

THE INFLUENCE OF A DIET WITH SOYBEAN, SUNFLOWER SEED AND FLAXSEED ON THE MEAT QUALITY OF CROSSBRED WAGYU BEEF

Paula A. C. C. Pereira^{1*}, Júlio C. C. Balieiro², Marco A. Trindade³, Roger D. Barbora¹ and Andrea C. S. Barretto¹

¹Department of Food Technology and Engineering, UNESP-São Paulo State University, Cristovão Colombo street 2265, São José do Rio Preto, SP, Brazil;

²Department of nutrition and animal production, FMVZ/USP-São Paulo State University, Duque de Caxias Norte avenue 225, Pirassununga, SP, Brazil;

³Department of Food Engineering, FZEA/USP- São Paulo State University, Duque de Caxias Norte avenue 225, Pirassununga, SP, Brazil.

*Corresponding author email: andreasb@ibilce.unesp.br

Abstract – Studies have suggested that the lipid composition of beef can influence taste and tenderness, and these can be influenced by the animal's diet. The objective of this study was to evaluate crossbred Wagyu beef, submitted to three diets enriched with soybean, sunflower seed and flaxseed, for cooking loss, shear force and sensory acceptance. The cooking loss ranged from 13.9 to 16.6%, and the shear force was near to 3.5 kg. The acceptance test evaluated appearance, odor, juiciness, tenderness, taste and overall acceptance. The diets did not influence cooking loss, shear force and sensory attributes, except for tenderness, which was more acceptable for animals fed with sunflower seed showing that the inclusion of sunflower seed may be an alternative to increase tenderness.

Key Words – Cooking loss, shear force, sensory acceptance.

I. INTRODUCTION

The Wagyu, a *Bos taurus* breed, is of Japanese origin and its meat has, as its main characteristic, a high degree of marbling [1]. This breed does not adapt to Brazilian climatic conditions, so crossbreeding has been carried out between breeds that produce better quality meat with breeds that are more suited to the Brazilian climate. Also strategies such as feeding under confinement are used as a way to achieve higher quality in the final product [2]. According to Laborde et al. [3] feeding influences fat deposition and the lipid profile of cattle from the lipid sources available in Brazil for cattle feed soy is widely used because of its high nutritional value, availability and low cost. In meat, besides the nutritional quality, the sensory characteristics are also very important, and are extremely relevant when the consumer is choosing and buying. Three factors are judged at the time of purchase, they are appearance, texture and taste - but what influences the final buying decision is the appearance [4]. The objective of this study was to evaluate the influence of diet with different oil sources (soybeans, sunflower seeds and flaxseed) on cooking loss, shear force and sensory acceptance of Wagyu beef 3-cross ($\frac{1}{2}$ Wagyu, $\frac{1}{4}$ Angus, $\frac{1}{4}$ Nellore) confined for 100 days.

II. MATERIALS AND METHODS

The crossbred Wagyu animals were separated for a period of 100 days at the end of the confinement phase (Table 1), 24 animals were divided into three different treatments:

Sf: addition of sunflower seed with bark; Fs: addition of flaxseed; Sb: addition of soybeans to the diet.

Samples of 1-inch thickness *longissimus dorsi* muscle were removed from the 12th rib, packed in a vacuum and stored under refrigeration at 2 ° C. For determination of cooking loss and shear force, the steaks were removed from the package and weighed, baked in a conventional electric oven (FELS3, Imequi Brazil) at a temperature of 150 ° C, until the internal temperature reached 71°C, controlled by an individually introduced thermocouple. Subsequently, the steaks were cooled to room temperature and weighed again. The cooking loss was calculated by the difference between initial and final weight, and expressed as a percentage. Meat tenderness was determined by the maximum shear force using a TA.XT / Plus / 50 Texture Analyzer (Texture Technologies Corp. and Stable Micro Systems Ltd, Hamilton, MA, USA) using the Warner-Bratzler cell with 3.30 mm, load cell of 25 kg and velocity of 20 cm / m, according to Andrade et al. [6]. The trials were repeated for the 24 steaks by removing 10 samples from each steak, 1/2 inch in diameter, and the cut of samples was done parallel to the meat fibers. Sensory analysis was performed on the 10th day after sample collection and was performed with 118 untrained consumers (undergraduate students and servers), and an affective acceptance test using a hedonic scale of nine points, in monadic form and following a complete block design. The samples from the three treatments were roasted in a conventional electric oven (FELS3, Imequi, Brazil) to an internal temperature of 71 ° C, and then the steaks were cut into 2cm cubes. The attributes evaluated were: appearance, odor, juiciness, tenderness, taste and overall acceptance. The data were evaluated through statistical analysis of variance (ANOVA), and the difference between the means of the results by the Tukey test, at a confidence level of 5%, using the Minitab software.

III. RESULTS AND DISCUSSION

It can be seen that the diet did not influence the results of cooking loss and shear force (Table 2). A similar result was found by Barker et al. [7], where animals were submitted to different diets that did not influence cooking loss and shear force. Similar results were also described by Carvalho [8], where animals were fed palm oil, flaxseed oil, soybean oil calcium salts and soybean grain. It was presented that the cooking loss and the shear force did not present significant difference for the different diets.

Table 1. Composition of experimental diets.

<i>Feedstock (%)</i>	<i>Sb</i>	<i>Fs</i>	<i>Sf</i>
<i>Sugarcane bagasse</i>	13,65	9,51	8,10
<i>Corn – wet grain silage</i>	63,59	71,98	72,37
<i>Peanut bran</i>	3,00	6,85	6,57
<i>Soybean</i>	17,00	0,00	0,00
<i>Sunflower seed</i>	0,00	0,00	8,80
<i>Flaxseed</i>	0,00	7,50	0,00
<i>Others elements</i>	2,46	2,46	2,46
<i>Urea Livestock</i>	0,30	1,20	1,20
<i>Potassium chloride</i>	0,00	0,50	0,50

Sf: addition of sunflower seed with bark; Fs: addition of flaxseed; Sb: addition of soybeans to the diet.

Table 2. Results of the analysis of cooking loss, shear force and sensorial analysis.

	<i>Sb</i>	<i>Fs</i>	<i>Sf</i>
<i>Cooking loss</i>	13,93 ± 2,93 ^a	15,54 ± 2,45 ^a	16,62 ± 2,32 ^a
<i>Shear force</i>	3,51 ± 0,80 ^a	3,48 ± 0,66 ^a	3,47 ± 0,71 ^a
<i>Appearance</i>	7,37 ± 1,33 ^a	7,54 ± 1,26 ^a	7,475 ± 1,22 ^a
<i>Odor</i>	7,58 ± 1,29 ^a	7,63 ± 1,26 ^a	7,70 ± 1,19 ^a
<i>Juiciness</i>	7,01 ± 1,62 ^a	7,36 ± 1,42 ^a	7,26 ± 1,46 ^a
<i>Tenderness</i>	7,25 ± 1,59 ^b	7,41 ± 1,39 ^{ab}	7,72 ± 1,23 ^a
<i>Taste</i>	7,08 ± 1,39 ^a	7,44 ± 1,26 ^a	7,13 ± 1,45 ^a
<i>Overall acceptance</i>	7,12 ± 1,29 ^a	7,42 ± 1,20 ^a	7,33 ± 1,29 ^a

^{ab} Averages followed by different letters on the line differ from each other.

Sf: addition of sunflower seed with bark; Fs: addition of flaxseed; Sb: addition of soybeans to the diet.

For the sensorial analysis, there was no significant difference ($p < 0.05$) for all attributes (Table 2), except for the tenderness, which presented greater acceptance for the beef which animals fed with sunflower seed. Similar results for sensory acceptance were also described by Carvalho [8].

IV. CONCLUSION

The inclusion of sunflower seeds in the diets of crossbred Wagyu cattle showed increased sensorial acceptance for the tenderness attribute.

REFERENCES

- Motoyama, M., Sasaki, K., & Watanabe, A. (2016). Wagyu and the factors contributing its beef quality : A Japanese industry overview. *Meat Science* 120: 10-18.
- Silva, M.L.P. (2016). Desempenho e qualidade da carne de bovinos cruzados alimentados com diferentes dietas em confinamento. (Tese de doutorado). Universidade Estadual Paulista, Jaboticabal. (In portuguese).
- Laborde, F.L., Mandell, I.B., Tosh, J.J., Wilton, J.W., Buchanan-Smith, J.G.(2001). Breed effects on growth performance, carcass characteristics, fatty acid composition, and palatability attributes in finishing steers. *Journal of Animal Science* 79(2):355-365.
- Bassi, M.S.; Ladeira, M.M.; Chizzotti, M.L.; Chizzotti, F.H.M.; Oliveira, D.M.; Machado Neto, O.R.M.; Carvalho, J.R.R.; Nogueira Neto, A.A. (2012). Grãos de oleaginosas na alimentação de novilhos zebuínos: consumo, digestibilidade e desempenho. *Revista Brasileira de Zootecnia* 41(2): 353-359.
- Liu, Q.; Lanari, M. C.; Schaefer, D. M. (1995). A review of dietary vitamin E supplementation for improvement of beef quality. *Journal of Animal Science* 73(10): 3131–3140.
- Andrade, E.N.; Neto, A.P.; Roça, R. O.; Faria, M. H.; Resende, F. D.; Siqueira, G. R.; Pinheiro, R. S. (2014). Beef quality of young Angus×Nelore cattle supplemented with rumen-protected lipids during rearing and fattening periods. *Meat Science* 98: 591-598
- Barker,B.P.; Mies, W.L.; Turner, J.W.; Lunt, D.K.; Smith, S.B. (1995). Influence of production system on Carcass characteristics of F₁ Wagyu x Angus Steers and heifers. *Meat Science* 41(3): 1-5
- Carvalho, I.P.C. (2012). Fontes lipídicas na terminação de novilhos de corte em pastejo. (Tese de doutorado). Universidade Estadual Paulista, Jaboticabal. (In portuguese).