

Modeling the impact of the physiological, muscular and sensory characteristics to evaluate beef quality



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Genetics of Meat Quality (GemQual)

Background

Vanhonaker et al., 2013

The majority of meat consumers claim to reduce their meat consumption due to multiple reasons as:

- 🍷 Environment
- 🍷 Animal Welfare
- 🍷 Disappointment by the Quality

Experimental protocol

- 🍷 450 Steers / 15 breed / 5 EU country
- 🍷 Similar Diet
- 🍷 slaughter age : 15month
- 🍷 sample collected from *Longissimus thoracis muscle*
- 🍷 51 variable describing the physiological, muscular and sensory characteristics, to evaluate beef quality

Objective

Modeling the impact of the physiological and muscular characteristics on the beef sensory quality

Methodology

- 🍷 Using a Hierarchical cluster and Principal component analyses approach to reduce the total number of variable
- 🍷 Implementing an Analysis of covariance (ANCOVA) to study the relationship between the different selected cluster :

$$Y_i = \text{Breed} + aX_i + b$$

Y_i = single cluster

X_i = All variables – (Variables of the cluster Y_i)

Selecting the important explicatory variables using the Akaike information criterion (AIC)

Clustering Data



Figure 1: Dendrogram representing the relation between 51 variables clustered by 10 groups

Model Application

	Tenderness & Juiciness	Flavour	Animal Growth	Muscle	Ageing	Oxidative metabolism	Lightness and Yellowness	Lipids	Redness	Maturity
Tenderness & Juiciness	***	*	*	*	*		***	*	***	*
Flavour		***	*	*	***	**		**		*
Animal Growth			***	*	**		***			
Muscle				***	*	*	**	*	*	*
Ageing					***		*			**
Oxidative metabolism						***	***		***	**
Lightness and Yellowness							***	*	*	
Lipids								***	**	**
Redness									***	**
Maturity										***

«*»: p < 0.05 ; «**»: p < 0.01 ; «***»: p < 0.001

Corrélation + (Blue) Corrélation - (Red)

Conclusion

- 🍷 The physiological characteristics studied (growth, muscle mass) negatively impact sensory quality
- 🍷 The muscle characteristics studied (Ageing, lipids, oxidative metabolism) have a positive impact on sensory qualities

Perspectives

- 🍷 Validation of model simulations based on actual results
- 🍷 Comparison of the taste results of the jury (GemQual) with the taste results obtained by consumers (Meat Standards Australia project)

Table 1: Representation of the relationships between the 10 clusters from the ANCOVA model