Some production traits of indigenous Hair goats bred under extensive conditions in Turkey. 2nd communication: viability and growth performances of kids

Abstract
In this study, it was studied that viability in preweaning period and growth performance in the period from birth to 8 months of age of Hair kids (Anatolian Black Goat). A total data of 439 kids in 2003 and 2004 years were used in the study. Survival rates of kids at 1st, 2nd and 3rd months were 98.86%, 96.81% and 95.44%, respectively. The effects of year, farm and age of dam on this trait were statistically insignificant, although the effect of birth type on only the survival rate at 3rd month was significant (p<0.05). The body weights of kids at birth, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th months were 2.19 kg, 6.19 kg, 9.70 kg, 13.08 kg, 16.31 kg, 18.77 kg, 20.25 kg, 25.38 kg and 23.32 kg, respectively. The effects of sex and age of dam on body weights in all growth periods, the effect of year on weights in growth periods except for 7th and 8th months, the effect of farm on weights in growth periods except for 6th and 8th months and the effect of birth type on birth weight and weights at 4th and 5th months were statistically significant (p<0.05). In the result of this study, it was determined that Hair kids reared under extensive conditions had high performance especially in terms of viability.

Keywords: Hair goat, kid, viability, growth

Zusammenfassung

Schlüsselwörter: Haarziege, Anatolische Schwarze Ziege, Kitze, Überlebensrate, Wachstum

Introduction
The Hair goat is an indigenous breed generally reared in mountainous and forestry regions of Turkey, constituting approximately 96% of total goat population of 6.5 million in Turkey (ANONYMOUS, 2005). They provide a major source of animal protein and household cash income for smallholder farmers in this regions. The economic importance of these goats depends largely on viability and growth performance of kids.
Viability and growth of kids are important determinants of productivity in goat breeding (LAES-FETTBACK and PETERS, 1995; LANARI et al., 2003). In tropical and subtropical regions, kid mortality rate is considered one of the major contributory factors adversely affecting goat production enterprises. Fertility and a high level of kid mortality represents a significant barrier to increased productivity (HUSAIN et al., 1995; NIZNIKOWSKI et al., 2006). The growth determines the meat producing ability of kids up marketable age (RINGDORFER, 2001). Rapid growth during the preweaning period minimizes the cost of rearing and thus provides more profit to the farmer (AL-SHOREPY et al., 2002).

Information on growth and viability of the Hair goats is very limited, although this goat is the most common goat breed in Turkey. The aim of this study is to determine viability and growth performances of kids of Hair goat under extensive conditions.

Materials and methods
This study was carried out at two private farms in Aydın province of Aegean region in Turkey. The material of the study was formed the data of 439 kids born from Hair goats (Anatolian Black Goat) of which the ages are between two and seven in breeding periods of two years. The goats were fed by depending on completely pasture conditions in the period of the study and any extra feed wasn’t given to its. The births occurred between January and April months. All the kids were identified with ear tags applied at birth. The kids were weaned approximately at 3 months of age. Before weaning, kids were fed by suckling their mother twice a day and they were kept in the pen in all days. After weaning, kids were taken to pasture separately from their mothers and they were completely fed depending on pasture conditions.

In order to determine viability of kids, dead kids were recorded every day and the number of kids, the number of mother and death date were recorded. Data were analysed and presented as percentages survival. Survival rates of kids at 1st, 2nd, 3rd months were calculated as total number of alive kids at these months per total number of born kids.

The kids were weighed at birth and afterwards once every months up to 8 months of age to be determined their growth performances. The body weights of kids at 1st, 2nd, 3rd, 4th, 5th, 6th, 7th and 8th months were calculated by interpolation.

The effects of birth year, farm, age of dam, type of birth and sex on the growth and viability were investigated in this study.

Growth performance of kids was analysed by linear models of statistical analysis as shown below:

\[ Y_{ijklm} = \mu + a_i + b_j + c_k + d_l + s_m + e_{ijklmn} \]

where: \( Y_{ijklm} \) = the body weight of any individual in studied period, \( \mu \) = the expected mean, \( a_i \) = the effect of birth year (\( i: 2003 \) and 2004), \( b_j \) = the effect of farm (\( j: 1 \) and 2), \( c_k \) = the effect of dam’s age (\( k: 2, 3, 4, 5, 6 \) and 7 years), \( d_l \) = the effect of type of birth (\( l: \) single and twin), \( s_m \) = the effect of sex (\( m: \) male and female) and \( e_{ijklmn} \) = the random error.

In this study, chi square test was performed for the statistical analysis of survival rates (STEEL and TORRIE, 1980). The effects of year, farm, age of dam, type of birth and sex on growth were analysed by using least squares method (HARVEY, 1975). Significant differences between least square means were assessed using the contrast-
test (SEARLE, 1971). It was assumed that there was no significant interaction between factors under investigation. The data were analysed with general linear models (GLM) procedure of the SPSS programme package (OZDAMAR, 1999).

**Results**

Table 1 shows the survival rates of kids in the periods from birth to 1, 2 and 3 months of age. The overall survival rates for the above mentioned periods were 98.86%, 96.81% and 95.44%, respectively. For whole periods, it was found that the effects of year, farm, age of dam and sex were statistically insignificant, although the effect of birth type was significant only for survival rate in the period from birth to 3 months of age (p<0.05).

**Table 1**
The survival rates of kids at different growth periods (%) (Überlebensrate der Kitzen bis zum 3. Lebensmonat [%])

<table>
<thead>
<tr>
<th>Studied factors</th>
<th>Number of born kids</th>
<th>Birth-1 month</th>
<th>Birth-2 months</th>
<th>Birth-3 months</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overall</strong></td>
<td>439</td>
<td>434 98.86</td>
<td>425 96.81</td>
<td>419 95.44</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>226</td>
<td>225 99.56</td>
<td>218 96.46</td>
<td>213 94.25</td>
</tr>
<tr>
<td>2004</td>
<td>213</td>
<td>209 98.12</td>
<td>207 97.18</td>
<td>206 96.71</td>
</tr>
<tr>
<td><strong>Farm</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>225</td>
<td>222 98.67</td>
<td>220 97.78</td>
<td>219 97.33</td>
</tr>
<tr>
<td>2</td>
<td>214</td>
<td>212 99.90</td>
<td>205 95.79</td>
<td>200 93.46</td>
</tr>
<tr>
<td><strong>Type of birth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>421</td>
<td>416 98.81</td>
<td>409 97.15</td>
<td>405 96.20a</td>
</tr>
<tr>
<td>Twin</td>
<td>18</td>
<td>18 100.00</td>
<td>16 88.89</td>
<td>14 77.78b</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>218</td>
<td>217 99.54</td>
<td>211 96.79</td>
<td>207 94.95</td>
</tr>
<tr>
<td>Female</td>
<td>221</td>
<td>217 98.19</td>
<td>214 96.83</td>
<td>212 95.93</td>
</tr>
<tr>
<td><strong>Age of dam</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>65 97.01</td>
<td>65 97.01</td>
<td>65 97.01</td>
</tr>
<tr>
<td>3</td>
<td>66</td>
<td>65 98.48</td>
<td>63 95.45</td>
<td>62 93.94</td>
</tr>
<tr>
<td>4</td>
<td>97</td>
<td>96 98.97</td>
<td>93 95.88</td>
<td>91 93.81</td>
</tr>
<tr>
<td>5</td>
<td>106</td>
<td>106 100.00</td>
<td>104 98.11</td>
<td>103 97.17</td>
</tr>
<tr>
<td>6</td>
<td>59</td>
<td>58 98.31</td>
<td>58 98.31</td>
<td>56 94.92</td>
</tr>
<tr>
<td>7</td>
<td>44</td>
<td>44 100.00</td>
<td>42 95.45</td>
<td>42 95.45</td>
</tr>
</tbody>
</table>

a, b = type of birth is statically significant on viability at 3rd month (p<0.05)

The body weights of kids at birth, 3rd and 6th months are presented on Table 2, although the body weights of kids between birth and 8th month are presented on Figure 1.

![](image.png)

Fig. 1: Body weight of kids on different growth periods (kg) (Körpergewicht der Kitzen in den einzelnen Lebensmonaten bis zum Monat [kg])
As shown on Graphic, body weight of kids increased gradually between birth and 5\textsuperscript{th} month and increasing of body weight between 6\textsuperscript{th} and 7\textsuperscript{th} months was more than that between 5\textsuperscript{th} and 6\textsuperscript{th} months. Although the body weight of kids decreased at 8\textsuperscript{th} month. The body weights of kids at 1\textsuperscript{st}, 2\textsuperscript{nd}, 3\textsuperscript{rd}, 4\textsuperscript{th}, 5\textsuperscript{th}, 6\textsuperscript{th}, 7\textsuperscript{th} and 8\textsuperscript{th} months were 2.19 kg, 6.19 kg, 9.70 kg, 13.08 kg, 18.77 kg, 20.25 kg, 25.38 kg and 23.32 kg, respectively.

Table 2

Least squares means and standard errors of body weight of kids on different growth periods (kg).

<table>
<thead>
<tr>
<th>Factors</th>
<th>Birth weight</th>
<th>3\textsuperscript{rd} Month</th>
<th>6\textsuperscript{th} Month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>(\bar{x})</td>
<td>(s_\tau)</td>
</tr>
<tr>
<td><strong>Expected mean</strong></td>
<td>439</td>
<td>2.19</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>226</td>
<td>2.05\textsuperscript{b}</td>
<td>0.05</td>
</tr>
<tr>
<td>2004</td>
<td>213</td>
<td>2.33\textsuperscript{a}</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Farm</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>225</td>
<td>2.36\textsuperscript{a}</td>
<td>0.05</td>
</tr>
<tr>
<td>2</td>
<td>214</td>
<td>2.02\textsuperscript{b}</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>218</td>
<td>2.46\textsuperscript{a}</td>
<td>0.05</td>
</tr>
<tr>
<td>Female</td>
<td>221</td>
<td>1.92\textsuperscript{b}</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Type of birth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>421</td>
<td>2.60\textsuperscript{a}</td>
<td>0.02</td>
</tr>
<tr>
<td>Twin</td>
<td>18</td>
<td>1.78\textsuperscript{b}</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Age of dam</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>2.05\textsuperscript{c}</td>
<td>0.06</td>
</tr>
<tr>
<td>3</td>
<td>66</td>
<td>2.11\textsuperscript{bc}</td>
<td>0.06</td>
</tr>
<tr>
<td>4</td>
<td>97</td>
<td>2.30\textsuperscript{a}</td>
<td>0.06</td>
</tr>
<tr>
<td>5</td>
<td>106</td>
<td>2.28\textsuperscript{a}</td>
<td>0.05</td>
</tr>
<tr>
<td>6</td>
<td>59</td>
<td>2.20\textsuperscript{ab}</td>
<td>0.06</td>
</tr>
<tr>
<td>7</td>
<td>44</td>
<td>2.19\textsuperscript{ab}</td>
<td>0.07</td>
</tr>
</tbody>
</table>

\(a, b, c, d\) = differences between values with different letter in subgroups in every column are statically significant (\(P<0.05\)); \(n.s.\) = \(P>0.05\); ***\(P<0.001\); *\(P<0.05\).

Birth weight of male kids was higher than that female kids and also birth weight of single kids was higher than that twin kids. Birth weights of male, female, single and twin kids were 2.46 kg, 1.92 kg, 2.60 kg and 1.78 kg, respectively. The kids, age of dam was 4 years, had the highest birth weight, with a trend towards increased birth weight from 2 to 4 years old.

The effect of sex on the body weights in all growth periods was statistically significant and the body weight of male kids was higher than that female kids. Significant levels were \(P<0.001\) for all growth periods except for 2\textsuperscript{nd} and 8\textsuperscript{th} months, it was \(P<0.01\) for 2\textsuperscript{nd} and 8\textsuperscript{th} months.

The effect of age of dam on body weights in all growth periods, the effect of type of birth on body weights at birth, 4\textsuperscript{th} and 5\textsuperscript{th} months, the effect of birth year on body weights in the periods except for 7\textsuperscript{th} and 8\textsuperscript{th} months and the effect of farm on body weights in the periods except for 6\textsuperscript{th} and 8\textsuperscript{th} were statistically significant (\(P<0.05\)).
Discussion

The survival rate of kids in preweaning period was rather high in this study. It is contrary to the results of SONMEZ et al. (1971) who reported that the mortality rate of Hair goat kids were very high in the period of first 12 week after birth and this quantity increase more in years when the winter season was hard. The survival rate in the period from birth to 3 months of age determined in this study (95.44%) is higher than the result of ESER (1998), although it is similar to the result of FERIK (1995) for the survival rate of Hair goat kids in same period.

The effect of birth type on survival rate was statistically insignificant (p>0.05) for birth-1 and birth-2 months of age, whereas it was significant for the period from birth to 3 months of age (p<0.05) and in this period, the survival rate of single kids was higher than that twin kids, as expected and described by PETERS and LAES-FETTBACK, (1995). The significant effect of birth type on survival rate in the period from birth to 3 months of age is similar to the results of ALEXANDRE et al. (1999) and AWEMU et al. (1999). It is also differ from the results of HUSAIN et al. (1995), IKWUEGBU et al. (1995), MARZOUK et al. (2000) and TURKSON (2003).

The effect of sex on survival rate was statistically insignificant for all stages (p>0.05). This result is similar with the results of MARZOUK et al. (2000), SENGONCA et al. (2003), TURKSON (2003) who have studied this trait on different goat breeds, although this result is differ from the results of LAES-FETTBACK and PETERS (1995), ALEXANDRE et al. (1999), TURKSON et al. (2004) and NIZNIKOWSKI et al. (2006) who have determined that the mortality rate of male kids is higher than that female kids.

The effect of dam age on survival rate of kids was insignificant for all the studied periods. It is contrast to general inform which the survival rates of the kids of young does is the lower than that older goats because of the low birth weight of the kids of young does and low milk yield of young does. This result could be related to be provided the good management conditions to the kids of which the body weight is low and the mother’s milk is inadequate for its feeding. In this study, the insignificant effect of dam age on survival rate of kids is similar to the results of HUSAIN et al. (1995), IKWUEGBU et al. (1995) and MARZOUK et al. (2000), although it is differ from the results of ALEXANDRE et al. (1999) and AWEMU et al. (1999) who studied this trait on different goat breeds.

Body weight of kids in goat rearing is very important because it has positive bearings on their survival rate, adult body weight and later productivity. The mean values of birth weight of kids in this study (2.19 kg) is lower than the values reported in other studies of Hair goats (FERIK, 1995; ESER, 1998; SENGONCA et al., 2003). The presumptive reason for the low birth weight in this study could be feeding of the goats depending on completely pasture conditions and also the pregnancy period of goats meeting the winter season when the pasture conditions were inadequate for feeding of goats.

It was determined that the effects of all the environmental factors on the birth weight were statistically significant (p<0.001). The significant effects of sex and dam age on the birth weight lasted up 8th months. The body weight of male kids was more high than that female kids and the body weight of single kids was more high than that twin kids in all growth periods. This results are in accordance with the other reports (ODABASIOGLU and ALTIN, 1992; IKWUEGBU et al., 1995; LAES-FETTBACK
and Peters, 1995; Mourad and Anous, 1998; Alexandre et al., 1999; Toukourou and Peters 1999; Marzouk et al., 2000; Mourad et al., 2000; Unalan and Cebeci, 2001; Al-Shorepy et al., 2002; Sengonca et al., 2003; Todaro et al., 2004; Turkson et al., 2004; and Niznikowski et al., 2006). The increasing of the birth weight with increasing of dam age and having the lower body weight of kids of young goats could be explained with high reproductive performance of goats in mature age. This result is in accordance with the results of Verma et al. (1991), Ferik (1995), Eser (1998), Alexandre et al. (1999), Marzouk et al. (2000) and Mourad et al. (2000) who studied this issue on different goat breeds.

The body weights of kids at 3rd and 6th months were 13.08 kg and 20.25 kg, respectively. This results obtained are differ from the other results on Hair goats. Ferik (1995) reported the body weights of Hair kids at 3rd and 6th months as 16.17 kg and 22.96 kg, respectively. Although Eser (1998) reported this values as 13.75 kg and 19.33 kg, respectively. This differences among values could be related to management conditions.

It was thought that while the body weights of kids increased gradually up to 6th month, increasing of the body weight between 6th and 7th months was more than the other growth periods and the mean of body weight at 8th month was lower than that 7th month depended on decreasing the numbers of kids in this periods in result of selling of kids.

In this study, the significant effect of sex on the body weights in the periods between 1st and 8th months is similar to the results of Mourad and Anous (1998), Al-Shorepy et al. (2002), Sengonca et al. (2003) and Mahgoup et al. (2005). Although this result is differ from the results of Ndlovu and Simela (1996) and Mourad et al. (2000) who reported that the effect of sex was insignificant on the body weights in different growth periods for different goat breeds.

The insignificant effect of birth type on the body weights in growth periods after birth can be explanied with good management and feeding conditions provided to twin kids. In the study, it was determined that the effect of birth type was significant on the body weights at only 4th and 5th months. It was most possible that the number of twin kids is few and the herd composition is different in result of selling the kids. The differences among the production years in terms of the body weights of kids in different growth periods could be explained with the climate and pasture conditions, and also the difference among farms is explained with the differences on the management conditions.

In the result of this study which was studied the viability and growth performances of Hair kids bred on private farm conditions, although the feeding of kids depended on the completely pasture conditions on postweaning period and any breeding technique wasn’t applied in the farms, it was determined that the kids had high performance especially in terms of viability. The birth weights of kids in this study were lower than traditional birth weight of Hair goats. It was possible that the feeding of does depended on completely pasture conditions and the pregnancy period of does met to winter season when the pasture conditions were inadequate for the feeding of does. It concluded that if appropriate breeding techniques are used and the management conditions are improved the production levels of the kids can increase.
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