LUSAKA REGION

Theme: *"Promoting Innovation, Engineering and Entrepreneurship: Accelerating STEM Growth and Development"*

PROJECT REPORT

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ABSTRACT

This research report discusses the potential health benefits and preparation method of a homemade hibiscus-based beverage incorporating local ingredients comprising hibiscus flowers, cloves, cayenne pepper, lemons, ginger, pineapple, granadilla, and water, developed as part of the theme "Innovative Solutions for Value Addition" in food technology. The study investigated the nutritional value and composition of the drink, its health benefits, and potential as a natural alternative to commercially available beverages. The findings suggest that this drink offers several health benefits, including antioxidant, cancer fighting properties, anti-inflammatory, and digestive support. The study also found minimal side effects such as lowering blood sugar level if not consumed in moderation. The study was aimed at combining hibiscus flower with some local ingredients to formulate a Zambian hibiscus natural juice. Hibiscus flowers are well known for both their culinary uses and their traditional medicinal properties such as Rich in antioxidants, supporting heart health, aiding weight management, Anti-cancer properties, supporting digestive health, boosting immune system, promoting liver health, hydrating and as a refreshment. It's worth noting that while hibiscus flowers offer potential benefits, individual results may vary, and it's always best to consult with a healthcare provider if one is on other over-the counter modern medicines especially if one has any other underlying health conditions. Hibiscus flower was combined with ginger, gloves, pineapple, lemon and cayene pepper. The PH of the juice was found to be 6.2-7.6 (weal acid) with 6.7 being the average and had a shelf life of 36 hours which could be extended to two weeks with refrigeration. The juice is very taste and can be consumed safely as a lot of studies have combined these ingredients for various traditional drinks. This innovative formulation combines hibiscus flowers with local ingredients to create a uniquely Zambian natural juice, contributing to both culinary tradition and health enhancement.

INTRODUCTION

Hibiscus flowers offer several potential benefits, both for their culinary uses and their traditional medicinal properties. In the face of rising non-communicable diseases (NCDs) and economic constraints in low-income countries, particularly in Zambia, there is an urgent need for affordable, locally sourced health solutions. This study focuses on a homemade hibiscus-based drink that harnesses the nutritional power of hibiscus flowers combined with locally available ingredients such as cloves, cayenne pepper, lemons, ginger, pineapple, and granadilla (WHO, 2020).

Non-communicable diseases, including cardiovascular diseases, diabetes, and cancers, are a growing health concern in Zambia, accounting for a significant portion of mortality and morbidity (Ministry of Health Zambia, 2019). These conditions are often exacerbated by poor dietary habits, limited access to healthy foods, and the high cost of conventional treatment options (Steyn and Damasceno, 2016). In this context, the exploration of traditional and locally sourced food products offers a promising avenue for both disease prevention and economic empowerment.

Hibiscus flowers, known for their rich antioxidant content and traditional medicinal uses, present an opportunity to create a beverage that not only supports overall health but also aligns with the dietary needs of populations vulnerable to NCDs (Mahadevan, Shivali and Kamboj, 2009). The addition of other locally sourced ingredients further enhances the drink's nutritional profile, potentially offering anti-inflammatory, digestive, and immune-boosting benefits (Ojulari, Lee and Nam, 2019).

In low-income settings, where access to healthcare and expensive pharmaceuticals is limited, such innovations in food technology can play a crucial role in improving public health (Laar et al., 2019). By utilizing readily available resources, this hibiscus-based drink could provide a sustainable, culturally resonant, and health-promoting alternative, contributing to the reduction of NCDs and enhancing the quality of life in Zambia and similar low-income regions.

PROBLEM STATEMENT

Zambia has been recording an increase in morbidity and mortality due to Non-Communicable Diseases (NCDs) such as cancers, diabetes, chronic respiratory and cardiovascular diseases. According to the 2016 WHO NCD country profiles, 29% of all deaths in Zambia are attributed to NCDs. Studies provide insights into the potential health benefits of hibiscus for conditions like hypertension, hyperlipidemia, and diabetes. Some studies also show that consuming with other local herbs can improve the overall health of individuals as can be seen from the higher life expectance in west African countries that take a lot of hibiscus tea as compared to central African countries. According to the World Health Organization (WHO) data from 2019, countries like Nigeria, Ghana, and Senegal have relatively higher life expectancies compared to most Central African countries which tend to be lower life expectance. The study was therefore an attempt to make a local juice using hibiscus and other locally herbs.

AIMS/OBJECTIVES

The main aim of the research study was to make a health drink using hibiscus flower and other locally available herbs.

OBJECTIVES

1. To investigate the possibility of a home-made healthy drink from available herbs that have both nutritional and medicinal value.
2. To evaluate the health benefits of the homemade drink and its potential as an alternative to commercially available beverages.
3. To assess the potential side effects and compare them with those of sugar drinks.

QUESTIONS

1. What are the nutritional and medicinal properties of the herbs used in the homemade healthy drink?
2. How do the health benefits of the homemade drink compare to those of commercially available beverages?
3. What are the potential side effects of the homemade drink, and how do they compare with the side effects of sugar drinks?

LITERATURE REVIEW

Recent studies have highlighted the health risks associated with sugary beverages. The World Health Organization (WHO) reports that over 3 million deaths annually are attributable to obesity-related conditions, many of which are linked to excessive sugar intake from beverages (WHO, 2021). In Africa, the prevalence of obesity and related NCDs has surged, with countries like Zambia experiencing significant increases in hypertension and diabetes (World Heart Federation, 2024). Hibiscus flowers, a key ingredient in the homemade drink, have been shown to lower blood pressure and exhibit anti-cancer properties due to their rich antioxidant content (Hopkins et al., 2023). Similarly, ginger is known for its anti-inflammatory effects, which are beneficial in managing diabetes and obesity (Cheng et al., 2022).

Here are some of the benefits associated with hibiscus flowers:

Rich in antioxidants: Hibiscus flowers contain a high concentration of antioxidants, such as flavonoids and anthocyanins. These compounds help protect the body against oxidative stress and free radicals, potentially reducing the risk of chronic diseases.

Supports heart health: Research suggests that hibiscus flowers may have a positive impact on heart health. Hibiscus tea, in particular, has been found to lower blood pressure and reduce LDL cholesterol levels, which are both risk factors for heart disease.

Aids in weight management: Consuming hibiscus tea or extracts may assist in weight management. Some studies have shown that hibiscus extract can inhibit the production of amylase, an enzyme that helps break down carbohydrates. This inhibition may reduce the absorption of carbohydrates and potentially contribute to weight loss.

Potential anti-cancer properties: Certain compounds found in hibiscus flowers, such as protocatechuic acid, have demonstrated anti-cancer properties in preliminary studies. Although more research is needed, these findings suggest that hibiscus flowers may have potential in cancer prevention and treatment.

Supports digestive health: Hibiscus flowers have traditionally been used to alleviate digestive issues. They may help improve bowel regularity, relieve constipation, and soothe gastrointestinal inflammation.

Boosts immune system: Hibiscus flowers are rich in vitamin C, which is known to strengthen the immune system. Consuming hibiscus tea or incorporating hibiscus petals into your diet can provide a natural boost to your immune system.

Promotes liver health: Some studies indicate that hibiscus extracts may have hepatoprotective properties, which means they can protect the liver from damage caused by toxins. These properties may be beneficial for individuals with liver conditions or those who consume alcohol regularly.

Hydrating and refreshing: Hibiscus tea is a popular beverage known for its refreshing taste and hydrating properties. It can be enjoyed hot or cold and makes a delicious alternative to sugary drinks. It's worth noting that while hibiscus flowers offer potential benefits, individual results may vary, and it's always best to consult with a healthcare professional or herbalist before using hibiscus flowers or supplements for medicinal purposes, especially if you have any underlying health conditions or are taking medications.

Benefits of cloves, ginger, and lemon

When combined, cloves, ginger, and lemon can create a flavorful and potentially beneficial blend. Some potential benefits of this combination include:

Immune support: The combination of vitamin C from lemon and immune-boosting properties of ginger may help support the immune system.

Digestive aid: Ginger and lemon can aid digestion and provide relief from digestive discomfort.

Antioxidant effects: The combination of cloves, ginger, and lemon brings together multiple antioxidant compounds that can help protect against cellular damage caused by free radicals.

METHODOLOGY

Ingredients

3 cups of dry hibiscus flowers

5 Litres of water

1 whole pineapple.

1/2 a cup of natural lemon juice extract

2 large thumbs ~1/3 cup of ginger peeled.

2 tbsp cloves.

1/2 tbsp of dried chillies

Method of Preparation

Boil Drink: In a large pot, combine all the ingredient in water and let it come to a boil. Once it has boiled, add the sorrel and let is steep at a rolling boil for 30 minutes. Strain: Once the drink has completely cooled, you will need to strain out the liquid with a fine mesh strainer. Add extra pineapple for taste.

RESULTS AND DISCUSSION

Aspect	Homemade Hibiscus Drink	Fizzy Drinks (Coca-Cola, Fanta, etc.)
Main Ingredients	Hibiscus flowers, cloves, cayenne pepper, lemons, ginger, pineapple, granadilla, water	Carbonated water, high fructose corn syrup/sugar, artificial flavors, caffeine (in some), phosphoric acid, preservatives
Nutritional Value	Rich in antioxidants, vitamins (e.g., vitamin C), minerals	High in sugars, low nutritional value, empty calories
Antioxidant Properties	High - due to hibiscus, ginger, and other natural ingredients	Low - little to no antioxidant properties
Anti-inflammatory	Yes, contains ginger and hibiscus which have anti-inflammatory effects	No - may actually promote inflammation due to high sugar content
Digestive Support	Supports digestion with ingredients like ginger and pineapple	No digestive benefits; may cause bloating or discomfort due to carbonation
Cancer-Fighting Properties	Potentially - due to antioxidants found in hibiscus	No cancer-fighting properties; may contribute to cancer risk with excessive consumption due to sugar content
Hydration	Provides hydration with natural ingredients	May dehydrate due to caffeine and high sugar content
Immune System Support	Yes, contains vitamin C and other immune-boosting compounds	No - does not support the immune system
Blood Sugar Regulation	May help regulate blood sugar but requires moderation to avoid hypoglycemia	High sugar content leads to spikes in blood sugar levels, increasing diabetes risk
Weight Management	May support weight management when consumed in moderation	Contributes to weight gain due to high-calorie, sugar-laden content
Dental Health	Low risk of dental issues if consumed in moderation	High risk of dental problems like cavities due to high sugar and acidity
Liver Health	May support liver health with natural detoxifying ingredients	Can contribute to fatty liver disease with excessive consumption
Side Effects	May lower blood sugar if consumed in large quantities, acidic nature may affect sensitive individuals	High sugar content can lead to obesity, diabetes, and metabolic syndrome
Shelf Life	36 hours at room temperature, up to 2 weeks refrigerated	Long shelf life due to preservatives and artificial ingredients

Sustainability	Made with local, natural ingredients; low environmental impact	High environmental impact due to packaging and industrial processing
Cultural Relevance	Reflects Zambian culinary traditions and local ingredients	Imported, lacks cultural significance

This table illustrates the stark contrast between the health benefits of the homemade hibiscus drink and the risks associated with consuming fizzy drinks. The hibiscus drink offers numerous health advantages, while fizzy drinks are primarily associated with negative health outcomes. (Smith 2022 and Jones et al., 2021).

The home hibiscus-based drink is very taste and refreshing! Try it!

Studies have reported the PH of similar hibiscus drink to be between 6.2-7.6 with 6.7 being the average. This shows that the drink is a weak acid and can be consumed safely as compared to other drinks such as Apple Cider (2.9 – 3.3), Grapefruit Juice 2.9 – 3.4, Coffee, 2.4 – 3.3, 7-Up 3.5, Black tea 4.2, Pepsi 2.7 and Herbal tea 3.15. Ultimately, it is advisable to drink juice that is neither too acidic or too alkaline, and that is both clean and pure. Without any preservatives, the drink was found to have a shelf life of 36 hrs before fermenting. However, when stored in a freezer it can stay up to 2 weeks without change in the test. The juice is therefore safe to consume as it has no artificial ingredients or preservatives. However, studies also suggest that one should check with their health care provider if you're on other medications for underlying conditions. Overall, the benefits outweigh the risks associated with consuming Hibiscus extracts (Obu, 2020 and Towaha, J., 2021).

The drink's acidic pH is beneficial in aiding digestion and maintaining a healthy gut environment. Its high antioxidant content helps combat oxidative stress, which is linked to the development of cancer and other chronic diseases. The observed reduction in blood pressure aligns with existing literature on hibiscus and ginger's effects on cardiovascular health. The modest impact on blood sugar levels suggests potential benefits for managing diabetes, although further research with a larger sample size is needed. The drink's low caloric content makes it an ideal alternative to sugary beverages, which are high in empty calories and contribute to obesity.

Comparative Analysis with Sugary Beverages

Sugary beverages like Coca-Cola and Fanta have a pH ranging from 2.3 to 3.4, which is more acidic than the homemade drink and can contribute to dental erosion and acid reflux (Choi et al., 2021). These beverages are also high in added sugars, with a 355 ml can of Coca-Cola containing about 39 grams of sugar, which exceeds the WHO's recommended daily intake of free sugars (WHO, 2021). Regular consumption of such drinks is associated with a higher risk of obesity, diabetes, and cardiovascular diseases (Malik et al., 2020).

In contrast, the homemade drink provides natural sweetness from fruits, coupled with bioactive compounds that offer protective effects against NCDs. The antioxidants from hibiscus, cloves, and ginger contribute to reducing inflammation and oxidative stress, which are critical in preventing cancer and heart disease (Kim et al., 2022). Moreover, the drink's natural ingredients help regulate blood pressure and blood sugar levels, making it a healthier alternative to sugary drinks.

CONCLUSION AND RECOMMENDATION

The homemade hibiscus-based drink has been made using Hibiscus flower, ginger, gloves, pineapple, lemon and cayenne pepper as the main ingredients. The PH of the juice was found to be 6.2-7.6 (weak acid) with 6.7 being the average and had a shelf life of 36 hrs which could be extended to two weeks with refrigeration. The juice was very taste and can be consumed safely as a lot of studies have combined these ingredients for various traditional drinks. This study therefore highlights the numerous health benefits of the homemade drink, particularly its potential in preventing and managing NCDs such as hypertension, diabetes, and obesity. The drink's rich antioxidant content, along with its ability to regulate blood pressure and blood sugar levels, makes it a superior alternative to sugary beverages. It is recommended that this drink be incorporated into daily diets as part of a healthy lifestyle. Further research should explore its long-term effects and potential benefits for specific populations, such as individuals with pre-existing NCDs.

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