

Sensory Characteristics and Consumer Acceptance of Malaysian Dessert Bubur Cha Cha with Plant Extracts

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Abstract

Bubur cha cha is one of the most popular and favourite traditional dessert in Malaysia. Bubur cha cha is made from flour, water and a few drops of colourants. However, prolonged consumption of foods with artificial colourants can cause adverse health effects. Hence, in this study, plant extracts have been used to replace food colourants in the preparation of the bubur cha cha. These plant extracts are not only to provide natural colours but also the dietary fibres. The objectives of this study are to formulate the bubur cha cha using several plant extracts and to determine consumer acceptance towards a healthier bubur cha cha. Different plant extracts were shown to affect the amount of flour added. Plants with more roughage were found to need an additional flour as compared to plants with less roughage in order to achieve optimum texture. Consumers were observed to have a higher preference towards a mixture of bubur cha cha with plant extracts than the traditional bubur cha cha. This study concludes that the introduction of plant extracts as one of the ingredients in the traditional foods does not affect consumers' acceptance. Hence, this approach can be applied in the preparation of the traditional food to make it more nutritious than the original recipe. In addition, this approach is useful in increasing the intake of dietary fibre among Malaysians.

Keywords: Bubur Cha Cha; Plant Extract; Natural Colourant; Dietary Fibre

Introduction

Plants are a source of dietary fibre needed for the body. Consuming sufficient amount of dietary fibre, which is also known as roughage can provide many health benefits including weight management and reducing the risk for chronic diseases [1,2]. Insufficient intake of fibres can cause constipation and eventually may lead to colon cancer [3]. In addition, constipation is common condition among Malaysians and involves between 15 to 30 percent of the population [4]. The Malaysian Ministry of Health [5] recommends between 25 and 38 grams dietary fibre intake a day [6]. Unfortunately, the intake of dietary fibre among Malaysians is still below the recommended amount [7,8]. Less than 70 percent of young Malaysians were reported to consume fruit at a rate of less than once a day [7]. Familiarity and habitual intake of vegetables were shown to increase the intake of dietary fibre especially among children [9].

In addition, previous studies have shown that fibres can improve the textural properties of the dough [10-12] and the quality of the food products [13]. The presence of plant fibers in the dough can result in cross-linking which may influence the structure and properties of the end products [10]. However, excessive amounts

of insoluble dietary fibre can affect the gluten network formation hence reducing the quality of the products [14].

Other than the dietary fibre, plant extracts can also provide colours to foods [15,16]. The colours of food can enhance the aesthetic value of foods where it can stimulate or suppress one's appetite [17]. Artificial food colourants otherwise known as food dyes are widely used in the preparation of foods due to the stability, cheaper than natural colourants [18] and also to standardize the colour of the products [19]. Although the relationship between intake of artificial colourant and behavioral implications is inconclusive [20], yet various studies reported the association between continuous consumption of the artificial colourants and behavioural implications among children [21-24]. Despite the possible health implications related to the continuous consumption of artificial colourants, the demand towards food colourant, however, is still increasing [16].

Bubur cha cha is one of Malaysia's favourable traditional desserts [25]. It consists of colourful starchy chunks. It is sometimes added with diced sweet potatoes or yam, and then cooked with coconut milk mixed with palm sugar. The colorful starchy chunks are made of tapioca flour and added with artificial colours to make it colorful and vibrant. Since Bubur cha cha is one of the National

Food Heritage (NFH) [26], it is important to provide alternatives to artificial colourants used in the bubur cha cha by introducing natural ingredients in food products [27,28]. This approach will not only lead to healthier foods [28] but also may result in better sensory quality [11].

Materials and Methods

Plant Materials

In this study, several vegetables were used, namely spinach (*Spinacia oleracea*), pumpkin (*Cucurbita moscata*), carrot (*Daucus carota*), and beetroot (*Beta vulgaris*). These vegetables were selected to give various colour to the bubur cha cha. All vegetables were purchased from local supermarkets and were taken to the laboratory for immediate use. The vegetables were properly washed under running before blended at a ratio of 80 grams of individual vegetables with 80 ml of water.

Preparation of bubur cha cha

The bubur cha cha was formulated in triplicate following the traditional recipe with slight modifications in the ratio of the ingredients. The formulation was prepared by mixing 100 grams of tapioca flour with 80 ml water for the control that is bubur cha cha without any plant extracts. However, upon the addition of plant extracts and the respective roughage, an extra amount of flour was added until the dough reached the desired texture. The dough was kneaded manually before it was placed on a cutting board and rolled out to a uniform thickness. The rolled dough was then sliced into the desired size and shape. This was followed by boiling them in water for 10 seconds until they floated on the surface of water. The cooked bubur cha cha pieces were then strained and placed in a bowl of cold-water to reduce the temperature. The cooled bubur cha cha were arranged on the dryer mat and dried in the dehydrator at 35°C for 6 hours, until they feel dry to the touch. Once dried, the bubur cha cha pieces were packaged in a dry container and stored in cool and dry place.

Prior to the sensory evaluation, the dried bubur cha cha pieces were boiled in water for 10 minutes and strained. Later, coconut milk and palm sugar were added to the remaining water used to cook the bubur cha cha in a ratio of 1:1:1/3 to become a sauce. Once boiled, the strained cooked bubur cha cha were added to the sweetened sauce with a pinch of salt and stirred until the mixture boiled again. Finally, the bubur cha cha was ready to be served.

Consumer acceptability

A total of 50 consumers were recruited among the faculty members to evaluate the control bubur cha cha, bubur cha cha with the respective plant extract, and the bubur cha cha that consisted of all plant extracts. These consumers consisted of both genders between the ages of 19 and 42. The bubur cha cha samples were presented in a 50 g paper cup with three-digit random number codes. These samples were rated for overall acceptability, appearance, taste, texture, aroma, and colour. Evaluations were conducted using a nine-point hedonic scale to determine the degree of liking (9

= like extremely, 5 = neither like nor dislike, 1 = dislike extremely) [29].

Data analysis

The sensory quality of the bubur cha cha with and without the plant extracts were carried out in triplicate and mean values with standard deviation (SD) were computed using Microsoft Excel, 2010.

Result and Discussion

Formulation of bubur cha cha with plant extracts

Several formulations were prepared to get the optimum colour and dough texture for bubur cha cha with plant extracts. The results showed that the dough added with different plant extracts needed different amounts of flour: bubur cha cha with spinach extract the greatest amount of additional flour (70 grams), followed by carrot (55 grams), beetroot (40 grams) and lastly pumpkin (35 grams). The amount of flour added to the doughs with different plant extracts was different because the proportions and the type of fibers in plants may have influenced the dough properties [14,30,31] and other attributes such as water binding, gelling, and structure building, which resulted in texture modification [32].

Consumer acceptability

The majority of the consumers were female (68%) with an age range of 20 to 23 years old (76%). The remaining consumers were in their mid-20s (6%) and a few were aged 19 years (2%), 32 (2%) and 42 (2%) years old, respectively.

Sensory Attribute	Type of Bubur cha cha					
	Plain	Beet-root	Spinach	Carrot	Pumpkin	Mixture
Appearance	6.06 ± 1.93	5.48 ± 1.78	5.36 ± 1.51	5.20 ± 1.67	5.78 ± 1.79	6.98 ± 0.96
Taste	4.48 ± 1.66	5.40 ± 1.80	4.60 ± 1.94	5.26 ± 1.58	5.48 ± 2.14	7.02 ± 0.96
Texture	5.00 ± 1.71	5.84 ± 1.45	5.44 ± 1.64	5.46 ± 1.45	5.62 ± 1.85	7.26 ± 0.92
Aroma	5.82 ± 1.65	5.94 ± 1.63	5.76 ± 1.80	5.66 ± 1.44	5.94 ± 1.78	7.18 ± 1.06
Colour	6.04 ± 1.68	5.76 ± 1.70	5.58 ± 1.80	5.62 ± 1.55	6.00 ± 2.01	7.32 ± 0.99
Overall acceptability	5.46 ± 1.74	5.94 ± 1.46	5.40 ± 1.85	5.90 ± 1.27	6.14 ± 1.83	7.76 ± 0.89

Table 1: Mean and standard deviations of sensory evaluation toward *bubur cha cha* with and without plant extracts.

As shown in table 1, the mixture of bubur cha cha had the highest score for all the evaluation characteristics, namely appearance (6.98 ± 0.96), taste (7.02 ± 0.96), texture (7.26 ± 0.92), aroma (7.18 ± 1.06), colour (7.32 ± 0.99) and overall acceptability (7.76 ± 0.89) compared to control and bubur cha cha of the respective plant extracts. In the case of bubur cha cha with its respective plant extract, the pumpkin bubur chacha had the highest overall acceptability (6.14 ± 1.83), followed by beetroot bubur cha cha (5.94 ±

1.46) and carrot bubur cha cha (5.90 ± 1.27) while spinach was the least (5.40 ± 1.85). The after taste of spinach and its bitterness may result in low acceptability among the consumers. Similar findings were reported by Galla., *et al.* [33] where food products with higher proportion of spinach resulted in after taste and lower acceptability by the consumers. In addition, the green colour of the spinach could be associated with bitterness hence reducing its acceptability [34].

Based on appearance, taste and colour, the consumers preferred pumpkin bubur cha cha than any other bubur cha cha. Beetroot bubur cha cha was preferred the most in terms of texture (5.84 ± 1.45) and aroma (5.94 ± 1.63). However, the bubur cha cha without any plant extracts was shown to have a better score than the bubur cha cha added with plant extracts in terms of appearance (6.06 ± 1.93) and colour (6.04 ± 1.68). The dull colour of the bubur cha cha with plant extracts after being cooked may contribute to lower acceptance. When subjected to heat, the less stable plant pigments such as betalains in beetroot [35] chlorophyll in spinach [36] and carotenoid in potatoes [37], became dull or had loss its intense colour [36], hence resulting in poor appearance. Nevertheless, the bubur cha cha without any plant extracts had the lowest score in terms of taste (4.48 ± 1.66) and texture (5.00 ± 1.71). The present findings support a conclusion made by Spence., *et al.* [38], that consumers are always associated colour to the taste of foods.

The findings also demonstrated that younger consumers were willing to accept the new taste of traditional foods even though the bubur cha cha has been rated as the most favourite traditional desserts among Malaysians [25]. Similar conclusion was derived by Omar., *et al.* [39] and Almli., *et al.* [40], where taste was the main contributor that influenced consumers' satisfaction towards traditional foods. Guerrero., *et al.* [41] however concluded that quality of the innovative foods was the most to be considered by the consumers followed by taste. Hence, this study provides an insight into the possibility of increasing the intake of dietary the fibre by incorporating it as part of the ingredients especially in traditional foods. This approach may not only improve the dietary fibre consumption but may also make Malaysia traditional desserts healthier compared to traditional desserts using traditional recipes. In addition, coconut milk was one of the main ingredients used to prepare the sauce for bubur cha cha by token of its creamy flavor [42]. However, the traditional bubur cha cha can be regarded as an empty calorie food due to limited nutrients it provides whilst the calories are mainly provided by the tapioca flour, palm sugar and coconut milk [43]. Coconut milk was reported to have higher fat content than dairy milk [44].

Conclusion

This study concludes that the introduction of plant extracts as one of the ingredients in the traditional foods does not affect consumers' acceptance. Although the authenticity of the traditional bubur cha cha was changed, the nutritional quality provided by the bubur cha cha with plant extracts would benefit the consumers most.

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