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Conception of new bioeconomic indexes to evaluate caprine genotypes of meat productivity

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Abstract

The comparison of different caprine genotypes' productivity remains limited by the technical and zootechnical parameters used to evaluate the individual animal performances such as kid's growth, goat lactation or herd reproduction. Data issued from 16 years of periodical animal survey of a herd compound from local goats, pure breeds and crosses was used to elaborate new bio-economic indexes allowing an accurate evaluation of the productive potentialities per genotype. The bio-economic indices have been developed to correct dairy performance and growth by the genotype reproductive parameters and kids' mortality rates. These indexes of overall productivity of genetic groups were subsequently adjusted by the metabolic weight of each group to take into account the production charges per animal which vary with the adult body size. The application of bio-economic indexes led to a genotypes classification quite different from this based on the comparison of individual performances. Some breeds, having high lactating performances or heavy kids weights at weaning, seem severely penalized by infertility or kid's mortality rates. Hence, the integration of the components of profitability, such as fertility, mortality and metabolic weight, in the evaluation criteria is essential for the reasonable herd management and genetic improvement. However, the development of bio-economic indexes must take into account all the components and production factors affecting the final animal phenotype and the farmer incomes.

Keywords: Goat, Kids' growth, Bioeconomic Indexes.

Introduction

In the Tunisian arid region, local goats are essentially raised in pastoral mode and ambulant herds valorise the vegetal resources of range lands under harsh conditions (Gaddour, 2005). Local goat populations are often considered genetically adapted to arid climate and is able to reproduce throughout the whole year, as well as for other caprine rustic populations (Najari et *al.,* 2006).

In this study we will conduct an evaluation of the profitability of different genetic groups, applying corrections to the raw performance parameters of reproductive and metabolic adult weight of each group (Akinsoyina et *al.,* 1997). Indeed the profitability of genetic groups can be estimated taking into account the efficiency of reproduction and conduct, and charges the animals infertile, to abortions and the number of kids died before weaning. As for charges of livestock, the main difference between the genetic groups may be represented by the metabolic adult weight (Caja, 1990).

Material and methods

Correction by the performance of reproduction

Index meat production

N1= number of kids produced by female at birth= (fertility rate-mortality rate)/100.

N2= number of female kids produced during the mating period at the age of 30 days= (fertility rate - mortality rate)/100.

N3= number of female kids produced during the mating period at the age of 90 days= (fertility rate - weaning mortality)/100.

Calculation of meat production corrected

V1= meat production per female at birth= N1*average weight of kids at birth.

V2= meat production per female at the age of 30 days= N2*average weight of kids to 30 days.

V3= meat production per female at the age of 90 days= N1*average weight of kids to 90 days produced per goat during the mating period on the age of 90 days= (fertility rate-weaning mortality rate)/100

Correction by weight metabolic

Index meat production

V'1= quantity of meat produced per female at birth= V1/metabolic weight.

V'2= quantity of meat produced per female at the age of 30 days= V2/metabolic weight.

V'3= quantity of meat produced per female at the age of 90 days= V3/metabolic weight.

Results and Discussion

Performances of meat corrected by the parameters of reproduction

The identification numbers of kids by genetic groups was calculated by subtracting the rate of mortality and fertility (Table 1).

For pure breeds, the local goat can be distinguished by the higher number of kids produced. A local goat gives kids at an average of 1.41 per goat worn by the mating period and 1.32 kids per female who have reached the age of 90 days during at the mating period (Table 2).

Table 1. Number of kid's, 1 and 3 months after correction of reproductive and mortality ratios.

Genetic groups	Numbers of kid's at:		
	birth (PN)	30 days (P30)	90 days (P90)
Alpine (A)	1.23	1.23	1.06
Damascus (D)	1.28	1.28	1.12
Murciana (M)	1.18	1.18	1.05
Local (Lo)	1.41	1.41	1.32
F1A	1.22	1.22	1.11
F2A	1.07	1.07	1.03
F1D	1.54	1.54	1.36
F2D	1.39	1.39	1.27
F1M	1.36	1.36	1.22
F2M	1.05	1.05	1.05

F1A, F2A: crossed alpine x local at first and second generation; F1D, F2D: crossed damascus x local at first and second generation; F1M, F2M: crossed murciana x local at first and second generation.

Amongst pure-breeds, the Damascus breed confirms his reputation as a race excelling in the area of meat production. We noticed a change in the classification of the Alpine goat, it presented a lower production of beef than the local population. Only the Crossed Damascus, F1D and F2D present a highter meat production with respect to the local population after the correction process.

Performances corrected by the weight metabolic

The objective of this correction is to include feeds for each genotype, to express their differences through metabolic weights of different genetic groups (Table 3).

Note that the local goat presents the highest return relative to pure breeds imported. While the performance of F1D is the highest of all genetic groups present, kids were heavier than the pure and the crossed alpine.

Table 2. Quantity of meat produced per female.

Genetic groups	Quantity of meat produced per female (kg) at:		
	birth (PrVNai)	30 days (PrVP30)	90 days (PrVP90)
Alpine (A)	4.44	9.99	13.89
Damascus (D)	4.69	10.49	16.21
Murciana (M)	2.80	7.49	11.59
Local (Lo)	4.04	9.44	15.67
F1A	3.73	9.95	14.82
F2A	3.58	9.15	14.57
F1D	5.36	11.99	21.47
F2D	4.71	11.48	18.51
F1M	3.56	8.80	14.36
F2M	2.86	7.57	12.59

F1A, F2A: crossed alpine x local at first and second generation; F1D, F2D: crossed damascus x local at first and second generation; F1M, F2M: crossed murciana x local at first and second generation.

Table 3. Quantity of meat produced in kg metabolic weight 1 kg female.

Genetic groups	Quantity of meat produced in kg metabolic weight 1 kg female at:		
	Birth (PrVPNaiPM)	30 days (PrVPM30)	90 days (PrVPM90)
Alpine (A)	0.23	0.52	0.72
Damascus(D)	0.26	0.58	0.90
Murciana (M)	0.20	0.54	0.84
Local (Lo)	0.30	0.71	1.18
F1A	0.25	0.67	1.00
F2A	0.21	0.54	0.85
F1D	0.34	0.76	1.37
F2D	0.30	0.73	1.18
F1M	0.26	0.65	1.06
F2M	0.21	0.55	0.91

F1A, F2A: crossed alpine x local at first and second generation; F1D, F2D: crossed damascus x local at first and second generation; F1M, F2M: crossed murciana x local at first and second generation.

Conclusion

Following the analysis, one can conclude that the assessment of the productivity of genetic groups pure and crossed led to different results depending on the approach of the comparison. Indeed, the use of bio-economic index led to the classifications of different genetic groups of those from studies of individual performances. Therefore, integration of the components of profitability, such as fertility, mortality and metabolic weight, is essential for the reasonable choice of race improvement. For the production of meat, Damascus race and the local population has allowed the best levels of profitability. However, the development of bio-indicators must take into account all the components and factors of production to achieve assessments with the objectives of economic and livestock crossing absorption of the local goat.

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