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Identification and Local differentiation of Albanian rabbit populations

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Abstract

Rabbit is a species with restricted spread in Albania. It is a population with morphological and biological variability and with high variation in coat color. Six measures of body conformation of six rabbit subpopulations were analyzed to determine the quantity of local differentiation of Albanian rabbit population. Data analyses showed that: (i) the local rabbits breed is classified in middle breeds group with harmonic body development: adult females and males have a body weight respectively of 3-3.5 kg and 4-5 kg. The female rabbits reach sexual maturity at the age 11-12 months. It is coupled 4-5 times a year. Total number of rabbits born is about 8.5 (5-12). During a year a female rabbit grows on average 30-32 young rabbits. Litter size at weaning is 5.5 (3-8). Litter weight at birth (g) is 344; (294-394). Body weights at weaning (5 weeks) and at 14 weeks is respectively, 780; (510-1050) and 2223.65 (2188.7-2258.6). (ii) the Albanian local rabbit population is distinguished for considerable level of local differentiation (iii) the main factor of this differential is the isolation in distance of rabbit subpopulations (iv) Local differential can contribute in genetic variability conservation of local rabbit population of Albania that is actually in the process of genetic erosion.

Keywords: Local differentiation; discriminate analyses; cluster analyses; local population; rabbit.

1. Introduction

The origin of Albanian local rabbit breed is difficult to be defined [3]. It might be originated from: (i) domestic animals, during the last period of Medievalism, in the region of southeastern Europe, France, Italy, Spain etc., which have been brought, during XIX century and later, in Albania from travelers who have visited these region, (ii) it is a population created as a result of the spontaneous process of the domestication of the wild rabbit that still lives in the different regions of Albania or (iii) actual population originates from a casual mixture of the animals domesticated in Albania those brought from other regions of Europe.[1]. Albanian local rabbit breed might be classified in the group of middle size breeds. [3]; [4]. The local population of rabbit in Albania is characterized from a great diversity of the morph -biologic features. It is distinguished for a great variation of mantel color, quality of coat, body size, head and other external features. Basing to morph-zootechnic variations, within and between local populations that breeding in different regions of Albanian, the level of local differentiation of Albanian local rabbit populations could be evaluated.

2. Material and Methods

The study, carried out in family farms of Poshnje and Kutalli of Berati region, Fier, region, Libonik and Devoll of Korca region and Blinisht of Lezha region, has been focused in the development of two main components:
1. Identification and characterization of the local population of rabbit in Albania; (a) census, (b) morphs-biologic traits, (c) the estimation of production and reproduction performances,
2. Local differentiation of Albanian rabbit population.
In these regions the rabbits are of local breed and are reared in extensive conditions with low inputs. To avoid inbreeding phenomena reproducing males are replaced every year. In general, the farmers do not buy reproducing males in neighboring farms. They, takes care to choose the males with well developed, body without any preference for their coat color. Six different indicators of body conformation of 280 adult rabbits are measured:

body length, chest circumference, width at hocks, thigh circumference, head circumference and live weight, reproduction characteristics and productive performances. The measures results are used to evaluate the mean value of traits in study and Pirson correlation coefficients (r). Discriminates analyses is used to evaluate the level of local differentiation of rabbit breeds. The hypothesis we tried to verify were:

1. the local rabbit breed population is constituted from subpopulations that differs from each other
2. the level of this differentiation is due to geographical distance between regions where is located the subpopulation. Geographic region of local rabbit breeds was use as differentiation criteria. According to the Discriminates Analysis`s procedure 5 linear combinations of the 6 input variables that best discriminate amongst the 6 groups will be constructed. The form of j-th discriminate function is following:

$$Dj = dj1Z1 + dj2Z2 + \ldots + djp\ Zp$$

where the Z's are the standardized input variables X, creating by subtracting the sample means and dividing by the sample standard deviations. The firs information on existence and the level of rabbit subpopulation differentiation is taken from graphical presentation of their distribution on the plan between the first two discriminate functions. Euclidian's distances between corresponding centroides centers of subpopulations in the study were used for cluster analyses. The dendrogramme of cluster analyses is compared with distances between regions to judge on possible links of geographical regions and subpopulations. Statistical data analyses, is done with STATGRAF Centurion XVI soft.

3. Results and Discussion

3.1. Identification and characterization of the local population of rabbit in Albania

3.1.1. Population data in regions surveyed are;

Population size (heads) 1200; Breeding 280 (♀), 90 (♂)

3.1.2. Description

Body conformation

The evaluation of mean values of conformation features (Table 1).

Table 1. The means of conformation characteristics by regions mean values of morph-biometric features

Characteristics	Poshnje	Kutalli	Fier	Korçë	Devoll	Lezhë
Body length	44.2±2.02^{a}	45.0±1.66^{a}	41.8±1.36^{b}	48.9±2.49^{c}	50.5±1.36^{c}	41.6±1.88^{b}
Chest circumference	32.3±1.65^{a}	32.5±1.21^{a}	30.6±0.95^{b}	29.1±3.58^{b}	31.1±1.78$^{a\,b}$	29.5±1.82^{b}
Width at hocks	13.3±1.36^{a}	13.7±1.28^{a}	12.7±1.19^{b}	14.1±0.64^{a}	13.7±1.23^{a}	17.3±2.51^{c}
Thing circumference	19.5±1.31^{a}	20.0±1.10^{a}	19.4±1.71^{a}	20.9±2.46^{ab}	21.5±0.89^{b}	16.8±2.88^{c}
Head circumference	22.1±1.40^{a}	22.5±1.31^{a}	21.5±1.17^{a}	23.8±2.25^{b}	23.2±1.86^{b}	22.3±1.19^{a}
Live weight	4.3±0.23^{a}	4.4±0.18^{a}	3.9±0.12^{b}	4.7±0.55^{c}	4.7±0.30^{c}	3.4±0.24^{d}

a-d means within a column with no common superscript differ significantly, $P<0.05$

Pearson correlation coefficients used to evaluate stochastic relation between the conformation features (Table 2) and comparisons of above data with corresponding values of other different rabbits, breeds of Mediterranean countries [1], [7] showed that the local rabbit breed population of Albania could be classified in the group of middle breeds. Referring mean indexes (I_{mean}-chest circumference/width at hocks = 0.46), Albanian local rabbit has a harmonic body development, approximately of cylindrical form. It is not distinguished for great development of musculature and it has relatively big head in comparison with body length (I_{mean}-head

circumference/body length = 0.51). The chest circumference and body length affect more on live weight than other conformation features. The Pearson correlation are respectively r = 0.71 and r = 0.68. The head with a prolix shape, convex profile. Sharp and erect ears, with a length over 20 cm. Their color fully coincides with the color of coat. Dark big eyes, red or black. Very long back feet, covered with thick and strong leather in the hoof side, where the nails are well distinguished from the pigment. The tail is right. The upper part is dark.

Table 2. Evaluation of phenotypic correlation coefficient

Characteristics	Body length	Chest circumference	Width at hocks	Thing circumference	Head circumference	Live weight
Body length	1.0	0.68	0.59	0.61	0.61	0.68
Chest circumference		1.0	0.45	0.60	0.63	0.71
Width at hocks			1.0	0.45	0.51	0.45
Thing circumference				1.0	0.63	0.61
Head circumference					1.0	0.64
Live weight						1.0

Coat and color

The typical color of the domestic rabbit is dusty to auburn. However, there are encountered dusty, dappled, totally white, or fur rabbits with a predomination of the maroon or mixed maroon with white. The high variability of coat color, which is encountered also in the animals breed in the same farm, might be explained with casual crossing. Figure 1.

Figure 1. Albanian local rabbit breeds

Reproduction characteristics

The female rabbits reach sexual maturity at the age 11-12 months. It is coupled 4-5 times a year. The litter size at birth (total born) is about 5-8 and rarely 12. [6]. During a year a female rabbit grows on average 30-32 young rabbits. Reproduction characteristics are provided in Tab. No.3

Tab. No. 3. Fertility and fecundity traits

Trait		**Mean**	**Range**
Conception rate (%)	%	**65**	**60 - 80**
Kindling interval (days)	day	**55**	**40 - 80**
Mother's weight at birth	kg	**3.2**	**3 - 3.5**
Litter size at birth (total born)	heads	**8.5**	**5 - 12**
Litter weight at weaning (5weeks)	g	**780**	**510 -1050**
Litter weight at birth	g	**344**	**294 - 394**
Litter size at weaning (5 weeks)	heads	**5.5**	**3 - 8**
Prénatal mortality per litter	heads	**3**	**2 - 4**
Number of litters per year	no	**4.5**	**4 -5**
Does longevity (years)	year	**3.5**	**3-6**

Productive performances

In the practice of small family farms, rabbits kept for meat are held up to the age of 12-14 weeks. Average data of the body weight gain from birth to the age of 14 weeks are provided in Tab. No.4

Table 4. Post-weaning grow, the traits of body weights and gains

Trait (g)	Mean	Range
Weight at birth	55	50-60
Weight at 14 days	218	195-241
Weight at 21 days	360	320-400
Weight at 28 days	570.	520-620
Weight at weaning (5 weeks)	780	510-1050
Weight at 8 weeks	1338.2	1303-1373
Weight at 12 weeks	1847.3	1815-1880
Weight at 14 weeks	2223.65	2188.7-2258.6
Daily gain 5-8 weeks	29.35	21.52-37.2
Daily gain 8– 14 weeks	29.75	22-37.5
Meat production from one rabbit/year (live weight)	1307.5	1115-1500

3.2. Local differentiation of Albanian rabbit population.

The differences between local rabbit subpopulations were evident in graphical presentation on the on the plans of first two discriminate functions. Fig.2, Poshnje-Kutalli-Fier, Korce-Devoll and Lezhe. Inside groups the distribution of individuals of rabbits was greater in Lezha region. The differences between rabbits reared in Kutalli and Poshnje farms were not significant. Using Euclidian's distances between corresponding centers of centroides of rabbit subpopulations, clusters analyses gave the dendrogramme presented at Fig 3. In addition, that it is presented the map of Albania with the regions where farms with local rabbit population are located. Comparisons of the distances between the groups evidenced by cluster analyses and respective distances of geographical regions of farms with rabbit subpopulations made possible the below affirmations:

1. Albanian local rabbit population could be divided in subpopulations with discrete groups between them
2. The difference between groups goes up with increasing of geographical distances between farms with local rabbit breeds.

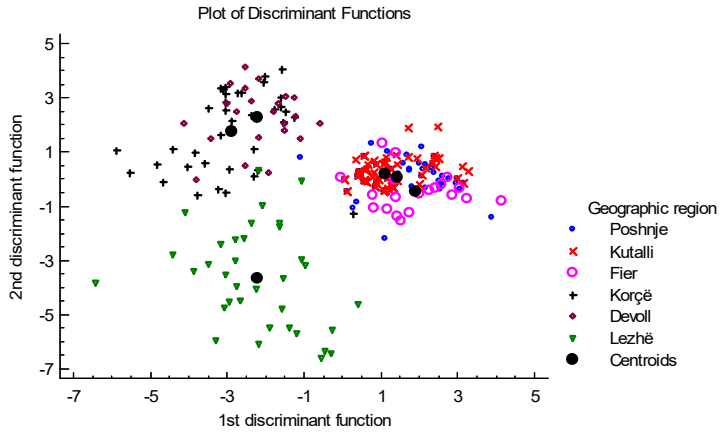

Figure 2. The distribution of local rabbit subpopulations on the plan of first two discriminate functions.

In general, the local differentiation of animal population belonging to the same breeds or originates from the same population, is result of a number of factors. Increase the value of this differentiation with increasing geographical distance between subpopulations can be explained with known effect of ‘’isolation in distance’’. Management of rabbits in Albania is carried on only in small scale family farms. It is not developed or implemented any rabbit breeding program. Selection of breeding male is an empiric action of the farmer. In general, he uses as male reproducer the animals of other farms of the same region.

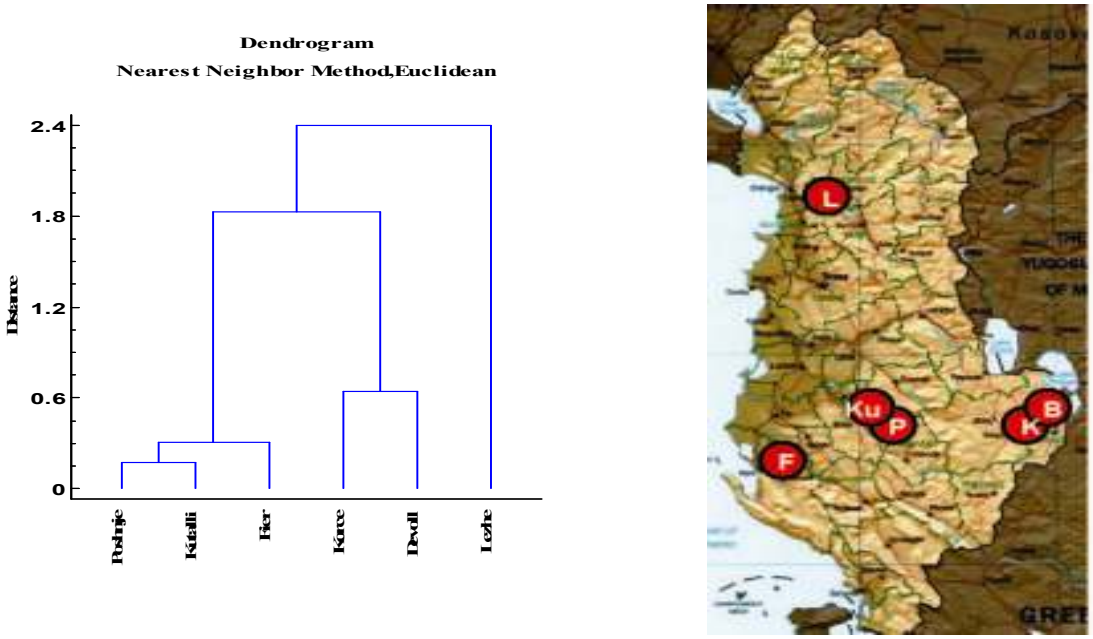

Figure 3. The dendrogram of local rabbit subpopulations groups in their geographical regions.

This action reduces the genetic exchange between farms with great geographical distance. According to [5] the result of ‘’isolation in distance’’ factor is the creation of isolated subpopulations. The same situation is identified by the above analyses of local rabbit population in Albania.

4. Conclusions

(i) Albanian local rabbit breeds classified in the group of medium breeds, with harmonic body development.

(ii) The Albanian local rabbit population is distinguished for considerable level of local differentiation. The main factor of this differential is the isolation in distance of rabbit subpopulations

(iii) Local differential can contribute in genetic variability conservation of local rabbit population of Albania that is actually in the process of genetic erosion.

5. References

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