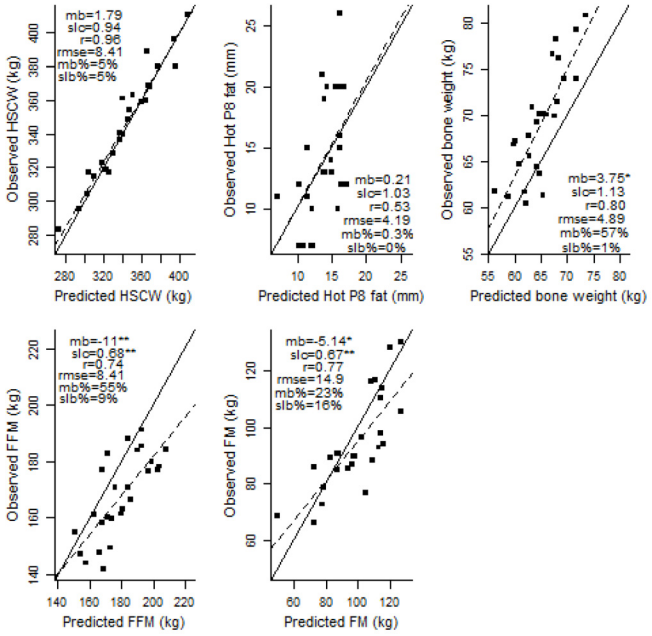

Fig. 1. Observed *versus* predicted carcass components: hot standard carcass weight (HSCW, kg), hot P8 fat (P8, mm), bone weight (bone, kg), fat free mass (FFM, kg), fat mass (FM, kg); solid line is (1:1) relationship and dashed line illustrates the trend; mb = mean bias, slc = slope coefficient, r = pearsons correlation, rmse = root mean square error, mb% = decomposed mean bias, slb% = decomposed slope bias; statistical differences (*$P < 0.05$, **$P < 0.01$) reported between means and slope different from 1.

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doi: 10.1016/j.anscip.2022.07.474

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

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Introduction

GemQual (Genetics of Meat Quality) is a European project focused on improving beef quality in European countries. The project's main challenge is to produce meat that meets consumer's expectations. The analysis made on samples collected from the project experimental farms to slaughterhouses includes a series of different variables representing physiological, muscular and sensory characteristics, to evaluate beef quality.

Material and methods

In this study, 436 young cattle from 15 cattle breeds were reared in 5 experimental research centers or farms (United Kingdom, Denmark, Spain, France and Italy) following the same experimental protocol. In all stations, the diet energy and protein content ratio was similar. Animals were slaughtered at 15 months of age, and samples were collected 24 h *post-mortem* from the *longissimus thoracis* muscle between the 6th and 13th ribs on the left carcass side (Albertí et al., 2008). Among the 51 variables characterising the animals, five variables from the dataset were related to tenderness, juiciness and flavor of the meat as determined by panelists. A Hierarchical cluster analysis of variables has been elaborated using the package ClustOfVar (Chavent et al., 2012) in R software version 3.6.1. Thus, by using the stability of partu-rition method, it was possible to identify the minimum number of clusters representing a maximum variability. Using the principal component analysis, each cluster was named based on variables which are the most represented in this cluster. An analysis of covariance model (ANCOVA) was used to study the relationships between different clusters.

Results and Discussion

The stability of parturition method suggests retaining 9 clusters. Based on the results of the PCA, the first dimension of 8 clusters were considered representatives showing the highest variation between them except from one cluster where 2 dimensions were selected explaining 2 different characteristics. Each group of variables in each cluster emphasizes different characteristics: <u>*Physiological traits*</u> such as animal maturity, growth rate, muscle mass; <u>*Sensorial traits*</u> such as tenderness and juiciness, flavor, meat color (lightness, yellowness and redness); and <u>*Muscular characteristics*</u> such as lipid content, ageing, oxidative metabolism (Fig.1). The ANCOVA results have shown that tenderness, juiciness and flavor are negatively associated with animal growth ($P < 0.05$), maturity ($P < 0.05$), and muscle mass ($P < 0.05$), and positively associated with beef ageing ($P < 0.05$) and oxidative metabolism ($P < 0.05$). The lipid cluster also presents a positive association with flavor ($P < 0.05$). Regarding meat color, beef yellowness and lightness are positively associated with animal growth ($P < 0.05$) and muscle mass ($P < 0.05$) and negatively associated with beef ageing ($P < 0.05$) and oxidative metabolism ($P < 0.05$). Muscle redness is positively associated with lipids ($P < 0.05$), tenderness, juiciness ($P < 0.05$) and oxidative metabolism ($P < 0.05$), (Table 1).

Conclusion and implications

As a conclusion, the studied muscular characteristic (lipids, ageing, oxidative metabolism) are positively associated with beef sensorial characteristics (tenderness and juiciness, flavor and meat color). On the other hand, the physiological characteristics (animal maturity, growth rate, muscle mass) are negatively associated with meat quality. It would be interesting to check if these results would be confirmed by using beef graded by untrained consumers.

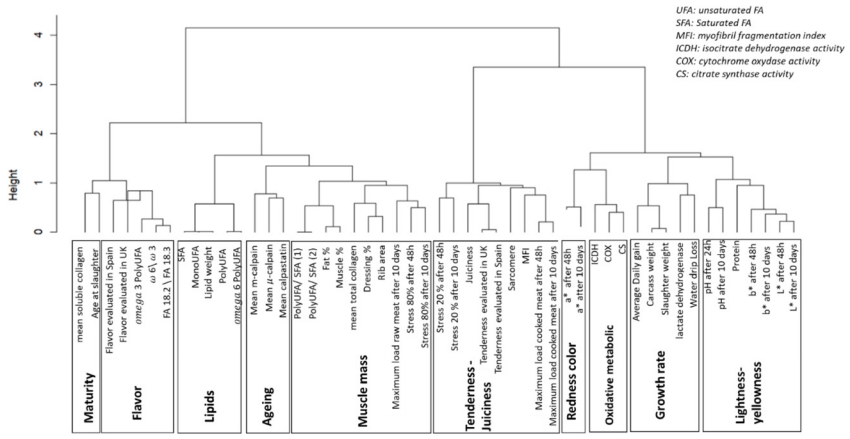

Fig. 1. Dendrogram representing the relation between 51 variables clustered by 10 groups.

Table 1
Representation of the relationships between the 10 cluster.

Cluster name + : Positive correlation / - : Negative correlation

	T&J	Flavor	Growth	Muscle	Ageing	Metab. Oxid	L&Y	Lipids	Redness	Maturity
T&J	+	+	-	-	+		+		+	-
Flavor		+	-	-	+	+		+		-
Growth			+	+	-		+			
Muscle				+	-	-	+	-	-	+
Ageing					+		-			+
Oxid.Metab						+	-		+	+
L&Y							+	-	+	
Lipids								+	+	+
Redness									+	+
Maturity										+

T&J : Tenderness and juiciness
L&Y : Lightness and yellowness
Oxid. Metab : Oxidative Metabolisme