Sensory attributes acceptance of potato patties prepared using different pre-cooked methods

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ABSTRACT Potato patties are popular snacks known for their appealing appearance, aroma, taste, and texture. This research evaluates the acceptance of potato patties pre-cooked using different methods. Potato patties were prepared using four different pre-cooking methods: boiling, steaming, baking, and frying. A total of 50 semi trained panellists participated in a sensory evaluation to assess the acceptability of the samples. All samples used the same formulation, with the only variable being the pre-cooking method applied to the potatoes. The results indicated significant differences in the tested attributes, showing that the samples were equally acceptable to the panellists. Sensory analysis revealed substantial differences ($p < 0.05$) in appearance, taste, aroma, and overall acceptance. The steaming method received high acceptance from the panel in terms of appearance, taste, aroma, and overall acceptance. Therefore, the findings from this research can help identify the most suitable pre-cooking methods for producing better potato patties, with steaming being a particularly effective method.

KEYWORDS: Acceptance; Cooking method; Sensory evaluation; Potato patties
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Original Article

INTRODUCTION

Potato patties are a popular Indonesian dish made from mashed potatoes combined with minced meat, chopped herbs, and various other ingredients before being fried. Typically, the potatoes are either boiled or fried until tender enough to be mashed. Once mashed, the potatoes are mixed with other ingredients, shaped into balls, and then flattened into discs. These discs are usually fried until golden brown. The prepared potato patties are dipped in egg and subsequently deep-fried to achieve a crispy exterior.

These patties can be enjoyed as an appetiser or as a side dish accompanying meals such as nasi lemak, nasi tumpang, nasi kuning, or soto ayam. This study investigates the acceptance of potatoes patties prepared using four different cooking methods: boiling, steaming, baking, and frying. The aim is to determine how these methods affect the texture and sensory attributes of the final product. According to Raatz *et al*. (2016), cooking methods that do not involve water contact better retain micronutrients like vitamins and minerals. Cooking methods can affect nutrient content, causing water-soluble nutrients to leach out and increasing resistant starch in potatoes (Robertson *et al*., 2018). Camire *et al*. (2013) adds that cooking or processing potatoes improves starch digestibility, which is low in raw potatoes due to the crystalline structure of starch granules that resist amylase digestion. Wilson (2002) found that baking potatoes takes about an hour to soften the centre, while preliminary tests showed full cooking in 40 minutes. Ciccone *et al*. (2020) noted high water loss in baking due to surface drying, affecting texture and sensory perception. Moreira (1997) stated that frying time, food surface, moisture, coating type, and cooking oil influence oil absorption. Frying is popular for its ease and sensory appeal. Shaker (2015) highlighted that fried products meet consumer sensory demands, but Ciccone *et al*. (2020) argued that frying is hard to control due to oil temperature variability, leading to uneven cooking. Ciccone *et al*. (2020) also noted that frying imparts a toasted aroma and flavour due to browning reactions.

Descours (2013) reported that steaming potatoes can lose aroma over time, caused by gelatinization and cell structure breakdown. Steamed potato texture affects sensory perception, with texture changes due to starch properties during cooking. Boiling potatoes causes starch gelatinization, affecting taste and texture. Swollen starch components during boiling break cell walls, releasing amylose (Amare *et al*., 2016). Azizi *et al*. (2020) noted high moisture content in boiled potatoes due to water absorption, softening tissues. Boiling is common, but Sharma (2019) found it less preferred than baking.

According to Bernardo (2020), sensory evaluation is a scientific method for measuring food quality based on sensory characteristics detectable by the five senses. Sensory acceptance tests measure panelists' acceptance of the final product. The sensory attributes evaluated in this test include aroma, consistency and texture, taste, and appearance (Lawless & Heymann, 2010). Conducting sensory acceptance tests requires following protocols to avoid errors. The evaluation area should be quiet and free from distractions to ensure accurate results and maintain panel focus (Lawless & Heymann, 2010). Human sensory evaluation provides the best model for understanding consumer perceptions and reactions to food products (Lawless & Heymann, 2010). This study aims to determine panel acceptance and preference for potatoes cooked using different methods to make potato patties. Sensory tests examine how manipulated variables alter human perception (Lawless & Heymann, 2010). Therefore, this study aimed to evaluate the sensory attributes of potato patties prepared by different pre-cooked methods.

METHODOLOGY

Sample

The potatoes (Yukon Gold variety), salt, egg and cooking oil were purchased from the local market in Kota Kinabalu, Sabah for the preparation of potato patties. The selection of Yukan Gold potatoes was based on several factors, including their availability and suitability for various types of cooking. The formulation of the ingredients was as follows: 2000 g (approximately 15 medium-sized potatoes) of Yukon Gold potatoes, 50 g of egg, 3-5 g of salt, and 1000 g of cooking oil.

Sample Preparation

The potatoes were initially rinsed with water and dried using a dry tissue. The skins were peeled, and the potatoes were cut specifically for boiling, steaming, baking and frying methods. The potatoes were then pre-cooked using four different methods: frying, baking, boiling, or steaming as shown in Table 1. The potatoes were then mashed with a fork until a smooth consistency was achieved. The mashed potatoes were subsequently mixed with additional ingredients, such as salt, tailored to each cooking method. The potato mixture was then shaped into round, flat patties (with a diameter of 6 cm) and dipped in egg. Finally, the prepared potato patties were fried and allowed to cool at room temperature.

Table 1. The time and temperature of different pre-cooked methods for making potato patties.

	Cooking method			
	Frying	**Boiling**	**Steaming**	**Baking**
Time	5 min	35 min	40 min	30 min
Temperature	180 °C	100 °C	100 °C	218 °C

Panel Selection

A group of semi-trained panellists, comprising students from the Faculty of Food Science and Nutrition aged 22-28, participated in the sensory assessment test. The panel included both men and women who were physically fit and not allergic to the samples. They assessed the samples based on taste, aroma, appearance, and texture. Potato samples were evaluated by 50 students at the sensory evaluation laboratory, Faculty of Food Science and Nutrition. Each sample was labelled with a unique 3-digit random number.

Statistical Analysis

The panel evaluated each sample using a 9-point hedonic scale, ranging from 1 (dislike extremely) to 9 (like extremely). The sensory attributes assessed included appearance, texture, aroma, taste, and overall acceptance. Data were analysed using multivariate statistical analysis. Analysis of variance (ANOVA) was performed using the proc mixed procedure in IBM SPSS version 28 to determine whether there were any significant differences in the acceptance of sensory attributes of the potato patties prepared using different cooking methods. The significance of the F-ratio ($p \leq 0.05$) from ANOVA indicated which attributes were used to identify differences between the cooking methods. Mean values were compared using Tukey's test at a 95% confidence level to evaluate panel acceptance among the four cooking methods applied to the potatoes for making potato patties.

RESULTS AND DISCUSSION

The sensory evaluation results of the final products (potato patties) made by using four different pre-cooked methods are shown in Figure 1, Figure 2, Figure 3, Figure 4 and Figure 5. Figure 1 shows that there were no significant differences ($p > 0.05$) in the texture acceptability of potatoes patties made by different cooking methods, making it uniformly acceptable to the panel. There were no significant differences in texture acceptability among most methods. However, baked potato patties (R3) received the highest mean score (6.74 ± 1.58), while fried potato patties (R4) scored the lowest (5.92 ± 1.71). Baking preserved a light, creamy texture, while frying led to a harder texture due to moisture loss (Ciccone, 2020; Amare, 2016).

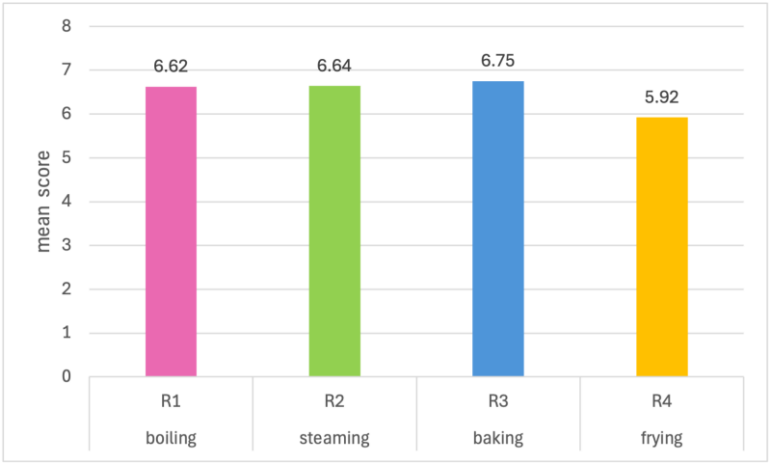

Figure 1. Texture acceptance of potato patties made by different pre-cooked methods.

Steamed potato patties (R2) scored the highest mean for taste (7.14 ± 1.65), followed by baked (R3), boiled (R1), and fried (R4) potato patties, the latter scoring the lowest (5.16 ± 2.01) (Figure 2). The steaming process retained moisture and starch, enhancing sensory properties, while frying resulted in a bitter taste due to browning (Larson, 2014; Remlan & Khattak, 2020).

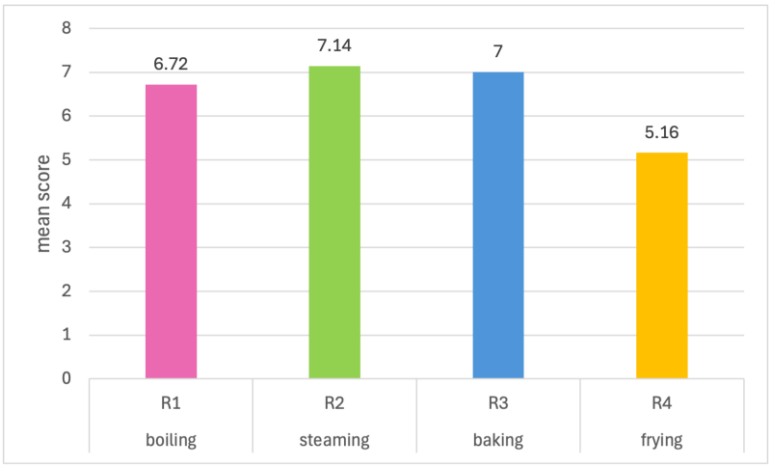

Figure 2. Taste acceptance of potato patties made from different pre-cooked methods.

Figure 3 indicates significant differences in appearance acceptability between the steamed (R2) and fried (R4) methods. However, the differences between steamed, baked (R3), and boiled (R1) methods were minimal due to similar mean values. Steamed samples had a visually appealing form, while fried samples exhibited a slightly brownish colour due to the browning process. Studies (Ray, 2021) highlight appearance, particularly colour, as a critical factor influencing sensory expectations and willingness to taste.

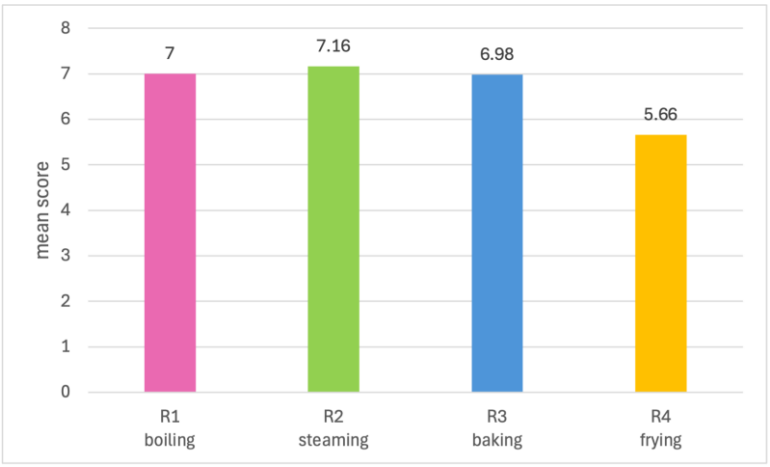

Figure 3. Appearance acceptance of potato patties made from different pre-cooked methods.

Figure 4 shows aroma acceptability of different pre-cooked potato patties. Steamed potato patties (R2) recorded the highest mean acceptance (6.90 ± 1.37) for aroma, with minimal differences compared to baked (R3) and boiled (R1) samples. Fried samples (R4) were less preferred (5.74 ± 1.81). Volatile compounds, such as amino acids, were more effectively retained in steaming and baking processes, contributing to desirable aromas (Ray, 2021).

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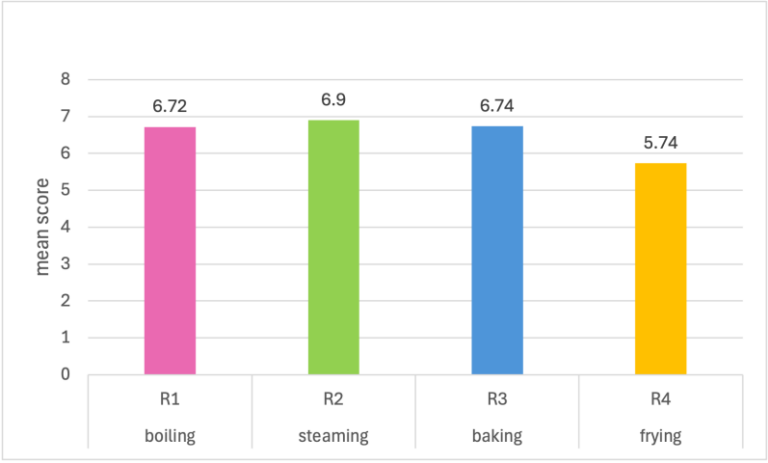

Figure 4. Aroma appearance acceptance of potato patties made from different pre-cooked methods.

The overall acceptance of potato patties made from different pre-cooked methods is shown in Figure 5. The steaming method (R2) achieved the highest overall acceptance (7.12 ± 1.42), followed by baked (R3) and boiled (R1) methods. Fried samples (R4) had the lowest acceptance (5.60 ± 1.90). These results underscore the superior sensory qualities of steamed potato patties, particularly in appearance, taste, and aroma (Choi & Kim, 2013).

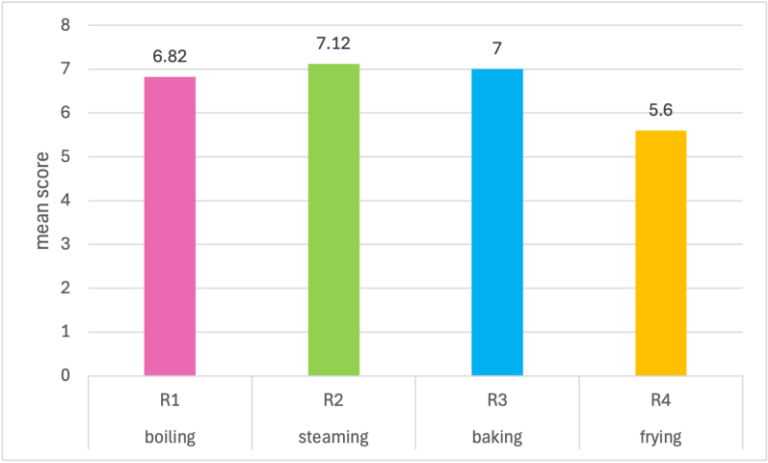

Figure 5. Overall acceptance of potato patties made from different pre-cooked methods.

CONCLUSION

Among four different pre-cooked methods, the steaming method (R2) emerged as the most preferred, achieving the highest scores for appearance, aroma, taste, and overall acceptance. Baking (R3) was particularly favoured for texture, while fried potato patties (R4) were the least acceptable due to less desirable sensory attributes. The findings confirm that steaming is the most suitable method for producing high-quality potato patties, combining superior sensory properties and overall acceptance. These results provide valuable guidance for optimising cooking methods in potato-based product preparation.

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