Assessment of the Carcass quality of Goats in the El-Tarf region, eastern Algeria

Ouennes Houria[*], Sahi Sameh[**], Bouzebda Afri Farida[*],Bouzebda Zoubir[*],Djaout Amel[***]

[*] Animal Production, Biotechnology and Health Laboratory. Institute of Agronomic and Veterinary Sciences. University of Mohammed Chérif Messaadia. Souk-Ahras 41 000, ALGERIA
[**] Chadli Bendjedid University of El Tarf. BP : 73, El Tarf 36000, ALGERIA
[***] Algerian National Institute for Agronomic Research (INRAA). Sétif 19 000, ALGERIA.

Abstract- The aim of this study is to assess goat carcasses (conformation, carcass measurements, fat cover, live weight, carcass weight, yield) and calculate correlation coefficients between the various parameters measured. In order to determine the influence of sex and age on body measurements and the characteristics of the goat carcass, as well as the relationship between live weight (pre-slaughter and post-slaughter) and body measurements. This study was carried out on a total of eighty goats from the local population at the Ain Assel abattoir in the wilaya of El-Tarf, eastern Algeria. The values recorded were 29.94 ± 7.86 kg, 64.84 ± 4.71 cm, 69.95 ± 5.18 cm, 61.88 ± 6.84 cm and 61.88 ± 4.94 cm for PV, HG, PT, LC and HC respectively. Carcass measurements for PC, K, G, F, TH, Pp and Ptm were 15.39 ± 4.89 kg, 68.40 ± 4.48 cm, 21.02 ± 4.48 cm, 32.97 ± 3.66 cm, 31.58 ± 4.56 cm, 1.62 ± 0.38 kg and 3.15 ± 0.65 kg respectively. If the variations are significant, this proves the possibility of selection with a view to improving these characteristics.

Keywords
Goat, Barymetry, Meat performance, Carcass, Algeria

I. INTRODUCTION

Livestock genetic resources are an important component of global food security, as this sector contributes to economic development and sustainable livelihoods for rural and urban populations (FAO 2024).In Algeria, ruminant farming, and more specifically small ruminants, goats in particular, are a vital component of the national economy, providing high-quality products in often difficult climatic and environmental conditions .In Algeria, the red meat sector is based on cattle and sheep farming, while camel and goat farming remain marginal. demand and the low elasticity of production (Ferrah 2005). Algerian goat herd is made up of four main breeds (Arabia, Makatia, M'zab or M'zabia and Kabyle) in addition to other so-called improved breeds, with a population of over 5 million head (FAOstat, 2023). The goat is considered to be a useful dairy animal that is well adapted to all environments, which favours its spread in mountainous, semi-arid and desert areas (Sahi et al., 2022).

In particular, goat meat is also a lean meat compared to other red meats. This is due to the fact that a large proportion of the total fat in goat carcasses is deposited in the viscera (Webb et al 2005). The main meat consumed in the El-tarf region comes from small ruminants, particularly goats (DSA 2024); goats from local populations are mainly reared for meat production, which accounts for around the largest share of regional red meat consumption. These animals are better adapted than sheep to harsh conditions and environments, because they have a greater capacity to consume the plant resources richest in cell walls, such as trees and shrubs and rangeland vegetation. In recent years, consumers have shown renewed interest in goat meat because of its good protein quality, low saturated fatty acid content and affordable price compared with beef and sheep meat (Devendra 1988; Yerou et al 2023).

Certain classic zootechnical performance criteria, such as carcass weight and growth rate, give a very interesting commercial advantage in line with the expectations of both producers and consumers. With this in mind, we have undertaken a study of carcass assessment measurements (conformation, carcass measurements, fat cover, live weight, carcass weight, yield) and the calculation of correlation coefficients between the various parameters measured.

II. MATERIALS AND METHODS

1. Study area

Our study was carried out at the slaughterhouse in Ain Assel, in the wilaya of El-Tarf , in the extreme north-east of Algeria. It should be stressed that this is not a slaughterhouse in the strict sense of the term, but rather a slaughterhouse located inside the livestock market. Every week, this livestock market receives several hundred head of cattle, sheep and especially goats, almost all of which come from neighbouring communes.

2.Animals studied

The study involved the analysis of body measurements and carcass measurements of 80 goats (57 males and 23 females) of local breeds from the El-Tarf region. Ante-mortem and post-mortem examination of these live goats and their carcasses did not reveal any marked anomalies. The age (months) of these animals was recorded according to their dentition.

3. Variables studied

3.1. On live animals

Before slaughter, these animals were weighed on a scale to determine live weight, and the following body measurements were taken using a tape measure: Height at withers (HG), Length of body (LC), Thoracic perimeter (PT), and Height at rump (HC) (Desta., 2009).

3.2. On Carcass

Carcass measurements were taken on the left half, as suggested (Sen et al., 2004; Abdel-Moneim, 2009a; Abdel-Moneim, 2009b; Limea et al., 2010). These linear measurements were: pelvis width (G), carcass length from tail to neck (K), thigh length (F) and chest depth (Th), and were taken using the standard reference method with a tape measure to the nearest 0.5 cm. Carcass weighing (CW) was carried out for each carcass separately (unlike collective weighing, which is done at the slaughterhouse) within the hour of slaughter (hot carcass). This operation was carried out either using an electronic scale, which is suitable for carcass weights of less than 30 kg, or using a load cell for carcasses over 30 kg. The weights of the skin (Pp) , head and limbs (Ptm) were determined using an appropriate electronic scale.The conformation and fat cover scores (from 1 to 5) of each cold carcass were determined visually using the ovine grid (OFIVAL., 2005). In this work, we sought to apply these methods of assessing the body condition of goats using palpation at different anatomical sites. New sites have been tested: the fat of the shoulders and the fat of the legs have also been observed, but it should be borne in mind that this assessment depends on the limits of the means available and the very thin state of the goats slaughtered.Carcass yield (CR) is the measure of carcass weight compared to the live weight of the animal and is calculated according to the formula:

$$RC = (\text{hot carcass weight/live weight})*100.$$

4.Statistical analysis

The effect of age and sex were compared using the Student Newman-Keuls multiple comparison test. The correlation coefficient was used to determine the degree of linear relationship between body weight, measurements and carcass traits. All data were analysed using SPSS (version 19) statistical analysis software.

III.RESULTS AND DISCUSSION

1. On live animals

The first important observation to emerge from this study concerns the structure of the herd. Male goats outnumber females (Table 1). The animals studied had an average age of 32.18 months. The average age for males and females was 20.32 and 61.57 months respectively. Males were slaughtered before the age of 60 months, making up of the category slaughtered at 12 months, while females accounted for 95 of the category over 60 months (Table 1).

These results confirm what has been described, i.e. that females tend to be used as breeders and are only intended for meat production at the end of their career, whereas the majority of males are exploited at an average age of less than one year for the production of kids for slaughter (Chapleau and Michaud, 2005). These data also corroborate those on goats in North Cameroon (Tama et al., 1994; Tamboura and Berte., 1994).

Table I. Presentation of the animals studied.

Age (months)	[6-12 [	12	] 12-18 [	[24-36 [	] 36-48 [	[48-60 [	+60	Average age
♂	11	13	11	10	08	03	01	20,32
♀	0	0	00	01	01	01	20	61,57
Total	11	13	11	11	09	04	21	32,18

♂: male, ♀: female.

Morphological measurements have traditionally been used to characterise different breeds of animals by many researchers, as well as to predict body weight and carcass characteristics (Khan et al., 2006; Pesmen and Yardimci., 2008; Abd-alla, 2014). Objectively measured body size and shape could improve selection for growth by allowing the breeder to recognise early and late maturation of animals of different sizes (Akpa et al., 2013). Where genetic evaluation still has limited use, the identification of certain descriptive linear traits can be useful and farmer-friendly tools to select goats with desirable traits (Haldar et al., 2014).The body measurements obtained in this study were as follows: height at withers (HG) 67.90 ±4.58 cm, length of body (LC) 61.88 ± 6.84 cm, circumference of chest (PT) 69.95 ±5.18 cm. Identical values have been reported for height at withers (67.9 cm) in Alpine goats bred in Hungary (Németh et al., 2005).

Body weight is an important economic trait in animal selection and the main objective of breeding practices is to improve economic characteristics. The live weight of the goat population studied, presented in Table 2, was 29.94 ± 7.86 kg. An average live weight of 54.08 in the Hungarian Alpine breed has been reported (Németh et al., 2005). Sexual dimorphism was not significant between females and males, no significant difference between live weights of goats varied significantly with sex ($p<0.05$), no significant difference was found in height at withers and body length which are commercially important traits for judging animals on local markets. However, a significant difference was found in thoracic perimeter (Table 3). Highly significant differences in Height at Withers and Height at Rump before Slaughter were found between age groups, for Thoracic Perimeter and Live Weight (kg) the differences were very highly significant ($p<0.001$) while Body Length was non-significant.Changes in the weight of the goat herd were observed in relation to changes in age. Statistical analysis of

the data showed broadly similar results. However, considering the age group of (24-36) months as adult age and based on live weight (LW), with an average live weight of (34.82 ± 6.69) kg, the change in live weight was highest in this age group for both sexes. This extension of the age of puberty will therefore have an unfavourable effect on the growth and carcass weight of goats, which would explain the reduction in the average weight of the slaughtered herd. Compared with the results for the West African dwarf breed with 21.06 ± 0.77 kg (females) and 26.27 ± 1.10 kg (males) mentioned (Ogah et al., 2012).

Consistent with our results, significant differences in body length, withers height and heart circumference, prior to slaughter between the two Egyptian sheep and goat species were found (Mamdouh et al., 2014). Similarly, significant phenotypic correlations between body weight and morphometric traits across sexes (Simeon and Adewale., 2017).

Table 2. Body measurements of the study population.

	Average	Standard deviation	Err. Std	Min	Max
HG (cm)	67,90	4,58	0,51	55	78
PT (cm)	69,95	5,18	0,58	38	80
LC (cm)	61,88	6,84	0,76	40	77
HC (cm)	71,19	4,94	0,55	60	89
PV (kg)	29,94	7,86	0,88	13,2	46,5

HG= Height at Withers. LC= Length of Body. PT= Thoracic Perimeter. HC=Height at Croup. PV= Live Weight (kg).

Table 3. Effect of sex on body measurements (cm) and live weight (kg) before slaughter.

	Male	Female	P
N	57	23	
HG (cm)	68.19 ± 4.79	67.17 ± 4.03	ns
PT (cm)	69.12 ± 5.55	72.00 ± 3.42	*
LC (cm)	61.62 ± 7.04	62.52 ± 6.40	ns
HC (cm)	71.56 ± 5.48	70.26 ± 3.11	ns
PV (kg)	29.92 ± 8.70	29.99 ± 5.38	ns

*N= Number of Animals. HG= Height at withers. LC= Length of Body. PT= Thoracic Perimeter. HC=Height at Croup. PV= Live Weight (kg). Ns= Difference not significant. * = Significant difference at p< 0.05.*

2. On Carcass

Measurements of the conformation of the different parts of the body are of great value in judging the quantitative characteristics of the meat and are also useful in developing appropriate selection criteria. In addition, due to the relative ease of measuring linear dimensions, they can be used as an indirect means of estimating weight using barymetric formulae, as well as for assessing carcass quality. The values of all linear measurements (G, K, F and Th) of the carcass are presented in Table 4, the average chest depth (Th) is higher than that reported by several authors (Attah et al., 2004; Ferrah., 2005; Ayeb et al., 2017) for kids at a similar or higher slaughter weight than our goats. The values of carcass measurements (K and F) were lower than those recorded for carcasses of kids fed on local forage resources in the arid zones of southern Tunisia (Ayeb et al., 2017). The carcass conformation and fat cover scores are shown in Table 4, with the average not exceeding 2.58 ± 0.50, which suggests that the fat cover percentages are acceptable. In fact, the amount of visible fat on the carcass influences consumer choice (Dransfield, 2008), with the majority preferring a low-fat cover, although these choice criteria have not been determined for all consumers. These results are still better than those presented by (Ayeb et al., 2017), where the average conformation score does not exceed 2.

The average carcass weight in the whole population was 15.39 ± 4.89 with extremes of 7.5 and 31.4 kg. These results can be explained by the fact that our farmers are not very interested in fattening goats, and prefer to apply it only to sheep (Perault, 2009; Jibir et al., 2013). Our results are in line with those observed by Marichal et al. (2003) for Canary goats, with an average slaughter weight of (15.9 ± 4.2) kg.The yield, with an average of 51.32 ± 6., firstly indicates the heterogeneity of the carcasses slaughtered, which in itself is not surprising given the wide variations (in weight and fat cover) of the goats slaughtered. The average yield reported on carcasses of Creole goats reared under intensive conditions confirms our results concerning the effect of age on yield (Alexandre et al., 2009).Sex had no significant effect on the various carcass characteristics ($p>0.05$). Whereas males had a significantly greater pelvic width (G: 21.72 ± 4.70 vs 19.30 ± 3.37 cm, $p<0.05$) than females and a very highly significantly lower breast depth (Th: 30.28 ± 3.65 vs 34.78 ± 5.06, $p<0.001$). While males had a slightly higher fat cover ($p<0.05$) than females (2.58 ± 0.50 vs 2.57 ± 0.51).

Table 4. Carcass measurements of slaughtered animals.

	Average	Standard deviation	Err, Std	Min	Max
PC (kg)	15,39	4,89	0,55	7,5	31,4
Pp (kg)	1,62	0,38	0,04	0,9	2,5
Ptm (kg)	3,15	0,65	0,07	1,9	5,1
K (cm)	68,40	5,52	0,62	55	80
G (cm)	21,02	4,48	0,50	13	34
F (cm)	32,97	3,66	0,41	24	40
TH (cm)	31,58	4,56	0,51	26	44
R (%)	51,32	6,63	0,74	36,38	68,06
CEC	2,58	0,50	0,06	2	3

CP= Carcass weight. CEC= Goat flesh classification. K= Carcass length. G= Width of pelvis. F= Leg length. TH= Breast depth. Pp= Skin weight. Ptm= Weight of head and legs.

Table 5. Effect of sex on body measurements (cm) and carcass weight (kg) after slaughter.

	Male	Female	P
N	57	23	
PC (kg)	15.53 ± 5.39	15.03 ± 3.40	ns
Pp (kg)	1.67 ± 0.40	1.50 ± 0.31	ns
Ptm (kg)	3.20 ± 0.68	3.01 ± 0.56	ns
K (cm)	68.62 ± 5.83	67.84 ± 4.75	ns
G (cm)	21.72 ± 4.70	19.30 ± 3.37	*
F (cm)	33.24 ± 3.95	32.30 ± 2.80	ns
TH (cm)	30.28 ± 3.65	34.78 ± 5.06	***
R	51.88 ± 6.87	49.93 ± 5.92	ns
CEC	2.58 ± 0.50	2.57 ± 0.51	*

*N= Number of animals. CP= Carcass weight. CEC= Goat flesh classification. K= Carcass length. G= Width of pelvis. F= Leg length. TH= Breast depth. Pp= Skin weight. Ptm= Weight of head and legs. Ns= Difference not significant. * = Significant difference at p< 0.05. *** = Very highly significant difference at p< 0.001.*

In general, sex had no significant effect on skin weight (Pp) (P > 0.05) or extremity weight (p(tm)) (P > 0.05), despite a slight superiority of males. These results seem to indicate that these weighings are not sufficient to determine growth performance in goats, at least conditional on sex. In our study, conformation score was positively correlated with sex. Previous studies have confirmed a link between conformation score and meat yield (Pamo et al., 2010).

Hot carcass weight and yield were significantly different according to age. These results confirm previous ones. Sen et al (2004) found that yearling sheep had a higher (p<0.05) carcass weight (14.9 kg) than Indian male goats (10.1 kg). As confirmed by Alexandre et al. (2009), age and carcass weight are often associated, with growth becoming increasingly important from one age group to the next. Limea et al (2006) report average carcass weights of 23.2 to 27.6 kg for Creole goat carcasses slaughtered at different weights. This confirms the influence of age on development and body growth.The low average carcass weight (14.28 ± 2.49) of females over 5 years of age is explained by the fact that these females arrive at the slaughterhouse in a poor state of fatness, at the end of their career, and without first undergoing a finishing phase. This state could be improved by better management of this category of animals, which have a high capacity to regain live weight and carcass weight (Chapleau and Michaud, 2005).

It was observed that the weight of the skin, with an average of (1.62 ± 0.38) kg, head and limbs (3.15 ± 0.65) kg, increased proportionally with height, live weight and carcass weight as a function of age. These weights have an influence on performance, while for age, no marked significance emerged for these weights (p >0.05). However, there was always a slight increase in these weights from one age group to the next (Table 7).

4.Correlation analysis

The data in Table 6 show that the correlation between live weight and height at withers r = 0.85 and between live weight and thoracic perimeter r = 0.65 are significant (P<0.05). Carcass weight, which has no significant errors because it is determined by electronic weighing, is a reliable criterion for assessing meat production in goats, and we feel that it is important to study its correlation with the other measured and calculated traits. Randrianariveloseheno et al (2015) reported that thoracic perimeter was a better parameter for predicting goat performance as well as live weight.

Of the measurements taken, some showed significant correlations (p < 0.05) with the carcass weight of the animals. The best correlation was with live weight (LW), with a coefficient of 0.89. Other, equally significant correlations exist between the carcass weight and the height at the withers of the animals r = 0.88, the evaluation of the carcass weight of the animal is also possible thanks to this coefficient correlation. The possibility of estimating carcass weight from conformation criteria is not unknown, since it has already been shown that body weight can be reasonably estimated from a few linear measurements. This is due to the significant correlation that exists between carcass weight and: carcass length K (0.20**), pelvic width G (0.15**)height at withers HG (0.38**); as well as with height at rump HC (0.40**), a high correlation is reported between carcass weight and live weight (0.89**).

Table 6. Correlation coefficient between carcass weight and the various measurements taken

	PC	R	CEC	K	G	F	TH	Pp	Ptm
HG	0,89**	0,13	0,18	0,40**	0,27*	0,34**	0,12	0,37**	0,43**
PT	0,26*	0,06	0,20	0,28*	0,30**	0,23*	0,46**	0,21	0,28*
LC	0,24*	0,08	0,06	0,33**	0,22*	0,16	0,25*	0,29**	0,32**
HC	,406**	0,03	0,12	0,28*	0,16	0,22	0,18	0,23*	0,45**
PV	0,90**	0,04	0,58**	0,29**	0,15	0,23*	0,05	0,22	0,47**
PC	1	0,46**	0,49**	0,20**	0,15**	0,30**	0,04	0,17	0,40**
R		1	-0,04	-0,15	0,04	0,19	-0,03	-0,06	-0,07
CEC			1	0,17	0,25*	0,03	-0,07	0,20	0,12
K				1	0,31**	0,26*	0,25*	0,44**	0,51**
G					1	,64**	0,23*	0,60**	0,14
F						1	0,20	0,42**	0,19
TH							1	0,17	0,16
Ptm								1	0,50**
Pp									1

*HG= Height at Withers. LC= Length of Body. PT= Thoracic Perimeter. HC=Height at Croup. PV= Live Weight (kg). PC= Carcass weight. CEC=flesh condition grading of goats. K= Carcass length. G= Width of pelvis. F= Leg length. TH= Breast depth. Pp= Skin weight. Ptm= Weight of head and limbs. * = Significant correlation at p< 0.05. ** = Significant correlation at p< 0.01. *** = Significant correlation at p< 0.001.*

The correlation coefficient is r = 0.20 for the length of the carcass, and r = 0.15 for the width of the pelvis, and r4 = 0.04 for the depth of the chest. These measurements are the most reliable, because they include the three measurements (width, length and depth) that make up the body volume, which Quételet likened to a cylinder.

The correlation between yield and carcass weight (r = 0.46), while it varies (-0.07 and -0.06) with the weight of the skin, head and limbs. This negative correlation (p > 0.05) confirms their impact on carcass yield, stating that as the weight of skin, head and limbs increases, yield decreases. This is due to the fact that growth is accompanied in all animals by a change in the distribution of all organs and in particular an increase in skin.Carcass weight and body condition (CEC) were positively correlated with each other (r = 0.49), indicating that carcass weight (0.49 **), live weight (0.57 **) and, to a lesser extent, G-pelvis width (0.25*) were significantly correlated with body condition (CEC) (p < 0.05). However, correlations with the other parameters measured were not significant (p > 0.05), while correlations with yield and breast depth were negative (p > 0.05).

This relationship is not surprising, since the assessment of body condition score is always subjective. Moreover, the relationship between fat and carcass weight that emerges from this classification is the most obvious in ruminants. In fact, the traditional breeding system does not allow the local goat's butchery aptitudes to be brought out because of the strong seasonal variations and the reduction in the quality of forage species in parallel with that of feed efficiency; this would be at the origin of slower growth, especially for males or those born late (Bas et al., 2005). The growth potential of these animals is therefore poorly exploited. This study shows that our carcasses have moved away from defects considered to be major, such as elongation of the carcass or leg (reduced K and F). This is a very advantageous result, since in every country in the world, people are looking for short, wide carcasses with a short leg; excessive elongation of the carcass and hind legs is considered to be a non-negligible defect, making the carcass non-compliant.

VI. CONCLUSION

Our study has shown the difficulty of formulating an effective body condition score for goats. In fact, in this species and at the ages considered, variations in body condition are linked more to differences in the balance between skeletal mass and muscle mass, with adipose tissue representing a small percentage of the animals' weight. We have seen that there are undeniably relationships between the various morphometric measurements and the carcass weight of the animal. However, these relationships are weaker in most cases, and the best morphometric measurement for estimating live weight and carcass weight is carcass length. The advantage of this measurement is that its correlation with live weight and carcass weight remains significant.

REFERENCES

1. Abd-alla S.M., 2014. A comparative Study on Body Measurements and Carcass Characteristics in Egyptian Sheep and Goats. *Asian J Anim Vet Adv*,**9**, 292-301.
2. Abdel-Moneim A.Y ., 2009a. Use of live body measurements for prediction of body and carcass cuts weights in three Egyptian breeds of sheep. *Egypt. J. Sheep Goat Sci*, **4**, 17-32.
3. Abdel-Moneim A.Y. , 2009b. Body and carcass characteristics of Ossimi, Barki and Rahmani ram lambs reared under intensive production system. *Egypt. J. Sheep Goat Sci*, **4**, 116.
4. Akpa G.N., Ambali A.L., Suleiman I.O.2013. Body Conformation, Testicular and Semen Characteristics as Influenced by Age, Hair Type and Body Condition of Red Sokoto Goat. *N Y Sci J*., **6** (7), 44-58.
5. Alexandre G., Limea L., Fanchone A., Coppry O., Mandonnet N., Boval M.2009. Effect of forage feeding on goat meat production: carcass characteristics and composition of Creole kids reared either at pasture or outdoors in the humid tropics. *Asian-Australas J Anim Sci*,**22**, 1140-1150.
6. Attah **S.,** Okubanjo **A.O.,** Omojola **A.B.,** Adesehinwa **A.O.K.,** 2004. Body and carcass linear measurements of goats slaughtered at different weights. *Lrrd*, **16**(8), 62.
7. Ayeb N., Barmat A., Fguiri I., Khorchani, 2017. Carcass measurements of kids fed local forage resources in arid areas of southern Tunisia. *La revue française de la recherche en viandes et produits carnés*. ISSN 2555-8560.
8. Bas P., Morand-Fehr P., El Aich A., Dahbi E., Araba A, 2005. Systèmes d'alimentation, performances de croissance et qualités nutritionnelles des viandes des chevreaux élevés dans l'arganeraie au sud-ouest du Maroc-Institut national de la recherché agronomique-Institut national agronomique de Paris-Grignon (Inra-Ina-PG), 16, rue Claude Bernard, 75 231. Paris Cedex 05, France.
9. Chapleau D., Michaud C., 2005. Expériences Québécoises de mise en marche du chevreau de boucherie. *Colloque sur la chèvre*. L'innovation, un outil de croissance! Pavillon des Pionniers, exhibition site, Saint Hyacinthe.
10. Desta H., 2009. Estimation of weight and age of sheep and goats, Technical Bulletin n° 23, *Ethiopia Sheep and Goat Productivity Improvement Program* (ESGPIP), p (1-11).
11. Dransfield E.,2008. The taste of fat. *Meat Science*, **80**, 37- 42.
12. DSA (Direction des Services Agricoles), 2017. Agricultural statistics for the Wilaya of El-Tarf.
13. Ferrah A.**,** 2005. Aide publique et développement de l'élevage en Algérie. Contribution à une analyse d'impact (2000-2005), p8.
14. Haldar A., Pal P., Datta M., Paul R., PAL K.S., Majumdar S.D., Biswas K. C., Pan S., 2014. Prolificacy and Its Relationship with Age, Body Weight, Parity, Previous Litter Size and Body Linear Type Traits in Meat-type Goats. *Asian Australas. J. Anim. Sci.Vol*. **27** (5), 628-634.
15. Jibir M., Isa A.M., Garba S., Jibrila I., Omojola A.B., 2013. Linear body measurements and slaughter characteristics of meat goats in the semi-arid zone of North-Western Nigeria. *Journal of Animal Science Advances*, **3**, 297- 303.
16. Khan H.F., Muhammad R., Ahmad G., Nawaz Rahimullah, Zubair M., 2006. Relationship of body weight with linear body measurements in goats. *J. Agric. Biol. Sci.* **1**, 51-54.
17. Limea L., Bocage B., Arquet R., Mahieu M., Alexandre G. , 2010. Carcass conformation and cut composition of Creole goat from Guadeloupe. *Trop. Anim. Health Prod.* **42**, 507-514.
18. Limea L., Alexandre G., Arquet R., Gravillon A., Bocage B., 2006. Carcass quality of Creole goats slaughtered at different weights. Presented at the 11$^{(th)}$ "Journées des Sciences du Muscle et Technologies des Viandes", Clermont-Ferrand, France.

19. Mamdouh S., Abd-Alla S.M., 2014. A Comparative Study on Body Measurements and Carcass Characteristics in Egyptian Sheep and Goats. *Asian J Anim Vet Adv*, **9**, 292-301.

20. Marichal A., Castro N., Capote J., Zamorano M.J., Argüello A., 2003. Effects of live weight at slaughter (6, 10 and 25 kg) on kid carcass and meat quality. *Livestock Prod. Sci*, 2003, **83**, 247-256.

21. Németh T., Molnár A., Baranyai G., Kukovics S., 2005. Morphologic characterization and body measurement of Hungarian goats. Book of abstracts of the 56th. *Annual Meeting of the European Association for animal production*. Uppsala, Sweeden 5-8 June, 271.

22. OFIVAL**,** 2005**.** Classifications des ovins. Guide technique et règlementaire; pesée, classement, marquage. Montreuil sous Bois, France, Office de l'élevage

23. Ogah D.M., Musa I.S., Yusuf N.D., 2012. Prediction of carcass weight from body measurements in West African Dwarf goat using canonical correlation analysis. Proceedings Book of 4 th International Scientific Conference on Small Ruminant Development Egyptian. *Journal of Sheep and Goat Sciences*, **8** (1), 75-79.

24. Pamo Tedonkeng E., Awono P.M.D., KO Tendonkeng F., Ngo Tama A.C., Boukila B. 2010. Growth performance of goats supplemented with Mucuna pruriens in North Cameroon. *revue Élev. Méd. vét. Pays trop*, **63** (1-2), 47-52.

25. Perault J., 2009. Consequences of undernourishment during the foetal period in the young, metabolic and experimental study in kid - Contribution to the search for relationships between live weight, morphometric measurements, adiposity and organ weight in kid. Thesis for the veterinary doctorate presented and publicly defended before the Faculty of Medicine of Créteil - National Veterinary School of Alfort, p (214-227).

26. Pesmen G., Yardimci M., 2008. Estimating the live weight using somebody measurements in Saanen goats. *Archiva Zootechnica*. **11** (4): 30-40.

27. Randrianariveloseheno A.J.M., Rakotozandriny J.N., Hantanirina I. H., Razafindratsito A.N.J., Razafindraseta N.N., Randriamahatana F., Rafenomanjato Z., 2015. Body Morphometric of Goat Local Race Destined to Slaughter in Madagascar. *Glob. j. anim. sci. res*, **3** (1), 271-279.

28. Sen A.R, Santra A., Karim S.A. , 2004. Carcass yield, composition and meat quality attributes of sheep and goat under semiarid conditions. *Meat Sci*. **66**, 757-763.

29. Simeon O., Adewale F ., 2017. Evaluation of the Relationship between Body Weight and Linear Measurements in West African Dwarf Goat as Influenced by Sex and Agro vegetational Zone. *Science International*, **5** (2), 63-67.

30. Tama A.C.N., Bourzat D., Zafindrajaona P-S., Lauvergne J.J., 1994. Genetic characterisation of goats in North Cameroon. In Small Ruminant Research and Developpement in Africa. *Proceeding of the Biennal conference of the African Small Ruminant Research* Network.UICC, Kampala, Uganda, p (55-62).

31. Tamboura H., Berte D., 1994. Traditional goat rearing system on the central plateau of Burkina Faso. In Small Ruminant Research and development in Africa. *Proceeding of the Biennal conference of the African Small Ruminant Research Network*. UICC, Kampala, Uganda, p (93-97).

32. Webb E., Casey N., Simela L., 2005. Goat meat quality. *Small Rumin, Res*, **60**, 153-166.

Ouennes Houria, lecturer, Institute of Agronomic and Veterinary Sciences. University of Mohammed Chérif Messaadia. Souk-Ahras 41 000, ALGERIA

Sahi Sameh, lecturer ,Chadli Bendjedid University of El Tarf. BP : 73, El Tarf 36000, ALGERIA

Bouzebda Afri Farida, Professeur, Institute of Agronomic and Veterinary Sciences. University of Mohammed Chérif Messaadia. Souk-Ahras 41 000, ALGERIA

Bouzebda Zoubir, Professeur, Institute of Agronomic and Veterinary Sciences. University of Mohammed Chérif Messaadia. Souk-Ahras 41 000, ALGERIA

Djaout Amel, lecturer,Institut National de la Recherche Agronomique d'Algérie (INRAA). Sétif 19 000, ALGERIA.

Corresponding Author: Ouennes Houria.