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Phenotypic and morphometric diversity of local chickens (BRAHMA) from wilaya of Tlemcen, Northwestern of Algeria

Berrezoug L, Bouchiba I, Hedeili N, Metahri R, Ameur Ameur A*, Gaouar SBS

Department of Biology, Faculty of Sciences of Nature and Life, Earth and Universe Sciences, Abi Beker University Belkaid , (UABT), Tlemcen, Algeria.

Corresponding Author: AMEUR AMEUR A, Abi Beker University Belkaid , (UABT), Tlemcen, Algeria.; **Email**: ameurabdelkader@gmail.com

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Abstract

The aim of contributing to the identification of the typology of traditional poultry farming and morphometric characterization of local breeds in the wilaya of Tlemcen. Several field surveys were conducted in this region to target BRAHMA type poultry farms based on pre-established contacts with farmers. A total of 67 individuals from the Brahma phenotype hens at different locations in the Tlemcen wilaya were investigated to identify and classify these individuals and to study the morphological differences between them according to their location. Fourteen measurements in which 11 quantitative and three qualitative traits were carried out in this work. The results obtained for all measurements made on the population BRAHMA chickens in the region of Tlemcen with the 8 communes visited, show that there is a significant difference between the morphological characters except two characters length of the tarsi (LT) and width of the thighs (LAC). Furthermore, In addition, sex shows a small significant difference between the measurements studied.Thus the results of the PCA and hierarchical classification show that there are four groups that share the same morphological characteristics except for some differences that may be due to climatic and environmental adaptation. This analysis made it possible to establish remarkable phenotypical differences, which have implications to take into account in the program of characterization and conservation of the species.

Keywords: Chicken; Brahma breeds; Body measurements; Phenotype; Characterization; Algeria

Introduction

Family or village poultry farming makes an important contribution to food security and poverty alleviation in many countries around the world. It produces mainly food for domestic consumption, in the form of meat or eggs, and generates income through the sale of these products. Eggs can provide a regular, albeit modest income. Whereas the sale of live birds provides a more flexible source of liquidity adapted to the needs (Dahloum, L., 2017).

In Algeria, since the 1980s, the poultry sector has experienced a notable development; the demographic growth and the change in feeding habits that have accompanied the urbanization of Algerian society are the main determinants of this development. This growth of the poultry industry contributes to job creation and the reduction of animal protein deficit. (Kaci, 2015).

Algeria's annual consumption of poultry meat is estimated at 6 kilos per inhabitant per year, for a production of 342,000 tons (Mahammi el al., 2014). As for the local breeds, exclusively exploited in extensive traditional breeding, they are poorly known and are grouped under the common name of DJAJE LAREB (Arab hen) without any information on the structuring of their population. (Mahammi 2015).

The Brahma is one of the largest breeds of Asian origin created in the United States from Cochin (cross between the Cochin and the Maltese Fighter) (The Livestock Conservatory, 2018). It characterized by its

large size and very wide shape, feathered up to the tarsi. The body is fleshy and voluminous, the chest broad. A small head with salient eyebrows. Despite its slow growth, the Brahma remains a coveted breed by many breeders. There are several varieties, such as the golden or silver Brahma, the blue perdix and the white. (Semenuik and pernot 2008).

Meanwhile, in Algerian markets, the local chicken is rare whatever its origin and its price is higher than that of the industrial chicken. His flesh is very appreciated by the consumer (Djelil, 2012).

Firstly, the aim of this work is to study the morphological and zootehnic characteristics of the BRAHMA chicken breed reared in the region of Tlemcen northwest of Algeria. Secondly is Support the poultry farmer in this area by placing at his disposal the interest of the Brahma breed in the markets and the financial benefit it can get from her flesh and eggs.

Materials and methods

Study zone

Our study was conducted at the level of the wilaya of tlemcen in eight different regions (Ain El Hadjer, Hennaya, Remchi, Taslit, Ain Youcef, Ain El Hout and Tounane) during the winter season (Figure 1). The climate is warm and temperate. In winter, there is much more rainfall in Tlemcen than in summer. The average temperature is 16.0 ° C.

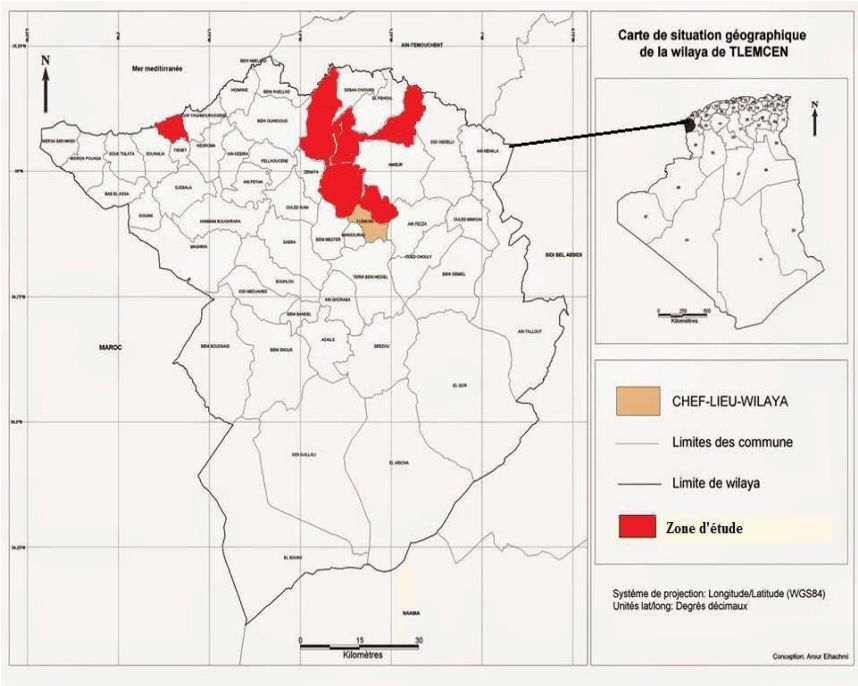

Figure 1. Representation of the study regions in wilaya of Tlemcen

Choice of animals

Our work was based on the study of the morphological characters of 67 individual distributed in the wilaya of Tlemcen. The numbers grouped by sex and number by region are shown in Table 1

Table 1. Distribution of the study population by region and sex

Studied Region	Males	Females	Total
Ain el hadjer	11	28	39
Hennaya	4	7	11
Ain youcef	1		0
Taslit	7	2	9
Remchi	2		2
Tounane	1	1	2
Ain el hout	1	2	3

Morphological traits

Fourteen measurements including 11 quantitative and 3 qualitative characters have been investigated in our work (Table 3.et Figure 2).

Table 3: The different qualitative and quantitative characteristics studied in this work

Quantitative measurement		*Qualitative measurement*	
PC	Body weight	**Sexe**	Male or femelle
LAT	Width of tarsus	**Cy**	Couleur des yeux
LT	Length of tarsus	**plumage color**	
LAC	Thigh width		
LC	Thigh length		
LAB	Beak Beak		
LB	length width		
LP	Breast width		
LOC	Neck length		
LTC:	Total length of the body		
AGE:	Age of the hen		
Nbre doeuf :	Number of eggs		

Chest width | Length of the tarsi | Beak width | Width of the tarsi | Body weight measurement

Figure 2: Taking some measurements during this work.

Statistical analysis

The descriptive analysis of body measurements was analyzed according to SPSS v 19 software. The effect of sex was compared by Student Newman-Keuls multiple comparison test. Multivariate analysis (PCA) was conducted to group homogeneous individuals with the same traits studied based on body measurements to

differentiate chicken according to these criteria, to define a classification of animals, and to construct a typology consisting of: identify individuals that are quite similar to each other.

Results and discussion

Socio-economic status of the breeder

During field surveys, the breeders interviewed are only men. Their age varies between 15 and 52 years with an average of 32 years. Regarding levels of education: two breeders have a university education, two have a secondary education and one has stopped his primary education. Another breeder who is 52 years old is illiterate. These primary results show that today the breeding of local chickens in Algeria depend only on men.

Regarding habitat, the farms were almost completely sheltered (days and nights), there was only one breeder that his farms were in semi-freedom (sheltered only at night). Shelters provided are made of local materials: wood, plastic, zinc sheet, wire mesh (figure 3).

Figure 3: Examples of shelters provided for local poultry (Original photo)

Body measurements

Descriptive analysis

The averages, standard deviations, minima and maxima of body measurements of hens are summarized in Table 3.

Table 3. Descriptive analysis of body measurements of Brahma chicken in each studied region

Quantitative traits	Study regions							P value
	Ain el hadjer	Hennaya	ain youcef	Tasslit	remchi	Tounane	Ain Hout	
	39	11	1	9	2	2	3	
PC	3,10±1,156	2,87±0,73	1,1	2,60±0,94	1,05±0,70	3,75±3,53	2,66±0,76	*
LAT	1,73±0,37	1,96±0,22	2	2,10±0,50	1,45±0,07	2±0,14	1,83±0,39	*
LT	17,64±3,70	15,84±2,38	19	19,10±3,4	15,70±0,98	18,75±1,06	14,06±3,24	NS
LAC	3,06±0,91	2,98±0,53	2,1	2,5667±0,75	2,15±0,07	3,60±0,42	3,2333±0,05	NS
LC	12,96±4,05	10,20±2,69	12,37	20,58±2,81	13,75±1,06	18,25±1,76	14±2,00	**
LAB	0,84±0,26	1,93±0,37	0,83	0,97±0,06	0,55±0,07	0,6±0,14	0,76±0,25	**
LB	1,75±0,53	1,93±0,37	2,18	2,38±0,20	2,60±0,56	2,2	2,23±0,32	**
LP	17,68±6,04	14,94±1,18	9,57	13,60±2,09	10,15±0,21	17,95±2,89	13,60±0,52	*
LOC	16,46±3,31	15,27±2	15	16,35±4,39	10,25±0,35	22,50±3,5	12	**
LTC	60,15±10,43	56,09±8,7	70	71,11±8,27	47,75±1,06	47,50±3,53	58±10,44	***
Nbre doeuf	166,64±2,98	165,43±3,20	ND	142,00±0,001	ND	168	150	***

** significant (<0.05), ** very significant (<0.01), *** highly significant (<0.001), **NS**: not significant, **ND**: not available*

Body measurements studied in both sexes of the BRAHMA chickens population in the Tlemcen area with the 8 visited communes studied are shown in Table 05. The results obtained show that there is a significant difference between the morphological characters except two characters Length of the tarsi (LT) and Width of the thighs (LAC) (Table 3).

Variation of individuals according to body measurements

Principal component analysis (PCA) was performed on body measurements. The result of this analysis showed that these variables presented 54.747% of the total inertia on both axes, which is relatively average. (Figure 4). It has been observed, that the quantitative characteristics studied in individuals of the BRAHMA population are mostly very close together, which is reflected in a very important level of statistical significance. Thus, Thus, the formation of two groups with two positive and negative correlations.

- **The first group**: positive correlation, includes (PC, LP, LAC) together and (LT, LAT, LTC, LOC, LB, LAB) together.
- **Second group**: negative correlation, includes the number of eggs.

We can say that the characters that are at the level of the first group are influenced by the same group of genes, or that these characters interact mutually, that is to say if one grows the other also will grow and they react in the same way against environmental conditions.

However, the egg number is negatively correlated, which means, it increases with the decrease of the other characters. In fact, when age increases the number of eggs decreases (taking into account the age). This is why breeders keep their chickens at a maximum age of 3 years.

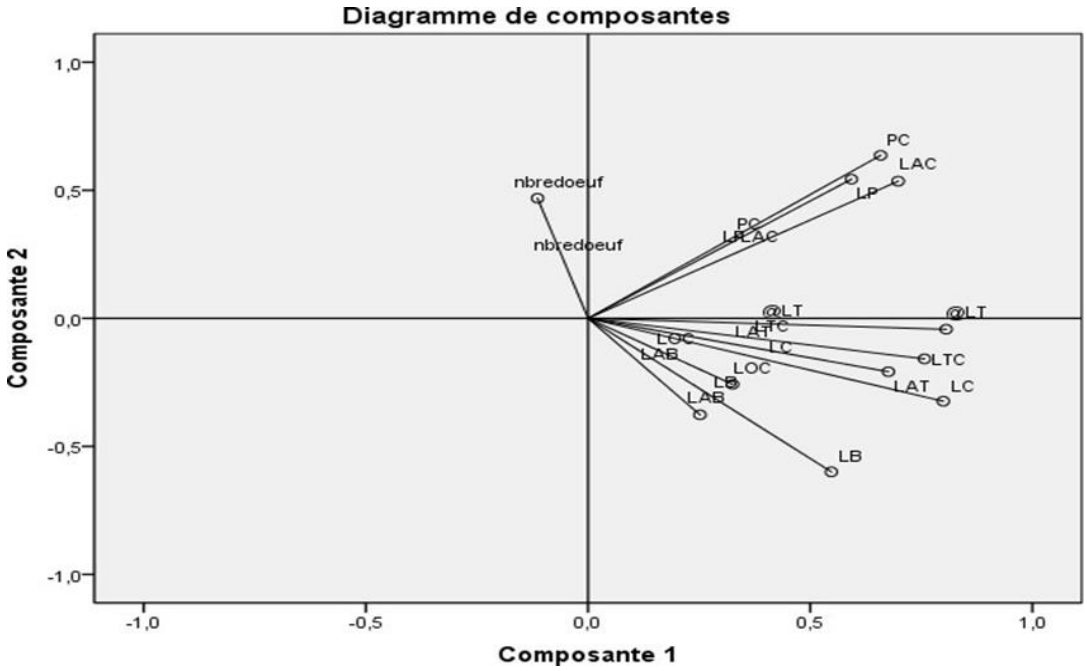

Figure 4. Presentation of Body Measurements by PCA in the Algerian BRAHMA Population

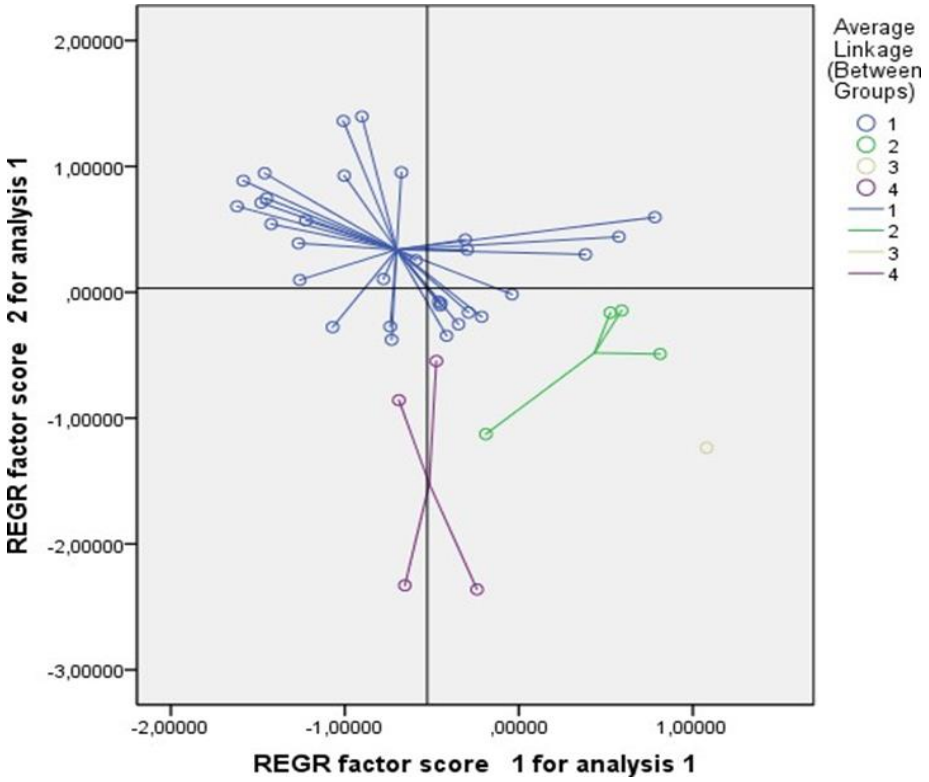

Figure 5. Presentation of individuals from the BRAHMA population by PCA

the results obtained in the figure show that there are four groups of which the first three are close (1.2.4) in the regions (Hennaya, Ain el Hadjer, Ain el Hout and Taslit ..), that means that the individuals of these

groups have a resemblance or are similar in the majority of their morphological characteristics. In addition, as far as concerns the group (3) which is far from other groups, this may mean that their individuals do not have a resemblance to other groups because the other regions are close, while the region of Tounane is a little far from them (Figure 5 and 6).

The difference in characters is due to climatic and environmental adaptation. The difference in characters is due to climatic and environmental adaptation.

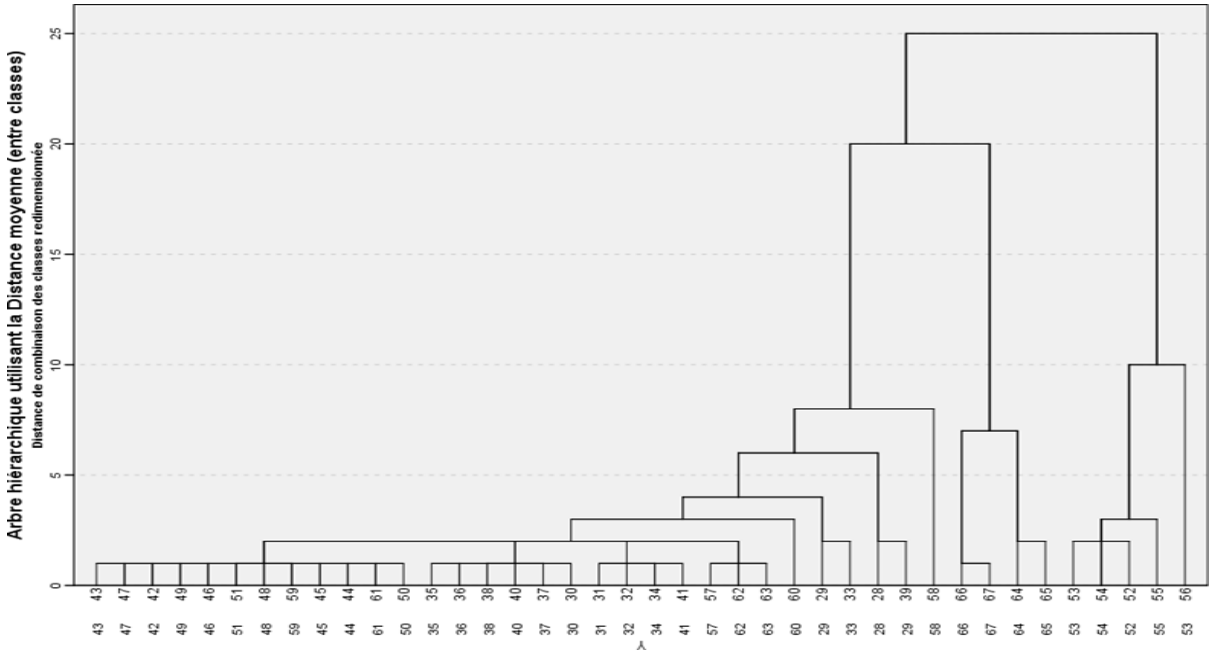

Figure 6: Hierarchical tree using average distance (between classes) among the population

Table 4: Classification of hens

Quantitative traits	Class 1	Class 2	Class 3	Class 4
	31	**4**	**1**	**4**
PC	2.74±0.66	1.98±0.68	1.5	1.98±0.39
LAT	1.66±0.29	1.9±0.5	2.1	1.72±0.13
LT	15.32±1.73	17.25±2.36	26	13.85±3.44
LAC	2.78±0.63	2.68±0.54	1.6	2.48±0.9
LC	10.1±2.55	16.5±0.58	22	15.3±2.78
LAB	0.88±0.28	0.85±0.24	0.9	0.93±0.1
LB	1.63±0.47	2.2±0.16	2.1	2.1±0.14
LP	14.18±1.12	24±1.63	22	12.25±1.37
LOC	15.8±82.17	17.7±51.19	20	14.7±53.2
LTC	52.1±3.94	71.7±54.5	80	55±3.65
number of eggs	167±2	160	168	146

Class 1: the individuals of this class are the most massive (2.74±0.66) kg, they carry the smallest tarsus 1.66±0.29 cm, the thinnest, and the shortest thighs (2.78±0.63), (10.1±2.55) they are in second position in egg production.

Class 2: Four individuals have the widest breast (24±1.63) cm with a significant weight (1.98±0.68) kg and broad tarsi (1.9±0.5) cm.

Class 3: There is only one massive hen (1.5) kg, which has the widest and the longest tarsus (2.1) cm, (26) cm, the longest neck (22) cm and the tallest body (80) cm they are better in egg production than the other classes (Table 4).

Class 4: these four individuals take the second position because of their weight (1.98 + -036) kg; they have the thinnest chest (12.25±1.37) cm with a medium body length (55±3.65) cm, and low egg production.

Qualitative traits:

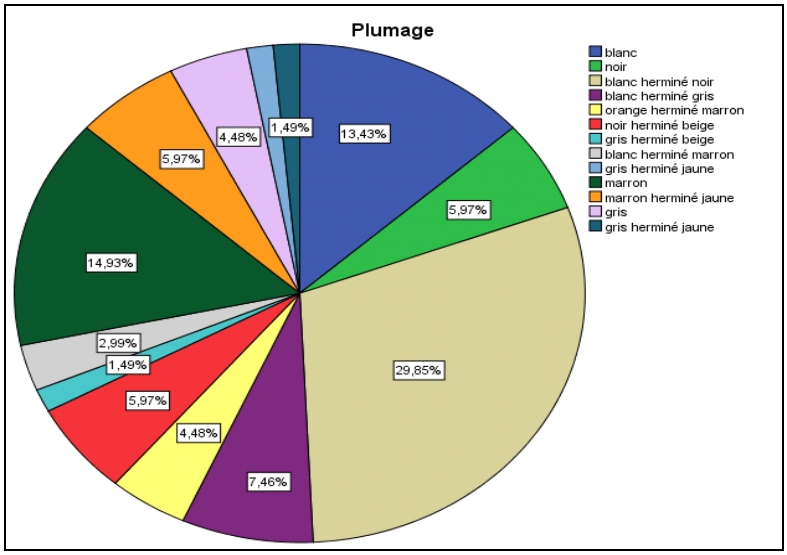

Figure 7: Plumage percentages for both sexes

The plumage of the studied individuals differs: White, Gray, Brown, black ... etc (Figure 7). The first hypothesis we asked was: does plumage influence production? However, the breeders told us that the color of plumage does not influence the production neither in the males or in the females, a gray or black hen or with other color lays the same quantity, same results are founded by Yapi-Gnaore et al. (2010) in Côte d'Ivoire.

It has also been found that the color of plumage does not influence the other characters. Therefore, we can say that the differentiation in the plumage pigmentation is due to the crossing mode (according to the wishes of the breeder)

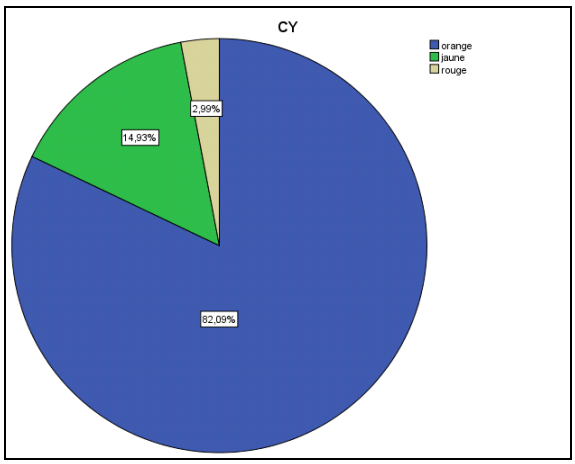

Figure 8: Percentages of color of eyes in both sexes (male and female)

In poultry, the color of the eyes goes from black to pearl, passing by black brown, dark brown, red brown, red orange and brown yellow (Coquerelle, 2000).

In our study and according to Figure 42, the major color is orange with a percentage of 82.09% (Figure 8). Thus, it has been found that the orange color is dominant in the Brahma race. Regarding the other colors (yellow and red), we can deduce that these individuals have mutations that caused this differentiation in pigmentation of the eyes.

Conclusion

During this study, surveys were conducted in the field of several regions (eight farms) which differ from each other by the breeders; their age, educational level, socio-economic status or the mode of rearing; the diet, biosecurity ... etc., which allowed us to describe the breeding in these regions and showed us that the breeding of chickens by comparing it from previous years and last five years has experienced a remarkable development and more organized in relation to local chicken farms, but it still has low productivity compared to industrial strains. Regarding the characters studied, the results obtained show that there is a slight difference between the individuals studied that has been translated by the differentiation in the environmental conditions and the zootechnical aspect.

We can improve the breeding with a small management and organization that will give productive productions and a good return to the breeders and our country too. For example, to make an identification of the Brahma race; to achieve it by molecular methods and to come out with a conclusive and definitive identification of the breed and the most important point is the improvement of its productivity, which consists in improving the zootechnical aspect by supporting the poultry farmer in this field by putting at his disposal the interest of the Brahma breed in the market and the financial benefit that he can have from his flesh and eggs by establishing awareness raising companies to preserve these resources in our country and to improve traditional breeding and especially the improvement of poultry farming.

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