Original Research Article

Exploring Consumer Awareness of Curculigo Latifolia as a Sugar Substitute

Nolila Mohd Nawi[1]*, Nur Atika Suboh[1]

[1]Department of Agribusiness and Bio Resource Economics, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

*Corresponding author: Nolila Mohd Nawi, Department of Agribusiness and Bio Resource Economics, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia; nolila@upm.edu.my

Abstract: Lemba or Pinang Puyuh, locally known as Curculigo Latifolia, is a prevalent plant species in Peninsular Malaysia and Borneo Island. Belonging to the flowering plant genus Hypoxidaceae, this plant harbours a sweet protein called Curculin extracted from its fruit. Remarkably, Curculin is 500 times sweeter than sucrose, making *C. latifolia* a viable low-calorie sweetener for individuals with diabetes or obesity. Despite its potential, many remain unaware of this sweet herb. This paper explores consumer awareness regarding *C. latifolia* as a sugar substitute. Primary data was gathered through a self-administered survey by employing structured questionnaires. In the Klang Valley, Malaysia, 350 respondents were randomly selected. The collected data were analyzed using descriptive, chi-square, and factor analyses. Surprisingly, 80.9% of respondents had never encountered *C. latifolia* as a sugar substitute. Chi-square analysis disclosed associations between socio-demographic factors, such as gender, and awareness of *C. latifolia*. Further investigation via factor analysis identified four influencing factors determining consumer awareness: promotion, health concern, product, and price. Given the potential of natural sugar substitutes like *C. latifolia* in reducing the risk of diseases like diabetes, effective advertising and promotion are crucial. Increasing consumer awareness and knowledge about this herb will be essential for its future acceptance as a sugar substitute.

Keywords: Awareness; *Curculigo latifolia*; Sugar substitute; Lemba

1. Introduction

In Malaysia, sugarcane cultivated in Chuping provides sources for raw sugar production. However, local sugarcane production can only supply about 1.4% of the country's total sugar production, necessitating importing 98.6% metric tonnes of raw sugar from major exporting countries such as Brazil and Australia, the world's primary sugarcane producers. Local sugarcane production declined significantly until 2016, and the country's self-sufficiency level for sugar has remained very low since 2000. Consequently, Malaysia

will continue to depend on sugar imports from other countries. Furthermore, sugar cane cultivation in Malaysia is limited by environmental factors such as weather and climate, hence the dependence on imports of two-thirds to sustain sugar requirements (Food Processing Ingredients Annual, 2017). In 2021, Malaysia recorded imports of raw sugar amounting to $674 million, with the primary source countries for these imports being Brazil ($433M), India ($135M), Thailand ($66.9M), South Africa ($13.6M), and Australia ($8.46M). The high value of raw sugar imports due to the decline in local sugarcane production can motivate Malaysia to explore sugar substitutes produced from sugarcane. The issues in sugarcane production and consumers' changing behaviour towards healthy lifestyles, such as low-sugar and low-calorie foods, have led them to an alternative or sugar substitute.

Furthermore, previous studies have reported that sugar may cause many health problems that trigger consumers to seek sugar substitutes or alternative sweeteners from natural sources or ingredients. Mintel (2016) reported that 26% of respondents indicated they would like to see more food and drinks that use naturally sourced sugar substitutes, while 19% stated they are buying more food and drink containing natural sugar substitutes. Additionally, reducing sugar intake is now a global trend among consumers, including young and old, which has caused sugar and alternative sweeteners to be the most scrutinised product ingredients (Cargill, 2018). Regarding natural sugar substitutes, stevia, derived from the leaves of Stevia rebaudiana, has been known and accepted by consumers worldwide. Meanwhile, *Curculigo latifolia* (Lemba) is an herb native to Malaysia that can also be utilized as a sugar substitute and could potentially reduce the dependency on sugar imports. Moreover, it is still new among the consumers. Thus, the general objective of this study is to explore consumers' awareness towards *C. latifolia* as a sugar substitute since it is still new to the market.

2. Literature Review

Sugar is a sweet material containing sucrose, the crystal in shape and colourless or white when pure but brown when less refined. Sucrose is a disaccharide comprising a combination of monosaccharides, glucose and fructose. Besides sugarcane, sorghum, maples, and palms are other sources of sugar production. In Malaysia, sugarcane is used as the primary production of sugar. The sucrose-containing material is a sweetener and a source of dietary carbohydrates and food preservatives. Sucrose is a simple carbohydrate that provides instant energy that the human body can easily absorb. According to the World Health Organization (2015), additional sugar intake should be minimized to below 10% of human's daily energy consumption. The average adult intake of extra sugar, including hidden sugar, should not exceed ten teaspoons daily, equivalent to about 50g. Extra sugar consumption refers to a loaded content of monosaccharides and disaccharides in food and drink products. The average sugar intake among adults in Malaysia is four and three teaspoons of table sugar and sweetened condensed milk, respectively (Malaysian Adult Nutrition Survey, 2003). The

amount exceeds the recommendation by the World Health Organisation and Malaysian Dietary Guidelines of a total daily intake of not more than 50g. Excess sugar consumption is associated with various adverse health effects.

Firstly, excess sugar intake leads to extra calories, and prolonged intake could result in weight gain, ultimately leading to obesity. In terms of obesity, 50.1% of Malaysian adults are overweight or obese (National Health and Morbidity Survey 2019). According to Kyaw *et al.* (2022), the occurrence of obesity in the Malaysian population surpasses the global average. Additionally, they revealed that the prevalence of obesity is higher among female respondents compared to their male respondents. Furthermore, the National Health and Morbidity Survey (2019) revealed the increase in diabetes prevalence in Malaysia within five years, from 13.4% in 2015 to 18.3% in 2019. This indicates that approximately 3.9 million adults aged 18 years and above are currently associated with diabetes in Malaysia. Secondly, obesity due to excess sugar consumption increases the risk of chronic illnesses such as diabetes, hypertension and heart disease. Previous studies have demonstrated that excessive sugar consumption leads to poor dietary quality (Yamada *et al.*, 2008; World Health Organization, 2015), obesity (Ludwig *et al.*, 2001), hypertension and dyslipidaemia (Dhingra *et al.*, 2007), dental caries (Rennie & Livingstone, 2007) and diabetes (Ishak *et al.*, 2013). According to Ishak *et al.* (2013), the risks of diabetes complications include heart attack, nephropathy, retinopathy, and neuropathy if prevention action is not taken to counter diabetes.

Several types of diabetic models are currently adopted for antidiabetic properties screening in plants (Ishak *et al.*, 2013). According to Malviya *et al.* (2010), plants capable of reducing blood glucose and improving insulin secretion possess antidiabetic effects. As consumer awareness of healthy living and lifestyle has evolved over the years, a growing demand for plant-based sugar substitutes considered safer to consume is growing. Consequently, *C. latifolia* has emerged as a viable option for those seeking a substitute for traditional sugar. *C. latifolia* is a shrub tree that can substitute sugar and possesses antidiabetic properties attributed to Curculin, which is 9,000 times sweeter than sucrose (Babaei *et al.*, 2012). Studies have also shown that extracts of *C. latifolia* reduce glucose and lipid levels that potentiate therapeutic options for diabetes and its complications (Ishak *et al.*, 2013). Furthermore, the sugar substitute market is expanding rapidly, which is driven by the flourishing food processing industry, increasing incidences of diabetes, and a rising prevalence of obesity among the population (Singh *et al.*, 2020).

The sugar substitute is an alternative to sugar that provides nutritive carbohydrates and energy, such as aspartame. According to Alberta Health Service (2015), sugar substitutes include both artificial and intense sweeteners obtained from natural sources. Intense sweeteners are categorized as tabletop and are present in beverages (such as pop or fruit-flavoured beverages), "diet" products, yogurt, breakfast cereals, canned fruit packed in water, baked goods, desserts, spreads, salad dressings and chewing gums. Sugar alcohols or non-nutritive sweeteners provide minimal or no carbohydrates and energy-reducing sugar

substitutes. In countries like Canada, sugar substitutes are approved by Canada's Food and Drug Regulations for additives under the Food and Drugs Act. Pre-packaged foods must include additives such as sugar substitutes on the list of ingredients (Canada Health, 2008). The approved sugar substitutes for usage in food products are permitted within the limit.

According to Kroger *et al.* (2006), sugar substitutes taste like sugar but are negligible caloric. A sugar substitute, also known as artificial sweetener, is a food additive with the same effect as sugar in taste; however, it usually has less food energy (Tandel, 2011). Thus, it is believed to not contribute to weight gain, do not cause cavities, or influence blood sugar levels. Since sugar substitutes have a higher sweetening capacity than sugar, only a tiny amount is required to sweeten foods and beverages. All, except saccharin, are approved as safe for use, especially among women during pregnancy. There are two types of sugar substitutes: natural and synthetic and artificial (Kakhia, n.d.). Natural sugar substitutes are classified according to their sweetness by weight, food energy, and energy density.

There is a resurgence of interest in exploring natural materials as a source in the wake of the adverse effects of pharmacotherapy over long-term consumption. Studies have reported that some medicinal plants can reduce blood glucose and improve insulin secretion. Secondary metabolites from plants, such as phenolic, alkaloids, and glycosides, are associated with antidiabetic properties (Malviya *et al.*, 2010). Phenolic compounds present abundantly in plants are potent antioxidants, antidiabetics, and anti-obesity sources. Currently, the well-accepted sugar substitute by Malaysian consumers is stevia. The findings by Kamarulzaman *et al.* (2014) revealed that most respondents were willing to use stevia-based products as a substitute for sugar.

Another potential sugar substitute is *C. latifolia,* locally known as Lemba. It is a shrub tree grown in the shade under a rubber tree. It belongs to the Hypoxidaceae family, which houses along with 20 other species, but Curculigo and Hypoxis are the most important genera of the family (Kocyan, 2007). There are four essential species in the genus of Curculigo, namely *C. latifolia, C. capitulations, C. racemes, and C. orchioides. C. latifolia* is an important medicinal plant widely distributed in Malaysia (Farzinebrahimi *et al.*, 2013). Lemba is traditionally employed as a remedy for various ailments. The rhizome is a topical ointment to treat cut wounds (Ahmad & Holdsworth, 1994), whereas the extracts can inhibit the hepatitis B virus (Wiart, 2000). Other uses of Lemba include making and weaving fish nets, rope and ulap doyo woven cloth out of the leaf's fibres (Raden *et al.*, 2017). In Kalimantan, Lemba is cultivated commercially because of its high economic value and diverse purposes. Botanically, the shrub produces a berry-like fruit that tastes sweet with modifying activities attributed to the sweet protein called Curculin (Yamashita *et al.*, 1990). It has been reported that the Curculin proteins are 500 times sweeter than sucrose (Kant, 2005; Masuda & Kitabatake, 2006). This highlights the potential use of Lemba as a low-calorie sweetener for diabetic and obese patients (Ismail *et al.*, 2010). Therefore, it is evident that *C. latifolia* is a suitable source for sugar substitutes.

Furthermore, honey is widely recognized as the primary alternative sweetener to sugar. Gyau *et al.* (2014) indicate that honey's price, colour, and packaging strongly influence consumer preference with favourable ratings of 51.9%, 36.4%, and 40.7%, respectively. Quantity, taste, and the origin of the honey have a moderate influence on the choice, whereas the production process does not influence consumer preferences. The findings partly support earlier research by Árváné *et al.* (2011), who observed price and packaging as the selection criteria for consumers in choosing honey in Hungary. Meanwhile, Pambo (2013) revealed that urban consumers were highly aware of fortified sugar and associated the factors influencing the consumers' awareness with age, purchases from supermarkets, newspaper reads, urban living, and household members with a child below the age of five years. These valuable insights are the foundation for creating sugar fortification programs in Kenya to meet consumers' preferences and needs.

There is a substantial rise in awareness among consumers on the association of nutritional quality in food products with health (Gao *et al.*, 2017). The association also acts as one of the factors influencing consumer's awareness towards sugar substitutes. In Europe, the dramatic increase in the prevalence of obesity and overweight since the 1980s has driven the food industry a shift in focus by reducing caloric content in sugar-free food production. However, low-calorie foods are often characterized by poor organoleptic qualities; thus, encouraging low-calorie foods will be challenging. Sucrose is the principal ingredient in the bakery that provides sweetness and other attributes during baking (control moisture retention, influence air incorporation, stabilize air bubbles, limit starch swelling) that create fine texture, leading to the irresistible palate of many delicacies. The consumption of sucrose as a sweetener has been associated with several nutritional and medical problems, with dental caries being the most widely described (Grenby, 1991). Therefore, there has been a great demand for new highly sweet, non-calorie and non-cariogenic sucrose substitutes for the diabetic and dietetic market. However, consumers still buy based on taste and price, which are more important than health or ingredient considerations when purchasing in the shop (Simplifying Sweetness, 2015). Kamarulzaman *et al.* (2014) reveal a significant relationship between the level of education and consumer's willingness to change for Stevia-based products. Liu *et al.* (2022) discovered a positive correlation between income levels and household consumption of sugar-free beverages in China. Meanwhile, Hasim *et al.* (2020) found that trust, perceived benefit, motivation and knowledge are the adoption factors for P3 Sweetener, a nanofood among the respondents.

3. Methodology

Primary data were collected using a structured questionnaire via face-to-face survey with 350 respondents who were selected through convenient sampling in Klang Valley, Malaysia. Data were analysed using SPSS Statistics v26, specifically descriptive, chi-square, and factor analysis. The descriptive analysis was used to describe the characteristics of variables in terms of frequency distribution, mean and percentage. Chi-square analysis

determined the association between consumers' awareness of *C. latifolia* as a sugar substitute and socio-demographic characteristics. Factor analysis was used to reduce the number of variables to a convenient level and group the variables as items into independent dimensions represented by the factors.

4. Results and Discussion

In this section, the results will be presented and discussed based on the method used for analysis, including descriptive analysis, chi-square analysis and factor analysis.

4.1. Descriptive Analysis

A total of 350 respondents participated in this study, and most were in the age range between 20 and 29 years old, accounting for 34% (119) of the total respondents. In terms of gender, 47.4% (166) of the respondents were male, whereas 52.6% (184) of the respondents were female. Malay dominated the racial composition, accounting for 51.7% (181), followed by Chinese respondents at 24.3% (85), Indian 20.3% (71), and others made up the remaining 3.7% (13). Regarding marital status, 55.7% of respondents were single, whereas 44.3% were married. The number of households of 3 to 4 people accounted for 37.1% (130), whereas 5 to 6 people accounted for 26.3% (92). Most respondents (31.1%) earned between RM 2001 and RM3000, and only 6.6% earned between RM4001 and RM5000 per month. Regarding education level, 33.4% (117) of the respondents attended secondary school, whereas 30.6% had attained a degree as their education level.

Respondents were asked to understand better their awareness of *C. latifolia* as a sugar substitute. Based on the findings in Table 1, the vast majority of the respondents answered, "never heard", which was 80.9% (283). The response followed this "heard but not sure", which was 9.4% (33), and 8% (28) answered "heard but knows a little". Only 1.7% (6) answered "know very well". This indicates a lack of awareness among consumers of the sweet herb *C. latifolia* in the market.

Table 1. Respondent's Awareness of *C. latifolia*

Awareness of *C. latifolia*	Frequency (n)	Percentage (%)
Never heard	283	80.9
Heard, but not sure	33	9.4
Heard but know a little	28	8.0
Know very well	6	1.7
Total	**350**	**100**

Respondents were also asked about the sources of information for those who acknowledged *C. latifolia*. Table 2 showed that television (23.88%), social media (19.4%) and relatives and family (19.4%) were the primary sources of information they obtained on *C. latifolia* as a sugar substitute.

Table 2. Sources of Information for *C. latifolia* as Sugar Substitute

Sources of information	Frequency (n)	Percentages (%)
Television	16	23.88
Magazine	4	5.97
Agri-Based products exhibition	5	7.46
Social media e.g. Facebook, Instagram. etc	13	19.4
Friends	7	10.45
Relatives and family	13	19.4
Newspaper	6	8.96
Others	3	4.48
Total	**67**	**100**

In response to the consumption of *C. latifolia* as a sugar substitute, a vast majority (95.1%) of the respondents expressed they had neither consumed nor purchased it, compared to only 4.9% expressed that they had consumed it before, as shown in Table 3.

Table 3. Consumption of *C. latifolia* as Sugar Substitute

Consumption of *C. latifolia*	Frequency (n)	Percentages (%)
Yes	17	4.9
No	333	95.1
Total	**350**	**100**

Table 4 shows that almost half of the respondents (41.2%) who have consumed *C. latifolia* enlisted the benefit as low calorie-sweetener, followed by natural sweetener (29.4%), and prevent diabetes (23.5%). There were only 5.9% who enlisted the benefit of *C. latifolia* to prevent obesity.

Table 4. Benefits of *C. latifolia*

Benefits of *C. latifolia*	Frequency (n)	Percentages (%)
Low calorie-sweetener	7	41.2
Prevent diabetes	4	23.5
Natural sweetener	5	29.4
Prevent obesity	1	5.9
Total	**17**	**100**

Table 5 shows convenient shop and agri-based product exhibitions such as Malaysia Agriculture, Horticulture and Agrotourism Show (MAHA) as the primary location of purchase, each accounting for 29.41%, followed by others locations (17.65%) and wet market (11.77%). Convenient shops and retail outlets each accounted for 5.88%.

Table 5. Location to Purchase *C. latifolia*

Location to Purchase	Frequency (n)	Percentages (%)
Convenient shop	1	5.88
Website or online shop	5	29.41
Retail outlets	1	5.88

Location to Purchase	Frequency (n)	Percentages (%)
Agri-based product exhibition, e.g. (MAHA)	5	29.41
Wet market	2	11.77
Others	3	17.65
Total	**17**	**100**

Table 6 shows that most respondents (72.4%) have enlisted "do not know about" as their main reason for not consuming *C. latifolia*. While 16.2% have enlisted because they "do not know where to get it", followed by 6.9% have enlisted because it is "difficult to get in the market", only 0.9% have enlisted because the price of being "expensive" and 3.6% have enlisted "do not like it" as their reasons.

Table 6. Reasons for not consuming *C. latifolia*

Reasons	Frequency (n)	Percentages (%)
Expensive	3	0.9
Do not know where to get it	54	16.2
Do not like it	12	3.6
Difficult to get in the market	23	6.9
Do not know about it	241	72.4
Total	**333**	**100**

Finally, a vast majority of the respondents (74.5%) have expressed their intention to consume or purchase *C. latifolia* in the future, indicating their willingness if it is readily available in the market, whereas 25.5% have expressed otherwise (Table 7).

Table 7. Intention to consume or purchase *C. latifolia* in the future

Intention to consume or purchase	Frequency (n)	Percentages (%)
Yes	248	74.5
No	85	25.5
Total	**333**	**100**

4.2. Chi-Square Analysis

Chi-Square analysis, as shown in Table 8, reveals that most socio-demographic profiles such as age, race, marital status, household and income have no significant relationships with consumers' awareness towards *C. latifolia* as a sugar substitute. However, gender differs significantly at a 99% confidence level, indicating its association with consumers' awareness towards *C. latifolia* as a sugar substitute. Gowdar *et al.* (2021) also reported a significant difference between gender and awareness of sugar substitutes, while age, education, and healthcare background did not reveal any statistical significance among consumers in the Riyadh region.

Table 8. The Summary of Chi-Square Analysis

Variables	X^2	df	P-value	Decision
Gender	13.627	3	0.003*	Reject H_o
Age	15.030	15	0.449	Failed to reject H_o
Race	10.249	9	0.331	Failed to reject H_o
Marital Status	3.222	6	0.781	Failed to reject H_o
Household	8.056	9	0.529	Failed to reject H_o
Income	12.516	15	0.640	Failed to reject H_o
Education level	8.577	18	0.969	Failed to reject H_o

Note:*Significant at 1% level of significance

4.3. Factor Analysis

The Keiser-Meyer-Olkin (KMO) sampling adequacy test and Bartlett's Test of Sphericity was used to measure sampling adequacy and to determine the presence of the correlation among the variables using Varimax rotation to clear up the relationship among factors. As shown in Table 9, the KMO Test result was 0.918, indicating the adequacy of the degree of shared variance among the variables and falling within the acceptable range above 0.5. On the other hand, Bartlett's Sphericity test showed the significance of correlation among variables at a 5% level. Therefore, factor analysis is deemed appropriate and can be pursued.

Table 9. KMO and Bartlett's Test

KMO	0.918
Bartlett's Test of Sphericity:	
Approx. Chi-Square	8869.03
Df	210
Sig.	0.000

Table 10 shows the final result of the factor analysis. Four factors were extracted from the factor solution: promotion, health concern, product and price with the percentage of variance of 29.359%, 18.178%, 17.747% and 17.068%, respectively. The total cumulative percentage of variance accounted for 82.352%.

Table 10. Summary Results of Factor Analysis

Item	Factor Loadings			
	F1	**F2**	**F3**	**F4**
Promotion				
I get information about *C. latifolia* products from MAHA Exhibition	0.853			
I knew about *C. latifolia* products from the billboard at highway	0.830			
There are promotions about *C. latifolia* products in the internet, television, radio, newspaper	0.819			
Health Concern				
I know that *C. latifolia* can reduced the glucose level in blood and increase the Insulin and Adiponectin levels		0.914		

Item	Factor Loadings			
	F1	F2	F3	F4
I aware that *C. latifolia* product can be used as a low-calories sweetener for diabetic and obese people		0.913		
I know that *C. latifolia* is suitable to use as a replacement for sugar because it 500 times sweeter than sucrose		0.892		
I use alternative sweetener like *C. latifolia* because I aware about the danger of sugar		0.879		
Product				
The colour and packaging of the *C. latifolia* products is attracting me to buy			0.774	
I know there are other products that are suitable to replace the sugar like *C. latifolia*			0.762	
I like the sweet taste from the *C. latifolia* products			0.736	
You were acknowledged about stevia sweetener is alike with *C. latifolia*			0.730	
I know there are many forms of *C. latifolia* like in liquid and powder form			0.727	
Price				
C. latifolia products are more expensive because of their benefits towards health				0.852
Price for *C. latifolia* products is reflecting the high value quality				0.848
The price of *C. latifolia* products are expensive than sucrose sugar				0.810
Substitute products for sugar like honey are expensive than *C. latifolia* products				0.790
Eigenvalues	**6.165**	**3.817**	**1.727**	**1.584**
Variance (%)	**29.359**	**18.178**	**17.747**	**17.068**
Cumulative Variance (%)	**29.359**	**47.536**	**65.283**	**82.352**
Cronbach's Alpha	**0.937**	**0.966**	**0.923**	**0.950**

Promotion was recognized as the first factor consisting of three items. The first sub-variables recorded the highest factor loading with 0.853, the second sub-variables with 0.830, and lastly 0.819. This factor had a total variance of 29.359% with Eigenvalues of 6.165, indicating that most consumers presumed promotion as the main factor related to their awareness towards *C. latifolia* as a sugar substitute. This finding is consistent with Kamarulzaman *et al.* (2014), where promotion was also found to influence stevia's acceptance as a sugar substitute among Malaysian consumers. The second factor related to consumers' awareness towards *C. latifolia* as a sugar substitute is known as a health concern. This factor consisted of four items with factor loadings of 0.914, 0.913, 0.892 and 0.879, respectively. The factor of health concern showed that it encouraged consumers to be aware of *C. latifolia* as a sugar substitute because consumers are concerned with their health. This finding is consistent with Mu'izzuddin *et al.* (2020) where consumers were willing to continue using stevia due to its health benefits. Most respondents wanted to recommend it for diabetic patients.

The third factor is named as a product consisting of five sub-variables with a variance percentage of 18.178%. The last factor that may encourage consumers' awareness towards *C. latifolia* as a sugar substitute is price, which consists of 4 sub-variables. The factor

loadings ranged between 0.790 to 0.852. This study's finding is congruent with Kamarulzaman *et al.* (2014), where health benefits, promotion, and price were the most influential factors in determining the acceptance of stevia as a sugar substitute among Malaysian consumers.

The internal consistency of measurement items and Cronbach's Alpha values were calculated, and the internal reliability of each factor was tested. The final alpha scores ranged between 0.923 to 0.966. The alpha scores for each factor exceeded 0.5. Thus, it meets Nunnaly (1978) guideline of explanatory research of alpha value between 0.5 and 0.6.

5. Conclusions

Findings from the study indicate that most respondents (80.9%) have never heard about *C. latifolia* as a sugar substitute. This shows that information about this kind of herb that can assist in better health for the consumers needs to be taken seriously by the related stakeholders, which can reach a greater audience. Furthermore, only gender was found to have a significant association with the respondent's awareness towards *C. latifolia* as a sugar substitute; a campaign that will be held must be able to cover other socio-demographic profiles such as education level and race. Further investigation using factor analysis has discovered four factors related to consumers' awareness of *C. latifolia* as a sugar substitute: promotion, health concern, product, and price. Therefore, it is recommended that the stakeholders should take this opportunity to promote the benefits and nutritional value of *C. latifolia* as a sugar substitute. The Ministry of Health should mainly organise more campaigns on the harmful effects of excessive sugar intake and endorse *C. latifolia* as an alternative to sugar, as it is also a natural sugar substitute besides stevia. Multi-media campaigns such as Nutrition Facts Education should be enlisted to raise consumer awareness. Other media platforms, such as social and mass media, could effectively disseminate information on *C. latifolia* as a sugar substitute to a wider audience.

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