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MORE ABOUT ON LOCAL DIFFERENTIATION OF ALBANIAN LOCAL SHEEP POPULATIONS.

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Abstract

The estimation of archaism index was used to study the local differentiation of seven Albanian local sheep populations. The estimation of archaism index was carried out using the morph-metric data of several features: whither height, tail length, ears length, horns and wattles presence, coat color, frontal-nasal profile. The cluster analyses was carried out using the Euclidian's distances between populations in the plan of two first principal components. The cluster analyzes showed the existence of four distinguish sheep groups: first group - Ruda, Bardhoke, Baca, second group – Shkodrane, third group - Lara of Polisi, Syska of Mati, and fourth group - Recka. Based on the geographic distances between the regions where are bred the animals of these local sheep breeds and their geographic isolation can be concluded that the presence of local differentiation of Albanian local sheep populations is caused by the isolation in distance. These results show that in currant sheep population of Albania it is possible to find direct descendants of animals that have populated the Balkan regions in the form of three migratory successive waves. Currant results could be consider as preliminary one because of limited number of features included in the study and the complicity of this topic. They can serve as a bases for in-depth studies on local differentiation hypotheses of Albanian local sheep population.

Key words: *index of archaism, local breed, local differentiation, sheep*

INTRODUCTION

The biodiversity of farm animals constitutes an important resource for food security of human beings. Its sustainable conservation and use are among the main objectives of Global Action Plan for Animal Genetic Resources [3]. In Global Action Plan the identification, characterization, evaluation of risk of extinction trend, the conservation, the farming and sustainable use are determined among the most priority fields.

The sheep species produces about 7 % of total annual milk yield. About 30% of meat production (live weight) is secured by small ruminants in Albania. There is a very old tradition for sheep farming in Albania.

Currant Albanian sheep population is characterized by a high level of genetic variability [4]. About 62.3% of sheep population are imported breeds and their crossbreds with local one [8]. Recka local sheep breed apart and all together other autochthonous breeds like as Ruda, Bardhoke, Shkodrane, Baca, Lara of Polis and Lara of Mati constitute respectively about 21.6 % and 17.2% of hole sheep population [8]. At the beginning of its domestication process the sheep had a small body, with short ears and short tail changing annually its wool covering [1]. The sheep with great body, with long, thin and fat tail, with wool of high variability of type, length and quality are currently frequent. A successful approach to study the domestication process and geographic spread out scenarios of sheep species is based on the variability of these qualities and archaism level of different features. Lauvergne [5] [6], to study the population scenarios of Mediterranean regions was based on the evaluation of the archaism of morph-biometric features of different sheep population or breeds conceiving it as a process developed in the form of concentric waves, sequentially, with the differentiation and distribution centre of Middle East. Under

this hypothesis, the first wave, which was the most eccentric and greater geographic coverage wave, was composed by sheep breeds with small body and short tail. These breeds are considered as most archaic in the region. Populations of the first wave were subject of successive overlapping process from more genetically evolved sheep breeds (breeds with long wool and thin tail), which were spread out in the region in the form of a second wave. With the third wave, sheep breeds with long and fat tails were scattered in Mediterranean regions. The archaism indices could be successfully used to judge about the belonging to the corresponding wave of currant sheep breeds. These indices are used by Lauvergne [1] to judge about the wave to which belonged several autochthonous sheep breeds of Franc. They were also used by Bonacini et al., [2] to explain the genetic effect of improving breeds on local breeds of Arc Alpin in Italy. Pares et al., [7] gives results of a comparative study of 14 European sheep breeds based on the estimation of archaism index.

In this study the archaism indices estimated for seven Albanian local sheep breeds are used to judge about local differentiation level between these breeds. The relation and belonging of autochthonous sheep breeds with ancient sheep populations spread out in these regions during their concentric waves diffusion is also judged.

MATERIAL AND METHOD

Seven Albanian autochthonous sheep breeds are included in the study. Measurements and observations were done in adult animals separately for each breed as follow: 56 animals (50 females and 6 males) of Ruda breed, 98 animals (91 females and 7 males) of Bardhoke breed, 62 animals (54 females and 8 males) of Baca breed, 58 animals (52 females and 6 males) of Shkodrane breed, 91 animals (84 females and 7 males) of Lara Matit breed, 67 animals (60 females and 7 males) Lara Polisit breed and 83 animals (75 females and 8 males) of Rrecka breed. Geografic regions where these breeds are farmed are presented in Fig. 1.

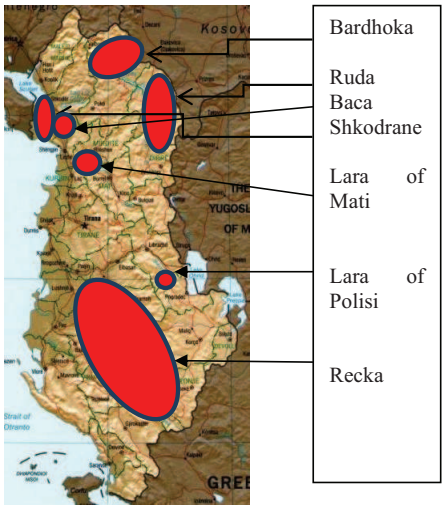

Fig. 1. Geographic distribution of seven local sheep breeds.

The features taken in consideration to estimate the archaism were treated as discrete variables with values (marks) 0-1, 0-1-2 or 0-1-2-3-4. The more archaic was the feature higher would the corresponding variable value be(mark). The marks determination was done based on the data of direct measurements for example: the interval where the average value of feature falls; indirect data for example the interval where average value of index auricular falls (the ratio between ear length and tail length) or from the observation of the presence or not of the feature (for example the horn presence in male and female animals). The features taken into consideration to estimate archaism were: length of ear, horn presence, wattles presence, whither height, tail length, frontal-nasal profile and coat color. Three indices were calculated: (i) index caudal = tail length /whither height, (ii) index auricular =ear length/whither height and (iii) Index of convexity = arc length /length of chord. To determine the archaism point of analyzed features the protocol described by [1] was used. (Table 1).

The archaism index was calculated as the very simplest of values (marks) of found archaism of all traits and indices taken into consideration [1]. The values of archaism index were used to make the first

classification(ranking) of breeds according to archaism level.

The analyses of principal components was used to judge about distances between breeds and their local differentiation

Table 1. The protocol to estimate the archaism marks for each feature.

Character	Mark	Degree
Ear length	0	Index auricular >0.19
	1	Index auricular from 0.16 to 0.19
	2	Index auricular <0.16
Horns	0	Horned males and females
	1	Horned males, polled females
	2	Horned females and polled females,
Wattles	0	Random presence
	1	Absence
Body format	0	Whither height >70 cm
	1	Whither height from 60cm up to 70 cm
	2	Whither height <60 cm
Tail length	0	Index caudal > 0.6
	1	Index caudal from 0.5 to 0.6
	2	Index caudal < 0.5
Frontal - nasal profile	0	Index of convexity <0.95
	1	Index of convexity from 0.95 to 1
	2	Index of convexity = 1
Colour	0	Completely white
	1	White fleece, colored legs.
	2	Colored fleece and colored legs.
	3	Two tones coloration
	4	More than two tones coloration.

RESULTS AND DISCUSSIONS

The evaluations of the averages of three indices calculated for each one of breeds are presented in Table 2. The archaism marks for each one analyzed features and the archaism index calculated as very simplest sum of these marks for each breed are presented in Table 3.The archaism index varies from 2 (Bardhoke breed) up to 12 (Rrecka breed). Shkodrane and Rrecka sheep breeds have higher archaism index. Currant populations of these two breeds are direct descendents of that part of corresponding populations that have been bred as pure for centuries until nowadays. These two breeds could be grouped in short tail breeds referring to the values of Index caudal. Bardhoke, Ruda and Baca breeds have lower values of archaism index.

Table 2. Number of animals and means of indices

Breed	N	Index auricular	Index caudal	Index of convexity
Bardhoke	8	0.21±0.02	0.57±0.27	0.92±0.08
Ruda	8	0.20±0.02	0.61±0.32	0.94±0.12
Baca	2	0.18±0.02	0.65±0.21	0.92±0.07
Lara of Matit	1	0.15±0.02	0.49±0.22	0.95±0.09
Lara of Polisit	7	0.14±0.02	0.49±0.31	0.95±0.11
Shkodrane	8	0.19±0.01	0.46±0.28	0.96±0.13
Rrecka	3	0.13±0.02	0.42±0.12	0.96±0.09

The graphic of the archaism indices frequencies (Fig. 2) gives an approximate vision regarding to groupings of local sheep breeds taken in analyses. There are evidenced three groups: Rude, Rude, Bardhoke and Baca breeds with archaism index of 2-3; Lara of Polisit and Lara of Mati breeds with archaism index of 8, Shkodrane and Rrecka breeds with archaism index 11-12. Starting from these groupings the hypothesis which may be raised is that Shkodrane and Recka sheep breeds belong to the first wave of population. Other sheep breeds could be considered as descendents of animals that have populated Albanian regions during the second waves. Besides that based on archaism marks of coat color and wattles presence features of 0 could be confirmed that these breeds could be grouped in standardized traditional breeds.

The analyzes of principal components (Fig. 2) identifies three groups according to which could be classified seven local sheep breeds taken into consideration.

Table 3. Marks of archaism and indices of archaism for seven Albanian sheep breeds.

Breed	Code	Note of archaism							Index of archaism
		Index auricular	Horns	Wattles	Format	Index caudal	Index of convexity	Colour	
Ruda	1	0	1	0	1	0	0	0	2
Bardhoke	2	0	1	0	0	1	1	0	3
Baca	3	1	1	0	1	0	0	0	3
Lara of Matit	4	2	2	0	1	1	1	1	8
Lara of Polisit	5	2	1	1	1	1	1	1	8
Shkodrane	6	1	2	1	2	2	1	2	11
Rrecka	7	2	2	1	2	2	1	2	12

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The differences between different breeds, their distances in the plan of two first principal components and the formed groups evidence the local differentiation phenomena that characterizes the local sheep population in Albania. Referring to their geographical breeding location (Fig. 1) and given groupings could be confirmed that this differentiation is result of isolation in distance and completeness of the factors that have formed over the centuries farmers behaviours and their preferences for these breeds.

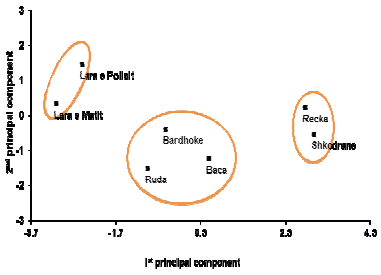

Fig. 2. The presentation of local breeds groupings on the plan of two first principal components.

The populations of Lara of Polisit and Lara of Mati sheep breeds can be considered geographically isolated in distance. Meanwhile these breeds are a group referring to archaism index. The observed differentiation level could be explained or could be result of conservative attitude of farmers towards these breeds. In both cases these breeds are conserved as pure breeds although in small number. Referring to archaism level the differentiation between them is small although they can be considered as isolated population in distance. For Ruda, Bardhoke and Baca sheep breeds the differentiation between their archaism index are similar to those associated with the effects of isolated in distance. Furthermore it should be noted that in the configuration of this group a considerable effect must have brought the genetic closeness of Baca and Bardhoke sheep breeds. Baca breed is relatively new one created by crossbreeding of Shkodrane breed with Bardhoke breed.

The above judges regarding to the archaism level of Albanian local sheep breeds and their local differentiation need to be fulfilled with more detailed studies. The study and evaluation of polymorphism in DNA level and their combination with the visible genetic profile study data and archaism index can results in more complete and accurate characterization of local sheep breeds in Albania.

CONCLUSIONS

Using the mark system of archaism for different features and archaism index for characterisation of local sheep breeds help to judge about the affiliation of currant sheep populations with incomes breeds during the process of sheep population of these regions.

Shkodrane and Rrecka sheep breed are among the most archaic sheep breeds in Albania. They can be considered to have arrived during the first wave of sheep population of Mediterranean region.

The differentiations of archaism indices can serve to judge about the differentiations level of local sheep breeds. The differentiation between sheep breeds could be explained by the action of factors related with isolation in distance and the farmers attitudes and preferences for pure breeds farming.

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