

The Impact of Food Neophobia on Consumer Expectations and Perceptions for The Visual Appearance of Rice

Wichit Sophitanontrat

*Department of Applied Bio-Resource Science,
Faculty of Interdisciplinary studies, Khon Kaen University, Nong Khai Campus,
Nong Khai 43000 Thailand*

Kritsda Khajareern

*Department of Applied Bio-Resource Science,
Faculty of Interdisciplinary studies, Khon Kaen University, Nong Khai Campus,
Nong Khai 43000 Thailand*

Abstract- This research was aimed to investigate how individual's food neophobia level affected consumer expectations and perceptions of the sizes and shapes of rice. Neophilic (n=32) and neophobic (n=28) consumers based on food neophobia scale, were recruited. This group of consumer responded to rate the visual hedonics, feeling, context of uses and purchase intention of eight whole grain rice samples which had different sizes and shapes (N=8; thin/short, thin/long, medium long (Control), rounded/long, rounded medium long I and II, long and rounded/short grains). The results showed that both of medium long and long grains had highest mean score for all attributes. Then these whole grain rice samples were cooked and rated again. The results showed that cooked thin/short rice had highest mean score for all attributes. Comparison of purchase intention of both of medium long and thin/short rice before and after cooking for neophilic and neophobia group showed the opposite results, before cooking, most of consumer panels intended to purchase medium long grain more than thin/short grain but after cooking they intended to purchase cooked thin/short rice more than cooked medium long rice. This information may be benefit for rice cultivar development, food label and advertisement.

Keywords – Expectation, Perception, Visual Appearance, Food Neophobia Scale

I. INTRODUCTION

Thailand is one of the world top three rice exporters [1]. Jasmine rice was a rice variety that has been demanded from other countries [2]. Jasmine rice (*Oryza sativa L.*) (Known as Khao Horm Mali in Thai) is the world-famous rice [3]. It is a non-glutinous fragrant variety and considered to be a top quality rice in Thailand [4] due to its fragrance aroma, superior taste, soft texture as well as high cooking quality [5]. In 2017 and 2020, Thai jasmine rice won the world's best rice 2017 winner at the World Rice Conference [6]. According to the contest criteria, appearance of rice grain including size and shape will be evaluate before the rice sample will be tasted by chefs from different countries in each year [7].

Expectation played a major role on consumer perception, liking, and acceptance towards food products [8]. It was also described by [9] that appearance as the first impression of a food product on the shelf affected customer's purchasing intention. Although aroma and taste of rice were considered as important characteristics of rice, size and shape of rice grain also important in the consumer's point of view [10]. In order to understand consumer and develop the product to match with their demands, it is essential to study consumer about their needs, wants, and preferences. Consumer's demand can be varied based on their background. Consumer can be classified into different groups and there are several types of criteria such as demographic, geographic, behavior, and psychographic characteristic and these characteristics influence on their food choice [11]. As consumers have more diverse lifestyles in a globalized world [12] and the food system becomes more complex, consumers in the world are faced with making food choices from the many food products offered [13], and the consumption behavior is more different [12]. Thus, it is not sufficient to characterize food consumers on the basis of demographic or sociodemographic data [14]. [15] offered consumer psychographic segmentation based on food neophobia (Reluctance to avoidance of novel foods) which was most frequently measured using the Food Neophobia Scale

(FNS; [16]). It was used to predict decisions to eat a novel food items [17]. [18] had explored the food neophobia constructs regarding the way of overcoming all individuals' food neophobia in general for molecular gastronomy cuisine applications and to examine how science-based cooked foods should be marketed based on these neophobia constructs. This individual's attitude towards foods influenced on food choices [19].

It is interesting to study the relationship of food neophobia and the different rice grain size and shape as a part in this study as well. The rice grain expectations and cooked rice perceptions towards the size and shape has never before been compared between food neophobic and neophilic consumers. This study may help approaching the consumer needs which may be benefit for the rice quality development and improvement especially to rice visual appearances. It will also be a crucial piece of information for food marketing strategies as advertising or product descriptions on food labels. To help understand rice consumer more thoroughly, the aim of the study was to investigate different groups of consumer based on food neophobia degree towards different types of rice.

II. METHODOLOGY

1. Sample preparation

Eight marketed rice products (Shown in Figure 1) were sampling from different superstores in Bangkok and online channels (Covering in the different sizes and shapes of grain rice which picked up the world's best rice winner at the World Rice Conference). The samples included thin/short (Thai Sang Yod rice), thin/long (India Basmati rice), medium long (Control; jasmine rice), rounded/long (Italy Arborio Risotto rice), rounded/medium long I (American California rose rice), rounded/medium long II (Myanmar Paw San rice), long (Cambodia Malys Angkor rice) and rounded/short grain (Japanese Koshi Hikari rice). All tested samples had been certified by The Thai Food and Drug Administrations. All broken grain, abnormal shape, different color shade was removed. Only perfect whole kernel rice grains were selected and used.



Figure 1. Different size and shape rice samples; (a) whole grain rice and (b) cooked rice samples (N=8). They consisted of thin/short, thin/long, medium long (Control), rounded/long, rounded/medium long I, rounded/ medium long II, long and rounded/short grain (From left to right).

The test was divided into 2 sessions: before (Expectation) and after cooking (Perception). For expectation session, each sample was served with approximately 100 grams in a clear plastic container and closed cover for 100 grams and encoded for blind tasting with three-digit random numbers to avoid any biases [20]. For perception session, all samples were cooked by conventional rice cooker (OTTO CR-110T Model) and following the cooking instruction as mentioned in the manufacturer label from each rice bag. They were served 100 grams in a container with an aluminum foil cover and encoded with random three digit numbers to avoid bias. They were presented in controlled temperature at 50 °C for a test [21].

2. Subjects

One hundred consumer panels ([22] recommended consumer panel size for various consumer sensory testing laboratory), of which 47 neophobics (mean age was 23.4 ± 2.5) and 53 neophilics (mean age was 23.3 ± 2.6) were divided by completing the food neophobia scale [16]. They were students and staffs of the university. They willing to participate in this research. These subjects had never been trained in sensory testing before. All participants must not have vision health problems.

3. Experiments

Appearance evaluation was divided into two sessions. There were eight raw whole grain rice samples in the first session and eight cooked rice samples in the second session. Serving order of each sample in each session were designed using Randomized Complete Block design [21].

After appearance consideration, consumer were asked to rate their degree of liking towards each sample in size, length (short, medium long, and long), shape (thin or rounded) of rice grain, and overall liking using a nine-point hedonic scale (1 = disliked extremely, to 9 = extremely liked) [23]. Opinion on Feeling level such as looking delicious and easy to chew were evaluated using the following 9- point mood scale (1 = not at all, to 9 = very much) [20]. Then context of uses was tested by rating the degree of appropriateness of consumption patterns to prepare rice for eating in different modes [24]: boiled and cooked were evaluated using the 9-point appropriateness scale ([25]; 1 = extremely inappropriate, to 9 = extremely appropriate). Finally, consumer panels evaluated their purchase intent to the samples by using a five-point structured scale (1 = certainly will not buy, to 5 = certainly will buy) [26].

4. Size and shape measurement

The morphometric parameters (length, width, thickness, and elliptic factor) of the grains were measured using Vernier caliper [27] then geometric mean diameters were calculated. The measurements of length (L), width (W) and thickness (T) in (mm) of hundred grains randomly measured in order to investigate geometric of different grain varieties [Geometric mean diameters (GMD) = (L x W x T)^{1/3}]. The sphericity (%) of each grain were calculated using this parameter; sphericity (S) = GMD/L (1.0 or less = round, 1.1-2.0 = bold, 2.1-3.0 = medium and over 3.0 = slender) [28].

5. Data analysis

The obtained data were analyzed using analyses of variance (ANOVA) ($p \leq 0.05$) considering sample and consumer panel (block) as sources of variation by SPSS/PC for Windows Version 26.0. The level of significance for all statistical analysis was set at 0.05. This significance level ($p \leq 0.05$), [29] also used for their sensory research.

III. RESULT AND DISCUSSION

For the results of the impacts of shape and size of rice grain products on visual hedonic preference and consumer perception were shown in Table 1 and 2.

Table 1 showed mean responses of grain rice and cooked rice with different size and shapes for neophilic consumer panels. Regarding to differences between the shapes of grain rice, it was found that participants liked long grain (7.5) better than medium long grain (6.75) and thin/short grain (6.25). They were less likely for thin/long grain (5.25) and rounded/long grain (5.88). Cooked rice, it was found that participants were most liked for the thin/short rice (7.75) which greater than medium long rice (5.88), long rice (5.75), and rounded/medium long rice (3.71), respectively. Rounded/short rice and rounded/medium long rice were perceived as having high ease of chewing and appropriate for porridge.

Table - 1 Mean responses for rice with different shapes for neophilic consumer panels

	Rounded/Long		Rounded/Medium long I		Rounded/Medium long II		Rounded/Short		Long		Medium long		Thin/Long		Thin/Short	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
	re	r	re	r	re	r	re	r	re	r	re	r	re	r	re	r
	cook	cook	cook	cook	cook	cook	cook	cook	cook	cook	cook	cook	cook	cook	cook	cook
	ing	ing	ing	ing	ing	ing	ing	ing	ing	ing	ing	ing	ing	ing	ing	ing
Shape liking	5.50 _b	6.50 _a bcd	6.50 _a b	2.86 _c **	6.00 _b	6.88 _a b	5.75 _b	5.38 _b cd	7.88 _a	7.88 _a	6.75 _a b	5.00 _c d*	5.25 _b	6.63 _a bc	6.25 _a b	7.38 _a
Size liking	5.38 _b c	6.50 _a bc	6.63 _a b	4.00 _d **	6.50 _a bc	6.88 _a b	5.75 _a bc	5.63 _b cd	7.13 _a	7.13 _a	6.75 _a b	5.50 _b cd	5.00 _c	6.38 _a bc	5.88 _a bc	7.50 _a *
Length	5.25 _b	5.75 _b	5.63 _b	2.71 _c	4.75 _c	6.75 _a	5.13 _b	6.00 _b	7.50 _a	7.50 _a	7.25 _a	5.75 _b	6.13 _a	6.13 _b	6.63 _a	8.00 _a

h	c		c	*		b*	c				*	bc		b	*		
liking																	
Plum	6.00 _a	7.25 _a	6.50 _a	3.71 _c	6.88 _a	7.13 _a	6.50 _a	6.25 _a	6.50 _a	6.50 _a	5.88 _a	6.25 _a	4.63 _b	7.00 _a	5.38 _a	7.38 _a	
p				*			b	b	b	b	b	b		**	b	**	
liking																	
Over	5.88 _b	6.88 _a	6.63 _a	3.71 _c	6.75 _a	7.00 _a	6.25 _a		5.88 _b	7.50 _a	7.50 _a	6.75 _a	5.88 _b	5.25 _c	6.63 _a	6.25 _a	7.75 _a
all			bc	**	b	b	bc					b			b	bc	*
liking																	
Looki																	
ng	5.50 _b	7.38 _a	6.75 _a	3.29 _d	5.63 _b	7.25 _a	6.00 _a	5.75 _b		7.75 _a	7.75 _a	6.88 _a	5.50 _c	5.00 _b	6.88 _a	6.63 _a	7.88 _a
delici		b*	b	*		bc	b	c				b	*		bc*	b	
ous																	
Easy																	
to	5.63 _b	6.75 _a	6.88 _a	6.57 _a	6.13 _a	7.00 _a	7.13 _a		7.25 _a	7.25 _a	7.25 _a	6.75 _a	6.75 _a	5.63 _b	6.88 _a	6.63 _a	7.38 _a
chew			b		b		b					b				b	
Suita																	
ble to	5.25 _a	6.13 _a	5.25 _a	3.57 _c	5.38 _a	7.38 _a	5.00 _b	7.50 _a		7.38 _a	7.38 _a	6.25 _a	6.50 _a	4.75 _b	6.63 _a	3.75 _c	7.00 _a
boil	bc	b	bc		bc	*	c	*				b	b	c	b		**
Suita																	
ble to	5.38 _b	6.75 _a	5.63 _b	4.14 _c	6.00 _b	7.25 _a	5.50 _b	5.00 _d		8.13 _a	8.13 _a	7.00 _a	5.25 _c	5.38 _b	7.13 _a	6.88 _a	8.25 _a
cook		bcd				b		c				b	dc*		bc*	b	
Purc																	
hase	3.25 _b	3.75 _a	3.25 _b	1.86 _d	3.50 _a	4.25 _a	3.25 _b	3.25 _b	4.50 _a	4.50 _a		4.75 _a	2.50 _c	2.75 _c	4.00 _a	4.13 _a	5.00 _a
intent	c	bc	c		bc	b	c	cd	b	b			d**		b	bc	
ion																	

Remark: * Different from before cooking significantly 0.05, ** 0.01

a, ab, b = Sample comparison in each item statistical significance at 0.05.

Table - 2 Mean responses for rice with different shapes for neophobic consumer panels.

	Rounded/Long		Rounded/Medium long I		Rounded/Medium long II		Rounded/Short		Long		Medium long		Thin/Long		Thin/Short	
	Before cooking	After cooking	Before cooking	After cooking	Before cooking	After cooking	Before cooking	After cooking	Before cooking	After cooking	Before cooking	After cooking	Before cooking	After cooking	Before cooking	After cooking
Shape liking	4.35 _c	5.35 _{cd}	5.95 _b	3.25 _{c**}	4.15 _c	6.75 _{a**}	4.55 _c	6.20 _{b**}	7.75 _a	4.70 _{d**}	7.85 _a	5.60 _{cd**}	6.10 _b	5.85 _b	5.95 _b	7.40 _{a**}
Size liking	4.70 _b	5.35 _{cd}	5.75 _b	3.40 _{c**}	4.35 _c	6.70 _{a**}	4.35 _c	6.35 _{b**}	7.25 _a	5.25 _{d**}	7.50 _a	5.60 _{cd**}	5.60 _b	6.15 _b	5.35 _b	7.45 _{a**}
Length liking	4.15 _c	4.45 _c	5.00 _c	3.95 _c	3.70 _d	6.35 _{b**}	3.65 _d	6.30 _{b**}	7.65 _a	5.75 _{b**}	7.65 _a	5.55 _{b**}	7.20 _a	5.70 _{b**}	6.55 _b	7.50 _{a*}
Plump liking	5.30 _{cd}	6.00 _b	6.40 _a	3.40 _{d**}	5.80 _a	6.75 _a	5.75 _b	6.00 _b	6.75 _a	5.05 _{c**}	6.95 _a	6.25 _a	4.90 _d	6.00 _b	5.15 _d	7.10 _{a**}
Overall liking	4.60 _c	5.70 _{cd*}	5.95 _b	3.60 _{c**}	4.75 _c	6.90 _{a**}	4.65 _c	6.35 _{b**}	7.65 _a	5.40 _{d**}	7.80 _a	5.80 _{cd**}	5.95 _b	6.00 _c	5.75 _b	7.70 _{a**}
Looking delicious	4.00 _c	6.25 _{bcd**}	6.35 _b	3.35 _{c**}	4.35 _d	7.00 _{a**}	5.15 _c	6.60 _{b**}	8.00 _a	5.25 _{d**}	8.05 _a	5.70 _{cd**}	5.95 _b	6.05 _b	6.10 _b	7.85 _{a**}
Easy to chew	4.50 _d	5.30 _d	6.15 _a	5.85 _b	5.00 _c	6.70 _a	5.25 _b	6.85 _a	7.10 _a	5.70 _c	7.20 _a	5.70 _c	6.30 _a	6.55 _a	5.90 _b	7.25 _{a*}
Suitable to boil	4.60 _b	5.70 _a	5.80 _b	3.80 _{d**}	4.45 _b	6.60 _{a**}	4.80 _b	5.95 _a	7.15 _a	4.80 _c	7.45 _a	5.40 _b	5.55 _b	5.80 _a	4.65 _b	6.90 _{a**}
Suitable to cook	4.50 _d	6.10 _b	5.15 _c	3.10 _{d**}	4.40 _d	7.00 _{a**}	4.60 _d	6.30 _{b**}	7.95 _a	5.25 _{c**}	8.20 _a	5.20 _{e**}	6.65 _b	6.15 _b	6.15 _b	7.80 _{a**}

Purc hase intent ion	2.25 _d	3.25 _b _{c**}	3.05 _b _c	1.60 _d _{**}	2.35 _d	4.20 _a _{**}	2.65 _c _d	3.45 _b _{**}	4.95_a	2.85 _b _{c**}	4.90_a	2.60 _c _{**}	3.40 _b	3.20 _b _c	3.25 _b _c	4.85_a _{**}
---	-------------------	-------------------------------------	-----------------------------------	------------------------------------	-------------------	------------------------------------	-----------------------------------	------------------------------------	-------------------------	-------------------------------------	-------------------------	------------------------------------	-------------------	-----------------------------------	-----------------------------------	--

Remark: * Different from before cooking significantly 0.05, ** 0.01

a, ab, b = Sample comparison in each item statistical significance at 0.05

Table 2 showed mean responses of grain rice and cooked rice with different size and shapes for neophobic consumer panels. As regards differences between the shapes of whole grain rice, participants like the medium long grain (7.8) and long grain (7.65) the most. Rounded/medium long grain, rounded/short grain, and rounded/medium long grain received liking score of 4.6, 4.6, and 4.7; respectively. There was not significantly different between neophilic and neophobic consumer except for the liking of long grain sample (7.5) was higher medium long grain (6.75). It was found that participants were most liked for the thin/short grain (7.7). Its overall liking mean score was higher than medium long (5.8) and long (5.5) grains which was not different from neophilic group. Result of purchasing intention of both grain rice and cooked rice; neophilic and neophobia consumers had the same responses. Most consumers intended to purchase medium long grain more than thin/short grain ($p \leq 0.05$). On the other hand, most of consumer intended to purchase for cooked thin/short rice more than cooked medium long rice ($p \leq 0.05$).

All grain rice and cooked rice samples were sampling to measure their length, width and thickness using a vernier caliper. Then the result used to calculate L/W ratio which used to determine their shape and sphericity. It showed that medium long, long and thin/short grains were slender shapes. Sphericity of medium long and long grain had higher than thin/short grain in a little bit. But after cooking, sphericity of cooked thin/short rice had higher than cooked medium long rice and cooked long rice (Table 3).

Table - 3 The morphometric parameters and geometric mean diameters of rice.

Type of rice	Sample	Average Length (mm.)	Average Width (mm.)	Average Thickness (mm.)	Average Geometric mean diameter (mm.)		L/W ratio	Shape	Sphericity (%)
					Min.	Max.			
Rounded/Long	Kernel	7.00	3.41	2.04	3.61	3.72	2.05	Bold	0.52
	Cooked	13.88	3.72	2.43	4.97	5.05	3.73	Slender	0.36
Rounded/Medium long I	Kernel	6.07	2.66	1.73	2.99	3.09	2.28	Medium	0.50
	Cooked	8.27	3.06	2.25	3.75	3.94	2.70	Medium	0.47
Rounded/Medium long II	Kernel	5.33	2.90	2.13	3.17	3.23	1.84	Bold	0.60
	Cooked	7.50	3.16	2.45	3.60	4.97	2.37	Medium	0.52
Rounded/Short	Kernel	5.19	2.68	1.93	2.94	3.04	1.94	Bold	0.58
	Cooked	12.33	2.96	2.04	2.00	2.14	4.16	Slender	0.34
Medium long	Kernel	7.62	2.03	1.69	2.91	3.01	3.76	Slender	0.39
	Cooked	10.52	2.42	2.37	3.82	4.11	4.35	Slender	0.37
Long	Kernel	6.87	1.89	1.57	2.70	2.75	3.64	Slender	0.40
	Cooked	10.52	2.39	2.15	3.69	3.87	4.40	Slender	0.36
Thin/Long	Kernel	7.86	1.80	1.49	2.74	2.79	4.38	Slender	0.35

	Cooked	23.08	2.08	2.10	4.51	4.96	11.11	Slender	0.20
Thin/Short	Kernel	1.49	1.49	1.49	2.51	2.60	4.00	Slender	0.38
	Cooked	8.28	2.20	2.49	3.46	3.68	3.77	Slender	0.43

ISO classification was as follows: sphericity = geometric mean diameter/length
L/W ratio > 3.0 (slender), 2.1-3.0 (medium), 1.1-2.0 (bold) and < 1.0 (round).

IV.CONCLUSION

In conclusion, consumer survey result showed that purchasing characteristic criteria which most of consumer panels preferred consisted of freshness, large size, medium length and medium plump of kernel grain. Both of medium long and long grain rice got highest scores for all attributes but after cooking, cooked thin/short rice got highest liking score for all attributes.

Overall liking of consumer panels related to purchasing intention is positive and sphericity is negative of whole grain rice in neophilic group, it means sphericity of jasmine rice should be decreased for more overall liking and purchasing intention.

Comparison of purchasing intention of both of medium long and thin/short rice before and after cooking for neophilic and neophobia group showed the opposite results, before cooking, most of consumer panels intended to purchase medium long grain more than thin/short grain but after cooking they intended to purchase cooked thin/short rice more than cooked medium long rice.

This information will be benefit for future development and commercial purpose; cultivar development, food labeling and advertising such as the figure of cooked thin/short rice should be shown on the product packaging. After cooking, long grain should not be swollen too much. The gold standard for cooked rice was cooked thin/short rice sample by using the proper ratio between water and rice with the cooking instruction

REFERENCES

- [1] S. Krishnapong, "Development of Production Model for Khoa Hom Mali Thung Kula Rong Hai Geographical Indication with Management Technology to Increase Aromatic Frangrant along Production Chain", Bangkok: Agricultural Research Development Agency, 2017.
- [2] P. Arunmas and A. Wipatayotin, "Thai rice feels the strain", Bangkok Post, <https://www.bangkokpost.com/business/1805799/thai-rice-feels-the-strain>, 2019.
- [3] A. Vanavichit, W. Kamolsukyeunyong, M. Siangliw, J. L. Siangliw, S. Traprab, S. Ruengphayak, E. Chaichoompu, C. Saensuk, E. Phuvanartnarubal, T. Toojinda, S. Tragoonrun, "Thai Horm Mali rice: origin and breeding for subsistence rainfed lowland rice 'system'", *Rice (NY)*, Vol. 11, pp. 20, 2018.
- [4] S. Rahman, A. Wiboonpongse, S. Sriboonchitta, Y. Chaovanapoonphol, "Production Efficiency of Jasmine Rice Producers in Northern and Northeastern Thailand", *Journal of Agricultural Economics*, Vol. 60, pp. 419-435, 2009.
- [5] TAS, "Thai Horm Mali Rice, Thai Agricultural Standard (TAS 4000)", Bangkok: National Bureau of Agricultural Commodity and Food Standards, Ministry of Agriculture and Cooperatives, 2003.
- [6] T. Fredrickson and P. Arunmas, "Thailand's fragrant Hom Mali rice voted world's best". Bangkok Post, <https://www.bangkokpost.com/learning/advanced/1357353/thailands-fragrant-hom-mali-rice-voted-worlds-best>, 2017.
- [7] Ministry of Commerce, Thailand, "Thai Horm Mali Rice: The World's Best Rice Champion in 2020", <https://www.bangkokbiznews.com/news/detail/911072>, 2020.
- [8] C. Symmank, S. Zahn, H. Rohm, "Visually suboptimal bananas: How ripeness affects consumer expectation and perception", *Appetite*, Vol. 120, pp. 472-481, 2018.
- [9] J. B. Hutching, "The importance of visual appearance of foods to the food processor and the consumer". *Journal of Food Quality*, Vol. 1, pp. 267-278, 1977.
- [10] M. Ayaad, Z. Han, K. Zheng, G. Hu, M. Abo-Yousef, S.E.S. Sobeih, Y. Xing, "Bin-based genome-wide association studies reveal superior alleles for improvement of appearance quality using a 4-way MAGIC population in rice", *Journal of Advanced Research*, vol. 28, pp.183-194, 2021.
- [11] R. Shepherd and P. Sparks, "Modelling food choice". In *Measurement of Food Preferences*, Glasgow, 1994.
- [12] M. C. D. Verain, H. Dagevos, G. Antonides, "Sustainable food consumption: product choice or curtailment?", *Appetite*, Vol. 91, pp. 375-384, 2015.
- [13] P. Rozin, "Food choice: An introduction", In *Understanding Consumers of Food Products*, USA, 2007.
- [14] S. Sarti, N. Darnall, F. Testa, "Market segmentation of consumers based on their actual sustainability and health-related purchases", *Journal of Cleaner Production*, Vol. 192, pp. 270-280, 2018.
- [15] A. S. Henriques, S. C. King, H. L. Meiselman, "Consumer segmentation based on food neophobia and its application to product development", *Food Quality and Preference*, Vol. 20, pp. 83-91, 2009.
- [16] P. Pliner and K. Hobden, "Development of a scale to measure the trait of food neophobia in humans", *Appetite*, Vol. 19, pp. 105-120, 1992.
- [17] C. Çinar, A.K. Karinen, J.M. Tybur, "The multidimensional nature of food neophobia". *Appetite*, Vol. 162, pp. 1-9, 2021.

- [18] I. Cifci, S. Demirkol, G.K. Altunel, H. Cifci, “Overcoming the food neophobia towards science-based cooked food: The supplier perspective”, *International Journal of Gastronomy and Food Science*, Vol. 22, pp. 1-10, 2020.
- [19] R. Oppenlander, “Food Choice and Sustainability: Why Buying Local, Eating Less Meat, and Taking Baby Steps Won't Work”, Langdon Street Press, Minneapolis, 2013.
- [20] K. Khajarearn, “Using sensory and mood perceptual maps for generating new energy drink product ideas”, *International Food Research Journal*, Vol. 20, pp. 175-181, 2013.
- [21] K. Nantachai, S. Laohasilsomjit, R. Tangwongchai, W. Voraputraporn, “Optimized formulation and cooking conditions of Khaw Dawk Mali 105 and Chainat 1 mixed rice”, *Khon Kaen University Research Journal*, Vol. 8, pp. 20-33, 2003.
- [22] A. V. A. Resurreccion, “Consumer Sensory Testing For Product Development”, Aspen Publication, Gaithersburg, 1998.
- [23] M. Meilgaard, G. V. Civille, B. T. Carr, “Sensory Evaluation Techniques”, CRC Press, USA, 2006.
- [24] H. N. J. Schifferstein, T. Wehrle, C. C. Carbon, “Consumer expectations for vegetables with typical and atypical colours: The case of carrots”, *Food Quality and Preference*, Vol. 72, pp. 98-108, 2019.
- [25] K. Khajarearn, “Application of sensory perceptual and contextual mapping for generating new beer product ideas”, Graduate School, Khon Kaen University, 2000.
- [26] M. A. De Almeida, N. D. M. Villanueva, J. S. Da Silva Pinto, E. Saldaña, C. J. Contreras-Castillo, “Sensory and physicochemical characteristics of low sodium salami”, *Scientia Agricola*, Vol. 73, pp. 347-355, 2016.
- [27] L. E. Morales-Martínez, L. A. Bello-Pérez, M. M. Sánchez-Rivera, E. Ventura-Zapata, A. R. Jiménez-Aparicio, “Morphometric, Physicochemical, Thermal, and Rheological Properties of Rice (*Oryza sativa* L.) Cultivars Indica × Japonica”, *Food and Nutrition Sciences*, Vol. 5, pp. 271-279, 2014.
- [28] K. M. Sahay and K. K. Singh, “Unit Operations of Agricultural Processing”, Vikas Publishing House Pvt. Ltd, New Delhi, 1994.
- [29] T. Okuyama, T. Akechi, A. Kugaya, H. Okamura, Y. Shima, M. Maruguchi, T. Hosaka, Y. Uchitomi, “Development and validation of the cancer fatigue scale: A brief, three-dimensional, self-rating scale for assessment of fatigue in cancer patients”, *Journal of Pain and Symptom Management*, Vol. 19, pp. 5-14, 2000.