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How to use projective mapping to describe the sensory quality of protein from animal side streams

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INTRODUCTION

Protein from animal blood is a potential source of high-quality proteins for human consumption, but the natural red colour and bloody flavour prevent the direct use as an alternative protein source for food applications. In this study, proteins from pig blood were hydrolysed using two different proteolytic enzymes for decolourisation. To optimise the flavour profile, the hydrolysed blood proteins were purified using diafiltration.

AIM

Using projective mapping to investigate the effect of enzymatic hydrolysis and diafiltration on the bitterness and metallic flavour of the protein.

METHOD

Porcine blood was hydrolysed with two different enzymes 1) Papain (0.35%, pH 7, 55°C, 3 hours) and 2) Alcalase (1.6%, pH 8, 55°C, 3 hours). Half of the hydrolysates were diafiltrated using a Spectrum hollow fibre 3 kDa membrane with a diafiltration volume of 0.2. The four different hydrolysates were freeze dried and served as 20 mL 1% protein solution in brown vials.

Table 1. Overview of the samples

Enzyme	With diafiltration	Without diafiltration
Papain	P W	P WO
Alcalase	A W	A WO

An accredited sensory panel (n=7) performed the projective mapping on an A2 white paper followed by an Ultra-Flash Profile. The panel performed two replicates with two duplicated samples in each replicate. Prior to the evaluation, the panel had one hour of training, and a subset of the samples was discussed. A Multiple Factor Analysis with a bootstrap was run on the factor scores of the samples to obtain confidence ellipses to calculate how many times a word was used and by how many panellists a word was used. A word should be used at least three times and by three different panellists to count. A table was made where the columns were a word, and the rows were the different samples, with the table values indicating the number of times a given word was used to describe a given product. This table was then added to the coordinate data from the Projective Mapping, and a MFA was run on the new data set.

RESULTS AND DISCUSSION

Using projective mapping, it was possible to distinguish between different samples of porcine blood hydrolysates, but only 59.2% of the sample variation was explained by Dim 1 and Dim 2.

The panel evaluated the duplicated samples to be not significantly different (Figure 1). The RV-coefficient (measurement of the closeness) between rep 1 and rep 2 was 0.62. This indicated that there is some agreement between the two reps, but the results could be optimised with more training.

The sensory profile of the blood hydrolysates are different when using papain instead of alcalase. The papain hydrolysates (P W) are described by a sweeter and more bitter taste, with a less metallic flavour (Figure 2 and 3).

Furthermore, the Papain sample was significantly different before and after diafiltration, (P W vs P WO), which most likely is due to removal of the small peptides, although a similar pattern was not seen for the Alcalase sample (Figure 1).

CONCLUSION

Projective mapping can be used as a screening tool to obtain an overview of the dominate difference, especially when the sample amount and time are limited.

The study showed that enzymatic hydrolysis diafiltration has an effect on the sensory quality of porcine blood hydrolysates, especially to decrease the metallic flavour.

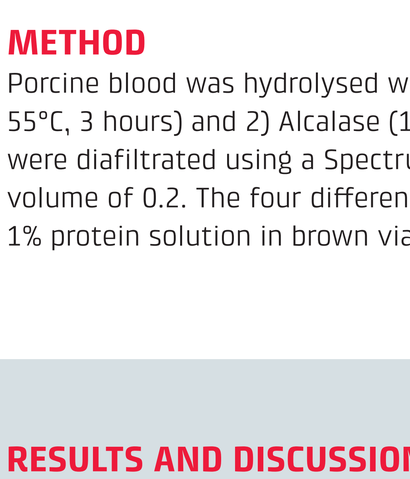

Figure 1. The factor scores with the 95% confident intervals for both replicates.

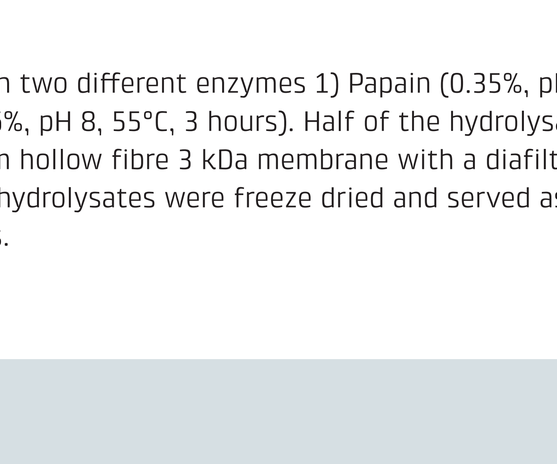

Figure 2. The factor scores of the samples for both replicates.

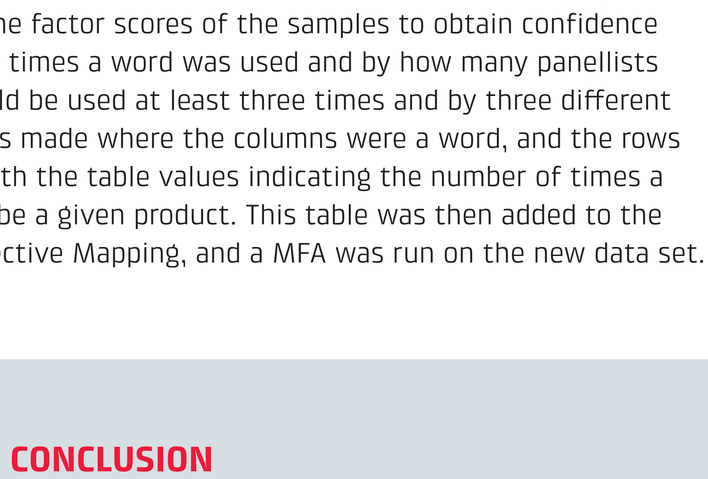

Figure 3. The correlation circle with the words from both replicates.

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