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III FOOD PRODUCTION AND PROCESSING

The effect of dark cutting and wet ageing on the technological properties of the beef

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Abstract. The study aimed to determine the effect of dark cutting on the technological properties of beef. Twenty-seven grass-fed beef cattle bulls from two farms were slaughtered at the age of 13–18 months. The sires of the offspring belonged to the Hereford and Simmental breeds, while the dams' breeds were Aberdeen-Angus, Hereford, and Simmental. Semitendinosus muscles were harvested from the carcasses for analysis, which was carried out on the 7th, 14th, 21st, and 28th days of ageing. Eight muscles exhibited a pH of 6 or higher within the wet ageing period, which was defined as the threshold for dark cutting. A linear mixed-effects model in the R 4.3.2 package 'lme4' was utilized to identify statistical differences between the groups. Dark cutting significantly affected the CIE L*a*b* colour space results. Meat samples with high pH tended to be darker and less intensively red and yellow compared to muscles with normal pH during the ageing period. However, no significant colour change was observed in either group over time of ageing. Dark cutting of the beef had a significant effect on water holding capacity (WHC), as meat samples with high pH retained moisture better even under external pressure. The loss of moisture from dark cutting meat samples during the ageing period varied from 5.97 to 7.24%, compared to 9.41–11.82% in muscles with normal pH. Drip loss of water in vacuum packages was also significantly lower in the dark cutting group (1.10–2.17%) during the last three ageing days compared to meat samples with normal pH (3.21–5.21%). WHC exhibited a significant decrease between day 7th and later ageing days in meat samples with normal pH, whereas an increase in drip loss in vacuum bags was observed over the ageing period. Although WHC remained stable during the ageing period in dark cutting beef, drip loss in vacuum bags increased, being significantly lower between day 7 and the last three days. While Warner-Bratzler shear force (WBSF) indicated that dark cutting beef was tenderer than meat samples with normal pH, no significant difference was found. The ageing period did not affect the tenderness of the beef in both pH level groups. The semitendinosus muscle, being a weight-bearing muscle, tends to have a denser structure with more connective tissue. This inherent toughness can make it resistant to tenderization during ageing compared to muscles with a finer texture and less connective tissue. The results revealed that the presence of dark cutting was not related to the chemical composition and the physical measurements of the semitendinosus muscle and the growth performance of the beef cattle. However, the fatness score on the SEUROPE scale was significantly lower (1.61) in carcasses with higher muscle pH values compared to normal ones (2.24). Dark cutting beef is often associated with leaner muscle tissue due to increased glycogen utilization and altered metabolic processes. Overall, the findings suggest that dark cutting significantly influences the colour and WHC of semitendinosus muscle in beef but does not have a substantial impact on tenderness.

Keywords: beef, semitendinosus muscle, dark cutting, wet ageing, technological properties.

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