

## **Carcass yield and physico-chemical characteristics of meat of French Alpine suckling goat kids**

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### **Abstract**

In the state of Chihuahua, Mexico, raising goat suckling kids was proposed as an alternative to the emerging economic development as means to sustain the activity. The goat population is predominantly composed of French Alpine breed. The aim of this study was to assess the performance, carcass characteristics and meat quality of ten suckling kids of French Alpine breed. The results showed acceptable level for most of the parameters studied for carcass yield and characteristics such as live weight, hot carcass weight, hot carcass yield, cold carcass weight, cold carcass yield, carcass yield, mesenteric fat, as well as physico-chemical composition of the muscle *Biceps femoralis* in term of moisture, protein, fat, ash, pH and color. The study proposed that raising French Alpine breed male kids reaches at marking age at an early age to fulfill the demand of the consumers.

**Keywords:** suckling kid; live weight; body components; French Alpine

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### **Introduction**

Among the countries of the American continent, Mexico has the largest inventory of goats (Merlos et al., 2008), the production of these animals take place mainly in areas of arid ecosystems. This type of climate and soil has favoured the development of a very characteristic caprine culture between regions, based on the grazing during the day and closure at night, whose main objective is the production of meat. In recent years, the development of goats has been planned with a double purpose: meat and milk production. In these transition systems, goat milking is performed after weaning, sale of kids and the rearing of the animals to increase the number of wombs as well as the sale of

breeding stock, stallions and yearlings (Arbiza and de Lucas, 2001). In these systems, where attempts to maximize milk production is a main goal, the kid is sold for slaughter at an early age (suckling kid). Since the demand for this type of animal focuses mainly on kids of no more than 12 kg live weight and less than a month and half old (Ricarte et al., 2005). In the state of Chihuahua, goat raising has been developed as dairy farm with defined breeds or crosses based on day grazing (in native grasses, combined with irrigated prairies) and night confinement, with supplementation in shed based on concentrates for dairy cattle (Rubio et al., 2011).

In regions where selling kids at early ages may represent an important income, therefore, studies are

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necessary in order to learn about potential yields and physico-chemical characteristics of the meat to meet the demand of the market.

The purpose of this study was to determine the characteristics and carcass yield, carcass composition and physico-chemical properties of *Biceps femoralis* muscle of French Alpine male suckling kids, in order to create awareness in the state of Chihuahua, about the potentials of this breed to reach the required level of acceptability of the consumer at very early age.

## Materials and Methods

This work was carried out at the Veterinary Science Department of the Autonomous University of Ciudad Juárez, Chihuahua, Mexico, located at 31°44'36" north latitude and 106°25'54" west longitude and 1,127 m over sea level height (Esquivel, 2010) with an annual rainfall of 230 mm and an annual media temperature of 16.5°C and a thermal oscillation of 14.5°C (Álvarez, 1980).

Ten male French Alpine kids were used to evaluate the yield carcass and physico-chemical characteristics of the meat. Before the slaughter, the kids were subject to a twelve hour fasting, afterward they were weighed to determine the slaughter live weight (SLW). The animals were sacrificed according to the Standard approved in Mexico (NOM-033-ZOO-1995) disgoring without prior sensitization, at 10-12 kg of weight and a  $35 \pm 5$  days of age.

After slaughtering, the head, skin, legs to the carpus and tarsus, respectively, digestive system, testicles, as well as lungs and trachea were removed leaving only the kidneys and perirenal fat (Colomer-Rocher et al., 1987) to obtain the hot carcass weight (HCW). The carcass was stored in refrigeration for 24 h at 4°C, and then weighed to obtain the cold carcass weight (CCW). The commercial yield (CY) was calculated by means of the following equation:  $(CCW/SLW) \times 100$ . The cold carcass was also divided in halve, one half was used to obtain the main components according to the described method by Colomer-Rocher et al. (1987). The determination of the following variables were also carried out: slaughter live weight (SLW), empty body weight (EBW), true performance (TP), remains (R) such as blood, skin, head and hooves, guts (G) and green viscera (GV). In order to obtain the exact measurements of the intact carcass, the Fisher and Boer (1994) method was applied. From the other half of the carcass, the physico-chemical characteristics were analyzed. Colour was measured using a Minolta CM-2002 colorimeter, obtaining three color variables: L\* brightness, a\* redness, b\* yellowness (Vergara et al., 1999) at 7 d postmortem. pH was conducted with a flesh penetration potentiometer (Hanna Model HI 99163), which was calibrated with buffer 4.00 and 7.00

(Vergara et al., 2003). Also proximate analysis of *Biceps femoralis* muscle was conducted to determine moisture, ashes, crude fat and protein (AOAC methods, 2001). For the statistical analysis of the data, a T-Student test for independent samples was applied ( $P < 0.05$ ), using the statistical package SPSS Version 17.0 (IBM, 2010; George and Mallory, 2006).

## Results and Discussion

Table 1 showed the carcass yields of French Alpine kid as 56.28% which is higher than Criollo kids 49.34% and Anglonubian 51.02 % as reported by Bonvillani et al. (2005). The mean values of carcass are presented in Table 2. The SLW of the kids was  $10.93 \pm 0.96$  kg, similar to the Criollo kids  $11.46 \pm 1.41$  kg and Anglonubian  $10.45 \pm 0.68$  kg reported by Bonvillani et al. (2005). The EBW for French Alpine kids was  $9.83 \pm 0.86$  kg, HCW was  $5.53 \pm 0.58$  kg resulting in similar findings in Criollo kids  $5.67 \pm 0.92$  kg and Anglonubian  $5.33 \pm 0.40$  kg (Colomer-Rocher et al., 1987). The French Alpine kids presented a CCW  $4.19 \pm 0.64$  kg). The weight of the carcass after dressing represents approximately 60% of total body weight (Fitzhugh and Taylor, 1971). Ozcan et al. (2014) recorded SLW 12.33 kg, EBW 10.60 kg, HCW 5.42 kg and CCW 5.20 kg in Gokceada kids. The weight of the right and left *Biceps femoralis* muscles were almost similar 82.9 g and 82.6 g, respectively.

The carcass measurements are shown in Table 3. Similar results were obtained by Bonvillani et al. (2010) in Criollo Cordobés kids, obtaining longer leg lengths (29.4 cm) but similar carcass length (46.1 cm), buttock width (10.9 cm) and chest depth (20.2 cm). Likewise, Ozcan et al. (2014) obtained similar results in Gokceada kids (side carcass length 48.52 cm, leg length 16.91 cm, chest depth 20.77 and subcutaneous fat thickness 0.21 cm).

The proximate analysis of *Biceps femoralis* are presented in Table 4. The *Biceps femoralis* analysis showed that except moisture (74.81%), other parameters including protein (17.03%), the percentage of fat (2.4 %) and ash (1.97%) were similar to the findings of Alvarez et al. (1995). In Table 5 the physico-chemical property of pH is shown at zero, 24 and 168 h (7 days). The pH obtained at 0 and 24 h and 7 days had no significant difference. These values are lower than those obtained by Argüello et al. (1998), Bonvillani et al. (2005) in Canary and Criollo and Boer crosses respectively.

The brightness (L\*) of *Biceps femoris* was 49.17, which was similar to the brightness of the same muscle in Anglonubian kids but different to Criollos kids (Bonvillani et al., 2005). The redness (a\*) and yellowness (b\*) of French Alpine kids carcass were greater than the carcasses studied by Bonvillani et al.

**Table 1: carcass yield (%) of French Alpine suckling kids**

Carcass traits	Percentages
Carcass yield	56.28%
Remains	22.93%
Green viscera	9.68%
Red viscera	6.49%
Mesenteric fat	1.7%
White viscera	0.33%
Total	99.97%

**Table 2: Weight (kg) for each carcass evaluated**

Variable	Mean±S.E.
Slaughter live weight	10.93±0.96
Empty body weight	9.83±0.86
Hot carcass weight	5.53±0.58
Cold carcass weight	4.19±0.63
Right femoral muscle weight	0.829±0.17
Left femoral muscle weight	0.826±0.11

**Table 3: Measurements of the intact carcass (cm)**

Variable	Mean±SE
Exterior carcass length	49±0.30
Side carcass length	48.25±0.40
Leg length	18.5±0.10
Circumference of buttock	34.4±0.80
Width of buttock	12±0.04
Chest depth	23.55±0.80
Thickness of subcutaneous fat	0.28±0.11

**Table 4: Proximate analysis on wet basis (%) of *Biceps femoralis* muscle**

Traits	French Alpine suckling kids
Moisture	74.814±0.18
Ashes	1.979±0.12
Crude fat	2.400±0.77
Crude Protein	17.031±0.39

**Table 5: Color and pH of *Biceps femoralis* muscle of French Alpine suckling kids**

Traits	0 h	24 h	7 days
Color L* (brightness)	49.311±3.02 <sup>a</sup>	49.227±3.02 <sup>a</sup>	49.229±2.93 <sup>a</sup>
a*(redness)	13.880±2.66 <sup>a</sup>	13.860±2.66 <sup>a</sup>	14.090±1.45 <sup>a</sup>
b*(yellowness)	6.180±2.94 <sup>a</sup>	6.170±2.94 <sup>a</sup>	6.190±1.22 <sup>a</sup>
pH	5.609±0.24 <sup>a</sup>	5.574±0.94 <sup>a</sup>	5.574±0.22 <sup>a</sup>

<sup>a-b</sup> Different superscripts in the same row indicate statistical difference (P<0.05)

(2005) and Ricarte et al. (2005). These differences probably were due to the age at the time of slaughtering of the French Alpine kids and milk feeding. The color ranges were mostly stable during the seven days, and the values of each femoral muscle had a constant faint pink color. The color is characteristic of this type of meat (pink brownish) which remained stable at 0, 24 h and 7 days. This could be related to feed type and age of kids (Castel et al., 1996). All meat characteristics depend primarily on the tissue, since the physico-chemical and proximate composition varies depending on age, breed and rearing conditions.

## Conclusion

According to the results obtained, kids meat is a good source of protein, its physico-chemical characteristics of color and pH are acceptable, which would be favorable as a new supply of animal protein for Chihuahua's population. It would be relevant to enhance all its features and therefore their benefits in order to help the development of this type of farming that has been slowed over the years by cultural and generation issues. The observation in this experiment allows us to suggest that raising French Alpine breed male kids reaches at marking age at an early age to fulfill the demand of the consumers.

## References

- Alvarez, F., Delfa, R., Sañudo, C. and González, C. 1995. Instrumental goat meat quality in terms of the different points awarded to the body condition. Sixth Conference on Animal Production, ITEA, Extra Volume (16): 660-662.
- Álvarez, G.A. 1980. State of Chihuahua Meteorological Bulletin, Department of Geography and Meteorology / S. A. R. H./ Gobierno del Estado/ U. G. R. Ch., P: 301.
- Arbiza y de Lucas. 2001. Goat milk and its production, México, Editores mexicanos unidos. P: 35.
- Argüello, A., Gines, R., Capote, J. and López, J.L. 1998. Approach to the study of the physical characteristics of kid goat meat from the Canary group. XXIII Conference of the SEOC. Sheep and Goat Production XXIII, 141-144.
- Association of Official Analytical Chemist (AOAC). 2001. Methods of Analysis of Association of Official Analytical Chemists. 16th Ed. Washington. D.C. Pp: 5-10, 20-29, 69-79.
- Bonvillani, A., Morandini, M., Petryna, A., Freire, V., Grivel, D., Grigioni, G. and Irueta, A. 2005. Comparison of the carcass and meat for Creole and Anglonubian kids. Argentine Congress of Animal Production. Rev. Arg. Prod. Anim. Pp: 362-363.
- Bonvillani, A., Peña, F., de Gea, G., Gómez, G., Petryna A. and Perea, J. 2010. Carcass characteristics of Criollo Cordobés kid goats under an extensive management system: Effects of gender and liveweight at slaughter. *Meat Science*, 86: 651-659.
- Castel, J.M., Caravaca, F. and Delgado, M. 1996. Goat meat production systems. In: Animal Husbandry. Bases of Animal Production. Goat production. C. Buxadé. MP. Madrid (Ed.).Pp: 219-236.
- Colomer-Rocher F., Morand-Fehr P. and A.H. Kirton. 1987. Standard Methods and Procedures for Goat Carcass Evaluation, Jointing and Tissue Separation. Livestock Production Science

- Proceedings of the Nutrition Society of Australia P: 25.
- Esquivel, B.M.I. 2010. Thesis: Evaluation of the fiber quality using Adios (thidiazuron±diuron) as a defoliant for cotton crop in the Valley of Juárez, Chihuahua. Universidad Autonoma de Ciudad Juarez, Ed. UACJ.
- Fisher, A.V. and H. de Boer. 1994. The EAAP standard method of sheep carcass assessment. Carcass measurements and dissection procedures Report of the EAAP Working Group on Carcass Evaluation, in cooperation with the CIHEAM Instituto Agronómico Mediterráneo of Zaragoza and the CEC Directorate General for Agriculture in Brussels. *Livestock Production Science*, 38: 149-159.
- Fitzhugh, H.A., Jr. and Taylor, St. C.S. 1971. Genetic analysis of degree of maturity. *Journal of Animal Science*, 33: 717-725.
- George, D. and P. Mallery. 2006. SPSS for Windows Step by Step. A simple Guide and Reference, 6th ed. Boston, MA. USA: Ed. Pearson.
- IBM. 2010. Statistical package SPSS Version, 17.0.
- Merlos-Brito Mayra I., Martínez-Rojero Rubén D., Torres-Hernández Glafiro., Mastache-Lagunas Ángel A. and Gallegos-Sánchez J. 2008. Evaluation of production traits in Boer goats x Local, Nubia x local and the local in the dry tropics of Guerrero. México. *Veterinary México*, 39: 324.
- Ozcan, M., Yalcintan, H., Tölü, C., Ekiz, B., Yilmaz, A. and Savaş, T. Carcass and meat quality of Gokceada Goat kids reared under extensive and semi-intensive production systems. *Meat Science*, 96: 496-502.
- Ricarte, A., Vera, T., Domingo, E., Díaz, R., González, F., Quinteros, J., Carduza, F., Irueta, M. and Grigioni, G. 2005. Carcass characteristics and meat of Creole goats and their crosses x Boer, under extensive grazing on the plains of La Rioja, Argentina.
- Rubio, T.E., Alemán, A.R. and Eguia, E.P. 2011. Reproductive strategies in dairy goats from northern Mexico, Morelia Michoacán, 3rd. International Congress and 12th National Congress of Socioeconomic Environmental Research and Livestock Production. P: 94.
- SAGARPA, 2012. Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food. Estimation of apparent domestic consumption of goat meat 1990-2012 (online) [www.sagarpa.gob.mx/Dgg/CNAovi.htm](http://www.sagarpa.gob.mx/Dgg/CNAovi.htm). Consultation: 29 julio 2012.
- Vergara, H., Molina, A. and Gallego, L. 1999. Influence of sex and slaughter weight on carcass and meat quality in light and medium weight lambs produced in intensive systems. *Meat Science*, 52: 221-226.
- Vergara, H., Gallego, L., García, A. and T. Landete-Castillejos. 2003. Influence of sex and slaughter weight on carcass and meat quality in light and medium weight lambs produced in intensive systems. *Meat Science*, 52: 221-226.