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Diet Effect upon Chemical Composition of Pelibuey and Polipay x Rambouillet Meat

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Abstract: An evaluation of the type of grain (corn and sorghum) effect upon the chemical composition of Pelibuey or Tabasco (P) and Polipay x Rambouillet (PR) lamb meat was performed. *Longissimus dorsi* samples from the right side carcass of lambs (eight from each breed) were analyzed. The physicochemical analysis were determined using Official Methods. The statistical package SPSS version 11 was used applying a factorial adjustment (2x2) considering the racial group Pelibuey (P) and Polipay x Rambouillet (PR) and both feeding levels applying corn (1) and sorghum (2). The effects of the type of cereals (corn and sorghum) provided to both ovine group did not present statistical difference significance ($p>0.05$). Neither did racial groups present significant differences ($p>0.05$) on the physicochemical components. Therefore, both races could be fed with either type of cereal depending on the necessities of the producer, availability of the cereal and the cost.

Key words: Corn · sorghum · lamb · pelibuey · polipay x rambouillet

INTRODUCTION

In Mexico, the production of ovine meat has increased in the last decade; even so, there is still a deficit between production and consumption. The national inventory considered around 2 million heads [1]; of which, 23% were located in the north-center region. The state of Chihuahua has not escaped from the ovine production dynamism. The state inventory passed from 352,036 heads in 2000 [1] to 580,660 heads in 2004 [2]. It is recognized that the elaboration of barbecue requires 95% of the ovine sacrifice whereas scarcely 5% is destined to cuts [3].

Main feed for sheep are grouped in two great categories; foraging and concentrated foods. The concentrated ones include the energetic foods, made up of cereals, which are from the qualitative point of view the most important group of the energetic concentrates [4].

Sorghum and corn are the most used cereals, these reported from 1990 to 1999 the 95% of the supply needed for cattle intake. The preference for the consumption of this cereal is based on the levels of supplies and prices, as well as the quality of energy they provide [2].

The demand of both young and light carcasses has promoted the feeding of lambs by nursing and concentrates. These animals present clear or pinkish color muscles with little amount of fat (smaller than 3 mm of thickness in the back), due to this characteristic the carcasses are considered of high quality. The classification system based on the weight and age criteria implies a carcass economic hierarchy that influence over other characters as fat degree, fat consistency, flavor and aroma [5-7].

Nevertheless, little it is known about the characteristics and quality of this type of meat. Therefore, according to the existing demand of this type of meat, the present study was focused on the evaluation of the meat quality of Pelibuey and Polipay x Rambouillet ovines. These two species have great diffusion national wide and have adapted perfectly to Chihuahua. *Longissimus dorsi* muscle chemical composition was determined due to the fact that it is considered a quality control parameter [7]. In addition, this investigation has

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the intention to foment the consumption of this type of meat, exposing its good nutritional properties.

MATERIALS AND METHODS

The investigation was carried out in the Food Chemistry Laboratory (V203) of the Institute of Biomedical Sciences, with the collaboration of the Cattle Department, both of the Autonomous University of Ciudad Juarez.

Sample obtention of *Longissimus dorsi* muscle: For the accomplishment of this work 16 lambs were used: 8 Pelibuey (P) and 8 Polipay x Rambouillet (PR), distributed in individual pens.

The lambs were weaned after sixty days after birth, with a period of adaptation of fifteen days. The feed consumed was weighed twice a day every twelve hours. The feed supplied increased when the rejection was higher then 5% of the offered portion. The first diet was composed of: flaked corn, alfalfa hay, harinolina, ammonium sulphate and a premixture of minerals. In the second one, corn was replaced by sorghum. When the lambs reached an age of six months, they were sacrificed, previously with an empty stomach for twelve hours. The sacrifice was by decollation, with previous stunning.

After the sacrifice, the full digestive system, lungs, heart, liver, spleen, trachea, skin, legs and head were weighed. Once the evisceration was concluded, the carcass was weighed, later cooled off to 4°C during twenty-four hours.

The cold carcass was divided longitudinally in two equal parts, on the left side the most important cuts were evaluated as leg, thorax, arm-shoulder, abdomen and neck. On the right side carcass, a cut was made on the back between the tenth and eleventh thoracic vertebra and the fourth and fifth lumbar vertebra, to obtain the *Longissimus dorsi* muscle, on which the chemical analyses were performed.

Sample preparation: A portion of approximately 100 g of *Longissimus dorsi* muscle was used, the portion was ground until obtaining a homogenous sample. The meat was stored hermetically in closed and labeled containers and frozen to -10°C until analysed.

Chemical analysis: The physicochemical analysis were determined using the AOAC techniques[8]. The percentage of protein was determined by the Kjeldahl method, the moisture by means of a dry furnace, fat was determined by the Soxhlet method and the ashes were determined by incineration.

Statistical analysis: The data analysis used the statistical package SPSS version 11, using a factorial adjustment (2x2) considering the racial group Pelibuey (P) and Polipay x Rambouillet (PR) and both feeding levels applying corn (1) and sorghum (2).

Tukey method was applied for mean comparison and a correlation coefficient (r=0.95).

RESULTS AND DISCUSSIONS

The average results obtained for the meat chemical composition comparing the Pelibuey race (P) and crossed fine wool ovines Polipay x Rambouillet (PR), appear in Table 1. The effects of the types of cereals (corn and sorghum) provided to both ovines did not present statistically significant difference ($p>0.05$).

Race effect: When comparing between races Pelibuey and Polipay x Rambouillet, significant differences ($p>0.05$) in the chemical components were not found. The Pelibuey lambs that were fed corn presented greater protein content compared to ones from the same race fed with sorghum. The Polipay x Rambouillet ovines fed with corn and sorghum presented the same fat content, these percentages are similar to the ones of the Pelibuey ovines fed with sorghum; these mentioned values are higher than the fat content of the Pelibuey race fed with corn, which registered a smaller value without presenting significant difference ($p>0.05$).

Cereal effect: When comparing the data of the racial group Pelibuey that was fed with corn and sorghum, a noticeable difference was displayed in the percentage of protein and fat because these components depended totally on the feed provided.

A variance analysis was made to compare the percentage of the chemical components (protein, fat, moisture and ashes) and their relation with the provided diet and the racial group, as shown in Graph 1 and 2.

There were no significant differences when comparing the percentage of protein, fat, moisture and ashes against the provided cereal, which show that neither corn nor sorghum affect the meat components. Also there was no significance in the percentage of the chemical components with its respective races, determining that the genetic factor did not have influence over the obtained results.

The racial groups did not present significant differences ($p>0.05$) in the components like protein, fat, moisture and ashes, which contrast with other similar studies made in other investigations.

Table 1: μ±σ of the Chemical components (%) of Pelibuey (P) and Polipay x Rambouillet (PR) meat

Chemical component	Average	Racial groups PRM (n=4)	PRS (n=4)	PM (n=4)	PS (n=3)
Protein	15.32±0.82	14.56±0.01	15.04±0.86	16.99±0.48	14.69±0.94
Fat	4.07±0.90	4.57±0.85	4.44±0.18	3.22±0.58	4.04±0.98
Moisture	74.35±0.79	73.70±0.59	74.03±0.63	74.07±0.66	75.61±0.29
Ashes	1.38±0.24	1.33±0.30	1.53±0.19	1.44±0.20	1.23±0.27

M=Corn based diet, S= Sorghum based diet

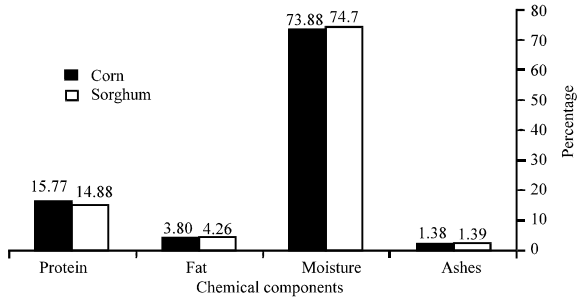

Fig. 1: Chemical component vs cereal

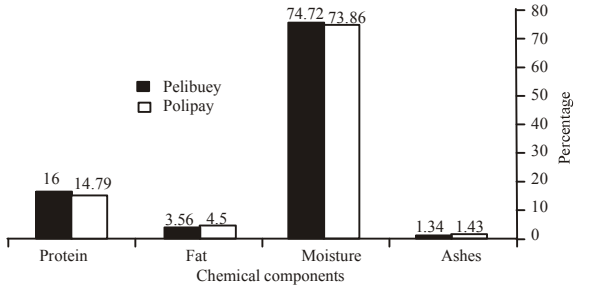

Fig. 2: Chemical component vs race

The average results obtained by Lopez *et al*. [9] show that Pelibuey ovines and the crossed Rambouillet and Suffolk had significant differences ($p<0.05$) in the moisture and fat content. The obtained values were moisture, 4.35%; protein, 20.86; fat, 4.17% and ashes, 0.58%. These values provide a higher content of protein (5.54%) than the one obtained in this study. This difference probably can be due to the sacrifice age, at a year of age and the type of feed provided. The contents of moisture and fat were similar in both cases.

Marinova *et al*. [10] analyzed lambs of three months of age, who were fed canola oil and obtained an average fat content of 10.31%. The meat presented 6.24% more fat than the one analyzed in this study. Canola oil increases the linoleic acid distribution in the carcass, increasing intramuscular fat and allowing a pleasant flavor of the meat.

Scerra *et al.* [11] notified a value of 10.17% in *Longissimus dorsi* of Italian Merinizzatta lambs that were fed citric pulp (orange), wheat and forage. The percentage of fat was higher than 6.10% compared to the results of the present work because citric pulp increases the fermentation of acetate and therefore elevates the amount of fat in the carcass.

The variation of protein and fat content depends of the animal growth and age, as well as factors that influence directly the meat quality as race, climate, sex, type of sacrifice and feed.

The increase in the corporal weight of the animal does not mean better meat quality. Eventhough there were differences in the weight of the obtained cuts of some carcasses, the yield percentage of each cut is similar in pure ovine races and crossed ones [1].

CONCLUSIONS

According to the diet provided to the ovines of the present investigation, a significant difference ($p>0.05$) did not exist between the chemical components of the meat. Therefore, the meat chemical composition of lambs fed with flaked corn, harinolina, alfalfa hay, ammonium sulphate and premixture of minerals did not differ from the ovines fed with the same diet replacing the rolado corn with sorghum. Due to these results the diet can be adapted to corn or sorghum depending on the necessities of the producer, availability of the cereal and its cost.

REFERENCES

1. Villamar, A.L., M.C. Segura, W.M.A. Barrera, V.H. Guzmán and L.R. Domínguez, 1999. La producción de carnes en México y sus perspectivas 1990-1999, SAGARPA. 1-53
2. INEGI. 2005
3. Rubio, M.S., N. Torres, J. Gutierrez and R.D. Mendez, 2004. Composition and sensory evaluation of lamb carcasses used for the traditional Mexican lamb dish, "barbacoa". Meat Sci., 67: 359-364.
4. Buxadé, C.C., 1997. Ovino de leche. 1ª Edición, Ed. Ediciones Mundi Prensa. pp: 15-87.

5. Arbiza, A.S.I. and T.J. De Lucas, 1996. Producción de carne ovina, 1ª Edición, Ed. Editores Mexicanos Unidos, S.A., pp: 1-166.
6. Gracey, J.E., 1989. Higiene de la carne. 8ª Edición, Ed. Interamericana Mc Graw Hill.
7. Colomer, R.F., R. Delfa and A.I. Sierra, 1988. Método normalizado para el estudio de los caracteres cuantitativos y cualitativos de las canales ovinas producidas en el área mediterránea, según los sistemas de producción. Cuadernos del Instituto Nacional de Investigaciones Agrarias, 17: 19-41.
8. Association of Official Analytical Chemists. Official Methods of Analysis. Washington (DC): AOAC, 1995.
9. López, P.M.G., L.M.S. Rubio and S.E.M. Valdés, 1999. Efecto del cruzamiento, sexo y dieta en la composición química de la carne de ovinos Pelibuey con Rambouillet y Suffolk. Vet. Méx. J (31) pp: 11-18.
10. Marinova, P., V. Banskalieva, S. Alexandrov, V. Tzvetkova and H. Stanchev, 2001. Carcass composition and meat quality of kids fed sunflower oil supplemented diet. Small Ruminant Res. J., 42: 219-227.
11. Scerra, V., P. Caparra, F. Fou, M. Lanza and A. Priolo, 2001. Citrus pulp and wheat straw silage as an ingredient in lamb diets: effects on growth and carcass and meat quality. Small Ruminant Res. J., 40: 51-56.