# CANDIDATE GENES CAST AND CAPN AS POTENTIAL COLOUR BIOMARKERS IN FRESH MEAT

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## I. INTRODUCTION

Recent advancements in molecular genetics in animal production have paved the way for the identification of markers associated with specific genes, which significantly influence meat quality [1]. Gene expression analysis is a technique that allows identifying whether a target gene is expressed in a given cell or organism, aiming to understand its relationship with the phenotype of interest studied. The meat colour has always been a topic of extensive research and discussion, given its status as the first characteristic evaluated by the final consumer. However, despite the widespread study of the calpastatin (CAST) and calpain (CAPN) genes and their association with tenderness [2], research on these genes in the context of fresh beef is a relatively new and developing area in the literature. Therefore, the objective of this study was to establish a correlation between the relative gene expression of CAST and CAPN and the colour parameters L<sup>\*</sup>, a<sup>\*</sup>, b<sup>\*</sup>, C<sup>\*</sup>, h<sup>\*</sup>, R630/580, Oxymyoglobin (OMb), Deoxymyoglobin (DMb) and Metmyoglobin (MMb) in fresh meat from Bos indicus animals.

## II. MATERIALS AND METHODS

Twenty-four non-castrated male Nelore cattle (*Bos indicus*) were used. The *Longissimus lumborum* (LL) muscles were portioned into 2.5 cm thick steaks and subjected to blooming (oxygenation) for 30 minutes in a refrigeration chamber at 2 °C ( $\pm$  2) at three days post-mortem and destined for instrumental colour analysis. LL samples were collected thirty minutes post-mortem to perform gene expression analysis of the CAST and CAPN genes. Real-time quantitative PCR (rt - qPCR) was performed, and relative expression was calculated using the 2<sup>-ΔΔCq</sup> method [3]. Pearson test (5%) was used to evaluate the relationship between the CAST and CAPN genes with the colour parameters.

## III. RESULTS AND DISCUSSION

The results (Figure 1) indicate that the expression of the CAST and CAPN genes can be used to estimate parameters related to meat colour significantly. Both genes showed positive correlations with a\*, b\*, C\*, h\* and R630/580. Also was observed a negative correlation of those genes with MMb (%).

The biological mechanisms between the calpain and calpastatin proteolytic system and the colour parameters presented (Figure 1) may be related to the concentration of Ca<sup>2+</sup> ions and post-mortem muscle contraction. During the maturation process there is an increase in the concentration of calcium ions and the activity of calpain, releasing calcium from intracellular reserves as part of the rigor-mortis process and activating the calpain enzyme through the maturation process [4]. In this way, increased calpain activity could degrade muscle proteins such as myoglobin, directly related to meat colour. We hypothesise that this degradation may affect the stability of myoglobin and its ability to

capture oxygen, influencing the meat colour parameters observed in the present study (Figure 1).



Figure 1. Pearson correlation matrix between CAST and CAPN genes expression, L\*, a\*, b\*, C\*, h\*, R630/580, MMb%, DMb%, OMb%. The upper value of each cell: Pearson correlation coefficient; the lower value: inferential test

## IV. CONCLUSION

The expression of CAST and CAPN genes in *Longissimus lumborum* muscle showed a significant correlation with colour parameters, which are potential candidates genes to indicate important characteristics of fresh meat colour.

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