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Efficacy of Beef Crust from Dry-Aged Beef Loins as Novel Functional Ingredient

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Objectives

Dry-aging is a traditional butchery process, but currently, it has been more practiced in a niche market as a value-adding process. As dry aging involves placing primal/sub-primal sections under a controlled refrigerated condition without packaging materials, the formation of the dried surface (crust) is inevitable due to moisture evaporation. A considerable portion of the crust is to be trimmed off as waste, which is one of the major drawbacks of dry aging. While the beef crust may still exert its functional/technological properties, no information is available regarding the efficacy of utilizing beef crust as a potential food ingredient. Thus, the objective of this study was to determine the physicochemical and functional properties of beef crust from dry-aged beef loins processed under various dry-aging conditions.

Materials and Methods

Paired bone-in beef shell loins from 13 cull cow carcasses (C-maturity) were obtained at 5d postmortem, divided into 2 sections and assigned to four aging treatments: wet-aging (WA), dry-aging (DA), dry-aging in water-permeable bag (DWA) and dry-aging under UV-light (UDA; 5 J/s/12 h per day). Beef sections were aged for 28d at 2°C, 65% RH and 0.8 m/s air flow. After aging, the crusts were separated and beef samples from WA and initial (aged for 0 d, INI) were collected for comparison. In three independent batches, the crust samples were freeze-dried and powdered. Moisture contents of samples were measured before lyophilization. Emulsification capacity, salt-soluble protein solubility, emulsifying activity index, and surface hydrophobicity were determined. CIE* color attributes, lipid oxidation (TBARS), and protein oxidation (carbonyl and thiol contents) were measured. The PROC MIXED procedure of SAS was used to analyze the data. Significance level of least square means was set at the confidence level of 95%.

Results

Beef crusts from dry-aged loins had lower moisture contents compared with WA and INI ($P < 0.05$), while no difference between dry-aging methods was found ($P > 0.05$). The crust samples had lower L* and chroma values than WA and INI ($P < 0.05$). Emulsification capacity of DA, DWA, and UDA were lower than WA and INI ($P < 0.05$), with DA being the lowest ($P < 0.05$). In general, the crust had a significantly higher salt-soluble protein solubility compared to WA, while no difference between crusts and INI was found ($P > 0.05$). For emulsifying activity index, DA exhibited higher values than DWA, UDA and WA ($P < 0.05$), and was comparable to INI ($P > 0.05$). DA and INI had higher surface hydrophobicity values than the other samples, which could possibly explain the results of emulsifying activity index. A trend of higher TBARS values was found in all dry-aged crusts than WA and INI ($P = 0.0688$). The crust from dry aging had a higher carbonyl content compared to WA ($P < 0.05$), while thiol contents were not affected by the treatment ($P = 0.1092$).

Conclusion

The results from the current study indicate that beef crusts exert its functional and technological properties, which could be superior or at least equivalent to wet-aged or unaged beef samples. This study provides novel insight into the potential feasibility and utilization of beef crust from dry-aged beef as a value-added product. Further studies determining the practical application of beef crust as a novel food ingredient (e.g., meat emulsion or beef patty) are in progress.