

EFFECT OF INOCULATION RATIO OF MOLD AND YEAST ON BEEF SIRLOIN DURING DRY AGING

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I. INTRODUCTION

In our previous study for the factors affecting characteristic flavor of dry-aged beef, we found that different air flow velocity changed sensory quality of dry-aged beef, possibly due to the different composition of mold and yeast on beef during dry aging (unpublished data). Then, we isolated mold (*Pilaira anomala*) and yeast (*Debaryomyces hansenii*) from the dry-aged beef and investigated their individual effect on flavor precursors such as the amount of free fatty acid and free amino acid, by lipolytic and proteolytic activities of the microorganisms. The results suggested that mold and yeast had significant but different roles on flavor precursors (unpublished data). Therefore, in the present study, the effect of inoculation ratio of mold and yeast was determined to suggest better application of microorganisms for dry aging process to industry.

II. MATERIALS AND METHODS

A total of 36 sirloins (Holstein steer, quality grade 3) were obtained and each 12 sirloins assigned for dry-aged beef with no inoculation of microorganism (control) and the inoculation of the mold and yeast at ratio of 1:1 (MY1) or 4:1 (MY4). After the inoculation of microorganism, the samples were dry-aged for 21 days (temperature, 4°C; relative humidity, approximately 75%). During aging process, the samples were collected at 0, 10, 15, and 21 days and trimmed off the crust before the analyses of umami intensity [1], shear force, and sensory quality [2] of dry-aged beef. In sensory evaluation, control and MY1 at day 15 were compared with MY4 at day 10, which selected based on the results from umami intensity and shear force. Sensory quality (dry-aged aroma, flavor, tenderness, and overall acceptance) of each sample was analyzed by a semi-trained panel using a 9-point hedonic scale (1 = dislike extremely, 9 = like extremely). For statistical analysis, the general linear model was performed using SAS 9.4 (SAS Institute Inc., Cary, NC, USA) on the basis of the Tukey's multiple range test at a level of $P < 0.05$.

III. RESULTS AND DISCUSSION

Table 1. Umami intensity and shear force of beef sirloin after the inoculation of mold and yeast at different ratio and dry-aged for 21 days

	Treatment ¹	Aging period (day)				SEM ²
		0	10	15	21	
Umami intensity	Control	0.28 ^c	0.46 ^{bx}	0.80 ^{ax}	0.44 ^{bx}	0.021
	MY1	0.28 ^b	0.27 ^{by}	0.64 ^{ax}	0.19 ^{bz}	0.027
	MY4	0.28 ^c	0.47 ^{ax}	0.46 ^{aby}	0.37 ^{bcy}	0.022
	SEM ³	0.006	0.016	0.041	0.014	
Shear force (N)	Control	23.56 ^a	24.96 ^{ax}	16.37 ^{by}	15.73 ^{by}	0.696
	MY1	23.56 ^a	17.10 ^{cy}	19.28 ^{bcx}	20.68 ^{abx}	0.737
	MY4	23.56 ^a	16.25 ^{bcy}	19.28 ^{bx}	14.80 ^{cy}	0.766
	SEM ³	1.124	0.767	0.418	0.354	

Umami intensity = $u + 1218 uv$. u: glutamic acid (%), v: inosine 5'-monophosphate (%).

¹Control, dry-aged beef with no inoculation; MY1, dry-aged beef inoculated with mold and yeast at the ratio of 1:1; MY4, dry-aged beef inoculated with mold and yeast at the ratio of 4:1

²Standard error of means (n=12), ³(n=9).

^{a-c}Different letters within the same row mean significant difference ($P < 0.05$).

^{x-z}Different letters within the same column mean significant difference ($P < 0.05$).

The inoculation of MY1 and MY4 affected the changes in umami intensity and shear force of dry-aged beef (Table 1). The highest umami intensity of control and MY1 reached at day 15, whereas that of MY4 was at day 10. Meanwhile, control had a significant decrease in shear force from day 15, while that of MY1 and MY4 reached a significantly lower value at day 10. Considering the values of umami intensity and shear force of all treatments in this study, 15 days of dry aging may be better for control and MY1, whereas 10 days was the best for MY4.

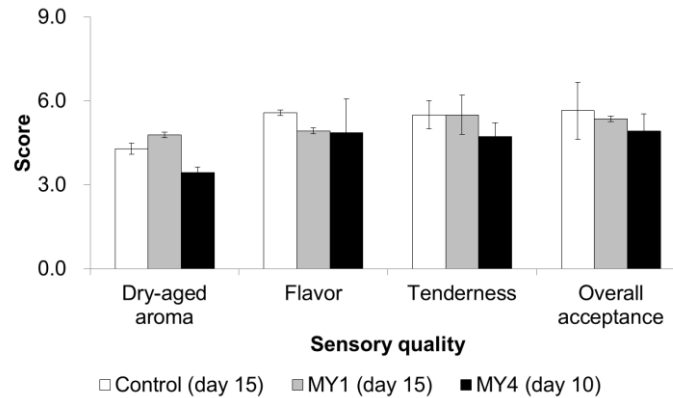


Figure 1. Sensory quality of dry-aged beef with different inoculation ratio of mold and yeast at different aging period (mean±standard deviation). Control, dry-aged beef at 15 day with no inoculation; MY1, dry-aged beef at 15 day after inoculating mold and yeast at the ratio of 1:1; MY4, dry-aged beef at 10 day after inoculating mold and yeast at the ratio of 4:1.

In sensory evaluation, we compared the sensory quality of dry-aged beef with/without the inoculation of MY1 and MY4 at different aging period (control and MY1 at day 15 and MY4 at day 10) (Fig. 1). As a result, no significant difference was found in all sensory parameters tested including dry-aged aroma, flavor, tenderness and overall acceptability of the samples at different aging periods. It means that the application of MY4 could reduce aging period significantly without adverse effect on its sensory quality.

IV. CONCLUSION

The inoculation ratio of the mold and yeast could affect sensory quality of dry-aged beef. MY4, which had a higher mold population, resulted in the improvement of umami intensity and shear force at least 5 days of shortened aging period when compared to control and MY1. Based on this study, MY4 could be better combination for dry-aged beef and its application would reduce aging period, which significantly reduce production cost for dry aging process.

ACKNOWLEDGEMENTS

This study was supported by “High Value-added Food Technology Development Program (Project No. 316048),” Korea Institute of Planning and Evaluation for Technology in Food, Agriculture, Forestry and Fisheries.

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