Effect of grazing on the odors, tastes, and metabolites of Japanese Shorthorn beef

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Objective: The grazing of cattle affects health conditions, carcass weights, and nutrient components [1,2]. Japanese Shorthorn is resistant to cool and suited to open grazing. We conduct grass-fed only beef production of Japanese Shorthorn. However, the effects of grazing on sensory properties such as odor and taste are not clarified. The Maillard reaction, an essential chemical reaction, occurs between amines and carbonyl compounds during meat processing. This reaction generates numerous chemicals which affect the sensory properties of cooked meats [3]. The aim of this study was to investigate the effect of grazing on the odors and tastes in Japanese Shorthorn beef and the relationship between their changes and Maillard reaction substrates.

Materials and Methods: Six Japanese Shorthorn steers were divided into two groups (housing/grazing) and only raised on grass from the pastures of the Yakumo Experimental Farm of Kitasato University. The round parts were aged for 2 weeks by the wet-aging method and then used for the experiments. At first, we investigated the differences in the odors and tastes. Beef samples were heated by electric griddle for 5 min and their odor compounds were analyzed by headspace solid-phase microextraction (HS- SPME). Beef tastes were evaluated with the electric taste sensor and the sensory evaluation was also performed in untrained panel- ists. Moreover, GC/MS metabolome analysis was conducted to measure metabolites in beef.

Results and Discussion: In grazed beef, the number of pyrazines, aldehydes, and furanones was higher than that of housed beef. In particular, 2,5-dimethyl-hydroxy-3(2*H*)-furanone (DMHF) was significantly high in grazed beef. Previously, we have reported that DMHF exerts physiological functions through inhalation [4-5]. This result indicates that grazing of Japanese Shorthorn adds functionality to the cooked beef. In addition, electric taste sensor analysis showed that the acidic bitterness and sweetness of grazed beef were higher than that of housed beef. The richness score of grazed beef in the sensory evaluation was significantly higher than that of housed beef. Thirty-nine metabolites including tryptophan, methionine, glucose, and maltose were identified from GC/MS metabolome analysis, and their contents were correlated with odor and taste values. These results suggest that the sensory properties of grazed Japanese Shorthorn beef would be improved by nutrient component changes.

Conclusion: Grazing of Japanese Shorthorn affected metabolites such as amino acids and sugars in meats. These changes would be associated with the flavor formation in cooked beef through the Maillard reaction. Cattle grazing is one of the sustainable beef productions and attracts attention in Japan. With global food shortages predicted in the future, our findings can help the expansion of Japanese Shorthorn production by grazing.

References:

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