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# Effect of Hair Color Variation on Milk Production and Kid Growth in Turkish Hair Goat

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**Abstract:** This study was conducted to investigate the effects of hair color variations in Turkish hair goat on doe milk production and growth performance of kids. A total of 86 kids which were born in the birth season of 2007 and 117 two-five years old goats were grouped as black, white, speckled and grizzly. Live weights at the age of 30 and 75 days were evaluated. The data were analyzed according to factorial experiment on randomized block design. Birth type had an effect on live weight gain at the age of 30 and 75 days ($p<0.01$) while sex had an effect on live weight gain at 75 days ($p<0.01$). There was no significant effect of color factor on lactation milk production and lactation duration and also on daily weight gain of kids at 30 and 75 days ($p>0.05$). These results showed that color variation had no effect on doe milk production and growth performance of kids due to the fact that climatically conditions in experimental region district do not lead to climatic stress. In conclusion, color of hair should not be used as a selection criterion to improve milk yield and growth performance of kids because neither milk production of different colored does nor growth performance of different colored kids were affected by differences in color hair.

**Key words:** Turkish hair goat, selection criteria, hair color, milk production, growth performance

## INTRODUCTION

Nearly every life form is affected in some way by high temperatures and goats are no exception. It is not climatic alone that causes stress to the goat but it is the combination of temperature and humidity when some crucial limit has been reached which shuts down all bodily functions other than those critical for survival. Sheep and goats tend to be less susceptible to climatic stress than swine, cattle, lamas and alpacas. Hair sheep usually tolerate climatic conditions better than woo led sheep. Dark-colored animals are more susceptible to climatic stress while light-colored animals may be prone to sunburn. Females usually handle heat better than males. The climatic is especially hard on fat animals. Horned animals dissipate heat better than polled (or disbudded) animals. There is evidence that hair color influences the susceptibility of the cow to climatic stress because coat color is related to the amount of heat absorbed from solar radiation.

In Bos indicus cattle the inward flow of heat at the skin of black steers was 16% greater than for brown steers and 58% greater than for white steers (Finch, 1986). Bos taurus cattle with dark coats exhibited greater heat transfer to the skin, higher body temperature and sharply reduced weight gains than those with white coats with increasing woolliness of the coat accentuating the effect (Finch, 1986). Furthermore, when dairy cows from an Arizona herd were categorized into white (<40% black), mixed (40-60% black) or >60% black, no production traits were different (perhaps because cows were cooled for the first 130 days of lactation) but white cows calving in February and March required fewer services per conception and had fewer open days than mixed and black cows (King *et al*., 1988).

The most immediate impact of climatic stress can be seen in changes of water and feed consumption. As the temperature rises so, does the animal's need for water. Plenty of water should be provided, free-choice, at all times. However if water becomes scarce, goats hold an advantage over other domestic non-desert species in that they are better adapted to utilize the water content of feeds. However, rising temperatures also tend to reduce voluntary feed intake. This is the result of an attempt by the animal to reduce the production of body heat especially from fibrous feeds, lower physical activity, seek shade and change grazing to night hours. Indeed, it has been reported that unpigmented goats are more adversely affected by climatic stress likely due to their decreased activity and increased water consumption (Darcan *et al*.,

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2009). The goat has its own line of defense when environmental temperatures exceed body temperature. The first means of protection is provided by the coat both from its color and physical characteristics. The principle behind coat color involves the reflection of sun rays. It has been documented that white coats provide maximum protection against radiant heat and black coats give minimum protection with variations falling in between. Reflective protection can be provided through physical characteristics of the coat as well. Contrary to popular opinion, long hair which lies close to the body is desirable.

In this way, the coat acts as a mat to physically prevent the sun rays from reaching the animal's body. In addition, long hair serves as an insulator from the heat, providing an air buffer zone between the outer environment and the animal's body.

Studies with regard to management practices have been made to decrease heat stress in goats (Darcan and Guney, 2008; Ocak *et al*., 2009). In the study of Darcan and Guney (2008), sprayed and ventilated does had a higher milk yield than those of control goats. Also Ocak *et al*. (2009) stated that fan treatment was more effective than sprinkler based on blood chemistry and physiological responses and may also be recommended as a means to alleviate heat stress in goats under Mediterranean climate conditions. However, the suitability of the colored goats for milk production or fattening material requires further study because there is no evidence about whether hair color would have effects on the on the daily weight gain of kids and milk yield and lactation duration of does.

It seemed worthwhile to investigate the suitability of the use of hair color variation as selection criteria in goats with regard to performance and farmer acceptability. Therefore, the objective of this experiment were to determine the affects of hair color variation on the daily weight gain of kids and milk yield and lactation duration of Turkish hair goat and also to determine whether hair color can be used as selection criteria or not.

## MATERIALS AND METHODS

Animal material was constituted with Turkish hair goat kids raised on a farm in Sarilar village in Amasya province (40°39' 35.01" N 35°52' 37.22" E. This study was continuation of a goat improvement project supported by Amasya governorship. To determine whether variation in hair color affects the weight gain of kids, 86 Turkish hair goat kids born in 2007 were classified as white, speckled and grizzly. Birth weight 30 and 75 days weights were measured for evaluation. Also to determine their lactation yields and lactation duration, data of 117 Turkish hair goat which was different from kids in same flock and aged between 2-5 was used. Weight of new born kids was measured within 24 h they were numbered and birth dates, birth types and sexes were recorded. For the goats in lactation, milk was sampled monthly by hand milking. Lactation yield was calculated by formula given below (Onder *et al*., 2009a):

$$LMY = aX_i + \sum_{i=2}^{n} \frac{(X_i + X_{i-1})}{2} \Delta t + 7X_n$$

Where:

$a$ = Time between give birth and first control date
$X_1$ = Value of the first control milk yield
$X_i$ = ith milk yield value
$\Delta t$ = Number of the days between two control dates
$X_n$ = Milk yield obtained from the last control

Feeding was depended only pasture in a rural fact, additional milk food was not given. Kids were weaned at the age of 75 days. Obtained data were evaluated by a completely randomized design. The mathematical model of the experiment was:

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

Where:

$Y_{ij}$ = Observed value of jth repetition of ith color
$\mu$ = Population mean
$\alpha_i$ = Effect of ith color
$e_{ij}$ = Error term

## RESULTS AND DISCUSSION

Results of the study showed that only birth type had a significant effect ($p<0.01$) on Daily Weight Gain (DWG) for 30 and 75 days but sex and color had no significant effects ($p>0.05$) on the parameters (Table 1). Table 1 shows that only birth type had a significant effect on daily weight gain for 30 and 75 days ($p<0.01$) but color factor had no significant effect ($p>0.05$). Daily weight gain

Table 1: Daily weight gains of different colored Turkish hair kids

| | | Daily weight gains (g) | | |
|---|---|---|---|---|
| Factors | n | 0-30 days | 30-75 days | 0-75 days |
| **Birth type** | | | | |
| Single | 64 | 157.6±5.610[a] | 55.2±4.050[a] | 97.2±4.23[a] |
| Twin | 22 | 99.9±10.25[b] | 37.5±7.410[b] | 73.5±6.08[b] |
| **Sex** | | | | |
| Male | 44 | 148.3±7.090 | 46.9±4.530 | 101.3±5.22[a] |
| Female | 42 | 137.1±8.770 | 54.4±5.390 | 80.6±4.68[b] |
| **Hair color** | | | | |
| Black | 25 | 140.5±8.880 | 54.0±5.790 | 90.5±5.88 |
| Speckled | 16 | 128.9±12.28 | 46.3±10.08 | 82.7±7.96 |
| White | 30 | 141.6±7.620 | 48.3±4.530 | 90.6±4.83 |
| Grizzly | 15 | 151.3±8.730 | 50.0±7.670 | 103.0±8.71 |

[a, b]Means ($\overline{X} \pm SE$) in the same row not sharing a common letter are significantly different ($p<0.01$)

Table 2: Differences on lactation duration (day) of different colored Turkish hair goats ( $\overline{X} + SE$ )

| | Hair color | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Traits | n | Black | n | White | n | Speckled | n | Grizzly |
| Lactation duration | 65 | 152.27±2.16 | 10 | 162.58±3.05 | 14 | 151.51±5.17 | 28 | 154.31±4.66 |
| Lactation yield | 65 | 75.02±2.71 | 10 | 89.49±4.34 | 14 | 72.01±6.78 | 28 | 73.68±6.59 |

of kids until 75 days of age was significantly affected by sex factor. The daily weight gains of speckled colored kids was lower ($p<0.01$) than those of white, black and grizzly colored kids. Sex and color factors had no effect on differences between daily weight gain from 30-75 days ($p>0.05$) but birth type was found as statistically significant on this parameter.

Growth potential of kids is one of the most important traits in genetic improvement schemes for meat production. A number of non-genetic factors affects these growth traits and directly obscures recognition of genetic potential. Hence, the performance records of an animal should be corrected for classifiable non-genetic sources of variation which is essential for obtaining precise estimates of genetic parameters and breeding values so that breeding animals with the potential genetic merit can be identified and selected for further genetic improvement (Thiruvenkadan *et al*., 2009). The results on the impact of birth type and sex agree with the previous studies (Duman and Demiroren, 2002; Ugur *et al*., 2004; Wenzhong *et al*., 2005; Safari *et al*., 2005; Onder *et al*., 2006, 2009b). Safari *et al*. (2005) found that genotype had significant effect on weight changes of Small East African (SEA) goats and crosses between Norwegian x SEA and sex no influenced.

Duman and Demiroren (2002) and Wenzhong *et al*. (2005) reported that birth type, birth weight and sex had significant effects on total weight of kids. Ugur *et al*. (2004) and Onder *et al*. (2009b) found that sex factor had no significant effect on daily weight gains for 30 and 75 days. Lee *et al*. (1998) notified that birth type had significant effects on 30 days daily weight gain and sex and birth type had significant effects on 30-60 days daily weight gain. As reported in sheep (Yazdi *et al*., 1998), the general trend was the differences between singles and twins decreased as the kids became older. Indeed the kids born and raised as twins had lower birth weight and slower early growth rate but had a higher post-weaning growth rate (Thiruvenkadan *et al*., 2009).

Probably, declining age trend can be attributed to a decreasing maternal effect including nursing and milk feeding of the kids by their mothers, especially after weaning. Further, twin kids were expected to compensate for having been retarded in their growth. The results of the current study confirmed the suggestions of Lee *et al*. (1998), Yazdi *et al*. (1998) and Thiruvenkadan *et al*. (2009). Several factors had been reported in the literature to influence the efficiency of milk production and lactation length (Guney *et al*., 2006; Carnicella *et al*., 2008). The magnitude of each factor on milk yield and lactation length differs among different husbandry and management practices. The study of such factors will help the goat breeder to be more competent in minimizing his losses. Darcan *et al*. (2009) was studied to understand the effects of skin pigmentation on physiological factors of thermoregulation and grazing behavior of dairy goats in a hot and humid climate.

Goats were categorized as predominantly pigmented skin and unpigmented skin. Researchers stated that the activity of pigmented does was higher compared to the unpigmented goats. In this study, unpigmented goats grazed (4.3 vs. 5.6 h), ruminated (2.0 vs. 2.4 h) and stood (0.8 vs. 1.2 h) less but laid down (2.2 vs. 1.8 h) more than pigmented goats. The results in study of Darcan *et al*. (2009) indicated that unpigmented goats are more adversely affected by climatic stress likely due to their decreased activity and increased water consumption. Based on the studies of Finch (1986) and King *et al*. (1988) on dairy cows and the study of Darcan *et al*. (2009) on goats, the responsiveness of hair color variation on the studied parameters was to be expected. In the study, there is no significant effect of color factor on lactation duration on lactation milk yields (Table 2). Therefore, the results indicate that the hair color is not necessary when a goat is used as a breeding. The results with respect to milk yield and growth performance show that either the level of the climatic stress caused by colored hair in the present study has no an effect on these parameters or it was not such a color classification that would cause a change in water and feed consumption of colored goats.

## CONCLUSION

The results of this study showed that the effect of birth type was found significant on daily weight gain for 30 and 75 days of kids. Sex factor was significant only for DWG of 75 days. Hair color factor had no significant effects daily weight gain of kids and on lactation duration and milk production. This might be attributed to the fact that temperature and relative humidity values are not high enough to lead to climatic stress.

## RECOMMENDATIONS

Based on the results, it is recommended that the hair color factor should not be used as a selection criterion.

Except for white colored kids should not be sold to slaughter house and they could be recommended to be held in flock. This study should be repeated under climate conditions which can lead to climatic stress.

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