

PAPER

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Effects of supplemental feeding on performance of Kilis goats kept on pasture condition

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ABSTRACT

In this study, the effects of supplemental feeding to extensive pasture condition on some reproductive and milk yield characteristics in Kilis goats have been investigated. For this study, 180 Kilis goats were used. These goats were assigned into two groups as control and treatment. Control goats were allowed to graze pasture, while treatment goats were additionally fed 750 g/day with concentrated feed per head plus pasture facility. At the end of the study the average fertility rate, marketable milk yield, lactation length and lactation milk yield were determined as 115.56%, 215.5 ± 5.28 l, 212.5 ± 1.09 days 293.7 ± 5.76 l, respectively, in the control goats; 131.1%, 304.1 ± 6.48 l, 256.5 ± 1.79 days, 408.3 ± 7.21 l, respectively, in the treatment goats. To conclude, supplementary feeding plus pasture improved reproductive and milk yield performance in Kilis goats.

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Kilis goats; milk yield characteristics; reproductive traits; supplemental feeding

Introduction

Goat farming in Turkey has been performed usually in and at the edge of the forests, unsuitable areas for cultivation, steep land and in places that were not suitable for other animal species. Approximately 500 000 acting goat farms have been contributing to livelihood of three million people in Turkey (Dellal & Dellal 2005). The families gathering with goat farming have utilised milk to produce salted yoghurt, cheese, butter or fresh milk. The native goat breeds in Turkey are more resistant to diseases and hard environmental conditions.

Turkey has a 10 347 159 goat population, 97% of them are native hair goats producing low amount of milk and having poor fertility while the remainder of the population are Angora goats (TÜİK 2015). Kilis goat are been known to have the highest milk yield and reproductive performance. Many studies and cross-breeding efforts by using exported breeds have been conducted to increase milk yield and reproductive performance of Hair goats (Koşum et al. 2004; Kaymakçı 2010). All quantitative yield characteristics are changing depending upon the environmental conditions independent of their genetic merits. Intensive goat farming, especially new goat farms that serve the ice cream sector, has increased in recent years. It has been a well-known fact that supplementary feeding

(flushing) before mating and during lactation affects milk yield and reproductive performance positively (Webb & Mamabolo 2004; Snyman 2010). Also, it has been well known that supplementary feeding before mating and during lactation in animals had positive effects on body condition score, ovulation rate and reproductive traits (Chowdhury et al. 2002; Karikari & Blasu 2009; Ray et al. 2012).

The population of Kilis goats is smaller than that of Hair goats. Nevertheless, Kilis goats have become notable for their high milk yield and reproductive performance under extensive farming systems. This is seen in the Kilis goats' population in Adana, Adayaman, Kahramanmaraş and Mersin, especially in Gaziantep, Hatay and Kilis provinces. This breed is different from Aleppo or Damascus goats despite their similarity in morphology (Keskin et al. 1996; Keskin 2000). Kilis goats showed a 100% gestation rate, 128.2% litter size, 177.9 days milking period and produced 95.24 l marketable milk under extensive breeding conditions in Hatay Province (Keskin et al. 1996). The studies on Kilis goats had been carried out in different regions of Turkey in the past (Yarkın & Sönmez 1961; Şengonca 1974; Tuncel & Aşkın 1982; Tuncel et al. 1983; Yalçın 1986; Özcan 1989; Baltacı 1990; Güney et al. 1992; Keskin 1995; Keskin et al. 1996; Kaymakçı 1997) and recently have been continued by

Aktepe (2009), Alizadehasl and Ünal (2011). Still, there is a need to work on Kilis Goat production in different regions of the country because of their higher milk yield and reproductive traits.

Therefore, the present study aimed to test the effects of supplemental feeding to extensive pasture condition on some milk yields and reproductive traits of Kilis goats in the Yayladağı district of Hatay province.

Materials and methods

This research was conducted between the years 2012 and 2014. In this study, 180 head Kilis goats aged 2–4 years old were used for three years and with the approval of the Mustafa Kemal University Ethics Committee (MKUHADYEK-2013-6/4). All yield characteristics of the groups were adjusted according to additive correction factors based on population mean. Goats were divided into two groups as Control (90 heads) and Treatment (90 heads) group to determine some of their reproductive and milk yield performances in the last year. Some milk yield and reproductive characteristics of goats were determined in the first two years of study under pasture conditions. Chemical composition of concentrated feed and its estimated nutrient supply is given in Table 1. The Control group was allowed to graze all day in extensive grazing systems (pasture land) without any additional feed supplement while the Treatment group was fed with 750 g/head/day of concentrated feed in the evenings. Pasture land included 8.50% *Trifolium* sp., 7.25% *Aegilops ovata*, 6.50% *Lolium perenne* L., 5.75% *Medicago rigidula*, 4.25%, *Trifolium angustifolium*, 0.25% *Aegilops triuncialis* and *Medicago sativa*. 38% annual forage legumes, 24% graminæ (*Poaceae*) and 17.75% of other plant species (Bilgin & Can, 1998). The goats used in the study were weighed by electronic bascule

(1 g sensitivity) and their body condition scores (BCS) were recorded by 3 researchers who are expert for BCS.

The animal material is assigned into the groups according to their live weight and BCS in the third year of the study. The BCS are assessed by 3 evaluators. When two of the assessment were the same in score that animal would be assigned to the group. Pasture allowance (control) and additional feeding (treatment) were started 2 months before the mating and continued throughout the lactation in the groups. Mating in flocks was done in a traditional system (90 females and 5 males in each group). The data regarding reproductive performance were recorded from lambing to dry season. The determined parameters as formulated by Kaymakci (2010) are given below:

- Pregnancy rate; number of pregnant goats/number of goats for mating * 100
- Infertility rate; number of none-pregnant goats/number of goats for mating * 100
- Birth rate; number of goats having birth/number of goats for mating * 100
- Single kidding rate; number of goats with single kid/number of goats having birth * 100
- Twinning rate; number of goats with twin kids/number of goats having birth * 100
- Mean kid number per birth; number of kids born/number of goats having birth * 100
- Kid yield; number of kids born/number of goats for mating * 100

Only marketable milk yield and lactation length was determined in the first two years while lactation milk yield was calculated in the last year. Milk yield controls in the groups were made by the ATC method in the ICAR procedure at intervals of 28 days. The Fleischman method was used for each goat lactation milk yield calculation (Gül 2008).

Table 1. Nutrient contents of concentrate feed.

Analytical Components (%)			
Raw protein	17	Raw ash	6.622
Raw cellulose	4.773	Starch	30.311
Raw fat	2.500	Sodium	0.100
Sugar	5.340	Calcium	1.164
Vitamins (mg)			
Vitamin D3	3.000	Vitamin A	15.000
Vitamin E	30	Vitamin B ₁	5
Trace Elements (mg)			
Selenium	0.3	Manganese	50
Cobalt	0.15	Ferrum	50
Niacin	300	Iodine	0.8
Copper	10		

Components: Lentil flour, wheat bran, sunflower seed meal, ddgs (gold), wheat, maize, locust bean, marble powder, canola, calcium, bypass oil, salt, urea, vitamin mineral.

Statistical analyses

Mathematical model of the experiment is;

$Y_{ij} = \mu + \alpha_i + e_{ij}$ in this model,

Y_{ij} , j th yield characteristic of animal in i th treatment group

μ = population mean of given trait,

α_i , effect of treatment

e_{ij} , error terms

The data regarding reproductive and milk yield performance were evaluated by using SPSS software (Windows version of SPSS release 22, Chicago, IL). Comparisons between group averages were made by

using the *t*-test in the same software (Kinnear & Gray 1994).

Results and discussion

All animals were weighed and their body condition scores (BCS) were identified (MLC 1981) before being exposed to additional feeding and these characteristics were taken into consideration while distributing them into groups. The live weights of control and treatment goats were determined as 47.3 ± 0.76 kg and 46.8 ± 0.71 kg ($p > 0.05$), respectively. Also, their respective body condition scores (BCS) were 2.5 ± 0.08 and 2.4 ± 0.05 ($p > 0.05$).

Some reproductive parameters are given in Table 2. All goats were fertile and gave birth in both treatment and control groups. All goats became pregnant after mating and there was no incidence of abortion during pregnancy in all goats irrespective to experimental groups.

As it is seen in Table 3, birth weight of kids varies according to gender and birth type. Various previously done studies declared that male kids are heavier than female kids and single born kids are heavier than multiple born kids (Demirören et al. 1999; Miah et al. 2002; Milligan et al. 2002). Average birth weight of kids is determined as 3.0 ± 0.06 kg in 2012 and 3.0 ± 0.04 kg in 2013 in single borns. There is no statistically significant difference between the two years ($p > 0.05$) in terms of birth weights. Also, this characteristic was weighed the same for twins as 2.3 ± 0.08 kg and 2.4 ± 0.06 kg, respectively ($p > 0.05$). The similarity of birth weight in 2012 and 2013 could be the result of mothers being exposed to similar environmental conditions in the last two months of their pregnancy. The weaning weight of kids is given in Table 4.

Average weaning weights of kids was found as 16.3 ± 0.15 kg in 2012; 16.0 ± 0.15 kg in 2013 in single born ($p > 0.05$). This trait was with same year ranking 14.7 ± 0.15 kg and 14.7 ± 0.24 kg in twins, respectively ($p > 0.05$). In the last year of this investigation it was

found out that additional feeding of Kilis goats resulted in an average birth weight of single born kids as 3.0 ± 0.05 kg in the Control group, and 3.5 ± 0.05 kg ($p < 0.05$) in the treatment group (Table 5).

Table 5 shows that the birth weight of single born kids from the treatment goats was significantly heavier (3.0 ± 0.05 vs 3.5 ± 0.05 kg, $p < 0.05$) than those of the control goats. This was the same for twins ($p < 0.05$). The current results regarding kid growth emphasised the importance of additional feeding before mating and during lactation in extensive goat farming (Martin et al. 2004; Scaramuzzi et al. 2006; Sultana et al. 2012). It has been reported that the nutritional level in maternal feeding during pregnancy affected the number of secondary muscle fibres in striated muscle tissue in foetus which had an effect on birth weight (Dwyer et al. 1994; Tygesen & Harrison 2005; Tygesen et al. 2007). Also, as given in Table 6, weaning kids from treatment goats were heavier than those of control goats ($p < 0.05$).

As usual, the effect of feeding on weaning weight is shown on the 60th day. The mean weaned birth weight in single born kids was found as 16.0 ± 0.14 kg in the control group, and 17.7 ± 0.29 kg in the treatment group ($p < 0.05$). Additional or supplemental feeding before mating and during lactation affected birth and weaning weights of Kilis goat kids irrespective of their birth type- single or twin, due to the increased

Table 3. The birth weights (kg) for 2012 and 2013 years.

Gender	<i>n</i>	Birth weight in 2012	<i>n</i>	Birth weight in 2013	<i>p</i> values
		<i>X</i> ±SE		<i>X</i> ±SE	
Single					
Male	97	3.1 ± 0.07	91	3.2 ± 0.05	0.664
Female	64	2.8 ± 0.09	74	2.8 ± 0.04	0.308
General	161	3.0 ± 0.06	165	3.0 ± 0.04	0.844
Twin					
Male	21	2.4 ± 0.10	15	2.5 ± 0.09	0.781
Female	29	2.2 ± 0.12	25	2.3 ± 0.07	0.520
General	50	2.3 ± 0.08	40	2.4 ± 0.06	0.376

Table 2. Reproductive traits in Kilis goats.

Characteristics	2012	2013	2014	
			Control	Treatment
Number of goat for mating (head)	180	180	90	90
Number of mated goat (head)	180	180	90	90
Number of goat having birth (head)	180	180	90	90
Birth rate (%)	100	100	100	100
Infertility rate (%)	0.00	0.00	0.00	0.00
Kid number (head)	211	205	104	118
Kidding rate (%)	117.22	113.89	115.56	131.10
Single kidding rate (%)	89.44	88.89	90.00	66.10
Twinning kidding rate (%)	10.56	11.11	10.00	33.90
Survival rate (%)	97.63	97.07	97.12	98.30

Table 4. The weaning (60.day) weights for 2012 and 2013 years.

Gender	<i>n</i>	Weaned weight in 2012 (kg)	<i>n</i>	Weaned weight in 2013 (kg)	<i>p</i> values
		<i>X</i> ±SE		<i>X</i> ±SE	
Single					
Male	96	16.8 ± 0.22	90	16.5 ± 0.21	0.719
Female	64	15.7 ± 0.16	72	15.4 ± 0.17	0.198
General	160	16.3 ± 0.15	162	16.0 ± 0.15	0.647
Twin					
Male	20	15.0 ± 0.19	15	14.9 ± 0.28	0.282
Female	26	14.4 ± 0.21	22	14.5 ± 0.35	0.576
General	46	14.7 ± 0.15	37	14.7 ± 0.24	0.217

Table 5. The birth weights (kg) in 2014 year.

	Groups				<i>p</i> values
	Control		Treatment		
	<i>N</i>	<i>X</i> ± <i>SE</i>	<i>n</i>	<i>X</i> ± <i>SE</i>	
Gender					
Single					
Male	48	3.0 ± 0.06	48	3.6 ± 0.07	0.000
Female	33	2.9 ± 0.08	30	3.4 ± 0.06	0.000
General	81	3.0 ± 0.05	78	3.5 ± 0.05	0.000
Twin					
Male	11	2.6 ± 0.06	16	3.1 ± 0.11	0.000
Female	12	2.4 ± 0.12	24	2.7 ± 0.09	0.002
General	23	2.5 ± 0.06	40	2.9 ± 0.08	0.001

Table 6. The weaning weights (kg) (60. day) in 2014 year.

	Groups				<i>p</i> values
	Control		Treatment		
	<i>N</i>	<i>X</i> ± <i>SE</i>	<i>n</i>	<i>X</i> ± <i>SE</i>	
Gender					
Single					
Male	47	16.1 ± 0.18	45	18.4 ± 0.33	0.000
Female	35	15.8 ± 0.23	28	17.0 ± 0.39	0.000
General	82	16.0 ± 0.14	73	17.7 ± 0.29	0.000
Twin					
Male	9	14.4 ± 0.29	17	16.6 ± 0.49	0.000
Female	10	13.9 ± 0.36	26	15.6 ± 0.33	0.000
General	19	14.1 ± 0.23	43	16.1 ± 0.22	0.000

Table 7. Lactation lengths and milk yield traits according to years.

Years	Marketable milk yield (l)	Lactation length (day)
	$\bar{X} \pm \text{SE}$	$\bar{X} \pm \text{SE}$
2012	214.1 ± 4.93	217.1 ± 1.54
2013	225.2 ± 3.81	221.3 ± 2.17
<i>p</i> values	0.357	0.348
Groups	2014 year	
	Marketable milk yield (l)	Lactation length (day)
	$\bar{X} \pm \text{SE}$	$\bar{X} \pm \text{SE}$
Control	215.5 ± 5.28	293.7 ± 5.76
Treatment	304.1 ± 6.48	408.3 ± 7.21
<i>p</i> values	0.000	0.000

milk yield of mothers. Zhang et al. (2008) reported that weaned weight was effected by birth weight. The current results are in line with those of Kaya (1999) and Aktepe (2009).

Lactation lengths, marketable and lactation milk yields of Kilis goats determined in this study are given in Table 7. As seen in Table 7, only marketable milk yield was calculated in the first two years of study because farmers were not milking in the period of suckling. Marketable milk yield was calculated as 214.1 ± 4.93 l in 2012 and 225.2 ± 3.81 l ($p > 0.05$), and the lactation length in the same year, ranking was found as 217.1 ± 1.54 day, 221.3 ± 2.17 day, respectively ($p > 0.05$). Lactation milk yield in 2014 and the previous year was calculated differently.

Marketable milk yield was calculated in the last year of the study by matching the starting date of the previous years' milk control date. These traits were established as 215.5 ± 5.28 l in the control group and 304.1 ± 6.48 l in the treatment group ($p < 0.05$). Also lactation lengths were found as 212.5 ± 1.09 day and 256.5 ± 1.79 day with the same group ranking. Lactation milk yield was obtained as 293.7 ± 5.76 l in the control group ($p < 0.05$). This value was calculated higher (408.3 ± 7.21 l) in the treatment group than the control group ($p < 0.05$). Additional feeding increased milk yield and lactation length treatment goats. Özcan (1989) emphasized that, lactation milk yield and length were 205–248 l, 260–300 day, respectively in Kilis goats. Kutlu (1990) recorded that the lactation length was 214.7 ± 1.64 days in Kilis goats. Kaymakçı (2010) pointed out the lactation milk yield between 300 and 500 l. Aktepe (2009) determined the lactation length as 178.6 ± 9.8 days and marketable milk yield as 212.9 ± 25.6 l in Kilis goats. Our findings are in accordance with other researchers' who have done studies in terms of milk yield and lactation length.

Conclusions

Sustainable and profitable goat breeding is depending on quality and quantity of products obtained from goats. The most important criterion of increasing the production is level of economic yield. As stated by Düzgüneş et al. (1987), the cost of improving the environmental conditions should be compensated by the increases in economical yields of animals. Despite lower milk yield and reproductive performance, additional feeding may be recommended in native Hair goats consisting of 97% of Turkey's total goat population. For example, the notable increases were obtained in both reproductive and milk yield traits with 750 g/day concentrated feed addition per Kilis goat in extensive farming condition. To conclude, the supplemental feeding in Kilis goats in extensive farming condition should be recommended for higher reproductive performance, heavier kids and higher milk yield performance.

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