# EFFECT OF DIFFERENT AGING METHODS ON THE FORMATION OF AROMA VOLATILES IN BEEF STRIP LOINS

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## I. OBJECTIVES

Dry-aged beef is well known for its unique flavor compared to unaged or wet-aged beef. Flavor can be perceived by 5 basic tastes combined with many different aromas. Aroma, especially, is regarded as a critical factor for meat flavor. Therefore, in order to understand the characteristic of dry-aged flavor, the analysis of aroma volatile compounds in dry-aged beef is necessary. In this study, we investigated the changes in aroma compounds of dry-aged beef in comparison to wet-aged beef during 28 d of aging.

## II. MATERIALS AND METHODS

Thirty beef strip loins were allocated to dry or wet aging randomly ($n = 15$ for each aging method). For wet aging, the samples were vacuum packaged and stored at 4°C, while dry aging was processed at 4°C, relative humidity of 75%, and air flow velocity of 2.5 m/s without any packaging. Both aging processes continued for 28 d, and the samples were collected on day 0, 7, 14, 21, and 28 ($n = 3$ for each aging period). Before sampling, the crust of dry-aged beef was trimmed off, and all samples from dry- and wet-aged beef with different aging periods were ground. Then, the ground beef was weighed 5 g in a vial and heated for 10 min at 80°C. Volatile compound analysis was conducted using electronic nose (Heracles II, Alpha MOS, Toulouse, France). After the analysis, each peak area was integrated (Alphasoft System, Alpha MOS), and statistical analysis was performed using general linear model (SAS version 9.4; SAS Institute Inc., Cary, NC). Significant differences were determined by Student-Newman-Keuls comparison test at a level of $P < 0.05$.

## III. RESULTS

As a result, 38 volatile compounds in dry- and wet-aged beef were identified during 28 d of aging and were assigned to the following chemical groups: acid, alcohol, aldehyde, ester, furan, hydrocarbon, ketone, N-containing compound, S-containing compound, and others. As shown in Figure 1, it was detected that the overall levels of volatile compounds in dry-aged beef increased, which were much higher than those in wet-aged beef ($P < 0.05$). Diverse volatile changes were observed in beef during dry aging. From day 14, the aroma of dry-aged beef could be differentiated from those of wet-aged or unaged beef. Most changes in the amounts of volatiles of dry-aged beef were associated with aldehydes, N-containing compounds, and S-containing compounds, which are known to be produced by lipid oxidation and/or microbial activity. We previously found an increase in lipid oxidation during dry aging, as well as increases of free fatty acids and free amino acids in dry-aged beef by microbial

activity (proteolysis and lipolysis). These findings were consistent with the results from other studies on dry- and wet-aged beef.

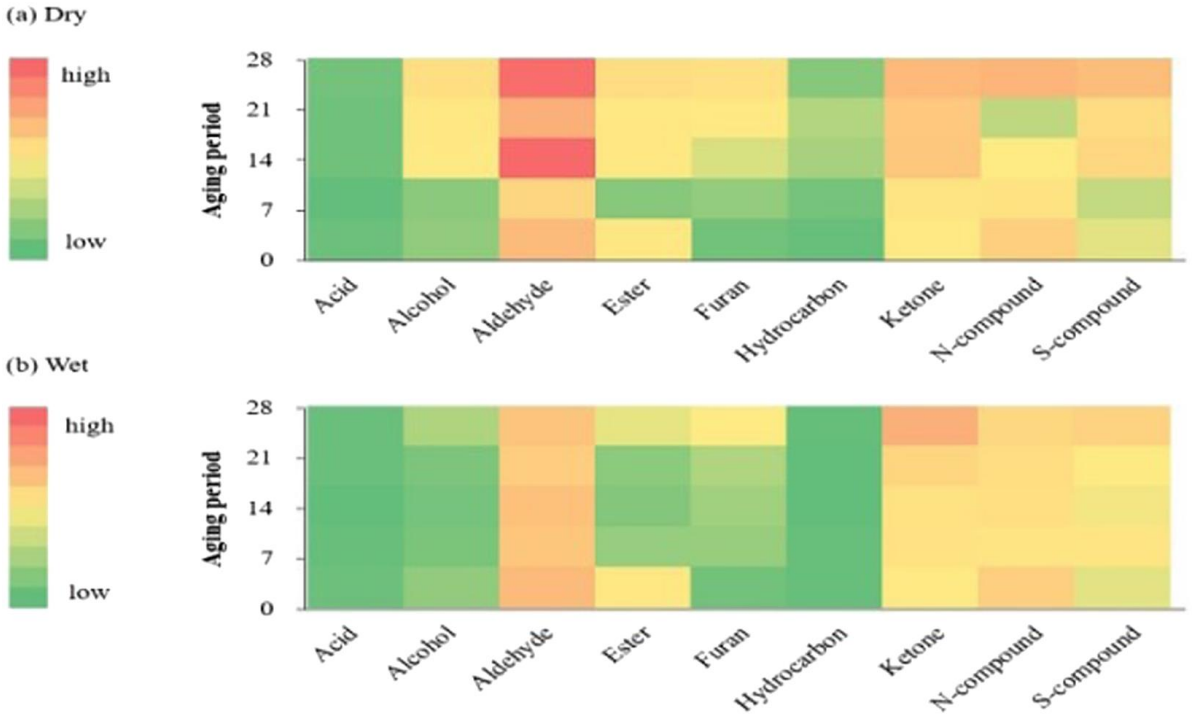


Figure 1.
Heat map on the changes of aroma volatiles in (a) dry-aged beef and (b) wet-aged beef during 28 days of aging period.

## IV. CONCLUSION

Based on the results from previous and our present studies, the formation of volatile compounds in dry-aged beef could be attributed to lipid oxidation and microbial activity during aging. Consequently, dry-aged beef had significantly higher amounts of volatile compounds with more distinctive changes than those in wet-aged beef, possibly resulting in the characteristic of dry-aged beef flavor.

Keywords: aging periods, aroma volatiles, dry aging, wet aging