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Assessing the Market Potential of Mamachef's Purply Ice Cream Made from Underutilized Local Crops in Malaysian Retail Markets

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Abstract

The Mamachef Purply Ice Cream is developed from purple sweet potato. A sensory analysis and interview session was done with 11 trained panelists. The data has been analyzed using Atlas.ti based on thematic analyses. This unique ice cream is like other commercial ice cream, with natural purple color, and free from food additives. Its flesh also acts as a fat replacer in the Mamachef Purply Ice Cream. The processing of Mamachef Purply Ice Cream would increase the economic aspects among small and medium entrepreneurs (SMEs) and farmers and has an excellent potential to be marketed commercial food outlets.

Keywords: Purple Sweet Potato; Malaysia; Sensory Evaluation; Underutilized

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1.0 Introduction

In Malaysia, sweet potato is produced a lot by farmers. The Department of Agriculture Peninsular Malaysia surveyed in 2017 to obtain the statistics for the country's growth of vegetables and cash crops (Department of Agriculture Malaysia, 2018). Based on that survey, sweet potato was found to be a cash crop with a 24.93% planted area in Malaysia. According to Vegetables and Cash Crops Statistics (Malaysia Department of Agriculture, 2018), in 2017, there was 4,634.79 Mt of sweet potato production in the country, and the highest production area in Selangor was Sepang. Thus, the study revealed that Malaysian consumers' demand and consumption of the local sweet potato, as one of the local tubers, especially the PSP, have been alarmingly low (Purnama & Azmi, 2021).

In the culinary sector, sweet potatoes, especially purple sweet potatoes (PSP), are not considered the primary ingredient in most traditional Malaysian dishes, including Malay traditional food. The use of sweet potato in Malay traditional food preparation is mainly limited to dessert making. Desserts such as che mek molek (a Kelantan delicacy) and bubur keledak are examples of Malay traditional

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food made from orange sweet potatoes, but not the purple variety. Several findings have suggested that most Malaysians rarely enjoy eating boiled sweet potato roots, especially purple sweet potatoes (Purnama & Azmi, 2021). Furthermore, research has also found that most children, adolescents, and young adults do not generally prefer to eat PSP. Therefore, Malaysian sweet potatoes, particularly the PSP, still need to be utilized.

It is expected to see most of the Malaysian purple sweet potatoes left unsold at the supermarket compared to other local vegetables. Due to this, the retail price of this crop has fluctuated, which is evident in the increased cost in 2016 and decreased price in 2017 (Malaysia Department of Agriculture, 2018). Recently, several manufacturers have reportedly produced snacks made of sweet potatoes as an addition to their snack varieties without the intention to promote its health benefits to the population. This shows that the high nutritional values of Malaysian PSP are still overlooked. A previous study reported that the orange sweet potato was more selected because of its vast availability and preference over other sweet potatoes in Malaysia. The consumption of sweet potatoes, especially the PSP, as a food source has decreased, even though they contain high vitamins and minerals, a good source of fibre, and are also suitable for food product formulation (Selvakumaran et al., 2019).

Ice cream has become the most popular food choice among the population nowadays, especially among people who are ice cream lovers. Various ice creams have been introduced to the market, including ice cream made from local cash crops. However, despite their various health benefits, PSP ice cream has rarely been found in the Malaysian market.

To date, most researches in Malaysia focus on the quality attributes of Malaysia purple-fleshed sweet potato at different peel conditions (Shaari et al., 2021), growth and yield performance of five purple sweet potatoes (*Ipomoea batatas*) accessions on colluvium soil (Yusoff et al., 2018), and effects of moist-heat treatments on colour improvement, physicochemical, antioxidant, and resistant starch properties of drum-dried purple sweet potato powder (Nevara et al., 2019). However, only some studies focused on dessert products, particularly ice cream, in the food acceptability process among trained panelists using purple sweet potato flesh as the main ingredient and its market potential. Thus, this study examines the acceptability of Mamachef Purply Ice Cream among trained panelists and the market potential in Malaysia.

2.0 Literature Review

According to the Department of Agriculture (FAMA), in Peninsular Malaysia, the Vegetables and Cash Crops Statistics in Malaysia for 2021 showed that sweet potato production in Malaysia was 56,343.50 metric tons in 2019, 54,750.40 metric tons in 2020 and continued to decrease to 53,613.80 metric tons in 2021. The ringgit value of production for sweet potato in 2021 was RM 96,504.79 and number nine for cash crops production value compared to other cash crops in 2021. The FAMA team usually assists most farmers in ensuring the crop is marketed correctly and bought by the intermediaries.

Since the sudden decrease in the 2017 figures needed an explanation, the researcher met with the FAMA Selangor officer to clarify this matter. He explained that there had been a lack of demand from consumers, which had consequently caused price fluctuation and inevitably influenced the production of the crop in that year. To rectify this problem, it is essential to introduce a new product made from sweet potato, which is popular and readily marketable as this can ensure price stability. Although PSP is a type of cash crop, ice cream can also be helpful as an alternative to fresh vegetables, as it could offer another choice for Malaysians, with most of the population having a low intake of vegetables, as previously reported in NMHS 2019. This scenario has shown a problem related to healthy eating among Malaysians.

Björck, Liljeberg, and Ostman (2008) reported that it is also a valuable medicinal plant having anti-cancer, anti-diabetic, and anti-inflammatory properties. Accordingly, sweet potato is reported to have a low GI, which is highly contained in white-skinned sweet potatoes and is used as diabetic-friendly food (Zhu & Sun, 2019). Besides that, the purple-fleshed sweet potato (PSP) has the highest concentration of anthocyanins. Overall, Wang et al. (2019) have suggested that practical applications of underutilized sweet potatoes should be diversified as it remains much underutilized on commercial levels, focusing on optimization in formulations and processing techniques to maximize the retention of bioactive ingredients. It is also used as a new ingredient for developing gluten-free products. Several value-added food products are being developed using sweet potatoes with functional ingredients. Sweet potato tubers could be processed into primary products such as flour, chips, puree, etc., and secondary products like biscuits, pasta, ice cream, and noodles (Giri et al., 2019). Therefore, sweet potato can be further developed as a sustainable crop for diverse, nutritionally enhanced, value-added food products to promote human health.

3.0 Methodology

A basic formulation of ice cream from PSP was developed to get an optimum percentage of each ingredient in the mixture. The original formulations of the ice cream were prepared according to the method by Gisslen (2004) with modifications by the researcher. A preliminary study was conducted in three months to get the correct formulation for PSP ice cream in the Pastry kitchen, Faculty of Hotel and Tourism Management, UiTM, Malaysia. The researcher used the original formulation and added the boiled PSP as well as other ingredients to get the formulations. The boiled form was used to ensure the anthocyanin content which contributes to natural purple color remain in the formulation. Boiled PSP flesh, milk, and heavy cream were the main ingredients used in the formulation.

For ice cream processing purposes, the PSPs were bought from the local market at Jalan Kebun, Seksyen 38, Shah Alam, Selangor, Malaysia, while other ingredients such as milk (Dutch Lady) and heavy cream (Anchor) were bought from Tesco Puncak Alam, Kuala Selangor, Malaysia. The study was conducted at the Food Analysis Laboratory and Pastry 1, Faculty of Hotel and Tourism Management, UiTM Puncak Alam, Selangor. A sensory analysis with hedonic scores and interview session were done with 11 trained panelists as

suggested by Aminah (2005). The trained panelists were among the food industry experts and academicians who have more than 10 years experiences in food development and sensory evaluation. The hedonic scores have been analyzed using SPSS Version 28 for the Mean and standard deviation, and interview data has been analyzed using Atlas. ti based on thematic analyses.

4.0 Findings

4.1 Trained Panelists' Profiles

The panelists' profiles based on each independent variable used in the survey, such as gender, age, race, marital status, and state of origin, are discussed. Table 1 shows the gender, race and age of panelists involved in this study.

Table 1. The number and percentage (%) of overall consumers reported by gender, marital status and age

Variables	N	%
Gender		
Male	5	45.0
Female	6	55.0
Race		
Malay	6	55.0
Chinese	3	27.0
Indian	2	18.0
Religion		
Islam	6	55.0
Buddhists	3	27.0
Hindu	2	18.0
Age		
20-29 years old	1	9.0
30-39 years old	3	27.0
40-49 years old	4	37.0
50-59 years old	3	27.0
Status		
Single	2	18.0
Married	9	82.0
State of Origin		
Selangor	3	28.0
Melaka	1	9.0
N. Sembilan	1	9.0
Johor	1	9.0
W. Persekutuan	2	18.0
Perak	1	9.0
Kelantan	1	9.0
Sabah	1	9.0

Overall, 11 panelists were involved in the study; 55 per cent (n=6) of them were female, while the other 45 per cent (n=5) were male. Most of them were Malays (55.0 per cent, n=6), followed by Chinese (27.0 per cent, n=3) and Indians (18.0 per cent, n=2). In line with that, 6 of them (55%) were Muslim, 3 were Buddhists (27%), and 2 were Hindus (18%). Besides that, the majority of them were in the group of 40-49 years old, representing around 37.0 per cent (n=4), followed by a group of 30-39 years old, representing about 27.0 per cent (n=3), the group of 50-59 years old with 27 per cent (n=3) and the lowest age group that actively involved were 20-29 years old with 9 per cent (n=1). 18.0 per cent of the panelists were single (n=2), and 82.0 per cent (n=9) were married. Three of them were from Selangor (28.0 per cent), followed by Wilayah Persekutuan with 18 per cent (n=2). Besides that, Melaka, Negeri Sembilan, Johor, Perak, Kelantan and Sabah had one panelist from each state (9.0 per cent).

4.2 The Sensory quality and acceptability Mamachef Purply Ice Cream

The mean score rating of the sensory quality and the acceptability of the Mamachef purply ice cream is tabulated in Table 2.

Table 2. Mean ratings for sensory quality and acceptance of ice cream evaluated by the trained panelists

Sample	Sensory Attributes				
	Taste/flavour	Texture	Colour	Appearance	Overall acceptance
Mamachef Purply Ice Cream	8.37±0.85	8.06±0.91	8.85±1.17	8.24±1.04	8.92±0.98

The results indicate that the majority of the panelists liked the taste/flavour of Mamachef Purply Ice Cream, with a mean of 8.37 (Sd=0.85). It is followed by appearance attribute whereby the majority of them also liked the appearance of the ice cream (mean=8.24, Sd=1.04). They also liked the texture, with a mean of 8.06 (Sd=0.91). The results for colour were the highest mean scores, with 8.85. It shows that they immensely liked the colour of the ice cream. The responses from the panelists in the sensory evaluation are also

subjective and depend on how they perceive the product. Overall, colour and taste/flavour are the most influential factors in the overall acceptability of the ice cream.

Most of the panelists found the ice cream was acceptable, with a mean of 8.92 (Sd=0.98). It is believed that this Mamachef Purply Ice Cream could be commercialized and introduced into the market. The PSP ice cream also has the potential to become a commercial product, and it will provide more options to the consumers.

4.3 Marketability of Mamachef Purply Ice Cream in Retail Outlet

Questions related to the marketability of the ice cream were asked to the panelists. The question asked was: "What do you think of the potential for this purple sweet potato ice cream to be promoted through retailing outlets?" It is a specific question which emphasises the marketability of ice cream in retail outlets. All of them answered the questions, and the answers are identified and discussed below.

All the trained panelists asserted that the ice cream had immense potential and should be promoted (n=11) as a healthy dessert in retail outlets. One of them also highlighted that this ice cream has the potential to be marketed internationally. According to them, it has advantages and specialities that could attract people or consumers to buy it. Furthermore, three of them stated that this ice cream will be well accepted by customers especially by those who have a healthy lifestyle. It could also become a favourite dessert for all ages of customers. Moreover, it will encourage young people, especially children, to eat high-fibre ice cream made from purple sweet potato, which contains vitamins and minerals. It will expose the young generation to local food sources with various health benefits. It might increase the consumption of local purple sweet potatoes. Some of the responses were:

Table 3. Responses on Potential of Marketability

Theme	Responses	Trained Panelist
<i>Be promoted as a healthy snack food</i>	This purple ice cream has the potential to be promoted in retail outlets. People will buy it.	1
	The potential of this ice cream is excellent; it would be well received by customers who are concerned about their food/ health. This can be part of their healthy dessert options.	2
<i>Acceptable to many people</i>	This tasty and unique ice cream will be well received by all people.	5
	This ice cream is acceptable to many people if it is marketed in retail shops.	7
<i>Will be customer focused</i>	This ice cream will be preferred by customers as a dessert. They will choose this ice cream. It has its own values. Once a customer eats it, they would want to buy it again.	10
<i>Ability to compete with existing dessert products</i>	Sure, it can compete with other options in the market because it different from them.	11
	It differs in terms of colours, appearance and texture. I believe it could compete with existing products in the market.	4
<i>Consumers will like the PSP ice cream</i>	I think consumers will like it because of its unique texture and taste.	3
	They will love it; it tastes good and purply colour.	6
<i>Healthy factor</i>	Yes, if this ice cream is sold in the retail outlet, consumers will buy it because it is suitable for all ages, and it is healthy too.	8
<i>Suitable to All Ages</i>	This ice cream is suitable for consumers of all ages. They will buy it if it is sold in a retail outlet.	9
	Taste them first, you will fall in love with it.	4

Overall, with the above responses, it is believed that the Mamachef Purply Ice Cream from PSP has a good potential for commercialization and marketability. This ice cream will receive a good response not only from older consumers, but also from the younger generations, especially children.

5.0 Discussion

The purple sweet potato flesh itself enhances the properties of food products including ice cream. The pleasant color responses obtained from the panelists was consistent with a previous study, which reported that the higher levels of anthocyanins in purple sweet potatoes gave the product its distinct purple colour (Giri & Sakhale, 2019). The findings also demonstrated the potential of purple sweet potatoes as a synthetic coloring agent in other food products (Truong & Avula, 2010). The PSP ice cream was verified as having added value by the inclusion of the purple sweet potatoes, the result was consistent with Cui and Zhu (2019), and Nurminah and Nainggolan (2019) who found that the flesh of purple sweet potatoes is good for processing food products.

6.0 Conclusion & Recommendation

The Mamachef Purply Ice Cream from PSP contained various nutrients, high mineral and fibre contents that can promote benefits to the consumers. As it was added to the purple sweet potato flesh as the major ingredients, as proved by many researchers has a lot of nutritional values and functional properties, this ice cream would enhance healthy eating practices of Malaysians. Overall, purple sweet potatoes could be a potential raw ingredient for the development of ice cream or other functional food products with improved nutritional values. The utilization and emphasis of the nutritional advantages of purple sweet potatoes in the food industry by developing more nutritious food products is recommended. Nevertheless, the acceptance study only focused on the trained panelists. For future research,

it is valuable to study the food acceptance analysis and sensory evaluation of consumers of all ages to study the acceptance of the ice cream for commercialisation purposes.

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Paper Contribution to Related Field of Study

This paper could contribute the new body of knowledge to the food product development on the purple sweet potatoes and sensory evaluation of food products.

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