

## The effect of salt replacement as seasoning from herbals on the quality of Vietnamese sausage.

Tanaporn Nungtala<sup>1</sup> and Chutikan Sakphisutthikul<sup>\*2</sup>

<sup>1</sup>Doctor of Public Health Program, Faculty of Public Health, Khon Kaen University, Thailand.

<sup>\*2</sup>Corresponding author: Dr.Chutikan Sakphisutthikul, Faculty of Public Health, Khon Kaen University, Thailand. E-mail: Chusak@kku.ac.th

**Abstract:** *This study investigates the impact of salt replacement with herbal seasonings on the quality attributes of Vietnamese sausages. Traditional seasoning in processed meats often relies heavily on sodium chloride (salt), which raises health concerns related to excessive sodium intake. In response to the growing demand for healthier food options, this study explores the potential of herbal extracts as a viable alternative to sodium chloride in Vietnamese sausage seasoning. The research evaluation of both physical properties and sensory test. Precise texture-measuring instruments assessed physical quality, including parameters like Hardness, Springiness, Chewiness, and Cohesiveness. The sensory evaluation involved a diverse panel of consumers aged 25 to 65, using a 5-point Hedonic Scale to assess attributes like flavor and overall acceptance. The results of this study, the physical quality evaluation demonstrates that all formulations with herbal seasonings exhibit consistent texture characteristics compared to the control group, with no statistically significant differences ( $p>0.05$ ). The suggestion is that herbal extracts can successfully replace sodium chloride without compromising essential textural properties in Vietnamese sausages. Moreover, the sensory evaluation reveals that consumers consistently prefer the flavor attribute of sausages seasoned with herbal extracts, aligning with the broader trend of seeking healthier and more natural food options. Despite variations in flavor, texture attributes exhibit no statistically significant differences, further emphasizing the viability of herbal-based seasonings. In conclusion, this study underscores the potential of herbal extracts to replace salt in Vietnamese sausages, offering healthier and more natural seasoning alternatives without sacrificing product quality. These findings contribute to the ongoing efforts in the food industry to cater to evolving consumer preferences for nutritious and flavorful food products.*

**Keywords:** salt replacement, herbal, Vietnamese sausage.

### 1. INTRODUCTION

The consumption of processed meat products, including Vietnamese sausages, has long been an integral part of diets worldwide due to their convenient availability and flavorful appeal.[1] However, excessive sodium consumption, primarily derived from salt, has raised substantial health concerns, particularly cardiovascular diseases and hypertension.[2] The use of sodium has prompted an urgent need to develop strategies that address the health implications associated with high sodium intake without compromising these products' sensory attributes and overall quality.[3] Aside from its preservative properties, salt plays a pivotal role in enhancing flavor, texture, and overall palatability in meat products such as Vietnamese sausages.[4] Consequently, researchers and the food industry are increasingly exploring alternative approaches to reduce salt content in processed meats while maintaining their sensory appeal and consumer acceptance. One such approach involves incorporating herbal ingredients as potential salt replacements, which offer distinct flavor profiles and contribute beneficial bioactive compounds.[5]

Herbal ingredients have garnered significant attention for their multifaceted applications in the culinary and health sectors. Their diverse flavors, ranging from mild to robust, have led to their incorporation in various food products as natural flavor enhancers.[6] Furthermore, herbal ingredients contain bioactive compounds such as polyphenols, antioxidants, and phytochemicals, which researchers have linked to potential health benefits. These attributes position herbal ingredients as promising candidates for replacing or reducing salt in processed meats, thus addressing the dual challenge of sodium reduction and maintaining product quality. Researchers aim to ascertain their efficacy in replicating the taste and sensory experience of traditional salt seasoning in Vietnamese sausages by harnessing the inherent flavors and health-promoting attributes of herbal ingredients.

This study investigates the effects of using herbal ingredients as salt replacements in Vietnamese sausages, explicitly focusing on the resulting changes in product quality. Through a comprehensive assessment encompassing physicochemical analyses, sensory evaluations, and microbiological studies, this research aims to provide valuable insights into the viability of employing herbal seasonings to enhance the nutritional profile of Vietnamese sausages. By evaluating parameters such as flavor intensity, texture, shelf life, and microbial stability, the study aims to determine the extent to which herbal seasonings can mimic the sensory attributes traditionally associated with salt while potentially introducing additional health benefits. The outcomes of this investigation hold the potential to contribute not only to the field of food science and technology but also to the broader endeavor of promoting healthier dietary choices without compromising on the gustatory appeal of traditional foods like Vietnamese sausages.

## 2. MATERIALS AND METHODS

### 2.1. SAMPLE PREPARATION

Fresh lean meat and lard, commonly used in Vietnamese sausage production, was sourced from a local market. Herbal ingredients, including *Suaeda maritima*, *Cnidioscolus chayamansa*, and *Morus alba* L., were obtained from a reputable supplier. The meat and lard was trimmed and then diced into uniform pieces. We prepared a control batch using traditional salt seasoning and then formulated experimental batches with different levels of herbal ingredients as replacements for salt. The mixed herbal extract (Figure 1) used as an ingredients was finely ground and homogeneously mixed with the minced meat to ensure even distribution.



**Figure 1.** Mixed herbal extract used as an ingredients

### 2.2 SAUSAGE FORMULATION

The minced pork, both control and experimental, was combined with other sausage ingredients and followed a standardized recipe. We prepared five formulations to assess how replacing sodium chloride content (NaCl) with combinations of selected herbs influences the qualities of Vietnamese sausages (refer to Table 1).

**Table 1.** Formulations experiment of Vietnamese sausage.

Ingredients	Content (%)				
	Control (F1)	F2-25	F3-30	F4-35	F5-100
Meat (lean:lard = 70:30)	65	65	65	65	65
Spices	3.0	3.0	3.0	3.0	3.0
Ice	2.0	2.0	2.0	2.0	2.0
NaCl	10.0	7.5	7.0	6.5	-
Herbal Extract Powder (HEP)	-	2.5	3.0	3.5	10.0
Sugar cane	20.0	20.0	20.0	20.0	20.0

### 2.3 PROCESSING AND COOKING

The meat and lard were first minced separately, then ground and mixed at 10°C for 3 minutes, using a bowl cutter, to create the meat emulsion. At 1.5 minutes, we incorporated ice into the mixture, and at 2 minutes, we introduced other ingredients (spices and additives). We standardized the other

ingredients across various formulations. Following mixing, we placed the mixture into a PE bag for shaping, sealed it, and subjected it to steaming at 120°C for 30 minutes to produce the final product.

#### **2.4 TEXTURE PROFILE ANALYSIS (TPA)**

We conducted Texture Profile Analysis (TPA) using a texture analyzer with a cylindrical aluminum probe (50 mm diameter). After cutting the samples into cylinders (30 mm height × 20 mm diameter), we positioned them on the instrument's base. The tests consisted of two compression cycles. The TPA textural parameters were measured at room temperature using the following conditions: a crosshead speed of 5.0 mm/s, 50% strain, a surface sensing force of 99.0 g, a threshold of 30.0 g, and a time interval of 1 second between the first and second compressions. The collected data were processed using Texture Expert version 1.0 software. From each sample's force–time curves, we calculated hardness, springiness, cohesiveness, gumminess, and chewiness.

#### **2.5 ORGANOLEPTIC TEST**

Fifty untrained panelists conducted the organoleptic test on the Vietnamese sausages, both those with mixed herbs extract powder (ranging from 0% to 100%) and those without added. The Vietnamese sausage samples had placed in the PE bags and steamed in boiling water for 20 minutes. Samples were allowed to cool at room temperature prior to sensory test. The panelists rated the sausage samples' taste, texture, appearance, and overall acceptance using a 5-point hedonic scale, ranging from 1 (dislike extremely) to 5 (like extremely).

#### **2.6 STATISTICAL ANALYSIS**

We conducted all experiments in triplicate. The experimental data underwent Analysis of Variance (ANOVA), and we assessed the differences between means using Duncan's New Multiple Range Test. Data analysis utilized an SPSS package.

### **3. RESULTS AND DISCUSSION**

#### **3.1 DEVELOPMENT OF VIETNAMESE SAUSAGE.**

The formulation of Vietnamese sausage used herbal extracts in powdered form; three herbal extracts: Chakram (*Suaeda maritima*) extract powder, serving as a substitute for sodium chloride; Chaya extract (*Cnidioscolus chayamansa*); and Baimon (*Morus alba* L.) extract powder, which replaced Monosodium L-glutamate (MSG). These herbal extracts were blended in all five formulations, while the ingredients, including meat, spices, ice, and sugar, were kept consistent in all recipes (shown in Table 1).

#### **3.2 EVALUATION OF VIETNAMESE SAUSAGE.**

In Table 2, the physical quality evaluation provides crucial insights into the viability of herbal-based seasoning powder blends in Vietnamese sausage formulations. This comprehensive analysis covered key texture characteristics, including Hardness, Springiness, Chewiness, and Cohesiveness, across all five product formulations. Notably, the absence of statistically significant differences when comparing these attributes to the control group ( $p > 0.05$ ) suggests that incorporating herbal extracts did not compromise the essential textural properties of Vietnamese sausages, underscores the formulations' success in maintaining textural consistency, a vital aspect of product quality and consumer satisfaction [7]. Consequently, these herbal-based blends appear viable alternatives without undermining the physical properties of the sausage, as outlined in Table 1.

Moreover, these findings align with the broader industry trend of seeking healthier and more natural alternatives in food product development [7-8]. Preserving consistent texture characteristics supports the use of herbal extracts to replace traditional seasonings, potentially reducing sodium content and enhancing the product's overall health profile. However, it is essential to acknowledge that while texture attributes remained consistent, sensory aspects such as flavor and overall acceptance (discussed in Table 3) may significantly influence consumer preferences and should be considered in product development [8].

**Table 2** Texture Profile Analysis of Vietnamese sausage

Experiment	Texture Profile <sup>ns</sup>			
	Hardness (N•cm <sup>-2</sup> )	Springiness (cm)	Chewiness (N•cm <sup>-2</sup> )	Cohesiveness
Control (F1)	23.26±2.04	0.92±0.01	18.61±0.01	0.85±0.02
F2-25	24.14±1.12	0.93±0.02	17.94±1.10	0.84±0.01
F3-30	23.38±0.28	0.90±0.01	18.58±0.33	0.84±0.02
F4-35	22.95±1.22	0.91±0.01	19.07±0.56	0.85±0.01
F5-100	24.51±0.28	0.92±0.02	19.54±0.42	0.84±0.01

Means (±SD) with the superscript “ns” indicates no significant differences among the means in the same column (P > 0.05).

Turning to the sensory evaluations in Table 3, they shed light on consumer preferences and acceptance of the Vietnamese sausage formulations. Notably, consumers consistently favored the flavors of product formulations 2 to 4 over the control formulations, indicating that incorporating herbal extracts, as outlined in Table 1, positively influenced the sausages' flavor profiles. This trend aligns with the broader consumer shift toward healthier, more natural food options, where herbal extracts, often rich in bioactive compounds, can contribute unique and appealing flavors while potentially offering health benefits [8]. These findings resonate with current industry trends emphasizing clean-label and natural ingredients to meet consumer tastes and nutrition demands [9].

Furthermore, the observation that texture attributes did not exhibit statistically significant differences (P>0.05) despite flavor variations is crucial. It implies that the improvements in flavor did not come at the expense of textural quality, reinforcing the viability of these formulations as alternatives in product development. Additionally, the fact that consumers did not show statistically significant differences (p>0.05) in their acceptance of Vietnamese sausage products in formulations 3 and 5 compared to the control formula products is promising. These herbal-based formulations have the potential to be well-received by consumers without compromising their overall liking for the product. Nevertheless, it is vital to recognize that consumer preferences are multifaceted and influenced by factors beyond flavor and texture, such as cultural and individual preferences [10].

**Table 3** Organoleptic test of Vietnamese sausage

Experiment	Sensory Attributes				
	Appearance	Flavor	Taste	Texture <sup>ns</sup>	Over all acceptance
Control (F1)	4.28±0.35 <sup>a</sup>	3.97±0.74 <sup>b</sup>	4.51±0.33 <sup>a</sup>	4.36±0.28	4.04±0.53 <sup>a</sup>
F2-25	4.16±0.57 <sup>a</sup>	4.22±0.35 <sup>a</sup>	3.55±0.08 <sup>b</sup>	4.23±1.01	3.58±0.41 <sup>b</sup>
F3-30	4.24±0.04 <sup>a</sup>	4.29±0.22 <sup>a</sup>	4.39±0.92 <sup>a</sup>	4.25±2.04	4.02±0.22 <sup>a</sup>
F4-35	4.28±0.89 <sup>a</sup>	4.10±0.76 <sup>a</sup>	3.64±1.05 <sup>b</sup>	4.18±0.67	3.67±0.34 <sup>b</sup>
F5-100	3.92±0.27 <sup>b</sup>	4.58±0.05 <sup>a</sup>	4.47±0.04 <sup>a</sup>	4.20±0.35	4.11±0.28 <sup>a</sup>

Means (±SD) with different superscript letters in the same column (a-b) indicate significant differences (P < 0.05). The superscript “ns” indicates no significant differences among the means in the same column.

#### 4. CONCLUSION

In conclusion, these results underscore the potential of herbal extracts to enhance the flavor profile of Vietnamese sausages without compromising their textural quality, making them a promising product development option in line with evolving consumer preferences for healthier and more natural food choices. Further research and refinement of these formulations hold the potential to yield innovative, consumer-friendly products that align with contemporary food industry trends.

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