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Non-genetic factors effect on the early body weights of local goats population in Tunisia

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Abstract

In this study it was evaluated the environmental effects on body weights of goat kids from birth to 5 months of age of local goat population in Tunisia. Except for birth weight, individual records were adjusted for standard ages (1, 2, 3, 4 and 5 months) using either extrapolation or interpolation on field data. Data were analyzed by SNK (α = 0.05) means comparison test and GLM procedure. The kidding five years, kidding month (December, January, February and March), birth type (single and twins), sex (male and female), coat color of kid and age of dam (2-10 years) were defined as non-genetic factors. The coat color had no significant effect on all body weights. Environmental effects estimated in this study are important and need to be taken into account for Tunisian local goat management and breeding improvement under harsh conditions.

Keywords: Goat, Arid land, Birth type, Growth, Kids.

Introduction

The national caprine herd, with about 1 500 000 goats, remains important in the national animal production (Gaddour *et al.,* 2009). In the southern arid zone, characterized by harsh and irregular natural conditions, the ambulant goat herds valorize rangeland resources since centuries in a traditional breeding mode (Najari *et al.,* 2007; Gaddour *et al.*, 2007; 2008).

The growth target is widely related to the final herd economic results especially for breeding systems based on the meat production. So, the assessment of the growth model is of particular importance in animal production, because of its practical implications in improvement plans, genetic characterization and organizing herd management (Najari *et al.,* 2007). Rather than the indigenous goat characterization, handling growth curve can help to optimise the animal production process and to avoid land degradation under arid conditions.

The mains objective of this study was to research the effects of environmental factors upon to early growth of Tunisian local goat under the Maghrebian goat management systems.

Material and Methods

All studied animals belong to the goat experimental herd of arid land institute of Medenine Tunisia. The data were analyzed using the statbox. The direct effects of the non-genetic factors on the body weights at different ages were obtained by an ANOVA analysis using the PROC GLM according to the following model:

$Yijklmno = \mu + Bi + Mj + Ak + Sl + Tm + Pn + \varepsilon ijklmn$

where Yijklmno is a single measurement of body weight of the individual;
μ = overall mean;
Bi = effect of birth year i;
Mj = effect of kidding month j;
Ak=effect of the age of the dam k;
Sl=effect of sex l;
Tm = effect of birth type m;
Pn =effect of the coat color pattern n;
εijklmn = random error assumed to be normally and independently distributed.

The meaning of SNK is that the comparison test (α=0.05) was performed to diagnose the inter-classes homogeneity for each non-genetic factor. In cases where the effect of the factor was significant a pos hoc mean homogeneity Duncan test was implemented to define the concrete responsibilities of the differences in the levels of the factor.

Results and Discussion

The body weights at different ages varied significantly with regarded to birth type, and sex. The birth month showed effect (P<0.01) on all the body weights except at 30 days of age. The age of the dam also showed effects (P<0.01) on the body weights from 60 to 150 days of age. However, the

effect of the coat color was not significant for all body weights.

The month of birth has a significant effect on the body weights from birth to 150 days of age, except for 30 days of age, which coincides with the results reported by Wenzhbong *et al.* (2005). Similar seasonal effects have been found by other authors (Nadarajah *et al.,* 1995). This could be explained by the same argument mentioned for the year effect. Al-Shorepy *et al.* (2002) indicated that the season of birth effect was not significant for birth weight. The effect of the month is caused by different feeding conditions generated in each season by irregular climatic conditions, especially in the arid areas (Gaddour *et al.,* 2007). Pastoral resources change very much from one month to another, and for the same month from one year to another, thus directly affecting the intake of the kids and indirectly the milk production by the dams (Najari *et al.,* 2007). Zhang *et al.* (2008) reported that the weight variation for Boer goat in different years and seasons might be partly explained by differences in management and sample size. The age of dam showed no effect (P>0.05) on the weights at birth and at the age of 30 days. Different results were obtained by Wenzhbong *et al.* (2005) and Djemali *et al.* (1994). The age of dam acts primarily by the variation of the mother dairy production according to the number of lactations (Najari, 2005). But this effect is probably more related to the lactation length than to the daily production; it is demonstrated by the no significance found for this effect on the weights at birth and at 30 days of age, just when all does are covering the demands of the kids. Djemali *et al.* (1994) has previously observed that growth traits increased with the age of dam up to 5 years of age, and they decreased in later ages. Another explanation of the mother age effect on the kids weights after 60 days is the high relation between milking ability and body size in this population, especially when lower body size is due to a praecox mating (Nadarajah *et al.,* 1995). Portolano *et al.* (2002) also reported that the age of dam had a significant effect on the pre and post-weaning growth period between 0 to 15 days of age and between 45 to 60 days of age, respectively, whereas it was not significant in the weaning period (between 30 and 45 days old). Kids born from older goats were heavier at birth but not in the case of goats above 8 to 10 years of age. Despite of this Al-Shorepy *et al.* (2002) did not find any significant effects of the age of dams at kidding for all traits. The body weights from birth to the age of 150 days for males are all significantly heavier than those for females, which are in agreement to the results reported by other authors (Gebrelul *et al.,* 1994; Ugur *et al.,* 2004; Najari, 2005). However, Ndlovu and Simela (1996) observed that the sex of kids did not affect body weights and growth rate from 90 to 180 days of age. The superiority of the males on females may be explained by the precocity of the male. The sexual dimorphism in favour of males in body growth found in this paper is a common characteristic expressed in mammals, but in domesticated populations the level of dimorphism is closely related to the degree of selection developed on the population. A high sexual dimorphism as this one found in this study is common in the primitive unselected breeds. This dimorphism is present throughout the life of the animals, but it increases proportionally from birth to adulthood, when the weight is about 35 kg in the female and 55 kg in the male (Chriha and Ghadri, 2001).

The effect of birth type on the body weight of kids at different ages was significant. Single kids are always heavier than twins. They also observed that the discrepancy in body weight of twins initially increased from 7% at birth to 22% at weaning. Portolano *et al.* (2002) showed that much of the variation in birth weight was associated to the type of birth, single birth was heavier than multiple born kids (Gebrelul *et al.,* 1994). Alexandre *et al.* (1997) indicated that the difference between the single and twins could reach up to 15%. This variation can be partially explained by insufficient maternal production of milk to satisfy the requirements of more than one kid under hard conditions and forage scarcity.

Conclusion

Most of the non-genetic effects tested in the present study are very important on body weights of kids during early age under Tunisian arid conditions, such as kidding year and month, sex, birth type and the age of dam. As this is one of the first studies on body weight of commercial kids developed in the North-African region, its findings can be used as a model to design regional policies on breeding, animal production and commercialization in this region.

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