44±0.02
7	12	67.84±0.06 ^b	8	149.87±0.16 ^a	12	59.85±0.08 ^b	8	87.34±0.07
Year (b _i)		*		**		**	**	
2013-2014 (1)	452	92.03±0.15 ^a	433	130.19±0.04 ^b	452	84.80±0.02 ^b	433	91.97±0.06 ^b
2014-2015 (2)	486	92.74±0.14 ^a	468	139.67±0.03 ^a	486	90.11±0.02 ^a	468	96.90±0.01 ^a
2015-2016 (3)	470	89.03±0.13 ^b	432	135.12±0.03 ^{ab}	470	84.21±0.02 ^b	432	95.02±0.01 ^a
Type of birth (d _i)							NS	
Single							919	94.85±0.01
Twin							414	94.41±0.01
Sex of lamb (s _m)							NS	
Male							670	93.72±0.01
Female							663	95.54±0.01

Means followed by different letters within classes differ: * P<0.05; **P<0.01; NS, non-significant

Type of birth

The average viabilities of 919 single and 414 twin lambs were 94.85 ± 0.01 and $94.41 \pm 0.01\%$, respectively, with no significant difference between them. This result is consistent with that of Aktaş et al. (2014), but generally inconsistent with the reports in the literature (Ünal et al. 2003; Koç 2004; Koncagül et al. 2013; Öztürk and Pembeci 2016). The effect of lamb birth type on viability is related to ewe's pregnancy, the care of her young after birth, and her ability to produce enough milk. It is also related to the birth weight of the lamb.

Sex of the lamb

The viabilities of 670 male and 663 female lambs were 93.72 ± 0.01 and $95.54 \pm 0.01\%$, respectively. The difference between the averages was not significant and was in agreement with the results reported by Ünal et al. (2003) for Karayaka and Bafra sheep, Koncagül et al. (2013) for Zom sheep, Aktaş et al. (2014) for Akkaraman sheep, and Öztürk and Pembeci (2016) for Akkaraman sheep. On the other hand, Koç (2004) found that the effect of the sex of the lamb on viability in Kıvrırcık sheep was statistically significant.

4. Conclusion

In this study, various breeding characteristics of Akkaraman sheep cultivated under peasant conditions were investigated. Although Akkaraman is not at a satisfactory level in terms of the characteristics discussed, it is said that Akkaraman is an important sheep breed when considering the conditions of the breeders' enterprises.

For this reason, researches aiming to reveal the characteristics of native sheep breeds in peasant enterprises gain importance.

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