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A Study of Organic Sweeteners in The Creation of Cocktails That Are Suitable for Health-Conscious Individuals

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Abstract: The purpose of this study is to determine whether using organic sweeteners can help create cocktails that are suitable for health-conscious people There's a rising desire for beverage options that are safe for people controlling blood sugar levels and pleasant, as the prevalence of diabetes climbs globally. In this situation, traditional sweeteners—which frequently have a high glycaemic index present a problem. This study assesses a variety of organic sweeteners, including erythritol, xylitol, monk fruit, and stevia, for their usefulness in beverage formulations, flavor profile, and glycaemic impact. The goal of the study is to create a cocktail menu that strike a balance between flavor, health advantages, and visual appeal using innovative mixology and analysis. The results offer insightful information for beverage firms, bartenders, and health-conscious consumers.

Keywords: cocktails, organic sweeteners, low-glycaemic index, mocktails, mixology

1. Introduction

Several organic sweeteners are suitable for use in the food industry and can be beneficial for individuals with diabetes due to their lower impact on blood sugar levels. Some organic sweeteners that are commonly used and considered suitable for diabetics include:

1. Stevia: Derived from the leaves of the Stevia rebaudiana plant, stevia is a zero-calorie sweetener that doesn't raise blood sugar levels. It is much sweeter than sugar, so only a small amount is needed. (Samuel et al., 2018)
2. Monk Fruit: Monk fruit extract, derived from the monk fruit, is another zero-calorie sweetener that doesn't impact blood sugar levels. It is also significantly sweeter than sugar. (Yeung, 2023)
3. Erythritol: Erythritol is a sugar alcohol that occurs naturally in certain fruits. It has a very low glycaemic index and provides sweetness without affecting blood sugar levels. It's commonly used as a sugar substitute in various food products. (Regnat et al., 2018)
4. Xylitol: Another sugar alcohol, xylitol, is found in small amounts in various fruits and vegetables. It has a minimal impact on blood sugar levels and can be used as a sweetener in many foods. (Pediatric Dentistry-28:2 2006, n.d.)
5. Yacon Syrup: Yacon syrup, derived from the yacon plant, contains fructooligosaccharides (FOS), which are prebiotic fibers that don't significantly raise blood sugar levels. It has a sweet taste and can be used as a sugar substitute. (Genta et al., 2009)

When using these sweeteners in food products, it's important to consider their sweetness intensity compared to sugar and to adjust the quantities accordingly. Additionally, while these sweeteners may have benefits for individuals with diabetes, moderation is key, as excessive consumption can still lead to digestive discomfort in some people. (Castro-Muñoz et al., 2022)

2. Literature review

1. Stevia:

Derived from the leaves of the Stevia rebaudiana plant, native to South America. Stevia is incredibly sweet, around 200-400 times sweeter than sugar, so only a small amount is needed to achieve the desired level of sweetness. Stevia has a glycemic index of zero, meaning it does not raise blood sugar levels. Available in liquid, powder, and granulated forms. Some products combine stevia with other ingredients to reduce its intensity. (Samuel et al., 2018)

2. Monk Fruit:

Monk fruit, also known as luo han guo, is a small green gourd native to Southeast Asia. Monk fruit extract is extremely sweet, about 100-250 times sweeter than sugar. It has a glycaemic index of zero and does not affect blood sugar levels. Available as a liquid extract or powdered form. Sometimes blended with other sweeteners to moderate its sweetness. (Yeung, 2023)

3. Erythritol:

Erythritol is a sugar alcohol found naturally in some fruits and fermented foods. It is around 60-80% as sweet as sugar.

Erythritol has a negligible effect on blood sugar and insulin levels, making it suitable for diabetics. Available in granulated and powdered forms, often used alone or in blends with other sweeteners. (Regnat et al., 2018)

4. Xylitol:

Xylitol is a sugar alcohol found in small amounts in various fruits and vegetables. It has the same sweetness as sugar. Xylitol has a low glycaemic index and does not significantly raise blood sugar levels. Available in granulated form and used similarly to sugar in various applications. (Wölnerhanssen et al., 2020)

5. Yacon Syrup:

Yacon syrup is derived from the roots of the yacon plant, native to South America. It has a sweet taste, similar to molasses or caramel. Yacon syrup contains fructooligosaccharides (FOS), which are prebiotic fibres that don't significantly affect blood sugar levels. Typically, available as a syrup and used as a natural sweetener or sugar substitute. (Neacşu & Madar, 2014; Saraiva et al., 2020)

These sweeteners are generally considered safe for individuals with diabetes when used in moderation.

Nutritional breakdown

1. Stevia:

Stevia is primarily known for its sweet taste and contains very few calories. It typically contains trace amounts of certain nutrients like vitamins A, B, and C, as well as minerals such as calcium, iron, magnesium, potassium, and zinc.

Caloric Content: Pure stevia extract has negligible calories and carbohydrates.

2. Monk Fruit:

Monk fruit sweeteners, similar to stevia, are mainly used for their intense sweetness with minimal caloric content. They do not contain significant nutrients.

3. Erythritol:

Erythritol is a sugar alcohol and has a very low-calorie count. It contains almost no nutrients and is primarily used as a sweetening agent.

Caloric Content: Erythritol provides about 0.24 calories per gram, significantly lower than sugar which provides 4 calories per gram.

4. Xylitol:

Xylitol, like erythritol, is a sugar alcohol with very few calories and negligible nutrients.

Caloric Content: Xylitol provides approximately 2.4 calories per gram.

5. Yacon Syrup:

Yacon syrup contains fructooligosaccharides (FOS), a type of soluble fiber that acts as a prebiotic. It might provide a small amount of potassium and antioxidants, but its nutrient content is generally low.

Caloric Content: Yacon syrup contains about 1.3-1.8 calories per gram, primarily from the FOS it contains. (Priya et al., 2011; Swiader et al., 2019)(Adriano et al., 2020)

Availability in market

1. Stevia: Typically sold as a powdered or liquid sweetener. The leaves of the Stevia rebaudiana plant are green and somewhat resemble mint leaves. Stevia powder is often white and looks similar to powdered sugar.
2. Monk Fruit: Monk fruit sweeteners are commonly available in liquid or powdered form. The fruit itself is small, round, and brown when fresh, but the extract or powder derived from it is usually white and granular, resembling regular sugar.
3. Erythritol: Erythritol looks similar to granulated sugar, with small, clear crystals. It is often available as a granulated or powdered sweetener and can be white or off-white in colour.
4. Xylitol: Similar in appearance to regular sugar, xylitol is available in granulated form. It has a crystalline structure and looks like sugar but may be slightly larger in granule size.
5. Yacon Syrup: Yacon syrup is a dark, viscous liquid resembling molasses or maple syrup in appearance. It can vary in color from light amber to dark brown and is commonly sold in bottles or containers.(Chattopadhyay et al., 2014; Esmat Abou-Arab et al., 2010)

Rates in Indian Market

1. Stevia: Stevia was available in various forms such as powder, liquid drops, and tablets. Prices could range from approximately ₹150 to ₹500 or more for a pack depending on the quantity and brand.
2. Monk Fruit: Monk fruit extract or blends were less commonly found compared to other sweeteners in India at the time. Prices might have varied widely, but they could be in a similar range to stevia or slightly higher.
3. Erythritol: Erythritol was available in granulated or powdered form. Prices might have ranged from ₹200 to ₹600 or more for a pack, again depending on the quantity and brand.
4. Xylitol: Xylitol prices might have been similar to erythritol or slightly higher. Prices could vary from ₹200 to ₹600 or more based on quantity and brand.
5. Yacon Syrup: Yacon syrup might have been less common and could have been priced higher compared to other sweeteners. Prices might have ranged from ₹300 to ₹1000 or more, depending on the brand and quantity. https://dir.indiamart.com/impcat/natural-sweetener.html

Uses in making of cocktails and mocktails.

They are versatile and can offer sweetness without the added calories or impact on blood sugar levels.

Here's how you can use them in beverages:

1. Stevia, Monk Fruit, Erythritol, and Xylitol: These sweeteners are available in powdered or liquid forms and can be used as a replacement for sugar in cocktails and mocktails. They are highly concentrated, so it's essential to use them sparingly and adjust the quantity to taste.

- Powdered Form: You can dissolve these sweeteners in warm water to create a syrup, making it easier to mix into cold beverages. Dissolve the sweetener in a small amount of warm water, then cool the syrup before using it in drinks.

- Liquid Form: Liquid stevia or monk fruit extracts can be added directly to beverages, adjusting the amount to achieve the desired level of sweetness.

2. Yacon Syrup: Yacon syrup, with its molasses-like consistency and sweet taste, can be used as a natural sweetener in cocktails and mocktails.

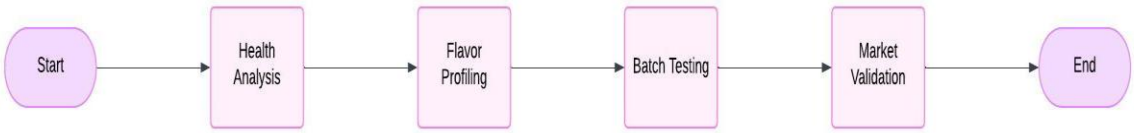
When using these sweeteners in cocktails or mocktails, consider the following:

- Start with a small amount and adjust to taste. These sweeteners are significantly sweeter than sugar, so a little goes a long way.
- Experiment with different quantities to find the right balance of sweetness for your drink.
- Some of these sweeteners, like erythritol and xylitol, might not dissolve as easily in cold liquids, so creating a syrup beforehand can help in mixing them thoroughly.

Using these organic sweeteners in cocktails and mocktails can provide a healthier alternative to traditional sugar, especially for those looking to reduce their sugar intake or manage blood sugar levels. Adjusting the quantities based on personal taste preferences is key to achieving the desired sweetness in your beverages.

3. Methodology

This study uses the Balanced Cocktail Development Model (BCDM) as a structured framework to help bartenders and hospitality professionals create drinks that satisfy the dietary requirements of people with diabetes or prediabetes in response to the difficulties in creating diabetic-friendly cocktails. The technique offers a methodical way to guarantee that health-conscious cocktails are both palatable and commercially viable. "The BCDM bridges the gap between nutritional considerations and operational feasibility in bar operations by focusing on key phases: Health Analysis, Flavor Profiling, Batch Testing, and Market Validation."



Health Analysis, Flavor Profiling, Batch Testing, and Market Validation are the four interrelated stages of the Balanced Cocktail Development Model (BCDM). Every stage offers a methodical way to create diabetic-friendly drinks that strike a balance between operational viability, sensory appeal, and health consciousness. Health analysis - All ingredients, including syrups, fruit juices, garnishes, and mixers, alcoholic beverages, non-alcoholic beverages, herbs, spices, garnishes are assessed by bartenders for their glycaemic index. low-glycaemic sweeteners, such as honey, agave nectar, or stevia, used to reduce blood sugar spikes. For example- simple syrup was replaced with honey syrup diluted with water to maintain sweetness while reducing the glycaemic load.

Alcohol Moderation- The model suggests lowering the amount of alcohol in cocktails because alcohol can raise blood sugar levels.

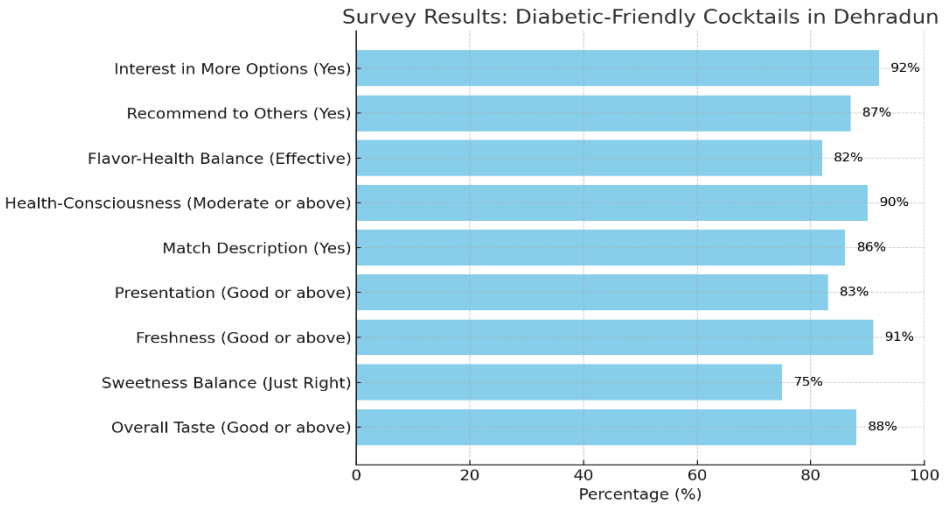
2. Flavor Profiling- Natural and organic sweeteners, such as honey or maple syrup uses which changed the flavor of the beverage. To preserve a consistent flavor, bartenders adjusted other elements like acidity (citrus), bitterness (bitters), and aromatics (herbs). Mangoes, berries, and oranges are examples of naturally sweet fruits were used to enhance flavor and appearance. The natural sweetness of drinks was enhanced by substituting artificial sweeteners with freshly squeezed juices and fruit purees.

3. Batch Testing- Small quantities of each cocktail were made by bartenders to assess how well tastes and sugars blend together. Based on preliminary findings, adjustments were performed with an emphasis on overall mouthfeel, balance, and sweetness levels. Recipes were tailored to the needs of people with diabetes or prediabetes by including them in taste tests. Customer feedback from people without diabetes guaranteed that a wider market will find the drink appealing.
4. Market Validation- To measure consumer enthusiasm, a limited-edition menu with diabetic-friendly beverages was introduced in a famous BAR of Dehradun, Uttarakhand with a heading "**Shaken & Stirred ...but naturally"** a limited-edition menu.
Five well-known classic drinks that were popular in the BARS were reimagined using low-glycaemic-index alternative components and marketed under the Innovative drinks category.

ame of the cocktail	Ingredients	Quantity	Glychemic Index/100ml	Substitute	Quantity	Glychemic index/100ml
anters Punch	Jamaican rum	45ml	0	NA		
	Lime Juice	15ml	32	NA		
	Cane sugar	30ml	68	Xylitol	30ml	7
lovers Club	Gin	45ml	0			
	Raspberry syrup	15ml	68	Fresh Raspberry juice	20ml	26
	Fresh Lemon Juice	15ml	20	NA		
	Egg White	Few drops	0	NA		
				Xylitol	10ml	7
aiquiri	White Rum	60ml	0	NA		
	Fresh Lime juice	20ml	32	NA		
	Fine Sugar	2 bar spoon	68	Erythritol	2 bar spoon	0
ojito	White Rum	45ml	0	NA		
	Fresh Lime Juice	20ml	32	NA		
	Mint Leaves	6 no.	3	NA		
	Cane sugar	2Tsp	68	Stevia	2Tsp	0
ong Island Tea	Vodka	15ml	0	NA		
	Tequila	15ml	0	NA		
	Rum	15ml	0	NA		
	Gin	15ml	0	NA		
	Cointreau	15ml	0	NA		
	Lemon Juice	25ml	20	NA		
	Simple Syrup	30ml	68	Erythritol	30ml	0
	Cola	To top	63	Diet Coke	To top	0

Sources for glycaemic-index: https://glycemic-index.net/alcoholic-beverage-distilled-rum-80-proof/

A QR code survey form was distributed among 120 participants who tried the limited-edition menu.



According to the survey, Dehradun residents are very satisfied and accept diabetic-friendly cocktails. Important points to note are:

- Excellent ratings for freshness and flavour.
- favourable response to ingredients that are health conscious.
- considerable desire to broaden the selection of these products.

These findings point to a bright future for health-conscious and diabetic-friendly beverages in the hospitality industry. Additionally, the feedback offers practical suggestions for improving customer happiness and recipe refinement.

4. Discussion

There might not be much of a market for diabetic-friendly cocktails, which makes it difficult to justify the time and money spent looking for and trying out different ingredients.
Bartenders must select sweeteners with a low glycaemic index since people with prediabetes need to keep an eye on their blood sugar levels. It is essential to comprehend the glycaemic influence of various substances, such as syrups, juices, and garnishes.
Ingredient Knowledge: As mixers, fruit juices, and liqueurs are frequently used as base ingredients in cocktails, bartenders need to be knowledgeable about how much sugar is in each of these beverages.
Since alcohol itself can raise blood sugar levels, it could be essential to make cocktails with less alcohol or provide mocktail substitutes. Bartenders must strike a balance between the amount of alcohol in a drink and its satisfaction.
Bartenders may need to point people with prediabetes towards safer options because they may not be aware of how alcohol affects their condition.
Every customer with prediabetes will have different nutritional requirements and preferences. Bartenders may have to make beverages to order, which calls for adaptability and inventiveness.
Ingredient Availability: A bar's capacity to customise its offerings may be limited if certain organic sweeteners or speciality ingredients are not easily accessible. (Saraiva et al., 2020)

1. Syrup substitute:
Honey Syrup: In most recipes, honey can be substituted for simple syrup by diluting honey with water. Honey has a distinct flavour and antimicrobial qualities that go well with whisky or herbal spices.
Maple Syrup: Although it contains more sugar than ordinary sugar, maple syrup has a rich flavour and a lower glycaemic effect. Small amounts of it can be used to make concoctions like spiced mocktails or espresso martinis.

2. Harmonise the Taste
Sometimes using organic sweeteners will change a drink's flavour character. To balance the sweetness, adjust other ingredients such as citrus, bitters, or herbs.
If you want a more balanced flavor without sacrificing the health advantages, try combining other sweeteners, like agave nectar with stevia.

3. Add Fruits and Natural Juices in There
To sweeten beverages, use naturally sweet fruits like mangoes, oranges, and berries. In place of additional sweets, freshly squeezed juices or purees can bring out the inherent sweetness of a cocktail or mocktail. Fruit slices or purees can also be added to beverages to enhance sweetness and flavour intensity without the need for extra sweeteners.

4. Making Infusions and Syrups

Make syrups flavoured with real ingredients like ginger, cinnamon, or vanilla to get sweetness and depth without adding a lot of sweets. Herbal infusions using rosemary, mint, or basil can also give beverages an inherent sweetness and scent.

5. Evaluating and Modifying Recipes

Make sure the sweetener blends well with the other ingredients by testing each batch. The number of organic sweeteners used may need to be adjusted because they differ in terms of sweetness intensity. Taste-test a variety of people, including those who have diabetes, to fine-tune the sweetness and general harmony of flavours. (Gandhi et al., 2018; O'Donnell & Kearsley, 2012) Limitation- Stevia: Discomfort in the digestive tract; further study is needed to address any possible reproductive issues.

Monk Fruit: Overuse may cause intestinal problems.

Large-scale bloating or diarrhoea caused by erythritol is less severe than that caused by other sugar alcohols.

Xylitol: upsets digestive systems if overconsumed.

Yacon syrup's prebiotic component may cause gas or diarrhoea if drunk in excess. (Grembecka, 2015)

6. Conclusion

In the hospitality sector, creating a bar menu that is diabetic-friendly offers both opportunities and obstacles for creativity. Although the market for these products may be specialized, meeting the dietary requirements of clients who have diabetes or prediabetes calls for a delicate balancing act between inventiveness, ingredient expertise, and flexibility. To accommodate individual demands, bartenders must take into account low-glycaemic sweeteners, moderation in alcohol content, and customized beverage preparation. The availability of natural substitutes such fresh fruit juices, honey syrup, and maple syrup provides a variety of choices for making tasty but health-conscious beverages. The taste and health profile of beverages can also be improved by utilizing infusions and custom syrups made with herbs, spices, and natural sweeteners. Iterative testing is essential for assessing recipes while accounting for the distinct sweetness profiles of organic alternatives. For maximum enjoyment and safety, the menu can be improved with input from customers, particularly those with particular dietary requirements. Bartenders may broaden their menus and establish a new standard for inclusivity in the bar business by balancing flavors, making ingredients easily accessible, and staying dedicated to health-conscious innovation. This strategy not only satisfies the demands of an expanding clientele but also perfectly captures the development of modern hospitality techniques.

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