THE EFECT OF FUNGAL BIOSTARTER ON MIOFIBRYLLAR PROTEIN STATUS AND STABILITY OF DRY AGED BEEF

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I. INTRODUCTION

Dry-aging of beef (DAB) is the process of maturing this meat in a refrigerated room or fridge for several weeks or even months at controlled temperature, relative humidity, and air flow with spontaneous microbiological occurrence. Beef produced using this method is a niche product that meets the expectations of consumers who appreciate its unique sensory qualities such as taste or aroma. However, incorrect aging processes may lead to the growth of pathogenic microorganisms on the surface of the meat. The study of Hangasaki and Asato [1] and Przybylski et al. [2] reported that *Mucor flavus* strain can be appropriate for the DAB process. It can stabilise microflora as well as improve quality of DAB, especially flavour, odour and softness. However, its effect on muscle protein status is unknown. On the other hand, excessive proteolysis of proteins and muscle tissue components can lead to protein oxidation and, consequently, to their aggregation and reduction of nutritional value. The aim of this study was to analyse the influence of the *Mucor flavus* KKP 2092p biostarter on the proteolysis and status of muscular protein as well as sensory quality of DAB.

II. MATERIALS AND METHODS

Meat control samples (N=5) and samples inoculated with the *Mucor flavus* KKP 2092p biostarter (N=5) from the culture collection of the University of Warsaw, originated from 5 individuals crossbred from Holstein-Friesian cows with bulls of meat breeds, were put into the dry-aging fridge (DryAger, Bad Saulgau, Germany) for 28 days. The physicochemical parameters as: pH, colour parameters, chemical composition of muscle, the content of malondialdehyde, muscular protein proteolysis and polymerization (SDS-PAGE) and sensory quality were assessed after aging. Protein stability as well as heterogeneity, size of particles and potential to aggregation was measured on the intrinsic tryptophan fluorescence (NanoDSF assay). Prometheus Panta (NanoTemper GmbH, Munich, Germany) was used to run all Trp fluorescence measurements [3]. The obtained data were calculated using STATISTICA version 13.3 software (TIBCO Software Inc. 2017). Differences between groups were identified using t-Student's test, at $P < 0.05$.

III. RESULTS AND DISCUSSION

Results presented in Table 1 showed that beef aged with *Mucor flavus* appeared as more soft with significant differences ($P<0.05$) and more juicy as well as with higher acceptability. This is with agreement with results presented on Figure 1a and literature [2]. The analysis of proteolysis of proteins by SDS-PAGE showed that beef samples matured with the *Mucor flavus* showed a significantly higher degree of degradation of such proteins as: 170.6 kDa, 81.7 kDa, 60.2 kDa, Troponin T, 28.9 kDa. Protein oxidation and aggregation were not demonstrated either by SDS-PAGE or nanoDSF (Figure 1a and 1b). The applied miniaturized measurement of intrinsic tryptophan fluorescence (NanoDSF

assay and DLS) for description of protein stability showed differences between *Mucor flavus* and control samples in area of particle size and its heterogeneity (Figure 1b) [3].

Table 1 Meat characteristics after 28 days of aging

Traits	Biostarter-	Biostarter+	SEM	P-value
pH	5.70	5.74	0.02	0.57
*L**	35.28	34.85	1.14	0.89
*a**	20.09	20.60	0.43	0.65
*b**	18.28	18.01	0.26	0.70
Protein content (%)	22.05	21.70	1.64	0.94
Fat content (%)	17.85	16.60	5.83	0.95
Collagen content (%)	1.45	1.48	0.09	0.92
The content of malondialdehyde (mg/kg)	0.17	0.25	0.03	0.26
Softness of aged meat (0-9 unites)	6.59[a]	7.35[b]	0.22	0.02
Juiciness of aged meat (0-9 unites)	6.78	7.43	0.21	0.13
Palatability of aged meat (0-9 unites)	7.12	7.38	0.17	0.57

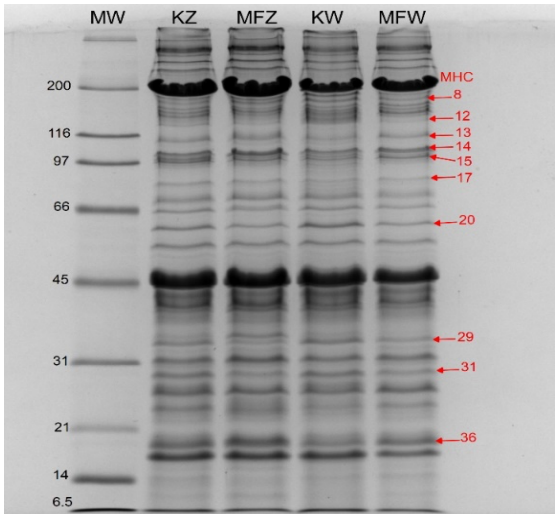

Figure 1. Impact of the aging system on changes of selected protein bands of *Longissimus* beef muscle

IV. CONCLUSION

The results showed a significant effect of the fungal biostarter *Mucor flavus* KKP 2092p on proteolysis of numerous myofibrillar protein without affecting the degree of oxidation and its polymerization. The beef aged with the biostarter was also tender in sensory assessment.

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