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RELEVANCE OF A MODELLING APPROACH TO MONITOR THE SENSORY ATTRIBUTES OF BLUE CHEESES DURING RIPENING

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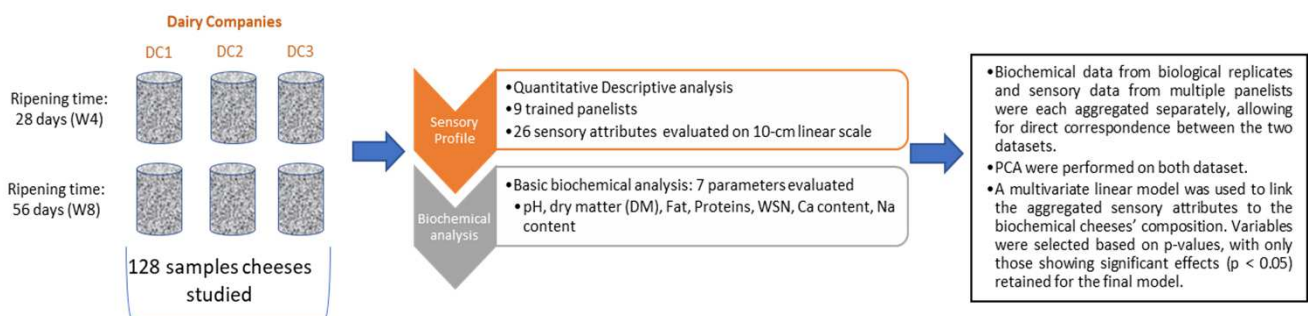
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Introduction

Fourme d'Ambert is a French PDO Blue Cheese made from cow's milk. These cheeses are generally characterized by typical sensory properties such as a "marbled with blue-green veins" appearance and characteristic flavors such as "mouldy aroma, salty and bitter tastes". These sensory properties are the result of changes in biochemical parameters during ripening. In order to better control and monitor the quality of the sensory properties of their products, cheese companies are keen to identify the main biochemical parameters that could contribute to these changes in sensory properties.

By adopting an original multi-criteria approach, the objective of this study is to rely on a modelling approach to identify significant associations between early biochemical markers and the final sensory attributes of Fourme d'Ambert cheeses.

Materials and methods



Results

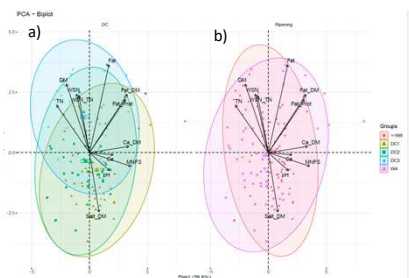


Figure 2: Biplot from PCA performed on biochemical analysis: Impact of dairy companies (a) and ripening (b)

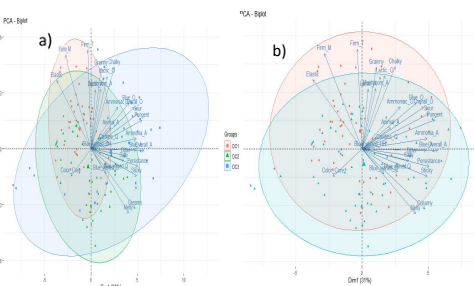


Figure 3: Biplot from PCA performed on sensory profile: Impact of dairy companies (a) and ripening (b)

Regarding the effect of ripening (Fig.2 and 3), W4 cheeses are distinguished by parameters such as fat and dry matter, which affect texture, characterized by firm and elastic products. On the other hand, W8 cheeses are described by proteolysis variables such as WSN/TN and TN, which are associated with a melting and creamy texture.

The origin of cheeses (DC) seems to have an impact on both physicochemical and sensory variables (Fig.2 and 3). Cheeses from both DC1 and DC2 have quite similar physicochemical and sensory profile. Only DC3 differs by a distinctive and intense aromatic profile combined with a more pronounced proteolysis.

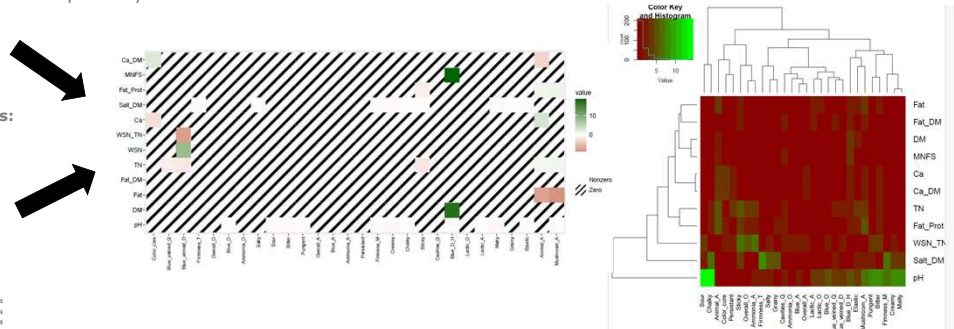


Figure 4: Coefficients and Heat map (p_value) obtained from the correlations between sensory terms and physicochemical parameters.

Heat map coloring shows the strength of the correlation based on the p-value. The result is that irrelevant variables are in red, and the lighter the green, the more relevant the variables are.

Modelling is used to estimate a link coefficient between each biochemical variable and each sensory variable (taking into account the sensory correlation structure).

For example, pH is significant and is correlated with different sensory variables in relation as well basic tastes « Sour and bitter » as texture « Grainy, melty and firm ». In the same manner, Salt/DM seems to be a relevant variable and a potential indicator to control the quality of Blue cheeses. Correlations are observed between salty perception and textural perception « Firm, chalky, sticky ».

Conclusion & Perspective

Despite the ellipses overlap concerning the ripening and dairy companies effects, the first results reveal some interesting links between biophysicochemical and sensory attributes which require further statistical treatments. Actually, a penalized regression approach could be considered, as it allows for more efficient variable selection, particularly in cases with limited data or high correlations in biochemical variables. Additionally, using a generalized linear model (GLM) may provide a better fit for the sensory data by avoiding the assumption of normality, potentially improving the accuracy of the model.