International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 9 Issue 3, May-Jun 2025 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Formulation and Evaluation of Hibiscus Punch - A Functional Beverage with Antioxidant Properties

M. Divya Sri[1], Dr. A. Swaroopa Rani[2], P. Jaideep Reddy[3]

[1]Student, Department of Food Technology, Oil Technological & Pharmaceutical Research Institute, JNT University, Anantapuramu, Andhra Pradesh, India
[2]Professor, Head & Chairman-Board of Studies, Department of Food Technology, Oil Technological & Pharmaceutical Research Institute, JNT University, Anantapuramu, Andhra Pradesh, India
[3]Managing Director, Uday Food and Beverages, Govindapalle, Anantapuramu, Andhra Pradesh, India

ABSTRACT

The present study attempts to formulate and evaluate a functional beverage using Hibiscus sabdariffa, widely known for its deep red color, acidic flavor, and antioxidant properties. The beverage, Hibiscus Punch GoliSoda, was formulated to exhibit both sensorial appeal and potential health benefits. Hibiscus extract, lime juice, brown sugar, and ginger were used in the formulation with optional citric acid for acidity control and was carbonated for taste. Physicochemical evaluation revealed that the optimized sample had improved antioxidant activity, total phenolic content, and ascorbic acid content when compared to the control. Microbial evaluation confirmed the safety of the beverage with low total viable counts and absence of coliforms. Nutritional evaluation revealed the presence of key nutrients in the form of natural sugars, vitamin C, and polyphenols. Carbonation evaluation revealed good CO_2 retention and sensorial evaluation exhibited high consumer acceptability based on taste, flavor, and appearance. The study concludes that Hibiscus Punch GoliSoda is a promising functional beverage that unites traditional herbal medicine and modern drink technology, offering a natural and health-boosting alternative to chemical carbonated drinks.

KEYWORDS: *Hibiscus sabdariffa, Functional beverage, Antioxidant activity, Natural formulation, GoliSoda*

How to cite this paper: M. Divya Sri | Dr. A. Swaroopa Rani | P. Jaideep Reddy "Formulation and Evaluation of Hibiscus Punch - A Functional Beverage with Antioxidant Properties" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-9 | Issue-3, June 2025, pp.404-409, URL: www.ijtsrd.com/papers/ijtsrd79999.pdf

IJTSRD79999

1. INTRODUCTION

There has been growing consumer demand for healthier food products over the past few years, driven by growing knowledge of lifestyle illnesses and the influence of nutrition in disease prevention and health. Functional beverages—beverages that are beneficial to health regardless of their hydration and nutritional value—have become an exciting category in the health and wellness space. Functional beverages are commonly enriched with bioactive compounds such as antioxidants, vitamins, minerals, probiotics, or plant extracts that seek to deliver unique physiological effects. Among other phytochemical-dense plant materials, Hibiscus sabdariffa is of particular interest because of its phytochemical richness and traditional use in herbal medicine. Roselle is the common name of hibiscus that is distinguished by its intense red color, acidic taste, and high content of natural antioxidants, along with high contents of some anthocyanins, flavonoids, and polyphenols. These phytochemicals have been shown to scavenge free radicals, lower oxidative stress, and enhance cardiovascular and metabolic health. The production of beverages that employ Hibiscus sabdariffa aligns with the dual goals of consumer preference and public well-being. Not only does it capitalize on the therapeutic properties of plant materials, but it also caters to the modern thirst for cool, flavorful beverages. Caffeine-free, tea-like beverages composed of hibiscus are calorie-free in nature and appeal to a wide segment of the population, such as those who seek alternatives to carbonated soft drinks and synthetic energy drinks.

The objective of this research is to create a hibiscus-based punch—Hibiscus Punch GoliSoda—via optimization of its formulation for sensory

acceptability and antioxidant activity. The drink is intended to be a functional drink with a mix of tradition and modernity. The main objective of this research is to determine the antioxidant activity and sensory attributes of the formulation and determine its viability as a commercial functional drink.

2. MATERIALS AND METHODS:

Raw materials: Dried Hibiscus Calyces, Brown Sugar ,Lime Juice ,Ginger, Carbonated Water, Salt (a pinch, optional for flavor balancing)

Preparation Of Hibiscus Extract:

The hibiscus calyces were initially weighed (10–15 grams) with a digital balance and gently rinsed under running water to clear the surface dust and impurities. Following cleaning, the calyces were immersed in 200 mL of boiling distilled water. The mixture was left to boil at low heat for 10–15 minutes to facilitate efficient extraction of pigments, flavor, and antioxidant compounds. Once a deep red-colored extract is achieved, the mixture was discarded from the heat and left to cool naturally to room temperature. The chilled extract was subsequently filtered through strainer to eliminate the solid remains, giving a transparent hibiscus extract. The extracted was kept in a clean, airtight container in a refrigerated environment until future application in the production of the hibiscus punch.

Preparation of Kiwi Juice:

Choose ripe and firm kiwifruits with no signs of spoilage. Wash the kiwi fruits thoroughly to remove any dirt or pesticides. Remove the fuzzy skin from the kiwifruit using a peeler or knife. Cut the kiwifruit into slices or pieces and blend it by adding water lemon juice. After blending extraction of juice is done.

Mixing of ginger bug and kiwi juice:

Kiwi soda is prepared by mixing ginger bug with kiwi juice and a teaspoon of brown sugar is added for the fermentation. Mix the ginger bug and kiwi juice in tightly sealed glass bottle and keep it for fermentation for 2days at room temperaturece. Once you observe bubbles it means carbonation is generated and place the bottle in refrigerator and serve it cool.

Flow Chart of Hibiscus Punch:

Selection of Ingredients
↓
Cleaning of Dried Hibiscus Calyces
↓
Preparation of Hibiscus Extract
(Boiling and Filtering)
↓
Mixing Hibiscus Extract with Brown Sugar, Lime Juice, and Ginger
↓
Optional Addition of Salt or Citric Acid
↓
Refrigeration of Mixture for Flavor Enhancement
↓
Addition of Chilled Carbonated Water
↓
Final Hibiscus Punch Formed

Procedure:

Preparation of hibiscus punch started with the extraction of hibiscus calyces. Dried hibiscus petals (10–15 grams) were initially cleaned properly to remove any impurities and dust, then added to 200 mL of boiling distilled water. The solution was left to steep slowly for around 10–15 minutes on low heat to facilitate effective extraction of anthocyanins, flavoring compounds, and antioxidants without breaking down sensitive bioactive compounds. After a deep red-colored extract was achieved, it was filtered through a muslin cloth to divide the liquid from the solid residues. The clear hibiscus extract was then cooled to room temperature.

To prepare the punch, the cooled hibiscus extract was poured into a clean mixing vessel. Brown sugar (30–50 grams) was added gradually and mixed till dissolved completely, contributing the desired sweetness to counteract the natural tartness of hibiscus. To complement the flavor and antioxidant content, freshly squeezed lime juice (10–15 mL) was added, supplemented by fresh ginger grated (5–10 grams), which imparted a mild spicy touch to the drink. Based on the required taste, a pinch of salt or a small quantity of citric acid (0.5–1 gram) could be added optionally to balance and adjust the flavor.

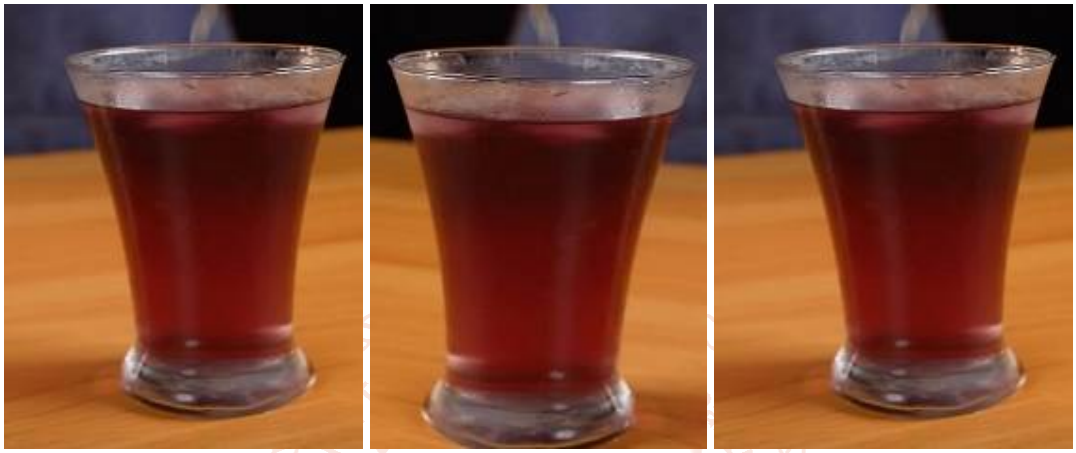
Once the ingredients were properly mixed, the prepared base was left at room temperature for a minimum of 30 minutes to let the flavors mingle and the drink get chilled. Immediately before tasting or serving, cold

carbonated water of about 250 mL was carefully poured over the hibiscus mixture. The mixture was stirred lightly to maintain the carbonation and prevent loss of fizz. The ready-made final hibiscus punch was presented with a bright red ruby color, refreshing scent, and a well-balanced sweet-sour-spicy taste. The drink was served.

Formulations :

Table:1 formulations

INGREDIENTS	Variation 1	Variation 2	Variation 3
Dried hibiscus calyces	10g	15g	20g
Brown sugar	30g	40g	50g
Lime juice	10ml	12ml	15ml
Fresh ginger	5g	7g	10g
Carbonated water	250ml	250ml	250ml



TRAIL-1 TRAIL-2 TRAIL-3

METHODS

Determination of pH: Calibrate the pH meter using pH 7.0 and pH 4.0 buffer solutions then rinse the electrode with distilled water and blot dry, now immerse the electrode in the soda sample and wait for the reading to stabilize and record the ph.

Determination of Titratable Acidity: Pipette 10 mL of the sample into a conical flask and add ~50 mL distilled water sequentially adds 2–3 drops of phenolphthalein indicator and titrate with 0.1 N NaOH until a faint pink colour persists for 30Seconds note the titre value.

$$\text{Formula: Acidity} = \frac{\text{Titrate value} \times \text{equivalent weight of NaOH} \times \text{normality of NaOH}}{\text{weight of the sample}}$$

Determination of Total Soluble Solids (Brix): Calibrate the refractometer using distilled water (should read 0 °Brix), then mix the soda sample thoroughly place 1-2 drops of the sample on the refractometer prism and close the cover and wait for a stable reading read and record the value as °Brix.

Formula:

$$\text{TSS (\%)} = \text{Brix reading} \times \text{conversion factor}$$

Determination of Antioxidant Activity (DPPH Assay): Antioxidant activity of Hibiscus Punch was found out through the DPPH assay. DPPH solution was combined with the sample beverages and stored in the dark for 30 minutes. Absorbance was recorded at 517 nm on a spectrophotometer. Decrease in absorbance indicated free radical scavenging, and the antioxidant activity was reported in terms of percentage inhibition. This method was applied for determination of antioxidant potential of control and optimized samples.

Carbonation: It is perform to check the amount of carbon dioxide produced during natural fermentation. It is done by pressure measurement method. It measures pressure buildup due to CO_2 inside the sealed bottle.

Total Plate Count (TPC): The TPC of the soda was calculated using the pour plate technique and Plate Count Agar. One millilitre of the adequately diluted material was added to sterile Petri dishes, followed by molten agar. Plates were incubated at 35 ± 2°C for 48 h. Following incubation, all visible colonies were enumerated and reported as cfu/mL to determine the overall microbial load in the product.

Yeast and Mold Count: Yeast and Mold were counted on Potato Dextrose Agar (PDA) that was acidified to pH 3.5 using tartaric acid. Dilution sample one millilitre was plated by applying the pour plate technique and incubated at 25 ± 2°C for 120 hours. During incubation, yeasts in the form of wet creamy colonies and Molds as dry filamentous colonies, result being stated as cfu/ml.

Sensory Analysis: the sensory analysis is done according to hedonic scale rating (table 2). The formulations are exposed to sensory analysis along with control. Different panelist gave the rating for sensory attributes like color, flavor, taste, appearance, taste and overall acceptability. The mean score is the overall acceptability.

Table: 2 Hedonic Scale

OPINION	RATING
Like extremely	9
Like very much	8
Like moderately	7
Like slightly	6
Neither like nor dislike	5
Dislike slightly	4
Dislike moderately	3
Dislike very much	2
Dislike extremely	1

3. RESULTS AND DISCUSSION

Sensory Analysis: According to sensory analysis of the three Hibiscus Punch variations, Variation 1 had the highest scores for most of the sensory characteristics, which reflected very high color, flavor, and overall acceptability. Variation 2 had moderate scores with lower ratings for flavor and texture. Variation 3 had the lowest scores in all the categories, particularly flavor and texture, which reflected that it was least acceptable to the panel. Overall, Variation 1 was the most acceptable formulation to the senses.

Table:3 Sensory analysis

Sensorial Attributes	Control	Variation 1	Variation 2	Variation 3
Color	9	9	8	7
Taste	9	9	8	7
Appearance	9	9	9	8
Flavor	9	8	8	7
Texture	9	8.5	8	7
Overall acceptability	9	9	8	7

Physico Chemical Analysis

The table 4 reflects the optimized Hibiscus Punch possessed better characteristics than the control. It possessed greater TSS (12.5°Brix) and carbonation (2.8 bar), which improved flavor and mouthfeel. The antioxidant activity was also elevated to 57.65%, signifying greater health benefits. Lower pH and acidity by a small amount also helped towards a balanced and refreshing taste.

Table:4 Physicochemical Analysis

PARAMETERS	Control	Optimised Variation
pH	6.23	6.17
TSS[*Brix]	10.2	12.5
Titratable acidity[%]	0.32	0.27
Carbonation[Bar]	1.2	2.8
Antioxidant Activity[%]	41.6	57.65

Microbial Analysis

The table 5 microbial analysis showed that both control and optimized Hibiscus Punch samples were within safe limits. The optimized sample had a lower Total Plate Count (1.8×10^2 CFU/mL) and yeast and mold count (1.2×10^1 CFU/mL) compared to the control. Coliforms were absent in both, indicating good hygiene and safety. The improved microbial quality of the optimized sample may be due to better formulation and acidic ingredients that inhibit microbial growth.

Table:5 Microbial Analysis

MICROBIAL PARAMETER	CONTROL SAMPLE (CFU/ML)	OPTIMIZED SAMPLE (CFU/ML)
Total Plate Count	4.5×10^2	1.8×10^2
Yeast & Mold Count	3.8×10^1	1.2×10^1
Coliforms	Absent	Absent

4. CONCLUSION

The creation of Hibiscus Punch brown sugar sweetened is a good example of marrying traditional botanicals with modern drink trends. The natural tartness of Hibiscus sabdariffa calyces was counter-balanced well by the rich, molasses-flavored sweetness of brown sugar to produce an acceptable and antioxidant-containing functional drink. Lime juice added not only to the flavor but also vitamin C content, whereas fresh ginger provided a subtle pungency and played a role in digestive benefits because of its bioactive compounds like gingerol. The addition of carbonation provided a welcome effervescence, adding sensory appeal and putting the product on par with market expectations for carbonated soft drinks. As compared to traditional sodas, which tend to incorporate artificial additives and refined sweeteners, this product has a clean-label status and utilizes minimally processed, botanical ingredients. Sensory evaluation analyses showed excellent consumer acceptability among important attributes such as color, aroma, flavor, mouthfeel, and general impression. This result confirms the potential of the beverage as an acceptable alternative to traditional carbonated beverages, especially for health-aware consumers looking for functional drinks made with natural components.

In conclusion, Hibiscus Punch with brown sugar is a nutritionally valued, organoleptically satisfactory, and market-applicable drink. Its readiness, therapeutic property, and applicability for household and industrial use place it on the list as a potential prospect in the burgeoning market of health-focused functional beverages**.**

5. REFERENCES

[1] Ali, B. H., Wabel, N. A., & Blunden, G. (2005). Phytochemical, pharmacological and toxicological aspects of Hibiscus sabdariffa L.: A review. Phytotherapy Research, 19(5), 369–375.

[2] Bhandari, P. R. (2012). Ginger (Zingiber officinale Roscoe) in the prevention and treatment of various diseases: A review. International Journal of Preventive Medicine, 3(4), 271–275.

[3] Blois, M. S. (1958). Antioxidant determinations by the use of a stable free radical. Nature, 181, 1199–1200.

[4] Da-Costa-Rocha, I., Bonnlaender, B., Sievers, H., Pischel, I., & Heinrich, M. (2014). Hibiscus sabdariffa L.–A phytochemical and pharmacological review. Food Chemistry, 165, 424–443.

[5] Elbagory, A. M., & Hussein, A. A. (2014). Antioxidant activity and phytochemical composition of Hibiscus sabdariffa calyces extracts. Journal of Medicinal Plants Research, 8(17), 665–672.

[6] El-Gharably, M. A., & El-Zalabani, S. M. (2020). Sensory evaluation and shelf life of herbal-based beverages. International Journal of Food Science and Nutrition, 5(3), 10–15.

[7] Galvano, F., La Fauci, L., Lazzarino, G., Fogliano, V., Ritieni, A., & Ciappellano, S. (2004). Cyanidins: metabolism and biological properties. Journal of Nutritional Biochemistry, 15(1), 2–11.

[8] Iftikhar, H., Rashid, M., & Khan, M. A. (2018). Comparative study of natural and commercial carbonated beverages for sensory and antioxidant properties. Pakistan Journal of Food Sciences, 28(3), 137–143.

[9] Jain, R., & Nema, R. (2017). Development and evaluation of herbal beverages from medicinal plants. Journal of Pharmacognosy and Phytochemistry, 6(4), 2161–2165.

[10] Mashhadi, N. S., Ghiasvand, R., Askari, G., Hariri, M., Darvishi, L., & Mofid, M. R. (2013). Anti-oxidative and anti-inflammatory effects of ginger in health and physical activity: review of current evidence. International Journal of Preventive Medicine, 4(Suppl 1), S36–S42.

[11] McKay, D. L., & Blumberg, J. B. (2007). A review of the bioactivity and potential health benefits of Hibiscus sabdariffa L. Phytotherapy Research, 21(6), 501–506.

[12] Mohammed, A. A., Al-Maqtari, Q. A., & Hassan, M. H. (2018). Functional properties of beverages based on ginger and lemon juices. Journal of Food and Nutrition Research, 6(4), 244–251.

[13] Obouayeba, A. P., Allou, A. S., Zézé, A., Koffi, N. M., & Kouadio, Y. J. (2014). Comparative study of the antioxidant and antimicrobial activities of red and white calyces of Hibiscus sabdariffa (Malvaceae). Journal of Pharmacognosy and Phytochemistry, 3(4), 121–126.

[14] Oyelade, O. J., & Ade-Omowaye, B. I. O. (2015). Functional and sensory properties of carbonated ginger–lemon drinks sweetened with natural sweeteners. African Journal of Food Science, 9(10), 520–525.

[15] Tsai, P. J., McIntosh, J., Pearce, P., Camden, B., & Jordan, B. R. (2002). Anthocyanin and antioxidant capacity in roselle (Hibiscus sabdariffa L.) extract. Food Research International, 35(4), 351–356.