Application of tenderness thresholds to Cachena beef

Ana Cristina Agulheiro-Santos^{1,2*}, Sara Ricardo-Rodrigues¹, Marta Laranjo^{1,3}, Maria

Eduarda Potes^{1,3}, Miguel Elias^{1,2}

¹ MED-Mediterranean Institute for Agriculture, Environment and Development & CHANGE-Global Change and

Sustainability Institute, IIFA-Instituto de Investigação e Formação Avançada, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal

² Departamento de Fitotecnia, Escola de Ciências e Tecnologia, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal

³ Departamento de Medicina Veterinária, Escola de Ciências e Tecnologia, Universidade de Évora, Pólo da Mitra, Ap. 94, 7006-554 Évora, Portugal

*Corresponding author email: acsantos@uevora.pt

I. INTRODUCTION

The Cachena is a highly hardy breed of cattle that is part of Portugal's genetic heritage. Breeding these cattle extensively is of great interest in the south-east of the Alentejo, an agricultural region with difficult climatic conditions and poor soils in Portugal. Cachena's animals are small, and the meat is known for its excellent characteristics of texture and flavor [1]. Therefore, the determination of the ideal tenderness is of extreme importance for the producers and consumers. According to several studies on fresh meat, consumers are willing to pay a higher price for meat that is guaranteed as tender [2]. A threshold can be defined as a specific point on the sensory stimulus scale where a transition occurs in a series of sensations or judgments [3].

Ricardo-Rodrigues *et al.* [4] have established a beef tenderness thresholds as a proposal for a reliable and rapid screening index for beef samples, using the texture profile analysis (TPA) and Warner Bratzler shear force (WBSF) methods. According to the model proposed by Ricardo-Rodrigues *et al.* [4], a beef cut is tender when WBSF is below 39.60 N and simultaneously hardness from TPA is below 31.89 N. The use of both parameters allows to establishment of a tenderness screening index for beef samples.

This study aims to assess the tenderness of various cuts of meat from young and adult Cachena animals.

II. MATERIALS AND METHODS

The animals were reared on a farm in Barrancos (South-east of Portugal) and were slaughtered at a slaughterhouse (Beja, South of Portugal). Two groups of animals were slaughtered: (A) 32 young animals aged between 9 and 20 months and the analysis of the tenderloin and sirloin cuts; (B) 33 adult animals aged between 5 and 12 years and the analysis of tenderloin, sirloin, knuckle, and silverside cuts.

The instrumental texture evaluation was performed by assessing the hardness obtained in TPA and shear force obtained in WBSF in grilled meat 72 hours after slaughter. The samples were treated, and the parameters were analyzed as described by Ricardo-Rodrigues *et al.* [4].

Data were analyzed according to the analysis of variance (ANOVA) using StatisticaTM v. 12.0, software (StatSoft Inc., 1984–2014). Differences between groups were identified based on Tukey's Honest Significant Difference (Tukey's HSD) test (p < 0.05).

III. RESULTS AND DISCUSSION

The texture results (Hardness in TPA and Warner-Bratzler shear force) obtained for different cuts of meat from young and adult animals are shown in Table 1.

Cachena meat	Cut	Hardness (N)	Shear force (N)
Young animals (A)	Tenderloin	10,92 ± 3,21 a	24,35 ± 5,28 a
	Sirloin	15,70 ± 7,83 bc	32,86 ± 8,31 bc
Adult animals (B)	Tenderloin	15,63 ± 4,28 bc	27,15 ± 5,01 abc
	Sirloin	23,28 ± 8,56 d	32,84 ± 7,89 d
	Knuckle	25,45 ± 9,99 de	38,28 ± 7,76 d
	Silverside	29,98 ± 13,46 e	42,92 ± 13,44 e

Table 1 – Comparison of hardness and shear force in different beef cuts from young and adult Cachena cattle breeds.

Data are expressed as means \pm SD. In the same column, different letters (a, b, c, d, and e) represent significantly different means (p < 0.05).

The tenderloin of adult Cachena animals exhibits hardness and shear force values similar to those of the sirloin of young Cachena animals. Additionally, it was observed that the instrumental parameter of hardness appears to differentiate the cuts better than the shear force.

According to the established tenderness index [4], Cachena meat from both young and adult animals should be considered tender based on its hardness and shear force values, with an average hardness value of less than 31.89 N and a shear force value of less than 39.60 N. Exception to this is the silverside with shear force values higher than those indicated in the texture index and the hardness values very close to the limit, which aligns with the results obtained from the sensory analysis (data not shown).

IV. CONCLUSION

According to the rapid screening index developed by Ricardo-Rodrigues *et al.* [4], the meat from Cachena cattle can be considered tender, whether it is obtained from young or adult animals, and for the loin, sirloin and steak cuts. Silverside is the only cut of meat that cannot be clearly classified as tender, which is why some precaution is recommended when selling it, as well as any gastronomic preparation other than grilling the meat.

Producers who are interested in this objective assessment of the quality/ tenderness of Cachena meat can use the TPA and WB methods, and the threshold value, as a tool to ensure the tenderness of the meat they sell. As a result, tender pieces of meat can be valued economically, based on the results obtained, in a safe and clear and reliable form.

ACKNOWLEDGEMENTS

The authors would like to thank MED (<u>https://doi.org/10.54499/UIDB/05183/2020;</u> <u>https://doi.org/10.54499/UIDP/05183/2020</u>) and CHANGE (<u>https://doi.org/10.54499/LA/P/0121/2020</u>).

FUNDING

This research was supported by project PDR2020-1.0.1-FEADER-030803, funded by national funds through Fundação para a Ciência e a Tecnologia (FCT)/MCTES and co-funded through the European Agricultural Fund for Rural Development (EAFRD), and by project UIDB/05183/2020 (MED) financed by national funds through FCT. Sara Ricardo-Rodrigues acknowledges a PhD grant from FCT (2021.07663.BD).

REFERENCES

[1] Cachena-Associação de Criadores de Raça Cachena. <u>https://www.cachena.pt</u>. Assessed on June, 31st 2024.
[2] Warner, R. D., Greenwood, P. L., Pethick, D. W., & Ferguson, D. M. (2010). Genetic and environmental effects on meat quality. Meat Science, 86 (1), 171–183.

[3] Holman, B. W. B., & Hopkins, D. L. (2021). The use of conventional laboratory-based methods to predict consumer acceptance of beef and sheep meat: A review. Meat Science, 181, 108586.

[4] Ricardo-Rodrigues, S., Laranjo, M., Elias, M., Potes, M. E., Agulheiro-Santos, A. C. (2024). Establishment of a tenderness screening index for beef cuts using instrumental and sensory texture evaluations. International Journal of Gastronomy and Food Science, 35,100889.