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

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Abstract
In Algeria, the work undertaken on the ecology of wild rodents mainly focuses on gerbils and meriones, and Clendactylidae. As for hystricid, 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 tot al 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 (Ghazaawat, 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 100 g 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, physico-chemical, characterization, Algeria

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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 Ntiamo-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 gerbils and meriones (Bela Bbas, et al, 1994; Adamou-Djerbaoui, 2012 ) , and the Céndactyloidea (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 concern 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 obiteral, 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 Algero-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 aisi a landscape diversifies or meets 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 seppe and the tell, and culminate at 1845m at the Jebel Tenouchi (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 prospection

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 hunters. 25 questions were asked about their age, education level, the field of work, occupations, etc. and there was a question about the use and breeding of porcupine in the region of study and how farmer and hunters treat this animal. (view 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 animal footprints and droppings (Figure 02).

![Figure 1: study zone](image1)

![Figure 2: Traces of the animal (Tlemcen 2018)](image2)

**Table 1: Geographical Location of Study Areas**

| Region    | Geographical Location                          |
|-----------|------------------------------------------------|
| Maghnya   | 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                 |
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.

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 pppes| Grd epis     | Length of the large pppes                                                  |
| Length of the large pppes| Pt epis      | Length of the large pppes                                                  |

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.
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![Figure 5: Cob pig trap (Maghnia, 2019)](image)

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.

| Character   | 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      |
| Icp         | 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     |
| Ilf         | 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 neck line 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)](image)

**Table 7**: 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 necklace 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)](image)

**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).
Table 10: 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).

**Figure 16:** Principal component analysis (distribution of individuals by skin colour)

**Figure 17:** Dendrogram of hierarchical ascending classification

**Figure 18:** 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).

Table 12: 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 cals – 410 K joules                 |

Table 13: Result of the analysis of "female" porcupine meat

| Parameters                                           | Results                                      |
|------------------------------------------------------|----------------------------------------------|
| Lipid content on 100g product                        | 3g                                           |
| Energy value of lipids on 100g 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 cals – 451 K joules                    |

If we compare our results with rabbit meat (Oryctolagus cuniculus), chicken (Gallus gallus domesticus), and calf taurillon (Bostaurus) 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 morphometric 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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