

# Screening of Japanese sensory descriptors for beef, pork, and chicken using questionnaire study on Japanese consumers and licensed chefs

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**Abstract**— Sensory properties of muscle foods such as beef, pork, and chicken, are the important factors for consumers' satisfaction. Meat quality characteristics have been diversified in recent years by new feed resources and animal breeds, therefore, sensory descriptors which can express diversified sensory properties should be established. In this study, we conducted the first screening of sensory descriptors for muscle foods by a questionnaire study on Japanese consumers and licensed chefs.

Two-hundred and ninety three sensory descriptors were collected from Japanese dictionary and applied to the questionnaire study. Respondents were 522 consumers and 234 licensed chefs living in Tokyo or Osaka regions in Japan, and chose the descriptors that were suitable for the sensory properties of 'good beef,' 'bad beef,' 'good pork,' 'bad pork,' 'good chicken,' 'bad chicken,' and 'not related to meat'. The frequency of selection of each descriptor was logged and subjected to a correspondence analysis.

The correspondence analysis presented that correspondence factors 1 and 2 indicated good/bad sensory characteristics and related/not related to meat characteristics, respectively. Sensory descriptors that had correspondence scores above zero for factor 2 were selected as the items suitable for evaluation of meat characteristics. The number of selected items was 91, which included 17, 24, and 50 items for taste, odor, and texture characteristics, respectively.

**Keywords**— sensory descriptor, Japanese, consumer

## I. INTRODUCTION

Sensory characteristics, such as taste, odor, and texture, are the important factors for consumers' satisfaction in muscle foods such as beef, pork, and chicken. Sensory evaluation has been used for analysis and improvement of sensory properties of meat. In previous sensory test of meat, there have been some typical evaluation items, such as 'tenderness,' 'juiciness,' 'flavour intensity,' 'overall palatability,'

etc. However, the reason why these evaluation items have been used for meat sensory test is not clear.

On the other hand, consumers' requirement has been diversified in the recent years in Japan [1]. Furthermore, meat quality characteristics also have been diversified in the recent years by new feed resources [2] and animal breeds. New sensory descriptors which can express the diversified sensory properties should be established for the purpose of analysis and improvement of sensory characteristics of meat.

In the previous study, we newly characterized two items, 'chewiness' and 'hardness' from texture vocabularies defined in ISO5492:1992, for meat texture evaluation, which has been analysed by 'tenderness' in previous sensory investigations [3]. We also presented that the changes in 'chewiness' and 'hardness' were different from each other during cooking end-point temperature increasing [4]. In addition, we found that beef marbling, which has been considered to improve 'tenderness', improves both 'chewiness' and 'hardness' [5]. New sensory items including new information of sensory properties were useful for characterize sensory properties of meat.

In the present study, we conducted the first phase screening of Japanese sensory descriptors including taste, odour and texture for muscle foods by a questionnaire study in the aim of establishment of new sensory items which can provide new information of sensory properties of meat.

## II. MATERIALS AND METHODS

### A. Collection of candidate sensory words

Candidate sensory words were collected from Japanese dictionary [6] and ISO5492:1992 [4]. The numbers of sensory words were 53, 77, and 163 for taste, odour, and texture characteristics, respectively.

The list of candidate words for taste and odour are indicated in tables 1 and 2, respectively.

Table 1 Candidate taste items

Japanese (English, if possible)	Japanese (English, if possible)
<i>Amami</i> (sweetness)	<i>Koubashii</i> amasa
<i>Sanmi</i> (sourness)	<i>Kotteri</i>
<i>Enmi</i> (saltiness)	<i>Pan-no-aji</i> (bread taste)
<i>Kumi</i> (bitterness)	<i>Kometsubu-no-aji</i> (rice taste)
<i>Umami</i>	<i>Zatsumi</i>
<i>Shibumi</i> (bitterness)	<i>Sappari</i> (fresh)
<i>Karami</i> (hotness)	<i>Shiokaze-no-aji</i> (salt-air taste)
<i>Koku</i> (body)	<i>Shigeki-teki</i> (stimulating)
<i>Akumi</i>	<i>Shitsukoi</i> (persistent)
<i>Assari</i> (plain)	<i>Shibo-aji</i> (fatty taste)
<i>Atsumi</i>	<i>Shoyu-aji</i> (soy source taste)
<i>Atoaji</i> (remind taste)	<i>Su-aji</i> (vinegar taste)
<i>Aburakkoi</i> (fatty)	<i>Sukkiri</i> (pure)
<i>Aburappoi</i> (fatty)	Smoky
<i>Ama-karai</i> (sweet and hot)	<i>Chi-no-aji</i> (bloody)
<i>Ama-zuppai</i> (sweet and sour)	<i>Tsuchi-no-aji</i> (soil-like)
<i>Ama-nigai</i> (sweet and bitter)	Tomato-aji
<i>Tanpaku</i>	<i>Noukou</i> (strong)
<i>Iso-no-aji</i> (taste of shore)	<i>Piritto-shita</i>
<i>Umi-no-aji</i> (taste of ocean)	<i>Pirikara</i> (hotness)
<i>Egumi</i>	<i>Horo-amai</i> (slightly sewwt)
<i>Kuse-ga-arui</i> (sharp)	<i>Horo-nigai</i> (slightly bitter)
<i>Kuse-no-nai</i> (mild)	<i>Mattari-shita</i>
<i>Kudoi</i>	<i>Maroyaka</i> (fullness)
<i>Koi</i> (strong)	Milky
<i>Koubashii</i> (roasted)	

Table 2 Candidate odour items

Japanese (English, if possible)	Japanese (English, if possible)
Amine-like	<i>Ibusareta</i> (fumed)
Almond-like	<i>Umi-no-kaori</i> (odour of ocean)
<i>Aoi</i> (green)	Ether-like
<i>Aokusai</i> (green)	Ester-like
Anis-like	<i>Onsen</i> (odour of spa)
Abura-kusai (oily)	<i>Kabi-shu</i> (mold)
<i>Amai</i> (sweet)	<i>Kankitsu</i> (citrus)
Alcohol-like	<i>Kampo-yaku</i> (herbal medicine)
Ammonia	<i>Ki-no-nioi</i> (woody)
Yeast-like	<i>Kinzoku-shu</i> (metallic)
<i>Iso-no-kaori</i> (odour of shore)	<i>Kusatta</i> (spoiled)
<i>Kusa-no-nioi</i> (grassy)	<i>Naizo-kusai</i> (pluck-like)

<i>Kusami</i> (bad smell)	<i>Namagusai</i>
<i>Yakusou</i> (medical herb-like)	<i>Niku-no-youna</i> (meaty)
Green	<i>Ninniku</i> (garlic)
<i>Kurumi</i> (walnut-like)	<i>Negi</i> (onion-like)
<i>Kemono-kusai</i> (bestial)	<i>Nonohana</i> (flower-like)
<i>Koubashii</i> (roasted)	Butter-like
<i>Koke-no-youna</i> (mossy)	<i>Hakka</i> (peppermint)
<i>Kogeta</i> (burned)	<i>Hakkou-shu</i> (fermented)
<i>Koshou-no-youna</i> (pepper-like)	<i>Hana-no-youna</i> (flower-like)
<i>Sakana-kusasa</i> (fish-like)	Vanilla-like
<i>San-shu</i> (acidic)	<i>Hinata-kusai</i> (sunny)
<i>Sanpa-shu</i> (rancid)	<i>Byoin-no-youna</i> (hospital-like)
<i>Shio-no-kaori</i> (salty)	Fruity
<i>Jushi-no-youna</i> (resin-like)	<i>Hoshikusa</i> (hay-like)
<i>Shoben-shu</i> (urin-like)	<i>Horo-nigai</i> (slightly bitter)
<i>Shinrin-no-kaori</i> (forest-like)	<i>Matsu-no-youna</i> (pine-like)
<i>Suppai-nioi</i> (acidic)	<i>Mame-shu</i> (bean-like)
Spicy	<i>Midori-no-kaori</i> (green)
<i>Sekiyu</i> (petroleum-like)	Milk-like
<i>Sekken</i> (soapy)	<i>Mori-no-kaori</i> (forest-like)
<i>Daikon-kusasa</i>	<i>Yakuhin-shu</i> (medical)
<i>Tanka-shu</i> (charred)	<i>Yani-kusai</i> (tar-like)
Cheese-like	<i>Yama-no-kaori</i> (mountain)
<i>Chi-no-nioi</i> (bloody)	<i>Rou-no-youna</i> (waxy)
<i>Tsuchi-kusai</i> (soil-like)	
<i>Doro-kusai</i> (mud-like)	

## B. Recruitment of participants

**Participants:** Participants of the questionnaire study were consumers and licensed chefs in Tokyo or Osaka recruited from approximately 500 thousand monitors registered with VLC Co. Ltd., Tokyo, Japan. The numbers of participants were 250, 272, 127, and 107 for consumers at Tokyo, consumers at Osaka, chefs at Tokyo, and chef at Osaka, respectively. The age of participants was from 20s to 60s, and the ratios of gender were equal in both consumer and licensed chefs. Consumer participants were limited to those who purchase fresh food at least once a week.

## C. Questionnaire study

The questionnaire study was conducted on the World Wide Web system in December 2010.

The candidate words were presented in participants in Japanese. The order of presentation of candidate

words was randomized for each participant. Participants evaluate the words using following options; 'related to good beef,' 'related to bad beef,' 'related to good pork,' 'related to bad pork,' 'related to good chicken,' 'related to bad chicken,' 'not related to meat characteristics,' and 'cannot choice'. Multiple answers were allowed other than 'cannot choice'. The frequency of selection of each candidate word in each option was logged and subjected to statistical analysis.

#### D. Statistical analysis

Statistical analysis was performed using the SAS system (version 9.12, SAS Institute, Cary, NC). Correspondence analysis was used for analysis of the frequency of selection of each candidate word by using CORRESP procedure of SAS, and the analysis was divided into taste, odour, and texture in each category of participants in each region.

### III. RESULTS AND DISCUSSIONS

Proportions of correspondence factors in taste, odour, and texture characteristics in each respondent category in each region were indicated in table 3.

Table 3 Proportions of correspondence factors

Category	Region	Factor	Proportions (%)		
Taste	Consumers	Tokyo	1	66.2	
			2	26.7	
			3	4.9	
	Osaka		1	68.5	
			2	27.4	
			3	2.7	
	Chefs	Tokyo		1	66.0
				2	24.9
				3	4.7
Osaka			1	63.5	
			2	26.4	
			3	5.7	
Odour	Consumers	Tokyo	1	71.1	
			2	26.9	
			3	0.9	
	Osaka		1	72.6	
			2	28.9	

Chefs	Tokyo		3	0.9	
			1	74.2	
			2	20.5	
	Osaka		3	2.6	
			1	67.2	
			2	26.1	
Texture	Consumers		3	2.4	
		Tokyo		1	69.7
				2	26.1
			3	2.9	
	Osaka		1	71.4	
			2	24.0	
			3	3.4	
	Chefs	Tokyo		1	68.5
				2	24.4
			3	3.9	
Osaka			1	68.5	
			2	24.5	
			3	4.5	

The explanation of each factor was similar in each sensory category in each respondent category in each region; factor 1 indicated 'good characteristics' or 'bad characteristics' and factor 2 indicated related/not related to sensory characteristics of meat. Factor 3 related to species of animals such as 'beef and pork' or 'chicken'.

Sensory words that had correspondence scores above zero for factor 2 in all four respondent categories were selected as the items suitable for evaluation of meat characteristics. The number of selected words was 91, which included 17, 24, and 50 words for taste, odour, and texture characteristics, respectively (not shown).

### IV. CONCLUSIONS

We selected 91 sensory descriptors from 293 candidate words as first phase of screening. Second phase screening of the sensory words using analytical sensory evaluation is needed for establishment of more adequate sensory evaluation system of meat in Japanese.

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