DIGESTIBILITY OF PROTEIN HYDROLYSATES FROM GAME MEAT

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I. INTRODUCTION

The game meat industry is growing in South Africa, thus expanding the range of protein sources. This study aimed to identify the most digestible protein fraction from springbok loin and investigate the techno-functional properties of these protein fractions. Protein hydrolysis results in active and inactive peptides. Peptides can improve functionality and produce bioactive peptides with health benefits. Several bioactive peptides impart antidiabetic, antioxidant, and antihypertensive properties. Bioactive peptides produced from game meat protein have the potential to help reduce the onset of diet-related non-communicable diseases, such as heart disease, stroke, and type 2 diabetes, when consumed in food products. This study was conducted to determine the effect of enzymatic hydrolysis (using Alcalase®) on the in vitro digestibility and techno-functional properties of whole protein and its fractions (sarcoplasmic and myofibrillar protein).

II. MATERIALS AND METHODS

Springbok (Antidorcas marsupialis) loins (a total of three) were purchased from Delicious Trading 5 (Pty) Ltd (Gauteng, South Africa). The loins were each, separately ground using a food processor. The blended meat was used immediately for protein extraction. The sarcoplasmic and myofibrillar proteins were extracted following a method described by (1). The blended springbok meat was homogenized with 0.03 M phosphate buffer (pH7), 1:10 ratio, for 30 seconds using a Waring blender. Half of the whole protein (WP) protein was divided into airtight containers and frozen at -20°C until analysis. Protein hydrolysates were prepared using the Alcalase® enzyme. For whole protein: 139.75mg alcalase was added to 10ml protein; sarcoplasmic protein: 41.55mg alcalase was added to 10ml protein; myofibrillar protein: 12.78mg alcalase was added to 10ml protein. The hydrolysates' degree of hydrolysis, in vitro protein digestibility and functional properties were also determined. An Analysis of Variance (ANOVA) was performed on the data from the different protein fractions and compared at $P \leq 0.05$ using Fisher's least significant difference (LSD) test following the general linear model (GLM) procedure.

III. RESULTS AND DISCUSSION

Table 1 shows the protein digestibility (g/100g), and degree of hydrolysis (%) of the hydrolysates from different protein fractions. Figure 1 shows the SDS-PAGE bands from the whole protein and the alcalase hydrolysed Springbok protein fractions. The protein digestibility of the different extracted fractions (sarcoplasmic and myofibrillar) tends to decrease ($p < 0.05$) when compared to the whole protein (2). This may be due to concentration or agglumatioation due to similarity of the fractional composition restricting enzyme access to binding sites. The protein digestibility likely decreases with each extraction. The estimated protein concentrations for the hydrolysed proteins are lower than their corresponding unhydrolyzed proteins, indicating that protein is lost during hydrolysis.

Table 1 – Protein digestibility of all the protein samples and degree of hydrolysis (%DH) of hydrolysates.

Protein Sample	**Digestibility (g/100g protein)**	**%DH**
Whole Protein	82.312 ±0.26^{c}	-

Sarcoplasmic	74.43 ±0.13[b]	-
Myofibrillar	72.9 ±0.77[b]	-
Hydrolysed Whole Protein	67.38 ±0.38[a]	1.74±0.07[a]
Hydrolysed Sarcoplasmic	66.75 ±0.26[a]	2.30±0.10[b]
Hydrolysed Myofibrillar	67.20 ±0.13[a]	2.09±0.13[bc]

For each column, mean values with different alphabets are significantly different (p < 0.05).

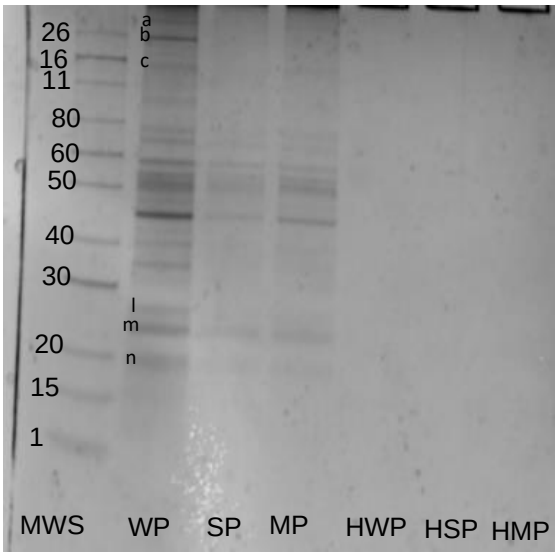

Figure 1. SDS-PAGE gel staining of hydrolysed and hydrolysed proteins

Figure 1: SDS-PAGE gel staining of hydrolysed and hydrolysed proteins. The molecular weight standard bands range between 260-10kDA. MWS= Molecular weight standard, WP= Whole protein, SP= Sarcoplasmic protein, MP= Myofibrillar protein, HWP= Hydrolysed whole protein, HSP= Hydrolysed sarcoplasmic protein, HMP= Hydrolysed myofibrillar protein. Letter A labels the bands of different molecular weights in the protein extracts.

IV. CONCLUSION

The study was conducted to determine the effect of enzymatic hydrolysis (using Alcalase®) on the *in vitro* digestibility and techno-functional properties of whole protein and its fractions (sarcoplasmic and myofibrillar protein). In terms of *in vitro* protein digestibility, it was found that enzymatic hydrolysis decreased the digestibility of whole protein and its fractions. Whole protein was the most digestible protein, which should be considered when finding novel ways of utilizing game meat proteins.

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