Research Article

Effect of Viscosity on Sensory Profile and Consumer Perception: Case Study of Soup-Based Products

Chang TingChen*, Nantawan Therdthai and Aussama Soontrunnarudrungsri
Department of Agro-Industrial, Faculty of Product Development, Kasetsart University, Thailand

* Corresponding author. E-mail: tingchen.c@ku.th DOI: 10.14416/j.asep.2023.02.002
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Abstract
Saltiness perception is affected by both extrinsic factors, such as like packaging, receptacle or external environment, and intrinsic factors including sweetness, sourness, and viscosity. This research aimed to study the saltiness perception and sensory profiles of different types of soups. Regarding the effect of xanthan gum, additions of different concentrations of xanthan gum responded to different viscosities in soup samples significantly. Chicken clear soup and Tomyum clear soup without xanthan gum had the significantly lowest viscosity, while Tomyum cream soup and Phanaeng curry with 0.25% xanthan gum had the significantly highest viscosity. Free Choice Profiling showed the first and second dimensions accounted for more than 80% of all soups samples. For the chicken clear soup, both time and xanthan gum only affected the viscosity. According to the consumer test, it was found that xanthan gum had a significant effect on the thickness intensity of all soups, while there was no found significant effect on saltiness perception and acceptance in all types of soup in this study.

Keywords: Soup, Viscosity, Consumer, Sensory, Saltiness perception

1 Introduction

Due to rapid urbanization and changing lifestyles, people around the world are transforming their dietary patterns, more and more processed foods that are high in saturated fats, trans fats, sugars, and salt are produced and launched into the market. Since taste and aroma play important roles in flavor perception, salt has been widely used to enhance flavor [1]. It is also called "king of all flavors" and has been considered as an essential component of the human diet [2]. In many cases, added salt enhances the positive sensory attributes of foods, even some unpalatable foods [3].

Salt is the primary source of sodium, and one of sodium's main functions is to balance the amount and distribution of water in our bodies, and transport specific nutrients and compounds, such as amino acids, glucose and vitamins into the cells. However, increased consumption of sodium is associated with some diseases. WHO and World Health Assembly recommend a 30% reduction in population salt/sodium intake by 2025 [2]. Reducing salt/sodium diet can help to reduce blood pressure and consequently lower the risk of cardiovascular disease, stroke, and coronary heart attack, which lead to lower the death rates (an estimated 2.5 million deaths could be prevented each year). Furthermore, some studies also indicated that excess sodium may have adverse health outcomes such as increased blood pressure, ventricular fibrosis, chronic kidney disease, renal damage, gastric cancer, and even osteoporosis.

Salt reduction in food has become a major concern for worldwide public health authorities. Some research mentioned that consumer perception depends on various factors, such as viscosity. Christensen, 1980 pointed out that viscosity had effects on perceived saltiness and sweetness. Low carboxymethylcellulose (CMC) thickened solutions produced little or no suppression of perceived taste intensity, whereas high viscous CMC solutions reduced perceived saltiness and sweetness significantly [4].

There are some soup products as processed foods

sold in the market. Soup is commonly made by combining liquids, such as water or stock with other ingredients, such as meat and vegetables, that contribute flavor and texture [5]. There are four main categories of soup, which are thin, thick, cold and national. They cover different types of soups and are widely recognized in today's modern kitchen [6]. The soup samples of this research were selected to cover most of soup categories; clear soups are considered as thin soup, cream soup and curry soup are considered as thick soup, and Tomyum soup is considered as national soup.

Tomyum is a famous Thai spicy soup, which is characterized by mixing spices and herbs including chili, galangal, shallots, lemongrass, and kaffir lime leaves. Lime juice, sugar and salt are added for sour, sweet and salty tastes, respectively [7]. Green curry soup and Phanaeng curry soup are Thai coconut milk-based curry, which is mix with curry paste of various culinary herbs and spices including lemon grass, kaffir lime peel, chili pepper, and peppercorn. Curry pastes are named according to the color of these main condiments and additional essential ingredients used in each recipe [8]. Coconut milk is an oil-in-water emulsion pressed from the solid endosperm of coconut [9], it serves as a natural solvent during food preparation by extracting both polar and non-polar compounds from various herbs and spices in Thai curry pastes [10].

To increase soup viscosity, some thickeners are used in common, such as cellulose, pectin and starch from plants, gelatin, casein, egg white protein and soy protein are animal origin colloids, derived from algae are agar, carrageenan, and alginate, and microbial origin hydrocolloids e.g. xanthan [11]. Among all mentioned thickeners, starch is widely applied in food industry, however, it can change the taste of soup product [12]. Xanthan gum, a microbial polysaccharide mainly produced by Xanthomonas campestris, it can be soluble in water easily, compatibility to various salts, good stability to heat, acid, and alkali. It can thicken foods while avoiding undesired texture sensations, such as mouthcoating, sliminess and stickiness [13], and therefore it has many applications in food [14]. Moreover, as food additive, xanthan gum has been widely applied as the thickener, stabilizer, emulsifier, etc. [15], [16], therefore, it is suitable to thicken the soup samples in this study.

The objective of this research was to study the effect of viscosity on sensory profiles, consumer acceptance and perception. The result of this study can benefit product development of reduced salt soup-based products.

2 Material and Methods

2.1 *Materials*

The soup samples in this project were the chicken clear soup, chicken cream soup, Tomyum clear soup, Tomyum cream soup, green curry soup, and Phanaeng curry soup. All ingredients were obtained from local supermarket, green curry and Phanaeng curry paste from CURRY & SPICES brand, coconut milk from Ampawa brand, condensed milk from Carnation brand, fish sauce from Tiparos brand, chili paste from Maepranom brand.

2.2 *Preparation of soups and sample treatments*

There were six types of soups used in the experiment, including chicken clear soup, chicken cream soup, Tomyum clear soup, Tomyum cream soup, green curry soup and Phanaeng curry soup (red curry soup). A standard formula and processes were used for the whole experiment with different viscosities. A set of sample consist one type of soup, and soup was separated into four treatment units; xanthan gum as thickener was added to three units (w/v) at 0.15%, 0.20% and 0.25%. One unit received no xanthan gum was the control.

The thickener was prepared by dissolving xanthan gum in 50 mL water, and kept for 8 h before using to make sure that xanthan gum was dissolved properly. After adding in soup samples, the sample was felt by a filter to make sure the xanthan gum mix well with the samples.

2.3 *Sensory profiling*

Free choice profiling (FCP) was executed by eight trained descriptive panelists from Kasetsart University Sensory and Consumer Research Center (KUSCR), each panelist had completed a training course on descriptive sensory testing. The eight trained panelists will reach a consensus on a lexicon for each type of soup and rate the intensities of sensory attributes with respect to soup samples of six varieties

(chicken clear soup, chicken cream soup, Tomyum clear soup, Tomyum cream soup, green curry soup and Phanaengcurry soup) and four different thickening agent concentrations (0.00, 0.15, 0.20, and 0.25 %w/v). For each evaluation session, the panels were presented with one bowl of soup sample at 55±5 °C and coded with 3-digit numbers to evaluate the aroma attributes, flavor and texture attributes. A 15-point intensity scale was used where 1 represents "just recognizable" and 15 represents "extremely intense".

2.4 *Consumer acceptance*

Both male and female consumers were recruited to participate in the product testing with a total number of 40 consumers. Samples were prepared on the same day as the sensory day, and all samples were maintained at 55±5 °C. Each sample was served 30 mL to each consumer. Consumers were asked to taste samples, assessment of overall liking, overall flavor liking, thickness liking and saltiness liking was performed on a nine-point hedonic scale ranging from 9 (like very much) to 1 (dislike very much). Furthermore, the intensity of overall flavor, thickness and saltiness were evaluated by using15-point intensity scale where 1 represents "just recognizable" and 15 represents "extremely intense". Consumers were presented with one set of samples at 55±5 °C per session. The samples contained different levels of xanthan gum. Consumers were served with one sample at a time, and between each sample, consumers were asked to rinse their mouths with drinking water. The serving order was random using William's Square design [17].

2.5 *Determination of viscosity measurement*

The viscosity of each sample was measured by Viscometer Brookfield DV-III ULTRA programmable rheometer, all the samples were measured at 55 °C. Each sample was measured for 3 replicates. Spindle 1 was used in this experiment with 500 mL glass beaker containing 450 mL of sample.

2.6 *Statistical analysis*

Randomized Complete Block Design (RCBD) was applied in the study where percentage of xanthan gum was independent variable. The correlation coefficients were obtained between saltiness perception and viscosity from viscometer and viscosity rating. The obtained data were analyzed by SPSS 19.0 statistical software (IBM Inc. Chicago, IL, USA), the analysis method included descriptive statistics, analysis of variance, and multiple comparison at $\alpha = 0.05$. Principal Component Analysis (PCA) map and Generalized Procrustes Analysis (GPA), which were common statistical tools to analyze FCP data, were generated from physical properties, sensory profiles by XLSTAT (Microsoft Excel®).

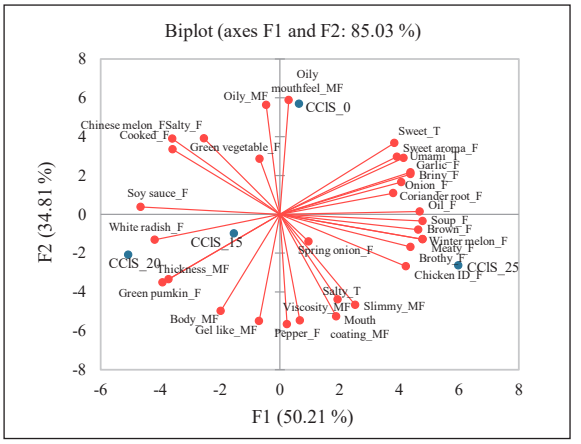
3 Results and Discussion

3.1 *Soup samples profiling*

Generally, all soups had the same finding in terms of viscosity that adding more xanthan gum caused higher viscosity, and panels perceived a higher intensity of viscosity mouth feel.

The principal component map is used to give further information about which product characteristics influenced sample attributes and attributes related to each other. The results were displayed in biplots in Figures 1–6 respectively, two axes represent the most influence on panels when they were characterizing soup samples [18]. Sensory characteristics of chicken clear soup were demonstrated in Figure 1, the PCA map showed 85% explanation with the first two principal components. As can be observed that the sample with no xanthan gum added tended to have a perceived higher oily mouth feel than the added samples. It might be the effect of xanthan gum that acted as an emulsifier [19], [20] to help prevent oil and water separation by stabilizing the O/W emulsion due to its lipophilic and hydrophilic groups. When 0.20% and 0.15% xanthan gum were added, panel-detected white radish flavor and thickness mouth feel. When sampled with 0.25% xanthan gum, the flavors of brothy, chicken and meaty were more intense.

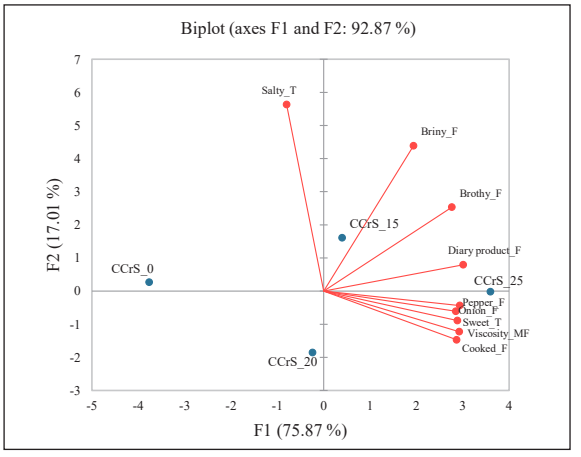
Figure 2 shows the PCA of chicken cream soup with an explanation of 92.87%, it could be observed that when 0.25% xanthan gum was added, consumers perceived a more intense flavor and mouth feel, such as dairy products, pepper, onion, and sweet taste. The intensity of the salty taste was higher at 0.15% xanthan gum. All attributes were weak when there was no xanthan gum added.



* _F=flavor, _MF=texture (mouth feel), _T=taste

** CClS= chicken clear soup

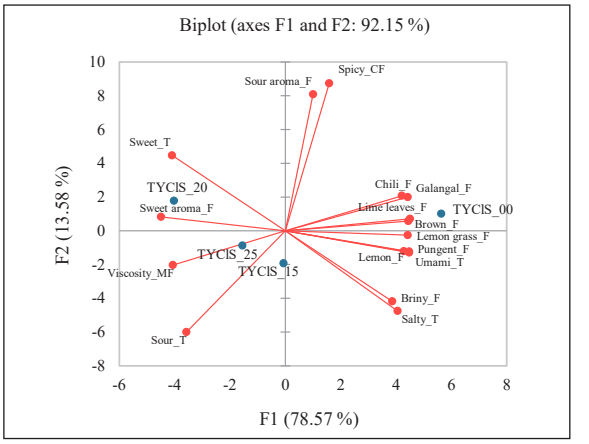
Figure 1: Principal component map of chicken clear soup samples.



*_F=flavor, _MF=texture (mouth feel), _T=taste

** CCrS= chicken cream soup

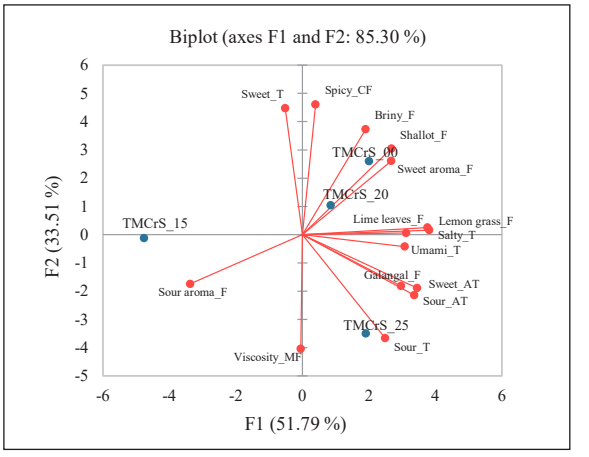
Figure 2: Principal component map of chicken cream soup samples.



*_F=flavor, _MF=texture (mouth feel), _T=taste

** TYClS= Tomyum clear soup

Figure 3: Principal component map of Tomyum Clear soup samples.



*_F=flavor, _MF=texture (mouth feel), _T=taste

** TMCrS= Tomyum cream soup

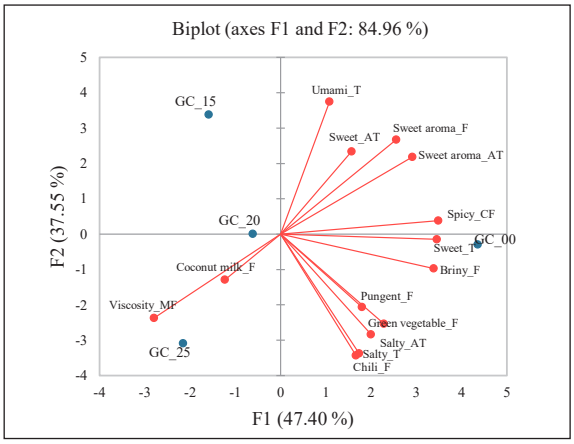
Figure 4: Principal component map of Tomyum Cream soup samples.

It was found in Figure 3 that when xanthan gum was added to Tomyum clear soup, the panel perceived higher intensity of sweet taste, sweet aroma flavor, and sour taste. On the other hand, when absent of xanthan gum, the flavor of lemongrass, brown, and pungent was more intense.

Figure 4 shows the principal component map of Tomyum cream soup samples with an explanation of 85.30%, it could be observed that at 0.00% and 0.20% of xanthan gum samples provide an intense flavor of brine, sweet aroma, lemongrass and lime leaves. Sour, aroma, and flavor were more intense when 0.15% xanthan gum was added.

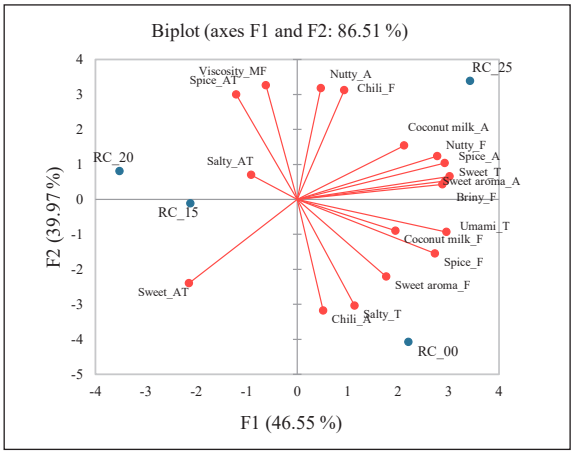
The principal component map of green curry soup samples with the explanation is 84.96% (Figure 5) that when a sample is without xanthan gum, consumers can perceive more intense sweet taste, briny flavor. Also, when a sample has the highest percentage of xanthan gum will be more intensity of coconut milk flavor.

The Phanaeng curry soup' PCA map with an



*_F=flavor, _MF=texture (mouth feel), _T=taste
** GC= green curry soup

Figure 5: Principal component map of green curry soup samples.



*_F=flavour, _MF=texture (mouth feel), _T=taste
** RC= Phanaeng curry soup

Figure 6: Principal component map of Phanaeng curry soup samples.

explanation of 86.51% showed that when the sample was without xanthan gum, panels could perceive more intensity of sweet aroma flavor, salty taste, spice flavor, coconut milk flavor and umami taste. the sample has 0.25% xanthan gum, which was perceived as having more chili flavor, nutty flavor, sweet taste and briny flavor.

3.2 *Consumer acceptance test*

From Tables 1–6, we can observe that in the same soup sample, only thickness intensity was significantly different. However, for the liking score of overall liking, thickness liking, saltiness liking and overall flavor liking were not significantly different, and for intensity of saltiness and overall flavor intensity, all mentioned above did not have a significant difference.

The results in this study were different from other researchers who found that taste and flavor attributes decreased in intensity with increasing thickener [21, 22] that might cause by the reduction in the efficiency of mixing between the liquid food and saliva [23]. Interestingly, consumers can perceive the thickness change between soups, but the liking score showed no significantly different, consumers liked the samples the same in all types of soup.

Table 1: Average score of liking and intensity of chicken clear soups with different levels of xanthan gum

% XG	Hedonic Scale			
	Overall Liking ns	Thickness ns	Saltiness ns	Overall Flavor ns
0.00	7.0±1.2	6.6±1.5	6.8±1.7	6.9±1.3
0.15%	6.7±1.3	6.8±1.3	6.6±1.7	6.5±1.7
0.20%	6.8±1.3	6.7±1.3	6.3±1.6	6.6±1.5
0.25%	6.7±1.5	6.7±1.5	6.7±1.6	6.6±1.4
	Intensity			
	Thickness	Saltiness ns	Overall Flavor ns	
0.00	5.6±2.7^{b}	7.2±3.2	7.7±3.5	
0.15%	7.4±2.5^{ab}	6.5±2.9	7.4±2.9	
0.20%	7.3±2.5^{ab}	6.7±2.9	7.7±2.7	
0.25%	8.3±2.5^{a}	6.9±2.6	7.9±2.8	

Note: *Values in the same column with different superscript different at $p < 0.05$.
ns indicates non-significant differences between treatments in the particular attributes.

Table 2: Average score of liking and intensity of chicken cream soups with different levels of xanthan gum

% XG	Hedonic Scale			
	Overall Liking ns	Thickness ns	Saltiness ns	Overall Flavor ns
0.00	6.5±1.7	6.1±1.9	6.2±1.5	6.5±1.7
0.15%	6.5±1.6	6.3±1.6	6.1±1.9	6.0±2.0
0.20%	6.8±1.6	6.6±1.7	6.2±1.6	6.7±1.3
0.25%	6.1±1.9	6.1±1.8	6.2±1.5	6.5±1.5
	Intensity			
	Thickness	Saltiness ns	Overall Flavor ns	
0.00	5.9±3.8^{c}	9.4±2.7	8.5±3.4	
0.15%	7.9±3.8^{b}	9.1±3.5	9.4±3.5	
0.20%	9.5±3.8^{ab}	9.3±3.1	9.2±2.9	
0.25%	11±3.8^{a}	8.6±3.3	9.2±3.0	

Note: *Values in the same column with different superscript different at $p < 0.05$.
ns indicates non-significant differences between treatments in the particular attributes.

Table 3: Average score of liking and intensity of Tomyum clear soups with different levels of xanthan gum

% XG	Hedonic Scale			
	Overall Liking ns	Thickness ns	Saltiness ns	Overall Flavor ns
0.00	6.3±1.3	6.3±1.6	6.2±1.5	6.5±1.3
0.15%	6.4±1.6	6.4±1.6	5.9±1.8	6.5±1.4
0.20%	6.6±1.4	6.3±1.5	6.3±1.7	6.7±1.5
0.25%	6.7±1.1	6.6±1.5	6.5±1.4	6.8±1.1
	Intensity			
	Thickness	Saltiness ns	Overall Flavor ns	
0.00	5.1±3.5[b]	6.0±3.1	8.4±3.4	
0.15%	5.9±3.2[bc]	5.5±3.1	7.8±3.0	
0.20%	7.0±3.3[ab]	6.1±3.2	8.6±2.9	
0.25%	8.2±3.4[a]	5.8±2.9	8.7±3.0	

Note: *Values in the same column with different superscript different at $p < 0.05$.

ns indicates non-significant differences between treatments in the particular attributes.

Table 4: Average score of liking and intensity of Tomyum cream soups with different levels of xanthan gum

% XG	Hedonic Scale			
	Overall Liking ns	Thickness ns	Saltiness ns	Overall Flavor ns
0.00	6.5±1.5	6.6±1.3	6.6±1.5	6.9±1.2
0.15%	6.5±1.2	6.3±1.6	6.1±1.9	6.0±2.0
0.20%	6.3±1.3	6.4±1.2	6.3±1.3	6.7±1.2
0.25%	6.0±1.5	6.2±1.4	6.2±1.6	6.5±1.2
	Intensity			
	Thickness	Saltiness ns	Overall Flavor ns	
0.00	6.5±3.0[c]	6.3±2.9	8.3±2.8	
0.15%	7.9±3.8[bc]	9.1±3.5	9.4±3.5	
0.20%	8.3±2.7[ab]	6.4±2.8	8.2±2.8	
0.25%	9.0±2.9[a]	6.2±3.0	7.9±2.8	

Note: *Values in the same column with different superscript different at $p < 0.05$.

ns indicates non-significant differences between treatments in the particular attributes.

Table 5: Average score of liking and intensity of green curry soups with different levels of xanthan gum

% XG	Hedonic Scale			
	Overall Liking ns	Thickness ns	Saltiness ns	Overall Flavor ns
0.00	5.9±1.8	6.1±1.5	6.2±1.5	6.1±1.6
0.15%	6.0±1.6	6.3±1.6	6.1±1.6	6.3±1.7
0.20%	6.0±1.8	6.2±1.5	6.0±1.8	6.5±1.5
0.25%	6.4±1.5	6.6±1.5	6.3±1.5	6.6±1.4
	Intensity			
	Thickness	Saltiness ns	Overall Flavor ns	
0.00	5.3±3.0[b]	5.7±2.8	6.8±2.3	
0.15%	6.0±2.7[b]	5.4±2.8	6.9±2.5	
0.20%	6.4±2.9[ba]	5.9±3.2	7.2±2.8	
0.25%	8.1±3.2[a]	6.0±2.8	7.6±2.6	

Note: *Values in the same column with different superscript different at $p < 0.05$.

ns indicates non-significant differences between treatments in the particular attributes.

Table 6: Average score of liking and intensity of Phanaeng curry soups with different levels of xanthan gum

% XG	Hedonic Scale			
	Overall Liking ns	Thickness ns	Saltiness ns	Overall Flavor ns
0.00	6.2±1.4	6.1±1.5	6.2±1.6	6.3±1.4
0.15%	6.2±1.9	6.5±1.6	6.4±1.7	6.4±1.6
0.20%	6.3±2.0	6.6±1.7	6.2±1.6	6.7±1.3
0.25%	6.4±1.7	6.6±1.9	6.3±1.6	6.7±1.4
	Intensity			
	Thickness	Saltiness ns	Overall Flavor ns	
0.00	6.4±2.6c	5.8±2.8	7.3±2.5	
0.15%	7.0±2.9bc	6.0±2.8	7.2±2.3	
0.20%	9.5±3.8ab	9.3±3.1	9.2±2.9	
0.25%	9.0±2.9a	6.2±2.8	7.3±2.5	

Note: *Values in the same column with different superscript different at $p < 0.05$.

ns indicates non-significant differences between treatments in the particular attributes.

3.3 *Viscosities of thickened soups*

The main effect of amount of xanthan gum was found significantly different and affected the viscosity of the products in each soup sample as shown in Table 7.

Table 7: Viscosity of soup samples measured by Brookfield

Samples	Viscosity (cp) at different % of Xanthan Gum			
	0.00%	0.15%	0.20%	0.25%
Chicken clean soup	16.33±0.19[a]	30.97±1.23[b]	34.20±0.59[c]	38.67±1.95[d]
Chicken cream soup	20.87±1.69[a]	31.63±1.69[b]	37.47±3.50[c]	40.43±0.61[c]
Tomyum clear soup	15.87±0.19[a]	39.27±0.48[b]	55.33±0.83[c]	65.47±0.69[d]
Tomyum cream soup	18.27±0.31[a]	49.23±1.11[b]	57.93±0.31[c]	71.77±1.20[d]
Green curry soup	20.67±0.68[a]	44.77±0.74[b]	53.43±0.52[c]	63.93±0.17[d]
Phaneng curry soup	21.50±0.36[a]	42.33±0.58[b]	60.97±0.42[c]	72.10±0.54[d]

Note: *Values in the same column with different superscript different at $p < 0.05$.

Chicken clear soup and Tomyum clear soup without adding xanthan gum had a significantly lower viscosity in all soups, which were 16.33 cp and 15.87 cp, respectively. Tomyum cream soup and Phanaeng curry with 0.25% xanthan gum had significantly higher viscosity among all soups, which were 71.77 cp and 72.10 cp, respectively as shown in Table 2. It also showed the viscosity of all soups with and without

added xanthan gum. It is indicated that the soup's viscosities were increased after xanthan gum was added, and the more xanthan gum was added, the higher the viscosity obtained, which might be caused by the intermolecular interaction or entanglement that increase the effective macromolecule dimensions and molecular weight [24].

The reason why Phanaeng curry soup with 0.25% xanthan gum added had a higher viscosity was the interaction of two kinds of thickener which were xanthan gum rice flour. Phanaeng curry paste normally contained shrimp paste, and shrimp paste sometimes contained rice flour in order to thicken the paste while cutting down on the amount of krill used. The thickeners (xanthan gum and rice flour) could help boost the effect on viscosity since xanthan gum can act as a binding agent for the flour, help increase the viscosity, they give mixes elasticity and stickiness. Additionally, it was reported that xanthan gum could promote association of starch molecules by bridging effects [25]. The increase in gel strength upon the increase of xanthan gum concentrations might be related to a better association between gelatinized starch granules promoted by xanthan gum [26]. Tomyum cream soup with 0.25% xanthan gum also showed high viscosity, which might be the effect of condensed milk since the viscosity of condensed milk was much higher than milk, to help increase overall viscosity. Moreover, increasing of oil concentration from condensed milk resulting in increasing of the effective volume fraction of the dispersed phase in the liquid, caused a narrower distance between particles, which led to the packing of the oil droplets, and these interparticle interactions are stronger [27]–[29]. The mentioned paper used CMC in the experiment, and CMC has similar properties to xanthan gum in that both of them are polymer structures, so the theory might be able to apply in this experiment.

It was also shown that chicken clear soup and Tom Yum clear soup have similar viscosity when there was no xanthan gum, but when xanthan gum was added, the Tom Yum viscosity increased more than chicken clear soup. It might be caused by tomato containing tomato pulp, pomace, and the main component of pomace is a polysaccharide, which can provide some physical properties such as water absorption and uptake. It is utilized as industrial food additives taking advantage of their useful physico-chemical properties (emulsifying, viscoelasticity, polyelectrolyte, adherence, bio-compatible, stabilizer, etc.) [30], [31].

Moreover, thickeners can help to boost the effect on viscosity since xanthan gum can act as a binding agent, help increase the viscosity, they give mixes elasticity and stickiness. According to the work of Giuseppina, 2008 and Oseweuba, 2021, the cited paper used starch in experiment, and it has a similar property with pomace that both of them are polysaccharides, therefore the theory might be able to apply in this experiment [30].

3.4 *Correlation between saltiness perception and viscosity*

Table 8 demonstrated the correlation coefficients, which were obtained between saltiness perception and viscosity from viscometer and viscosity rating. The objective was to evaluate the significance or lack of significance of this correlation as a step to study the feasibility of xanthan gum tests, as a predictive tool for the sensory characteristics of these soup samples. In this context, it would help to understand the consumer's response to these soup samples [32]. Negative correlations, which means when viscosity increased, the saltiness perception was decreased, were found in soup samples except for chicken cream soup and Tomyum soup since their correlation coefficient was quite low.

The reasons could be the flavor complexity of the soup samples as well as the context of eating. Since most Thai people consume chicken soup, Tomyum soup and curry soup with rice, in this case, the viscosity might not affect how they like the soup sample. Meiselman, 1994 also mentioned that several contexts, such as people issues (individual differences, social influences) and environmental issues (both physical and social) should be considered since it might have effects of foods preference behaviors [33]. Moreover, eating behavior depends heavily on brain function, and the brain mechanisms observed in this context are strongly influenced by genetic factors, sex and personality traits [34]. Overall, a complex picture arises from brain-imaging findings, because a multitude of factors influence human food choice [34], therefore, in this case, only viscosity change might not have strong effect on perception.

Table 8: Correlation between saltiness perception and viscosity

Soup	Corrletation Coefficient	
	Viscosity vs Saliness Rating	Viscosity Rating vs Saltiness Rating
Chicken clear soup	–0.93	–0.63
Chicken cream soup	–0.34	–0.33
Tomyum clear soup	–0.18	–0.08
Tomyum cream soup	0.01	0.07
Green curry	–0.64	–0.58
Phaneng curry	–0.76	–0.69

4 Conclusions

For soup viscosity, the more xanthan gum was added the higher viscosity of the soup. Differences can be found in both green curry soup and Phanaeng curry soup when the sample has the lowest and highest percentage of xanthan gum. According to soup sample profiles, viscosity mouthfeel was more intense when higher xanthan gum was added in all soup samples. According to the consumer test, xanthan gum showed a significant effect on the thickness of all soups, they still liked the sample while the viscosity was increased. The strong negative correlations were found in chicken clear soup, green curry, and paneng curry between saltiness perception and viscosity, when viscosity increased, the saltiness perception decreased in above-mentioned soup samples. This research protocol can be applied to other types of thickener or sensory stimuli. Since the study found a significant difference in saltiness perception in some soups of overtime sensory by trained panels, the result can be studied further to explore in more depth, such as increase time, or try on other types of soups.

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Author Contributions

S.C.: conceptualization, investigation, reviewing and editing; E.P.: investigation, methodology, writing an original draft; S.K.: research design, data analysis; M.S.: conceptualization, data curation, writing—reviewing and editing, funding acquisition, project administration. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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