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Consumer Auditory Expectations and Sensory Perceptions of Spicy Papaya Salad (Somtum), which were Mixed or Pounded by Various Mixing Equipment

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Abstract- The aim of this research is to compare between auditory expectations after hearing the sounds of mixing or pounding of spicy papaya salad (Somtum) and sensory perceptions after tasting them using consumer panels (n = 100). Each Somtum was mixed between shredded green raw papaya with Somtum dressing (Northeastern or Esan style) using three different mixing equipment (mixing bowl with ladder, and wooden or hardened clay mortars with wooden pestle). Their auditory expectations were evaluated, the results showed that the sounds of the wooden pestle pounding against both mortars had higher mean scores of appetizing, delicious, overall liking and purchase intent than the sound of the ladder mixing in bowl. After evaluating sensory perceptions, the results showed that Somtum which were pounded with a wooden pestle in both mortars had higher mean scores for being appetizing, overall satisfaction and purchase intent than Somtum which was mixed in a bowl. However, mean deliciousness scores of all samples were not different. Then consumer expectations were evaluated the sounds of mixing or pounding Somtum for 5 flavors of Somtum dressing (Esan, three taste, pickled crab, Thai taste and Esan noodle), the results showed that sounds of pounding Somtum with both mortars for all had higher mean overall satisfaction and purchase intent scores than the sound from mixing bowl. After perceptions, only Thai taste and Esan noodle Somtum which were pounded in both mortars had higher mean overall satisfaction and purchase intent scores than mixing in bowl.

Keywords – Auditory Expectations, Gustatory Perceptions, Spicy Papaya Salad, Somtum Dressing

I. INTRODUCTION

Refer to the plenary speaker's presentation in the topic of “where are we with sensory methods and where do we go?: a case study of hairdryer’s sound” by Gaston Ares, Universidad de la República, Uruguay of the 13th Pangborn sensory science symposium in 2019, it is the researcher’s inspiration to do this research. Sensory evaluation of foods does not include only taste and smell but also covers the visual aesthetic, physical touch and sound emitted. There is more research in noise and its impact on the perception of food [1][2]. Noise may be related to food chewing like cookies, crackers, crispy vegetables as celery, cucumber and others [3][4] as well as the sound of mixing equipment, such as juice blenders, cocktail shakers, Chinese frying pans and other items found in bars and restaurants. These auditory stimuli can have significant effects on food choices [5].

While presenting the sounds of different equipment combinations is interesting, mixing procedure sound can lead to the different consumer anticipation in food properties. Another important contribution to influence a consumer’s judgement is the food item’s written label. Containing information on the preparation and cooking directions for the consumer to follow, with the recommendation of appropriate final dishes being one of the most appealing to help consumers visualize what they can create. Last but not least it leads to the improvement of consumers’ purchasing probability [6].

In Thailand, noise from the pounding of chili paste (Nam Prik) and spicy papaya salad (Somtum) is well known in stimulating consumer appetite especially on traditional equipment like mortar (Krok) and wooden pestle (Sarg). Strength of hand creating pounding sound effects is a charming procedure of Thai traditional food operation culture [7]. Furthermore, mortars and pestles release the aroma of food by crushing them and are easy to clean. Suitable for pounding small amounts of food and not liquid food. They are found in almost every culture and are made from many materials, including clay and wood [7]. Most commercial wooden mortars are usually made of hardened woods, such as light or dark red meranti (Scientific name is *Shorea siamensis Miq.*; in Thai called “Rung”) and rain

tree or East Indian walnut (Scientific name is *Samanea saman*.; in Thai called "Jamjuree"). Palmyra or lontar palm (*Borassus flabellifer L.*) is used to make wood pestle.

An unmistakable taste of Thailand, Somtum is a classic Thai dish, the famous ethnic food of Thailand [8] and is usually made with spicy green shredded papaya, it is widely recognized as a traditional ethnic cuisine originating from Thailand. The dish is composed of various ingredients, including raw papaya, tomatoes, chili, palm sugar, garlic, lime, and roasted peanuts, among others [8]. this deliciously addictive dish is as versatile as it is spicy [9]. It originates from the north-east of Thailand, but is popular all over the country [9][10] and it has long been a popular traditional street food dish [11][12]. Generally, it consists of shredded green papaya as a main ingredient which includes cut tomato, snake bean, red chili, garlic and other seasoning ones [13]. Three main taste reagents consist of sour by lime juice, salty by fish sauce (Nam Pla) and a little sweet by sugar. Hog plum, pickled crab and fish are added for Somtum in Lao or Esan style while palm sugar, crushed roast ground nut and dried shrimp are added for Somtum in Thai style [14].

Currently, there are a lot of Somtum dressing products available in domestic and international markets as it easily and conveniently helps to prepare the dish at home [15]. Currently, this product has been introduced as an innovative addition to the business sector, with its availability in various products including ready-to-eat and seasoning [8]. However, in case of traditional equipment like a hardened clay mortar with a wooden pestle is not available, a wooden mortar or stainless-steel bowl with a ladle may be suitable. Mixing bowls may seem boring, but they are highly undervalued and an absolute kitchen essential [16]. A stainless-steel bowl is used to avoid chemical reactions between food and bowl. Stainless-steel will typically resist reactions with acidic foods, but it is not 100%. Directions written on the food label of exported Somtum dressing in Krok Yim brand (product by Krok Yim Thai Food Co., Ltd. as a case of this study) mentions that only a mixing bowl and stirring with a ladle is easy and enough for mixing shredded green papaya with the Somtum dressing in [17]. It is suspicious that whether there is a difference on consumer perception and expectation [18][19] before and after tasting with different equipment preparation or not as a voice of consumer [20]. Thus, it is interesting to compare the expectations and perceptions of Somtum which are prepared from Somtum dressing using different mixing equipment. The results may be used as a guidance for developing an innovative Somtum mixer in a future.

II. METHODOLOGY

Subjects:

To recruit consumer panels, students and staff of Khon Kaen University, Nongkhai Campus were invited via email newsletters. One hundred consumer panels ([21] recommended consumer panel size for various consumer sensory testing laboratory; 46 males and 54 females with age in average of 22.2 ± 3.1 years old) participated in this study for both sessions at a sensory evaluation room which is close to a food preparation room. Participants were informed of the study prior to giving informed consent. All participants must not have issues in their listening capabilities, had never been trained in sensory testing and must be willing to participate in this study.

Sample preparation:

Unripe or green papaya, red chili, cherry tomato and carrot were purchased from a supermarket. They were selected and cleaned by tap water. The papaya and carrot were peeled using a double-edged stainless-steel knife and rinsed again by tap water. Then both the peeled papaya and carrot were shredded into approximately 10-12 cm lengths using a shredding stainless-steel knife. The individual cherry tomatoes were chopped into 8 pieces each, but the red chili was minced by a grinder.

The preparation referred to the directions indicated on the different labels on the various Somtum dressing products. 100 grams of shredded green papaya were mixed with 25 grams of shredded carrot, 25 grams of chopped cherry tomato, 15 grams of minced red chili and 100 grams of Somtum dressing (Esan style; pickled crab and pickle fish). Three different mixing equipment (Mixing with a ladle in a stainless-steel mixing bowl, pounding with a wooden pestle in wooden and hardened clay mortars) were used for Somtum mixing in auditory expected evaluation and their sounds were recorded into mp3 files for session one. In addition, the sounds of mixing and pounding Somtum with five styles of Somtum dressings; Esan (pickled crab and pickle fish), three taste (Sour, salty and sweet), pickled crab, Thai taste and Esan noodle (rice vermicelli) were also recorded into mp3 files for the auditory expected test in session two.

Consumer study:

The test was divided into two sessions;
Session one: each consumer panel had to listen to each of the Somtum mixing sounds (using the three mixing equipment) which were recorded previously using earphones. And then each of them was asked to rate for 4 items of auditory expectations: sounds appetizing, sounds delicious and overall liking using 9- point scale (1 = not at all, to 9 = extremely) [22]. In addition, the purchase intent was rated using a five-point structured scale (1 = certainly will not buy, to 5 = certainly will buy) [23]. Then each of Somtum samples (25 grams; which were mixed with Esan Somtum dressing using the three mixing equipment) [8] were served to each consumer panel randomly for sensory evaluation [24] using Randomized Complete Block Design; RCBD [22]. After tasting, they were also asked to rate for 4 items of sensory perceptions: appetizing, delicious, and overall liking using 9-point scale, and purchase intent using a five-point structured scale.
Session two: each sound of Somtum mixing (using the three mixing equipment; which were recorded previously) with 5 styles of Somtum dressing; Esan, three taste, pickled crab, Thai taste and Esan noodle (Krokyim Thai Food, Co. Ltd.) were evaluated for auditory expectation by 100 consumer panels. Then each of these Somtum samples were served to individuals randomly for sensory perception test. Both expectation and perception test were asked to rate for 2 items similarly; overall liking using 9- point scale (1 = not at all, to 9 = extremely) and purchase intent was rated using a five-point structured scale (1 = certainly will not buy, to 5 = certainly).
Statistical analysis:
The data from two session were analyzed using T-test (before/after comparison test) and multivariate analyses of variance (MANOVA) ($p \leq 0.05$) considering sound (auditory expectations) and sample (sensory perceptions) using three mixing equipment as sources of variation by SPSS/PC for Windows version 28.0 developed by SPSS Inc., Chicago, USA. The level of significance for all statistical analysis was set at 0.05 [18][19].

III. Result and discussion

The result of auditory expectations was shown in Figure 1. Sound of Somtum pounding using both wooden and hardened clay mortars with a wooden pestle had higher mean scores of sounds appetizing, sounds delicious, overall liking and purchase intent than the sound of mixing using stainless-steel mixing bowl with a ladle. In accordance with [9] stated that Somtum would usually be made using traditional hardened clay mortar and wood pestle, and [7] described that people even enjoyed the sound of the wooden pestle smashing the mortar charmingly. In fact, sounds of both poundings were soft bass but exactly, the sound of metal clash from mixing between a ladder and a stainless-steel mixing bowl would be harder, louder and not familiar for Thai consumers. According to research, most of the consumer panels seemed to prefer the sound of pounding over mixing which was not the original sound for Somtum making.
After sensory perceptions, the result showed that Somtum which were pounded in both mortars with a wooden pestle had higher mean scores of being appetizing, overall liking and purchase intent than mixing in a stainless-steel bowl with a ladle. But mean deliciousness scores of all samples were not different. Notification, Somtum which was mixed using a mixing bowl with a ladder, its mean deliciousness score after tasting was higher than before tasting (sound listening) statistically. This result is probably an advantage of mixing commercial Somtum dressing and shredded papaya using this mixing equipment. Because consumer panels didn't expect it from the sound, but when they tasted it, it turned out to be more delicious than they thought. And not every household has the mortar and wooden pestle when it comes to making Somtum using commercial Somtum dressing after purchasing it. However, if there is a small party and important Thai guests are invited to eat Somtum at home, it would be nice if there is a wooden mortar and a wooden pestle to make it. Probably, those Thai guests had high expectations in the appetizing sounds of hearing the sound of Somtum making, and they had high perceptions after tasting it (Figure 1).
Incidentally, looks appetizing was a result of visual inspection. Therefore, there is a relationship with the presentation of the Somtum image on the food label. Using a mixing bowl and wooden mortar was not a harsh method of mixing. It might be possible that the mixture to remain in a state that is not too mushy, so they had higher mean appetizing scores.
For the results of consumer expectations which were evaluated the sounds of mixing or pounding Somtum for 5 flavors of Somtum dressing (Esan, three taste, pickled crab, Thai taste and Esan noodle) was shown in Figure 2. The results showed that sounds of pounding Somtum with both mortars for all had higher mean overall liking and purchase intent scores than the sound from a mixing bowl. After perceptions, only Thai taste and Esan noodle Somtum which were pounded in both mortars had higher mean overall liking and purchase intent scores than mixing in a bowl. In fact, dried shrimp was added in each Thai style Somtum sample and rice noodles were also added in

each Esan noodle style Somtum sample which were important ingredients in each style of Somtum. For these reasons, they effected these samples looked more appetizing than other Somtum samples. As such, they might have resulted in these Somtum samples having higher mean purchase intent score as well.

IV.CONCLUSION

The results of this research could be concluded that different mixing equipment for Somtum mixing with each Somtum dressing product causes consumers to expect different sounds from each Somtum making. The resulting difference also affected the consumer perceptions of the product. Especially mixing in a metal mixing bowl, most consumer panels accepted it lower than pounding in both wooden and harden clay mortars. Somtum dressing manufacturers might use these results to promote and advert their Somtum dressing products. Especially directions in the label or advertising for product information in order to consumers correctly mix Somtum from each of Somtum dressings. As a result, the product will be more accepted by consumers.

In addition, during the Somtum dressing formulations, entrepreneurs should use mixing equipment or mixing methods such as crumpling it by hand, shaking containers or mixing machines, etc. Because each mixing equipment or method might be not appropriate for each Somtum dressing. So that all Somtum dishes which were mixed with Somtum dressings were delicious by every equipment and every method.

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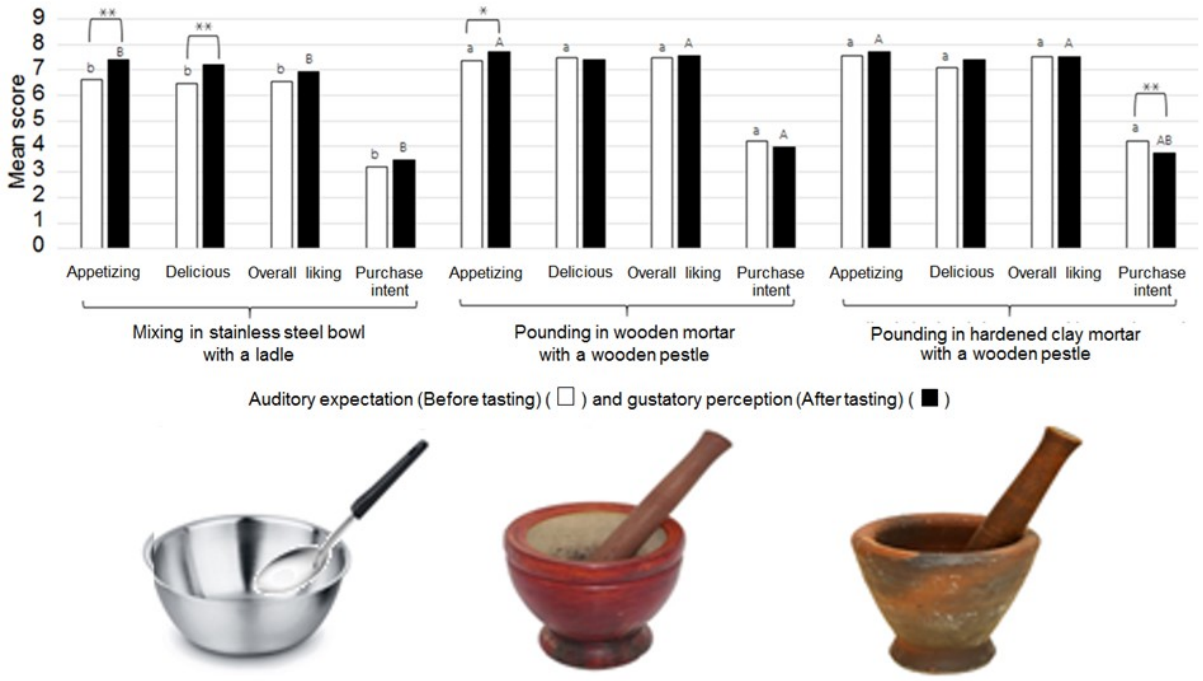

Figure - 1 Auditory expectations and sensory perceptions among Somtum mixing and pounding which were mixed and pounded with Esan Somtum dressing using 3 equipment for 4 items.

Remark: Comparisons of auditory expectations and sensory perceptions significantly *0.05,

a, ab, b = Comparison among items of sounds listening for Somtum mixing and pounding using 3 equipment statistically.

A, B = Comparison among items of tasting for Somtum mixing and pounding using 3 equipment statistically.

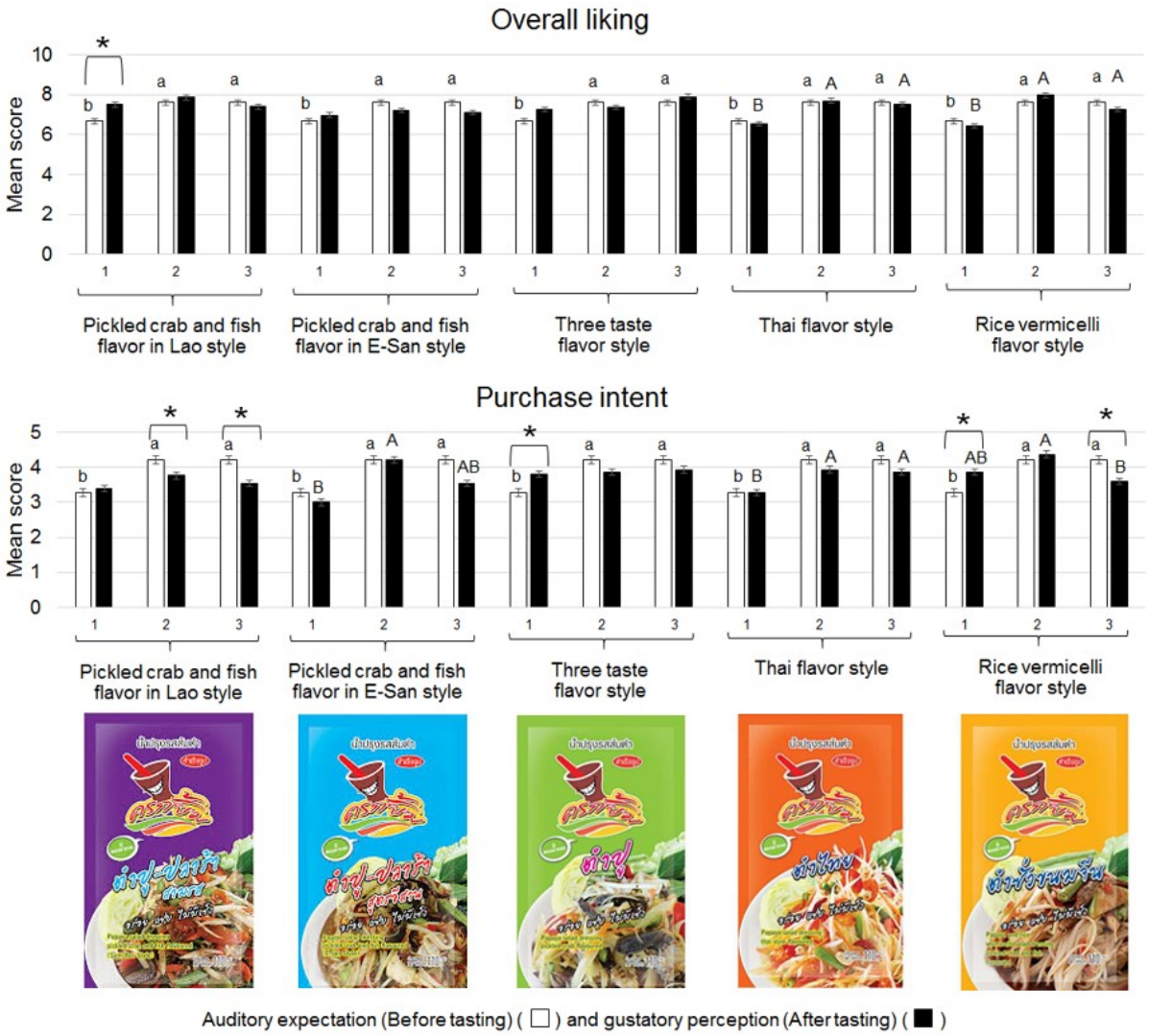

Figure - 2 Auditory expectations and sensory perceptions among Somtum mixing which were mixed and pounded with different Somtum dressings (Three taste, Esan, pickled crab, Thai taste and Esan noodle styles, respectively) using three mixing equipment for overall liking and purchase intent.

Remark: Comparisons of auditory expectations and sensory perceptions significantly *0.05,

a, ab, b = Comparison among items of sounds listening for Somtum mixing and pounding using 3 equipment statistically.

A, B = Comparison among items of tasting for Somtum mixing and pounding using 3 equipment statistically.