

Original Research Paper

Contribution to the morphometric characterization and physico-chemical analysis of meat of porcupines (*Hystrix cristata*) in Tlemcen region

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Article history: Received: August 7th 2021; revised: September 25th 2021; accepted December 11th 2021

Abstract

In Algeria, the work undertaken on the ecology of wild rodents mainly focuses on gerbils and merions, and Ctendactylidae. As for hystrix, to our knowledge studies are non-existent although porcupine (*Hystrix cristata*). Although being a protected species, the porcupine is considered an agricultural pest, with tasty meat, and therefore largely poached. This study took place over a two-year cycle from 2017 to 2019. Field investigations began in region of Tlemcen. A survey was carried out to collect information; we used 25 questions about farmer and hunter like age, jobs, profession ...) also a question about the use of porcupine in this area and how the farmer and hunter deal with this animal. Sampling was carried out on individuals of both sexes, male and female. A total of 22 individuals were sampled, including 12 males and 10 females. The description of the qualitative characteristics was made using a visual examination. Two qualitative variables were studied. The description of the quantitative characteristics was carried out using a tape measure in which each animal was subjected to 15 body measurements. For the physico-chemical analysis, 100 g of fresh meat from two healthy individuals was used. Descriptive analysis revealed that females are larger than males; the black color of the skin is the most dominant compared to the dark brown and light brown color. Principal component analysis (PCA) has shown that all quantitative variables are positively correlated with each other. The principal component analysis of individuals by region shows that the majority of individuals from the interior plains have high values (Maghnia and Remchi) and the majority of individuals from forest areas have the lowest values (Ghazawat, Mafrouche and Ain Fezza). Principal component analysis of individuals by sex shows that females contain high values compared to males. Principal component analysis of individuals by skin color shows no difference between individuals. The ascending hierarchical classification (CAH) confirmed the results of the CPA which allowed us to distinguish 4 classes. The results of physico-chemical analysis of the fresh meat of 2 individuals (male and female) of the Ghanmi breed, for 100g of fresh meat reveal that the protein content is 21.5-20 g, the lipid content is quite important in the female compared to the male. In contrast, the carbohydrate content and per 100 g of meat was zero.

Key words: porcupines, morphometric, physico-chemical, characterization, Algeria

ملخص

في الجزائر، أكثر البحوث الذي تم إجراؤها على علم بيئة القوارض البرية تتركز على الجربوع والطيور. أما بالنسبة للنيص (الشيهيم أو الدعلج) على حد علمنا الدراسات غير موجودة بالرغم من كونه نوعاً محمياً، وله لحم لذيذ كما أنه يعتبر آفة زراعية، وبالتالي يتم صيده على نطاق واسع. تمت هذه الدراسة على مدار عامين من 2017 إلى 2019. وبحيث بدأنا باستبيان ميداني في منطقة تلمسان. تم إجراؤه لجمع المعلومات؛ استخدمنا 25 سؤالاً حول المزارع والصيد مثل العمر والوظائف والمهنة (...) وأيضاً حول استخدامات النيص وكيف يتعامل المزارع والصيد مع هذا الحيوان. بحيث تم أخذ العينات على الأفراد من كلا الجنسين، ذكورا وإناثا. بعدد إجمالي 22 فرداً، منهم 12 ذكوراً و10 إناث. تم وصف الخصائص النوعية باستخدام الفحص البصري. وتمت القياسات للخصائص الكمية باستخدام شريط قياس خضع فيه كل حيوان لـ 15 قياساً جسدياً. بالنسبة للتحليل الفيزيائي والكيميائي، تم استخدام 100 غرام من اللحوم الطازجة من فردين. أظهر التحليل الوصفي أن الإناث أكبر حجماً من الذكور. واللون الأسود للجلد هو الأكثر انتشاراً مقارنةً باللون البني الغامق واللون البني الفاتح. كما أظهر تحليل الإحصائية أن جميع المتغيرات الكمية مرتبطة بشكل إيجابي مع بعضها البعض. وأوضح تحليل المكون الرئيسي للأفراد حسب المنطقة أن غالبية الأفراد من السهول الداخلية لديهم قيم عالية (مغنية ورمشي) وأن غالبية الأفراد من مناطق الغابات لديهم أدنى القيم (غزوات، المفروش، عين فزة). يظهر تحليل المكون الرئيسي للأفراد حسب الجنس أن النساء يحتوين على قيم عالية مقارنة بالرجال. يظهر تحليل المكون الرئيسي للأفراد حسب لون البشرة عدم وجود فرق بين الأفراد. كما بين التصنيف الهرمي التصاعدي 4 فئات. وأظهرت نتائج التحليل الفيزيائي والكيميائي للحوم الطازجة الذكر وأنثى من سلالة الغانمي، لكل 100 غرام من اللحم الطازج، أن محتوى البروتين هو 21.5 - 20 غرام، محتوى الدهون كافٍ، مهم في الأنثى مقارنة بالذكور. في المقابل، كان محتوى الكربوهيدرات في اللحم صفراً.

الكلمات المفتاحية: النيص. وصف. للتحليل الفيزيائي والكيميائي. الجزائر.

Introduction

Northwest Africa is one of the regions that deserves to be investigated by ecological research because on the one hand, it constitutes a biogeographic crossroads between the Palearctic and Afro-tropical regions (Olson et al, 2001) and on the other hand, it belongs to the Mediterranean region, one of the most important biodiversity hotspots in the world (Myers et al, 2000). Indeed, Algeria currently has 108 species of mammal (Stork and Samways, 1995; Abdelguerfi et al, 2009).

However, Cited by Yaa Ntiama-Baidu, 1987, in Africa, overexploitation threatens to destroy wildlife in many places, which is both an important traditional source of food and income and a cultural value. The Algerian mammalian population is unfortunately no exception to these threats. In Algeria, the work undertaken on the ecology of wild rodents is focused mainly on gerbilids and meriones (Bela Bbas, et al, 1994; Adamou-Djerbaoui, 2012), and the Ctendactylidae (Gouat and Gouat, 1982, 1983, 1985, 1987, 1988).

As for the Hystricid, to our knowledge studies are non-existent although the porcupine (*Hystrix cristata*) is cited by several authors (such as Koenen F, 1999, Lin W, 2012 and Giusy C, 2016). This animal is a rodent that is part of the list of non-domestic animal species protected by Decree No. 83/509 of 20 August 1983 on protected non-domestic wildlife, supplemented by Executive Decree No. 12-235 of 3 Rajab 1433 corresponding to 24 May 2012. Despite being a protected species, the porcupine is considered as an agricultural pest, with tasty meat, so widely poached (Sandro L et al, 2017).

Cited by Banfield, 1977, porcupine frequents a range of vegetation areas in North America, from semi-desert to tundra. Porcupines are also found in Africa and Asia, but these do not belong to the same family as the Porcupines of the New World.

With a view to the conservation of protected species, in particular this rodent. The prior collection of information is necessary. Our work therefore focused on the description of this animal at the level of the Tlemcen region. This study concerns a morpho-biometric description of porcupine (*Hystrix cristata*) and physico-chemical analysis of its meat.

Materials and methods

Experimental Site

This study took place over a two-year cycle from 2017 to 2019. Field investigations have begun in the Tlemcen wilaya (Figure 1). The latter occupies a position of choice within the national whole, wilaya has both border and oblitera, constituting a small inclusion in the north of the wilaya of naàma which is the continuity of the steppe part of the wilaya of Tlemcen. It is a region located geographically in the extreme west of Algeria at 1°27' and 1°51' west longitude and at 34°27' and 35°18' north latitude. It is bounded by the Mediterranean Sea to the north, the wilaya of Naàma to the south, the Algeco-Moroccan border to the west, the wilaya of sidi Babel abbots to the southeast and the wilaya of Ain timouchant to the northeast. The wilaya of Tlemcen covers an area of 9017.69 km. From the coast to the north to the steppe to the south constituting a landscape diversifies or meets it four distinct physical ensembles. This heterogeneity of relief begins with: The chain of the Traras mountains and the Sebaachionkh mountains whose altitude varies between 500 and 1000 M.

- The sublittoral plains represented by the basin of Tlemcen and the low valées of the Tafna and Isser, and the plateaus of Ouled Riah being located 200 and 400 M of altitude.
- The mountains of Tlemcen which stand as a real natural barrier between the steppe and the tell, and culminate at 1845m at the Jebel Tenouchifi (Sidi Djilali) and not exceeding the 20 KM wide.
- All the high steppe plains are wide of about 100 KM and an altitude of 1100 M on average.

Field prospecting

Field prospecting was done in Tlemcen region with farmers and hunters of the region, aiming not only to have a sampling of individuals for morpho-metric characterization, but also to define the environment and dispersion of porcupine in the region study (the range). Traps have also been set up for catching animals. During all our outings we took with us a tape put and a camera.

Morpho-Biometric study

a survey has been released in this study to hunter , 25 questions were asked about , their age , education level , the field of work , occupations ..ect and there was questions about the use and breeding of porcupine , in the region of study and how farmer and hunters treat this animal.(veiw the appendice 1).

the sampling of animals in the state of Tlemcen (table 01) is in objective to study the morphometric characteristics of the population of porc-epic (*Hystrix cristata*) in collaboration with farmers and hunters . however the selection of hunting areas was through Animals footprints and droppings (Figure 02)

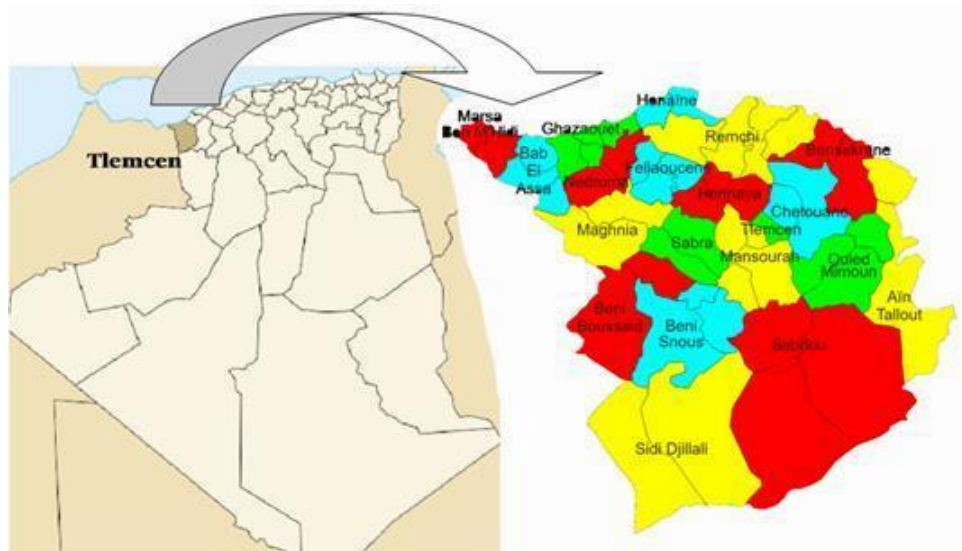


Figure 1: study zone

Table 1: Geographical Location of Study Areas

Region	Geographical Location
Maghnyia	34° 51' 42" North, 1° 43' 50" West
Ghazaouet	35° 05' 38" North, 1° 51' 37" West
Remchi	35° 03' 00" North, 1° 26' 00" West
Ain Fezza	34° 52' 38" North, 1° 14' 07" West
Mafrouche	34°47'45" North, 1°21'29" West



Figure 2: Traces of the animal (Tlemcen 2018)

Sampling was done on individuals of both sexes, male and female. A total of 22 individuals were sampled including 12 males and 10 females as shown in Table 2.

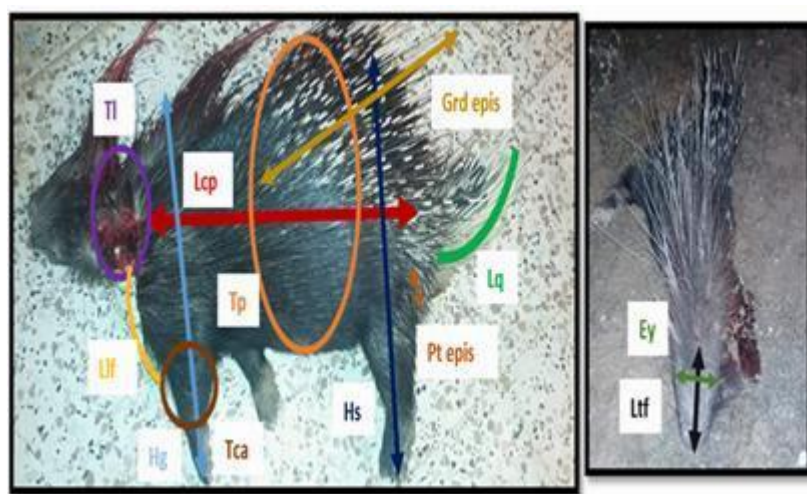


Figure 3: Representation of quantitative variables (Mafrouche, 2019)

Table 2: Distribution of the number of individuals by sex

Sexes	Number of individuals
Males	12
Females	10

The description of the qualitative characteristics was made using visual examination. Two qualitative variables were studied (Table 3):

Table 3: Qualitative variables studied

character	Abbreviation	Modality
sex	sex	1=male;2=female
Color of the dress	CR	1=light brown MC 2=brown darken (MF) 3=black(N)

The description of the quantitative characteristics was carried out using a tape measure, each animal of which was subjected to 15 body measurements (Figure 03) defined at the table 4.

The data processing was carried out by software R (3.5.1). Before starting the statistical tests, a normality test on the data of the different characters was carried out with the "Feather Spray" test. A descriptive analysis of the qualitative and quantitative variables as well as the correlation between the quantitative variables (Pearson test) was understood. The multivariate analysis was performed via the principal component analysis, hierarchical bottom-up classification and Mahalanobis distance.

Physico-chemical analysis of meat

The physico-chemical study was carried out for 2 individuals (male and female) of the Ghanmi breed, (Figure 4 and Table 5) at a private quality analysis laboratory approved by the state (Karaouzen)

Table 5: individuals sampled for meat analysis

sex	Weight (Kg)
female	24.5 Kg
Male	22.5 Kg

Table 4: Quantitative variables (definition)

measure	abbreviation	principle
Body length	lcp	The horizontal distance from the tip of the shoulder to the ischion
Height at withers	hg	The waist from the lower part of the front foot to the highest point of the shoulder on the withers.
Height at the sacrum	Broken	Distance from sacrum to ground
Chest circumference	Tp	The circumference of the body behind the scapula in a vertical plane, perpendicular to the longitudinal axis of the body.
Tower of the previous gun	tca	Tower of the front foot gun
Tail length	LQ	Distance from tail attachment point to endpoint
Neckline Tower	tl	The full circumference of the neck circumference
Front neckline length	LLF	Distance between the roots of the horns and the beginning of the withers
Frontal head length	Ltf	From the beginning of the forehead to the muzzle
Gap between the eyes	Ey	Distance between the eyes
Length of the large ppes	Grd epis	Length of the large ppes
Length of the large ppes	Pt epis	Length of the large ppes

NB: All measurements are in centimeters.

For the physico-chemical analysis, 100 g of fresh meat from two healthy individuals was used, collected cleanly in sterile sachets and placed in a cold cooler at 4 ° C and sent to the analysis laboratory. The manipulation in the laboratory is done within 24 hours after the bleeding of the animals. The preparation and analysis of the sample was done in the laboratory according to the protocol cited in the appendix 2



Figure 4: individuals sampled (male and female) after bleeding (Original 2019)

Results

Field prospecting

In the field, all of the people (farmers and hunters) interviewed were men between the ages of 20 and 40. Farmers set traps for animals (Figure 5) as animals are considered pests of agricultural fields. According to our survey to farmers this animal attacks mainly the fields of potatoes, pepper, pumpkin, turnip and cucumber. However it is noticed by these farmers that the porcupine does not cause damage on the fields of tomato, watermelon, pepper sting.

Porcupine hunters were more difficult to apprehend than farmers because Algerian legislation prohibits the hunting of this animal. Hunters were at 60% traders, the rest were officials in different areas. The main cause of the porcupine's hunt was for its tasty and beneficial meat (according to the people questioned its meat is used to treat diabetics, and the stomach of the porcupine is used in traditional therapy against stomach cancer) (Figure 6). According to several people interviewed they hunt this animal for pleasure. All hunters hunt porcupine during the night (because this animal is nocturnal) and this with the help of specialized dogs trained from a young age in hunting



Figure 5: Cob pig trap (Maghnia, 2019)

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Figure 6: Photos of dishes produced with porcupine meat (hunter from the Tlemcen region, 2019)

This animal is known by its aggressiveness and according to hunters the female becomes more dangerous after low-blooding which causes injury to dogs (the lesion by the spines causes swelling and great pain). Figure 7.

Field prospecting has allowed us to value and know closely the porcupine of the Tlemcen region. Two breeds are described in this region by farmers and hunters, GHANMI and ANZI. The majority of people say that the Tlemcen region is known by the GHANMI breed (Figure 8) and the eastern Algerian regions are known by the ANZI breed (Figure 9). Hunters say that the majority of hunted individuals are dark black and dark brown, but they have also encountered light-colored animals. (Figure 10 and 11)



Figure 7: Damage caused by porcupine (Tlemcen Region,2018)



Figure 8: photo of porcupine ANZI (hunters of the Benisaf region, 2018)



Figure 9: photo of porcupine GHANMI (Remchi ,2019)



Figure 10: white porcupine photo (Maghnia area hunter, 2017)



Figure 11: white porcupine photo (Benisaf Region Hunter, 2010)

Morphometric study

Descriptive analysis

The results of the quantitative characters are reported in: arithmetic mean, standard deviation and minimum and maximum values (Table 6).

Table 6: Descriptive analysis of body measurements in the porcupine population studied.

	Average (Cm)	Standard Error	Médiane (Cm)	Min (Cm)	Max(Cm)
weight	17.29	3.21	16.80	12.5	24.5
Grd.epis	44.76	5.99	45.50	36.0	55.0
Pt.Epis	2.16	0.71	1.90	1.3	3.6
lcp	44.30	6.55	42.50	36.5	60.0
hg	34.70	3.94	34.50	28.0	42.0
Tp	80.73	15.59	84.50	57.0	115.0
tca	17.80	0.54	17.60	17.0	19.0
Tq	17.86	0.54	17.70	17.0	19.0
tl	32.16	3.32	31.25	27.0	40.0
llf	18.53	2.31	17.70	15.8	24.0
Inf	19.36	0.36	19.40	18.6	20.0
Ey	11.41	0.28	11.40	11.0	12.0

LCp: Body length, HG: Height at withers, HS: Height at sacrum, TP: Chest circumference, TCA, Anterior barrel circumference, LQ: Tail length, TL: Neckline length, LLF: Front neckline length, LTF: Frontal head length, EY: Gap between the eyes, Grd epis: Large epi length, Pt epis: Largeepis length

For skin color (Figure 12) the data are represented as a percentage as suis: 59.09% black, 36.36% dark brown and 4.54% light brown. (Table 7)



Figure 12: the different results of porcupine colors found in the region of Tlemcen (Original, 2019)

Table7: Results of the qualitative characteristics of the individuals studied

The color of the skin	Number of individuals	Percentages %
Dark brown	8	36.36
black	13	59.09
Light brown	1	4.54
total	22	100

The graphical interpretation of the PCA's results is carried out mainly according to plan 1-2 (Table 08) (95.20% contribution for axis 1 and 1.84% for axis 2). Which is very interesting statistically.

Principal component analysis (PCA) of the body measurements variables in porcupine (with the value α set at 0.05) allowed their distributions as shown in Figure 13.

Table 8: The percentages of information represented by the selected dimensions

	Sun.1	Sun.2
variance	11.42	0.22
Percentage of variance	95.20	1.84
Cumulative percentages	95.20	97.05

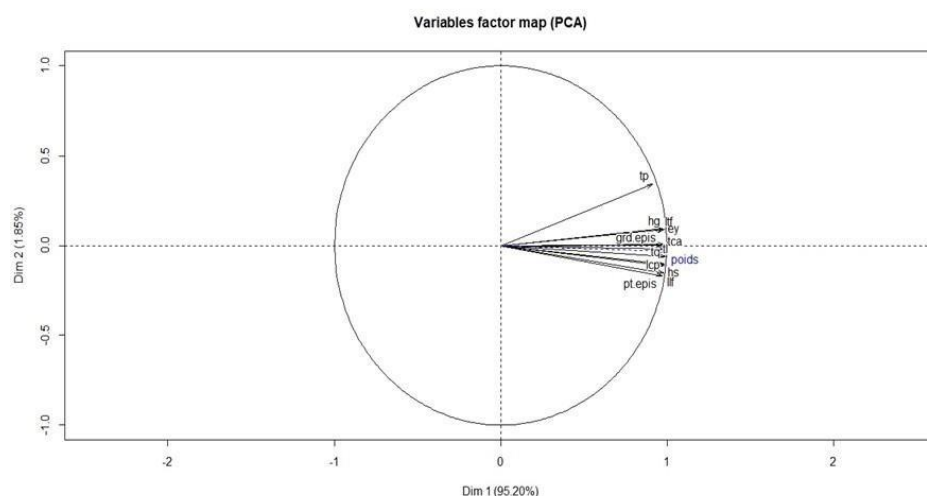


Figure 13: PCA correlation circle of study variables.

Figure 13 shows the correlation circle of the variables and shows that the variables are positively correlated and are grouped into a single group. Thus no negative correlation is observed.

The observed results show that the variables are close to the periphery of the circle and therefore expresses statistically correct results. The grouping of these traits can be explained by the fact that these traits are under the probable influence of the same group of genes globally.

Variation of variables

In order to identify in relation to that factors our sampled animals can be individualized, we began an analysis of the data by fixing the region, sex, and skin color.

Variation by region

Table 9 shows the body measurements in the porc-epic at the level of 5 different regions: Maghnia, Ghazawat, Remchi, Ain Fezza and Mafrouche in the wilaya of Tlemcen. (Table 9).

Table 9: variation of variables by region

Variables	P-value	Significance (P)
weight	0.028	*
Grd.epis	0.008	**
Pt.Epis	0.067	Ns
lcp	0.025	*
hg	0.028	*
Broken	0.060	Ns
Tp	0.097	Ns
tca	0.041	*
Tq	0.057	Ns
tl	0.027	*
Llf	0.039	*
Ltf	0.018	*
Ey	0.010	**

LCP: Body length, HG: Height at withers, HS: Height at sacrum, TP: Chest circumference, TCA, Anterior barrel circumference, LQ: Tail length, TL: Neckline length, LLF: Front neckline length, LTF: Frontal head length, EY: Gap between the eyes, Grd epis: Large epi length, Pt epis: Large epi length, *: $p < 0.05$ significant, **: $p < 0.01$ very significant, Ns: not significant

The results show that there is a significant variation ($p < 0.005$) depending on the region for the characters: Weight, length of the large spike, length of the body (Lcp), height at the withers (Hg), turn of the anterior barrel (Tca), turn of the neckline (Tl), length of the frontal neckline (Llf), length of the frontal head (Ltf), gap between the eyes (Ey) for the variables that remain, there are no significant differences between the variables ($p > 0.05$).

Principal component analysis of individuals by region shows that:

- The majority of individuals in the inner solid areas have important values. This is the case of animals in the maghnia and remchiregion.
- The majority of individuals in forested areas carry low values. This is the case of animals in the region of Ghazawat, Mafrouche and Ain Fezza.
- Animals in the Ain Fezza region and those in the Ghazawat region appear to be more homogeneous and grouping than other animals in other regions.

This difference in performance between animals of the open interior and forest and may be due to a form of adaptation to the climate, diet and environment but also has genetic differences. The regrouping of animals from the Ain Fezza regions and those from the Ghazawat region is probably due to the isolation of these two populations.

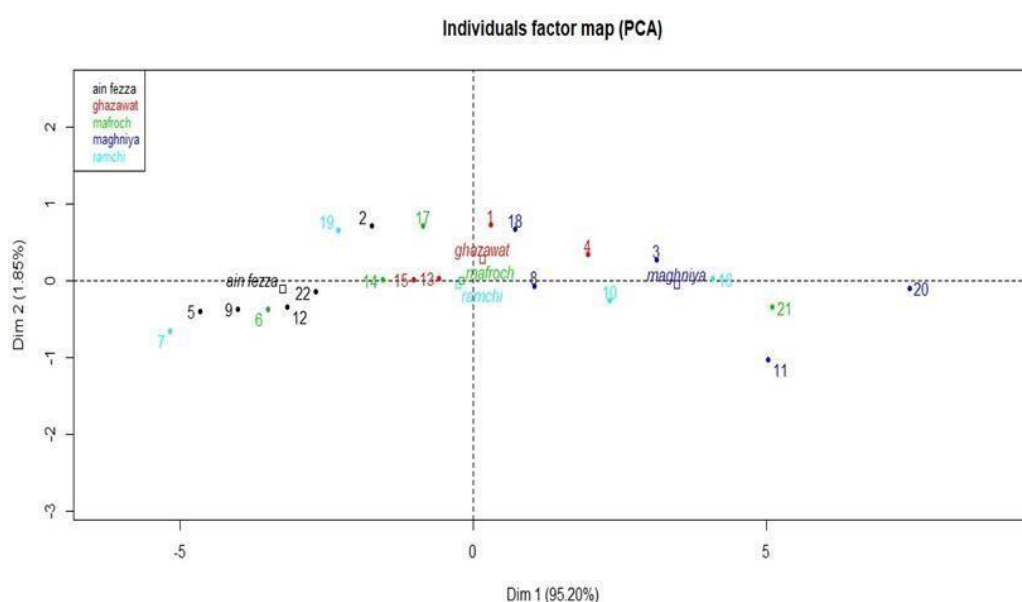


Figure14: Analysis of principal components (distribution of individuals by region)

Variations by sex

Table 10 presents body measurements in porcupine by sex in the study area. The results show that there is a significant variation ($p < 0.005$) by sex for the characters: Weight, height at the withers (Hg), height at the sacrum (Hs), turn of the anterior barrel (Tca), length of the tail (Lq), turn of the neckline (Tl), length of the frontal head (Ltf) and gap between the eyes (Ey).

For the remaining variables there are no significant differences between the two sexes ($p > 0.05$).

Principal component analysis of individuals by sex shows that the animals are fairly homogeneous and that sexual dimorphism is not very apparent (Figure 15).

Variations by skin color

From statistical analyses of body measurements in porcupine by skin colour in the Tlemcen region it is clear that there are no significant differences ($p > 0.05$) for any traits studied (Table 11).

Table10: Variation of variables by sex

Variables	P-Value	Significance (P)
weight	0.037	*
Grd.epis	0.062	Ns
Pt.epis	0.062	Ns
lcp	0.054	Ns
hg	0.021	*
Broken	0.041	*
Tp	1.93	Ns
tca	0.023	*
Tq	0.023	*
tl	0.043	*
Llf	0.073	Ns
Ltf	0.033	*
Ey	0.014	*

*LCp: Body length, HG: Height at withers, HS:Height at sacrum, TP: Chest circumference, TCA, Anterior barrel circumference, LQ: Tail length, TL: Neckline length, LLF:Front neckline length, LTF: Frontal head length, EY:Gap between the eyes, Grd epis:Large ppes length, Pt epis: Large ppeslength / * : $p < 0.05$ significant, Ns: not significant*

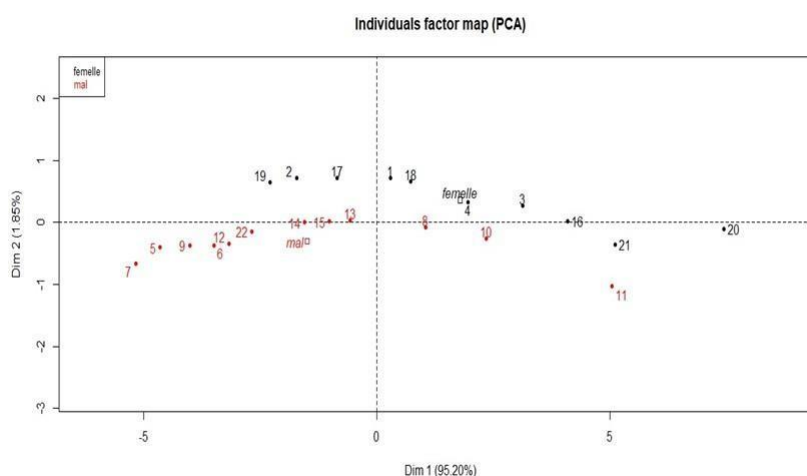


Figure 15: Analysis of major components (distribution of individuals by sex)

Table 11: variation of variables according to skin colour

Variables	P-value	Significance. (P)
weight	0.319	Ns
Grd.epis	0.315	Ns
Pt.epis	0.340	Ns
lcp	0.382	Ns
hg	0.278	Ns
Broken	0.372	Ns
Tp	0.281	Ns
tca	0.347	Ns
Tq	0.321	Ns
tl	0.340	Ns
Llf	0.365	Ns
Ltf	0.309	Ns
Ey	0.181	Ns

LCp: Body length, HG: Height at withers, HS:Height at sacrum, TP: Chest circumference, TCA, Anterior barrel circumference, LQ: Tail length, TL: Neckline length, LLF:Front neckline length, LTF: Frontal head length, EY:Gap between the eyes, Grd epis:Large ppes length, Pt epis: Large ppeslength, Ns: significant not significant

Principal component analysis of individuals by skin colour and distribution shows no difference between individuals (Figure 16).

Hierarchical Bottom-up Classification (HAC)

The hierarchical bottom-up classification (HFA) (Figure 16) of our sample reflects the same results expressed by the principal component analysis of individuals and it distinguished four (4) classes (Figure 18).

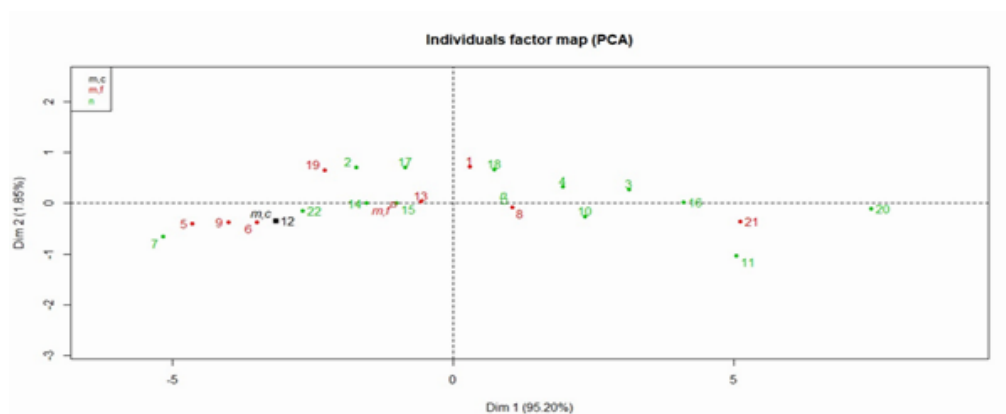


Figure16: Principal component analysis (distribution of individuals by skin colour)

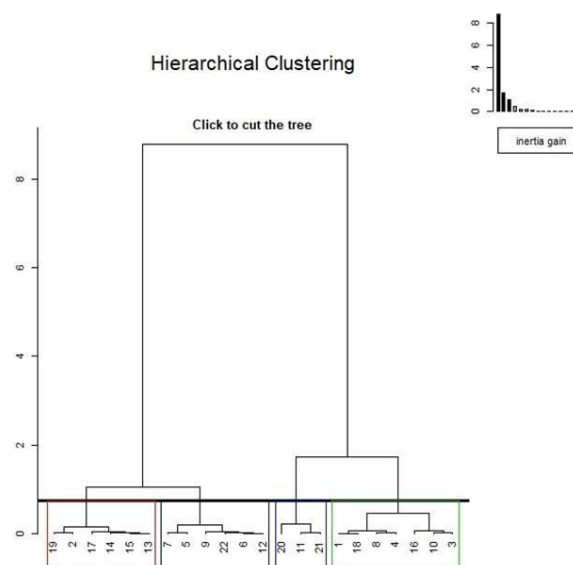


Figure17: Dendrogram of hierarchical ascending classification

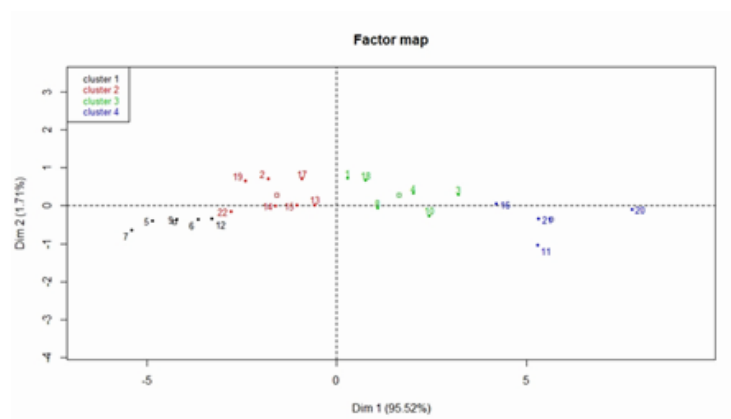


Figure18: Principal Component Analysis by Class

Cluster 1 in black group individuals who have low values for the characters studied..We detecte that the majority of individuals are from forested areas like a region of Ghazawat, Mafrouche and Ain Fezza.

Cluster 2 in red and cluster 3 in green group animals that have average values for the characters studied. The majority of animals was from Ain Fezza region and those of Ghazaouet region.

Cluster 4 in blue group together the individuals who have the most important values for the characters studied. We observe that the majority of individuals was from maghnia and remchi region.

The Dendrogram of hierarchical ascending classification of our sample reflects the same results expressed by the principal component analysis of individuals by region.

Distance de Mahalanobis

All morphometric analyses revealed the existence of morphologically differentiated (4 groupes). The Mahalanobis distance of all variables is not large and this means that the variables correspond to the standards of the data set. (Figure 19 and 20)

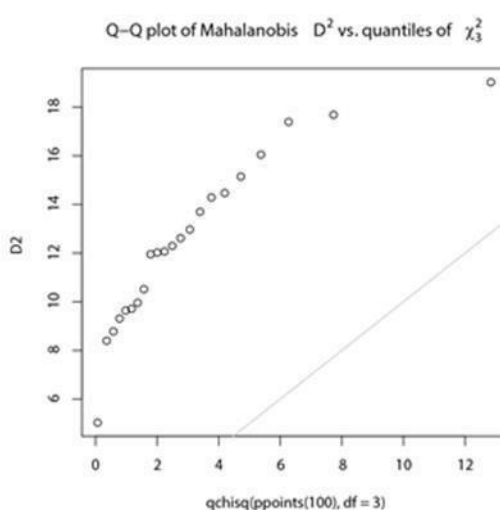
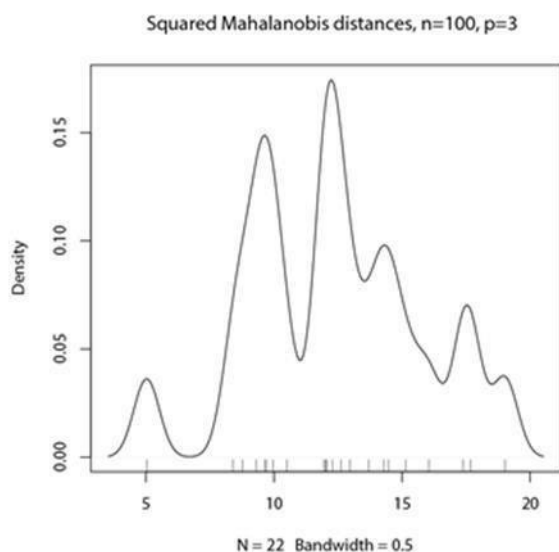


Figure 19: distance from Mahalanobis to squared

Figure 20: Quantile-Quantile Diagram

The dendrogram of the Mahalanobis distance (Figure 21) of our sample made it possible to distinguish four (4) classes based on the different body measurements carried out during our experiment and confirms the previous analyses.

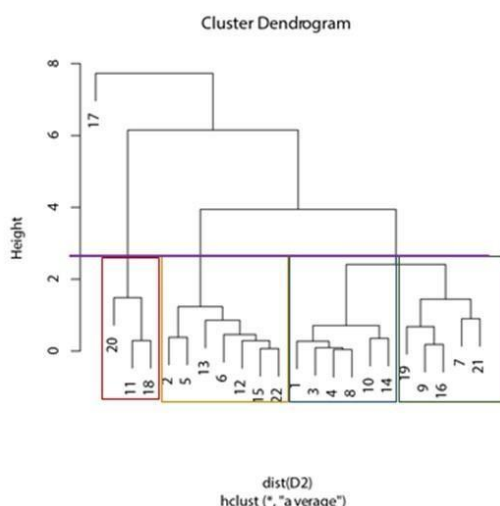


Figure 21: Dendrogram of mahalanobis distance

Physico-chemical analysis of meat

The results of physico-chemical analysis of the meat (100g of fresh meat) of the 2 individuals (male and female) of the Ghanmi breed are cited in Tables 12 (for the male) and 13 (for the female).

The analysis of the carbohydrate content and energy value of carbohydrates for 100 g of meat was negative that shows that porcupine meat is low in carbohydrates. On the other hand the protein content is 20-21.5 g per 100 g respectively for the female and the male. On the other hand, the lipid content is quite important in the female by contribution that of the male (3g in the female and 1.35 g in the male).

Table12: Result of the analysis of "male" porcupine meat

Parameters	Result
Lipid content	1.35g
Energy value of lipids	12.15 K cal –49.95 K joules
Protein content	21.53 g
Energy value of proteins	86.12 K cal – 360 K joules
Carbohydrate content	00 g
Energy value of carbohydrates	00 K cal –00 K joules
Total energy value	98.27 K cal – 410 K joules

Table13:Result of the analysis of "female" porcupine meat

Parameters	Results
Lipid content on 100g product	3g
Energy value of lipids on 100g of product	27K cal – 111 K joules
Protein content on 100g product	20 g
Energy value of proteins on 100g of product	80 K cal – 340 K joules
Carbohydrate content on 100g of product	00 g
Energy value of carbohydrates on 100g of product	00 K cal – 00 K joules
Total energy value on 100g of product	107 K cal – 451 K joules

If we compare our results with rabbit meat (*Oryctolagus cuniculus*), chicken (*Gallus gallus domesticus*), and calf taurillon (*Bos taurus*) for 100g described by Ciquale, 2008 and Combes, 2004; Salvini et al., 1998 it is noted that the protein content in rabbits and calf is close to that of male porcupine. For chickens and taurillons the protein content is less important than that of the male porcupine but is a little closer to the values of that of the female. If we compare the lipid content in chicken, veal, taurillon and rabbit these values are important compared to that reported at the level of the meat of the male and the female porcupine. On the other hand, the carbohydrate content in rabbits described by Ciquale, 2008 is 0.5 g / 100g of meat while in porcupine carbohydrates are non-existent. The total energy value per 100g of rabbit meat is 167 kcal while it is 98.27-107 Kcal in porcupine.

Conclusion

In the present study, we addressed the agro-ecological, phenotypic, physico-chemical aspect of cob pigs (*Hystrix cristata*) in the wilaya Tlemcen. Field surveys have begun to gain knowledge of this species in terms of its way of life, diet, habitat and distribution, characteristics and importance in the Tlemcen region. 22 adult porcupines were sampled: 10 females and 12 male in 5 different areas (Maghnia, Mafrouche, Ain Fezza, Ghazawat and Remchi) of the wilaya of Tlemcen. The morpho metric study is based on 13 quantitative variables and 3 qualitative variables; this approach was carried out by the descriptive analysis of the variables and a study of the correlations between the quantitative variables, followed by an analysis in main component and finally a hierarchical bottom-up classification. Descriptive analysis revealed that females have a greater build than males; the black color of the skin (59.09%) is the most dominant compared to the dark brown color (36.36%) and light brown (4.54%). The principal component analysis (PCA) showed that all quantitative variables are positively correlated with each other. The main component analysis of individuals by region shows that the majority of individuals in the interior plains have important values (Maghnia and Remchi) and the majority of individuals in forest areas have the lowest values (Ghazawat, Mafrouche and Ain Fezza). Principal component analysis of individuals by sex shows that females contain high values by intake to males. Principal component analysis of individuals by skin color shows no difference between individuals. The hierarchical bottom-up classification (CAH) confirmed the results of the

CPA which allowed us to distinguish 4 classes. The results of physico-chemical analysis of the fresh meat of the 2 individuals (male and female) of the Ghanmi breed, per 100g of fresh meat reveal that the protein content is 21.5-20 g, the lipid content is quite important in the female by intake to the male (3g in female and 1.35 g in the male). On the other hand, the carbohydrate content and for 100 g of meat was zero.

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