

VIETNAM NATIONAL UNIVERSITY  
OF AGRICULTURE

ACADÉMIE DE RECHERCHE  
ET D'ENSEIGNEMENT SUPÉRIEUR

# PROCEEDINGS

INTERNATIONAL CONFERENCE  
AGRICULTURE DEVELOPMENT IN THE CONTEXT  
OF INTERNATIONAL INTEGRATION:  
OPPORTUNITIES AND CHALLENGES

December 7 - 8, 2016

Vietnam National University of Agriculture, Hanoi, Vietnam

AGRICULTURAL UNIVERSITY PRESS - 2016

## **CHARACTERIZATION OF THE KABYLE BREED OF HEN (THAYAZIT LEKVAYEL) AND ITS FARMING SYSTEM IN THE REGION OF CHEMINI AND BOUZEGUENE (ALGERIA)**

Moula Nassim<sup>1,2\*</sup>

*<sup>1</sup>Fundamental and Applied Research for Animals & Health (FARAH),  
Sustainable Animal Production, ULg, Belgium*

*<sup>2</sup>Tropical Veterinary Institute, University of Liège, 20 boulevard de Colonster,  
B43, 4000 Liège, Belgium*

*Email\* : nassim.moula@ulg.ac.be*

### **ABSTRACT**

The rural poultry in Algeria is a supplier of popular products. The aims of this study are to characterize local chickens in Kabylie in terms of the livestock practices, management, flock structures, uses, performance and phenotypes. The present survey addresses this issue in the case of Kabylie, a mountainous coastal region of Algeria, and concerns 28 households raising poultry and a morpho - biometric description of 388 (290 females and 98 males) adult local chickens. The farming practices is characterized by a reduction in the time allocated for this activity and to deal with production costs which are aspects of an unproductive extensive livestock system considered as a secondary activity. The body weight is  $2.03 \pm 0.22$  kg and  $1.61 \pm 0.19$  kg respectively in the male and the female. The age at first egg, egg weight, egg production per hen per clutch, number of clutches per year, hatchability and number of chicks weaned are  $28.00 \pm 3.82$  weeks,  $49.03 \pm 3.66$  g,  $13.57 \pm 1.64$ ,  $3.82 \pm 1.14$ ,  $89.29 \pm 9.79\%$  and  $7.82 \pm 1.75$  respectively. The comb type is mostly single (89.43%). Skin colours are principally white (39.18%) and yellow (39.43). The comb and wattles are mostly red (93.30). Shanks colours are principally yellow (49.74%) and white (24.23%). The most common plumage colours are salmon (14.43%), white (12.11%), black (17%), grey (9.54%) and gold (9.02%). The genetic improvement of local poultry breeds is also to consider, provided that the suitability of the animal with respect to the context of its breeding is preserved.

Keywords: Algeria, biodiversity, indigenous chicken, Kabyle breed, livestock practices, morpho - biometric description.

### **1. INTRODUCTION**

In recent years, the management of animal biodiversity has become an important issue in the international scientific community due to changes in large - scale production systems. Animal genetic resources are capital for sustainable development and production of poultry. However, a gradual and relentless depleting of available breeds is now rife at

the scale of the planet. The appearance of diseases and epidemics, natural disasters and other conflicts also threaten these resources either through direct extinction or indirect effects such as the reduction in suitable habitat. Traditional poultry breeds contribute significantly to meat and egg production. Indigenous breeds represent in excess of 80% of the world poultry production (Besbes, 2009). However, most of these breeds have not been surveyed,

and not even known to the scientific community. According to the FAO, about 40 % of all avian breeds have an unknown risk status (Besbes, 2009). Important efforts are, therefore, necessary to evaluate these breeds.

The efficient management of animal genetic resources in general and avian, in particular, requires first the identification of the concerned breeds. But, it also requires their statistics such as their population sizes, their geographic distributions (their habitats) and, where financial means are available, their genetic diversity (Moula, 2012).

«The best-known native chicken breed of Algeria is called Kabyle. This breed was already described in *Chasse et pêche 1927* » (Luuk Hans, 2014). Moula *et al.*, (2012a) reported a noticeable change in the poultry genetic resources in Kabylie. The period at which they situate the beginning of this change is the early 1990's. The nature of the change discussed is a widening of phenotypic variability, a decrease in flock size and a loss in « quality » and flavor of both meat and eggs. The original phenotypes are described as predominantly black with some white in the plumage (pure black, mottled or barred) and with blue or black shanks. The partridge plumage along with the black and white varieties as the «true Kabyle chickens».

The aims of this study was to characterize local chickens in Central Kabylie in terms of the livestock practices, management, flock structures, uses, performance and phenotypes. The present survey addresses this issue in the case of Kabylie, a mountainous coastal region of Algeria, through a survey conducted in 84 households raising poultry and a morpho-biometric description of 388 adult local chickens.

## 2. MATERIALS AND METHODS

### 2.1. Survey of households keeping backyard poultry

This study was investigated in Kabylie (Algeria). The investigation concerned exclusively with the traditional aviculture. The study has been carried with 84 local chicken breeders from the districts of Chemini and Bouzeguene (Figure. 1). The interviews were semi-structured and covered household characteristics, poultry keeping practices as well as breed description, management and perceived evolution.

### 2.2. Morpho-biometric characterization

Adult males and females (290 and 98 respectively) were used for morpho - biometric characterization. The different body measurements were recorded by means of a digital balance, an electronic sliding caliper and a tape measure. The data collected were sex, body weight and reported age of animal, thoracic girth, feathers type and color, the comb's type, length, height and color, wattles height and color, tarsus length and diameter, wings length as well as the length and color of the beak.

### 2.3. Statistical analysis

All statistical analyses were performed with the R software (version 3.0.0). Descriptive statistics were calculated for both, quantitative and qualitative variables (mean, standard deviation, percentages). The Student test was used to compare the different body measurements between male and female. Finally, Pearson's correlation coefficients between the different body measurements were calculated.

## 3. RESULTS AND DISCUSSION

In Algeria few studies have concerned the characterization and identification of

poultry genetic resources (Moula *et al.*, 2009; 2012a; Halbouche *et al.*, 2009; Ait Kaki and Moula, 2013; Mahammi *et al.*, 2014; 2016; Dahloun *et al.*, 2016).

### 3.1. Survey of households keeping backyard poultry

The first backyard chickens are obtained by bought (39.29%), through inheritance (25%) and gifts (35.71%). Concerning feed and feeding systems for chickens, all poultry farmers (100%) provided supplementary feeding to their chickens as following: kitchen leftovers (91.67%), industrial feed (25%), crops and their residuals (14.29%). The animals live of what they find their environment (insects, worms, grasshoppers, larvae, grass, crops...). All farmers provide water to the birds. Drinking water sources cited are: the water tap (57.14%), the well (32.14%) and other sources such as streams, springs, fountains (10.71%). These farming practices are characterized by a reduction in the time allocated to them and to deal with high production costs which are the mark of an unproductive extensive livestock system considered as a secondary activity (Moula *et al.*, 2009; 2011; 2012a,b).

Use of eggs from the indigenous chickens include hatching chicks (100%) to get replacement stocks, eating at home (100%), sold for cash (14.29%) and a few (10.71%) are used for ceremonies. The chickens are kept for home consumption (100%), ceremonies (32.14%), gifts (28.57%) and a (21.43%) for cash. As reported in table 1, the indigenous chickens are valued mainly for their ability to scavenge (82.14%), good meat quality (85.71%), disease tolerance (78.57%) and general hardiness (78.57%). As reported in the studies of Moula *et al.* (2011) and Moula *et al.* (2012a,b), the purpose of keeping indigenous chickens at household level in the rural areas is for consumption and income.

The mainly cited constraints on the productivity of family - based poultry are: expensive chicken feed (46.43%), predators (32.14%), diseases (10.71%) and low production of local breeds (10.71%). The same constraints have been reported by Moula *et al.* (2011) and Moula *et al.* (2012a). These constraints are the expression of the extensive livestock with limited financial resources.

The mean egg performance traits of local chickens are shown in table 2. The mean age at first egg, egg weight, egg production per hen per clutch, number of clutches per year, hatchability and number of chicks weaned were 28.00 weeks, 49.03g, 13.57, 3.82, 89.29% and 7.82 respectively. These limited performances are the characteristics of local chicken breeds intended for mixed production (Moula *et al.*, 2009, 2011, 2012a, b; Duy *et al.*, 2015).

**Table 1. Farmers responses (%) to main uses of eggs, chicken and special attributes**

Use and attributes	n	%
Eggs		
Food	84	100
Cash	12	14,29
Ceremonies	9	10.71
Chicks	84	100
Chickens		
Food	84	100
Cash	18	21.43
Gifts	24	28.57
Ceremonies	27	32.14
Special attributes		
Disease tolerance	66	78.57
Meat quality	72	85.71
Ability to scavenge	69	82,14
General hardiness	66	78,57

**Table 2. Performance characterization of indigenous chickens in local Kabyle chicken (28 households)**

Variable	Mean $\pm$ SD	Median	Max	Min
Age at first egg (weeks)	28.00 $\pm$ 3.82	28.00	36	24
Egg production / hen / clutch	13.57 $\pm$ 1.64	13.50	16	10
Egg weight (g)	49.03 $\pm$ 3.66	48.63	57.01	39.35
Number of clutches per year	3.82 $\pm$ 1.14	4.00	6	2
Hatchability (%)	89.29 $\pm$ 9.79	90.00	100	60
Average number of chicks weaned	7.82 $\pm$ 1.75	8.00	11	4

**Table 3. Number (n) and percentages (%) of different feather colours in local chicken in Kabylie**

Feather colour	Male		Female		Total	
	n	%	n	%	n	%
Black	11	11.22	35	12.07	46	11.86
White	10	10.20	37	12.76	47	12.11
Golden	5	5.10	30	10.34	35	9.02
Silver	9	9.18	11	3.79	20	5.15
Light brown	7	7.14	17	5.86	24	6.19
Dark red	4	4.08	8	2.76	12	3.09
Dark brown	0	0.00	19	6.55	19	4.90
Barred	7	7.14	24	8.28	31	7.99
Blue	4	4.08	5	1.72	9	2.32
White Columbian black	4	4.08	8	2.76	12	3.09
Grey	7	7.14	30	10.34	37	9.54
Mottled	9	9.18	8	2.76	17	4.38
Partridge	0	0.00	6	2.07	6	1.55
Salmon	15	15.31	41	14.14	56	14.43
Tan	6	6.12	11	3.79	17	4.38

### 3.2. Morpho-biometric characterization

Colour variation of plumage, shanks, comb, wattles and skin with comb type is shown in tables 3 and 4. As reported in Table 3, the most common colours were salmon (14.43%), white (12.11%), black (17%), grey (9.54%) and gold (9.02%). Other

colours such as silver, blue, mottled, light brown, dark red, barred, partridge, dark brown, white columbian black and tan were less frequently encountered (between 1 and 8 percent). Globally, the population thus turned out to be highly heterogeneous. Male plumage colour in the largest group was salmon in 15.31% of the roosters.

Other principal groups shown were the black (11.22%) and white (10.20%) feathering. Like the cocks, hens were presented mainly salmon, white and black plumage colors with respectively 14.14%, 12.76% and 12.07%. The shanks colours varied from gray (7.73%), black (18.30%), white (24.23%) to yellow (49.74%). The predominant comb type was single (89.43%), followed by double (5.41%), pea (3.35%) and then walnut comb (1.80%). This extraordinary diversity reported in this study corresponds to those described

by Moula *et al.* (2009) and Mahammi *et al.* (2014). The genetic diversity could be the result of uncontrolled crossings of the local populations with industrial strains of hens.

Sex had a significant effect ( $P < 0.001$ ) on all the quantitative traits. Males had heavier body weight and larger body size compared to females (Table 5). Pearson's coefficients of correlation among various morphometric variables are shown in figure 2. All body measurements were positively ( $r \geq +0.32$ ) and significantly ( $P < 0.001$ ) inter - correlated.

**Table 4. Number (n) and percentages (%) of different types and colours of the comb and the wattles and the skin and shanks colour in local chicken in Kabylie**

	Male		Female		Total	
	n	%	n	%	n	%
Skin colour						
White	27	27.55	125	43.10	152	39.18
rose	16	16.33	43	14.83	59	15.21
Yellow	50	51.02	103	35.52	153	39.43
pigmented	5	5.10	19	6.55	24	6.19
Comb type						
Single	84	85.71	263	90.69	347	89.43
Double	7	7.14	14	4.83	21	5.41
Pea	5	5.10	8	2.76	13	3.35
Walnut	2	2.04	5	1.72	7	1.80
Comb and Wattles colour						
Red	91	92.86	271	93.45	362	93.30
Pink	2	2.04	11	3.79	13	3.35
Black	5	5.10	8	2.76	13	3.35
Shanks colour						
Black	25	25.51	46	15.86	71	18.30
Yellow	30	30.61	163	56.21	193	49.74
Gray	11	11.22	19	6.55	30	7.73
White	32	32.65	62	21.38	94	24.23

Characterization of the Kabyle breed of hen (Thayazit Lekkayel) and its farming system in the region of chemini and bouzeguene (Algeria)

**Table 5. Body weight and measurements according to sex in local Kabyle chicken** (mean  $\pm$  SD and median in parentheses)

Variable	Male (n= 98)	Female (n= 290)	P - value
Body weight (kg)	2.03 $\pm$ 0.22 (2.00)	1.61 $\pm$ 0.19 (1.58)	***
Tarsus length (cm)	9.94 $\pm$ 2.80 (9.63)	7.67 $\pm$ 2.93 (7.30)	***
Tarsus Diameter (mm)	12.26 $\pm$ 1.58 (12.00)	11.02 $\pm$ 1.53 (11.00)	***
Comb length (cm)	6.95 $\pm$ 0.95 (7.10)	5.29 $\pm$ 1.86 (5.70)	***
Comb height (cm)	3.20 $\pm$ 0.41 (3.11)	2.46 $\pm$ 0.57 (2.60)	***
Ear lobe length (cm)	3.02 $\pm$ 0.55 (2.98)	2.21 $\pm$ 0.61 (2.16)	***
Ear lobe width (cm)	2.38 $\pm$ 0.70 (2.45)	1.50 $\pm$ 0.63 (1.40)	***
Wattles length (cm)	3.66 $\pm$ 0.38 (3.52)	2.98 $\pm$ 0.51 (3.08)	***
Wattles width (cm)	2.94 $\pm$ 0.60 (3.06)	2.30 $\pm$ 0.58 (2.28)	***



**Figure 1. Location of the region of Chemini and Bouzeguene, Algeria**

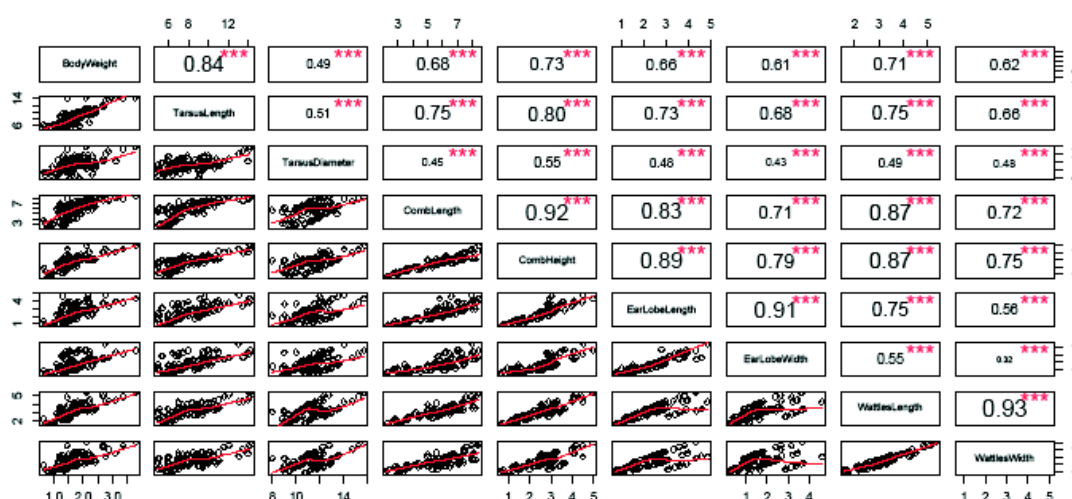


Figure 2. Correlation between all measurements

#### 4. CONCLUSIONS

The rich genetic diversity of local chickens in Kabylie seems to evolve in an anarchic way. This wealth should nevertheless provide a useful gene pool of major interest for the establishment of a true local breed, based on the strong commitment of farmers to produce what corresponds to a collective ideal. Improved farming practices are needed to improve the productivity of village poultry. It's important to select the animals with good production, then afford them a balanced diet, proper housing and establish a prophylactic measures to fight diseases rampant in the study area.

#### REFERENCES

- Ait, K. A., and N. Moula. (2013). Performances de productions de la poule locale kabyle. *Revue Agriculture*, 5: 1-4.
- Besbes, B. (2009). Genotype evaluation and breeding of poultry for performance under sub-optimal village conditions. *World's Poult. Sci.*, 65: 260-271.
- Dahloum, L., N. Moula, M. Halbouche, and M. Mignon-Ge-Rasteau (2016). Phenotypic characterization of the indigenous chickens (*Gallus gallus*) in the northwest of Algeria. *Archives Animal Breeding*, 59: 79-90.
- Duy, V. N., N. Moula, D. D. Luc, P. K. Dang, D. T. Hiep, P. H. Doan, V. D. Ton, F. Farnir (2015). Ho Chicken in Bac Ninh Province (Vietnam): From an Indigenous Chicken to Local Poultry Breed. *Int. J. Poult. Sci.*, 14:521-528.
- Halbouche, M., L. Dahloum, A. Mouats, M. Didi, S. Ghali, W. Boujenah, and A. Fellahi (2009). Inventaire phénotypique des populations avicoles locales dans le Nord-Ouest algérien. Actes des premières journées d'étude ressources génétiques avicoles locales: potentiel et perspectives de valorisation, 23 et 24 juin 2009, université de Mostaganem.
- Mahammi, F. Z., S. B. S. Gaouar, N. Tabet-Aoul, M. Tixier-Boichard, and N. Saidi-Mehtar (2014). Caractéristiques morpho-biométriques et systèmes d'élevage des poules locales en Algérie occidentale (Oranie). *Cah. Agric.*, 23: 111.
- Mahammi, F. Z., S. B. S. Gaouar, D. Laloê, R. Faugeras, N. Tabet-Aoul, X. Rognon, M. Tixier-Boichard, and N. Saidi-Mehtar (2016). A molecular analysis of the patterns of genetic diversity in local chickens from western Algeria in comparison with commercial lines and wild jungle fowls.



Characterization of the Kabyle breed of hen (Thayazit Lekvayel) and its farming system in the region of chemini and bouzeguene (Algeria)

- Journal of Animal Breeding and Genetics, 133: 59-70.
- Moula, N., F. Farnir, A. Salhi, M. Iguerouada, P. Leroy, and N. Antoine-Moussiaux (2012a). Backyard poultry in Kabylie (Algeria): from an indigenous chicken to a local poultry breed? *Animal Genetic Resources*, 50: 87-96.
- Moula, N. Biodiversité avicole dans les pays industrialisés et en développement: caractérisation et étude des performances de production de races gallines locales. Doctoral thesis, Université de Liège, Liège, Belgique. <http://hdl.handle.net/2268/116581>
- Moula, N., N. Detiffe, N. Antoine-Moussiaux, P. Leroy (2012b). Village poultry in Bas-Congo, Democratic Republic of Congo (DRC). *Livestock Research for Rural*. 24.
- Moula, N., A. Ait Kaki, P. Leroy, and N. Antoine-Moussiaux (2013). Quality assessment of marketed eggs in Basse Kabylie (Algeria). *Revista Brasileira de Ciência Avícola*, 15: 395-400.
- Moula, N., D. D. Luc, P. K. Dang, F. Farnir, V.D. Ton, D.V. Binh, P. Leroy, and N. Antoine-Moussiaux (2011). The Ri chicken breed and livelihoods in North Vietnam: characterization and prospects. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 112: 57-69.
- Moula, N., N. Antoine-Moussiaux, F. Farnir, J. Dettelleux, P. Leroy. 2009. Réhabilitation socio-économique d'une poule locale en voie d'extinction: la poule Kabyle (Thayazit lekvaïel). *Annales de Médecine Vétérinaire*, 153: 178-86.