Organoleptic characteristics of the classification of carcasses from bovine cattle in the tropics of veracruzano

Características organolepticas de la clasificación de canales procedentes de ganado bovino en el tropico veracruzano

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ABSTRACT
This research work was carried out in a municipal trail (TIF) in the North of Veracruz, Mexico, with the aim of physically analyzing the quality of beef. A sample of 90 male cattle, which were divided into the following groups: F1 pure Brahman (n=30), F2 Brahman Crossses/ Holstein (n=30) y F3 Brahman Crosses/ Brown Swiis (n=30), male cattle was used at 24 months of age. They received the same management and a food ration based on harinoline, soybean paste, grain corn, grain sage and a mixture of vitamins-minerals, which was offered to 3.5.0% (NRC, 2000) fresh water and forage to free access, averaging the 350 kg completed in intensive corral for slaughter during the 60 days of the experiment. The variables analyzed were: flesh color, fat color, marbling and texture. The results were evaluated through the STADISTIC programme, showing generally that cuts of meat from young uncastrated males with two years of age presented category A, characterized by white fat, with a deep red color, soft texture and abundant marbling in a rating of 11 and 12. Noting that young animals showed the best physical qualities in beef.

Keywords: meat, cattle, color, age, fat, tropics.

RESUMEN
El presente trabajo de investigación se realizó en un rastro municipal (TIF) en el Norte de Veracruz, México, con el objetivo de analizar físicamente la calidad de la carne vacuna. Se tomó una muestra de 90 bovinos machos, los cuales se dividieron en los siguientes grupos: F1 Brahman puro (n=30), F2 Brahman Crossses/ Holstein (n=30) y F3 Brahman Crosses/ Brown Swiis (n=30), bovinos machos, a los 24 meses de edad. Recibieron el mismo manejo y una ración alimenticia a base de harinolina, pasta de soya, grano de maíz, grano de soya y una mezcla de vitaminas-minerales, la cual se ofreció al 3.5.0% (NRC, 2000) agua fresca y forraje de libre acceso, promediando los 350 kg completados en corral intensivo para sacrificio durante los 60 días del experimento. Las variables analizadas fueron: color de pulpa, color de grasa, veteado y textura. Los resultados fueron evaluados a través del programa STADISTIC, mostrando en general que los cortes de carne de machos jóvenes sin castrar con dos años de edad presentaron categoría A, caracterizada por grasa blanca, de color rojo intenso, textura blanda y abundante veteado en una calificación de 11 y 12. Observando que los animales jóvenes mostraron las mejores cualidades físicas en la carne de res.

Palabras Clave: Carne, ganado, color, edad, grasa, trópico.

1 INTRODUCTION

Cull animals have unfavorable characteristics in terms of the quality of meat that can be obtained from their carcasses (Boles and Swan, 2002). One of them is the age of these bovines, since they are discarded when they are very old, and their meat has a darker color, is tougher and not very juicy, compared to meat from a young animal of two or three year old. Ignorance of the characteristics of the carcasses and the lack of a classification system directly affect the consumer, who does not have information regarding the quality and price of the meat he consumes (Lawrie, 1998).

The lack of an adequate culture in the selection of meat means that the demand is limited compared to the wide variety of quality grades and cuts that may exist in the market (Bartel, 2004). This also affects the processor and, of course, the producer, who is unaware of consumer preferences and the economic possibilities of the market. The problem is aggravated by the existing marketing system, the rancher economy (Miguel et al., 2003).

Bartel (2004) highlights that it is important that despite the existence of divergence in terms of perspectives, three types of qualities are identified in beef: hygienic-sanitary, nutritional and organoleptic (sensory); the first ensures that the meat to be consumed does not present a risk to human health; that is, absence of contaminants; the second; refers to the content and nutritional value of meat such as proteins, vitamins, minerals, carbohydrates, among others. In addition to the chemical and physical constants that it presents as pH, water retention capacity, fat content, thermal conductivity and consistency, among others (Realini et al., 2004). The third corresponds to the characteristics that are perceived through the senses at the time of purchase or consumption such as color, smell, tenderness, juiciness, flavor and aroma (McKenna et al., 2000).

La conjunción de estas tres aptitudes, determinan la calidad de la carne; es decir, la calidad (bovino en pie, su canal y carne) obedece al grado en que presentan ciertos atributos o características que la hagan adecuada para satisfacer determinadas necesidades de uso. Por lo que la calidad en la carne puede definirse como el conjunto de cualidades apreciadas y demandadas por los consumidores en la compra del producto, es el conjunto de características cuya clase inherente le confiere al producto un mayor grado de aceptación y precio frente a los consumidores; aspecto que representa ventajas competitivas en el mercado. Por lo anterior este trabajo de investigación tiene el objetivo evaluar el efecto de la calidad en la carne de res basada en la edad de los bovinos sacrificados (López *et al*., 2001).

2 MATERIALS AND METHODS

This research work was carried out in a Federal Inspection Type slaughterhouse (TIF) in the North of Veracruz, Mexico, with the objective of analyzing the quality of beef through an organoleptic study. A sample of 90 male bovines was used, which were divided into the following crosses, F1 pure Brahman (n=30), F1 Brahman/ Holstein cross (n=30) and Brahman/ Brown Swiss (n=30), with 24 months of age. They received the same management and a feed ration with 18% crude protein, based on flour, soybean paste, grain corn, grain sorghum and a vitamin-mineral mixture. The one that was offered at 3.5.0% (NRC, 2000) water and fresh forage with free access, until reaching a weight of 350 kg finished in an intensive corral for slaughter. The variables analyzed were: category, meat color, fat color, marbling and texture.

The animals were transported from the place of fattening to the TIF slaughterhouse, 24 hours before their sacrifice, in accordance with the NOM-051-ZOO-1995 standard for humane treatment in the movement of animals. The animals were sacrificed by stunning with a captive bolt gun and electrical stimulation. After the slaughter process, the carcasses were stored for 48 hours in the cold rooms of the slaughterhouse ($1 \pm 1° C$); We proceeded to take samples of "loin" (longissimus dorsi) bagged in high vacuum, which were then visually analyzed.

3 RESULTS AND DISCUSSION

In Table 1, it is observed in accordance with the provisions of Council Regulation (EEC) No. 1026/91 of April 22, which modifies Regulation (EEC) No. 1208/81, which establishes the classification made based on the age and sex of the animals, taking into account that category A for this study was the one that presented the best characteristics

Table 1. Category based on the age of the cattle slaughtered

Category	Description
A	Two-year-old uncastrated young males
B	Uncastrated males
C	Castrated males
D	Females that have given birth
E	Other females

Table 2 refers to meat color including only colors associated with changes in maturity (Bosselmann et al., 1996). For the evaluation of a carcass, it is closely related to other factors such as the stress produced by the inadequate handling of the cattle before slaughter or the type of supplements and vitamins that they ingested (Beef, 2002). Meat and fat color are also used as indirect estimators of muscle and fat maturity, respectively (Realine et al., 2004). Regarding the

desirable attributes or characteristics for human consumption, and whose relationship gives rise to the different degrees of classification, those that are subject to the NMX-FF-078-SCFI-2002 standard, in which it is detailed that carcasses of bovine cattle will be classified according to the following basic grades of quality: supreme, select, standard, commercial and unclassified (Montgomery et al., 2000). The grade out of classification is applied when the maturity identified in the carcass places it at a level of total ossification (NOM-030-ZOO-1995).

Table 2. Relationship of the category based on the color of fat and meat

Concept	Supreme	Select	Estándard	Commercial
Subcutaneous fat ditribution	Uniform laye ron loin leg and ribs	Uniform layer on loin leg and ribs	No uniform layer	No mínimum requirement
Perirenal fat	50% Coverage onwards	25% Coverage onwards	25% Coverage onwards	No mínimum requeriment
Fat color	White	White to creamy	Creamy slightly yellow.	Yellow
Meat color	Cherry red beef	Cherry red beef deep red	Intense red beef dark red	Dark red beef

With respect to the differences analyzed between the type of animal, these were the expected ones, observing that muscularity was a relevant characteristic in the purebred bulls of the Brahman F1 breed in this study, being beneficial both for carcass yield and for meat production. greater adiposity (amount of body fat) presented. The trade-off of fat for muscle between the racial purity of the Brahman and its racial crosses could partially and biologically explain the statistical insignificance of the differences observed for the study groups in terms of performance (McKenna et al., 2000).

The classification characteristics of the postmortem carcasses were very noticeable in the Brahman F1 cattle, observing that the color of the meat is one of the most important criteria considered by the consumer at the time of purchase. This will depend on various factors such as the concentration and chemical state of myoglobin (muscle pigment), the amount of fat infiltrated (marbling) and the structure of the muscle, the latter being closely linked to the pH (fat (Boleman et al. al., 1998) In relation to color, the Brahman bulls of 24 months presented a cherry red coloration, having the best quality, Sañudo (1991) also indicated that in general the differences between racial crosses are not important although it can be said that Brahman/Holstein crosses have darker meat as a result of their higher content of heme pigments, due to their higher milk production (Vaca and Carreón, 2004).

Regarding the effect of breed on carcass yield, it is possible that a non-significant but noticeable advantage, such as the one detected (almost 10%) in yield of Brahman cattle, is due to the higher fat content in the carcass. channel, as reported by Huerta and Ríos (1993). In another study of the characteristics of the meat, using dual-purpose types of known genetic composition (Rodríguez et al., 1997), they observed that the carcasses of pure F1 Brahman steers had a superior conformation to the F1 ½ Brahman/Holstein crosses and Brahman/ Brown Swiss. In addition, the F1 ½ Brahman steers had a greater coloration in both meat and fat (51.0±0.7%), significantly outperforming the F1 ½ Holstein, F1 ½ Brown Swiss, and F1 ½ Holstein, 3.3%, 4.4%, 3.1%, and 4.1%. F2 ½ Brahman and pure Brahman respectively.

The yield advantages observed for cross-type cattle (Brahman/Brown Swiss) support the preference of cattle wholesalers for predominantly Zebu cattle, and their willingness to pay more for them (Whipple et al., 1990). The assertion of Huerta and Ríos (1993) that "the lack of information and the existence of a series of beliefs (wholesalers and slaughterhouses), some unfounded, contribute to disqualifying the suitability of dual-purpose cattle as meat producers, should be understood only in the context of comparing its performance in cuts, and not in carcass, according to the unfavorable results presented here for the Dairy type, typical of dual-purpose cattle. However, it is important to bear in mind that meat yields are gaining greater commercial importance today due to their object.

4 CONCLUSION

Due to the fact that Mexico lacks planning and integration in all the processes related to the meat industry supported by the existing regulations, for this reason, SENACICA formed the System of Individual Identification of Cattle (SINIIGA), delegating its operation to the National Livestock Confederation (CNOG), which brings together the country's livestock organizations. The objectives of this system are to improve health programs, have control in the movement of cattle, technical support in herd management, genetic improvement and optimization of business processes so that the consumer has sufficient information regarding the product that is acquiring. Once production has been planned, integrated and homogenized, another important issue could be addressed, traceability, which would allow having product information from the production unit to the final consumer; this being the synthesis of the concept of quality.

REFERENCES

-Bartel H. S. 2004. **Veterinary Inspection of Meat. Editorial Acribia S.A. Saragossa Spain**. Pp. 78-90.

-BIF.2002. Guidelines for uniform beef improvement programs. 8th Ed. Beef Improvement Federation. Athens, GA, USA.pp: 27-31.

-Boles, J.A. y J.E. Swan. 2002. Processing and sensory characteristics of cooked roast beef: effect of breed, age, gender and storage conditions. Meat Science 62: 419-427.

-Boleman, S.L., S.J. Boleman, W.W. Morgan, D.S. Hale, D.B. Griffin, J.W. Savell, R.P. Ames, M.T. Smith, J.D. Tatum,T.G. Field, G.C. Smith, B.A. Gardner, J.B. Morgan, S.L.Northcutt, H.G. Dolezal, D.R. Gill y F.K. Ray. 1998. National Beef Quality Audit-1995: survey of producer-related defects and carcass. J. Anim. Sci. 76:96-103.

-Bosselmann, A., C. Moller, H. Steinhart, M. Kirchgessner y F. J. Schwarz. 1995.Pyridinoline cross-links in bovine muscle collagen. J. Food Sci. 60: 5 Tume, R. K., y A. Yang. 1996. Fat color in beef. Meat Focus International.March. 81.

-Huerta-Leidenz N., y G. Rios. 1993. Castration of cattle at different stages of their growth. I. Effects on productive behavior. A review. Journal of the Faculty of Agronomy (LUZ) 10: 87-115.

-Lawrie, R. A. 1998. Meat Science. 3rd Ed. Edit. Acribia. Saragossa, Spain. Pp. 165-187.

-López de Torre, B.M. Carballo G, A. Madrid V. 2001. Technology of meat and meat products, AMV Ediciones, first edition, Madrid Spain. pp. 56-93

-Lorenzen, C.L., D.S. Hale, D.B. Griffin, J.W. Savell, K.E.Belk, T.L. Frederick, M.F. Miller, T.H. Montgomery y G.C. Smith.1993. National beef quality audit: survey of producer-related defects and carcass quality and quantity attributes. J. Anim. Sci. 71:1495-1502.

-McKenna, D.R., D.L. Robert, P.K. Bates, T.B. Schmidt, D.S. Hale, D.B. Griffin, J.W. Savell, J.C. Brooks, J.B. Morgan,T.H. Montgomery, K.E. Belk y G.C. Smith. 2002. National beef quality audit-2000: survey of targeted cattle and carcass related to quality, quantity, and value of fed steers and heifers characteristics. J. Anim. Sci. 80:1212-1222.

-Miguel, E., F. Ruíz de Huidobro, M. T. Díaz, S. Velasco, S. Lauzurica, C. Pérez,Onega, E. Blázquez y V. Cañeque. 2003. Methods of carcass classification based on subjective assessments of carcass fatness and of carcass conformation: effect of sex on the prediction of tissue composition in carcass of sucking lambs. Animal Science 77:383-393.

-Montgomery, T. H., P. F. Dew y T. D. Keller. 2000. Comparison of cattle grading and reward systems used for some selected beef producing and consuming nations. VIII International Congress of Animal Nutrition. Chihuahua, Chih. Mexico, pp 38

-NOM-030-ZOO-1995. Specifications and procedures for the verification of meat carcasses, viscera, offal imported at animal health verification points. Official Journal of the Federation.
-NMX-FF-078-SCFI-2002. Classification of cattle carcasses. Official Journal of the Federation.

-NMX-FF-078-1991. Livestock products - beef carcass - Classification. Declaration of validity published in the Official Gazette of the Federation on September 18, 1991.

-Realini, C. E., S. K. Duckett, G. W. Brito, M. D. Rizza, D. De Mattos. 2004. Effect of pasture vs. concentrate feeding with or without antioxidants on carcass characteristics, fatty acid composition, and quality of Uruguayan beef. Meat Science 66:567-577.

-Rodríguez-Voigt A., E. Noguera, H.L. Rodriguez, N.O. Huerta-Leidenz, O. Moron- Fuenmayor, Y E. Rincon-Urdaneta. 1997. Crossbreeding dual-purpose cattle for beef production in tropical regions. Meat Science 47 (3/4): 177-185.

-Vaca R.J.L., Y Ch.R.R. Carreon. 2004. Carcass yield in Creole cattle from the Bolivian Chaco (Camiri, Cordillera-Santa Cruz Province-Bolivia) Veterinaria (Montevideo). 39 (155-156): 21-26.

-Whipple, G. Koohmaraie, M. Dikeman, M. E., J. D. Crouse, M. C. Hunt, y R. D. Klemm. 1990. Evaluation of atributes that affect longissimus muscle tenderness in Bos taurus and Bos indicus Cattle. J. Anim. Sci. 68:2716-2728.