

## Development and analysis of kiwi and pineapple carbonated beverage: A compliance-based approach to FSSAI regulations

Akul Agarwal, Purva Dhage, Pratiksha Nagwade

Department of Food Technology, MIT-ADT University, Pune, Maharashtra, India

### Abstract

This study presents the formulation and analysis of a carbonated beverage made using kiwi and pineapple juices, Bisleri Soda and citric acid. It follows the Food Safety and Standards Authority of India (FSSAI) regulations (FSSAI, 2020) <sup>[1]</sup> for the Total Soluble Solids (TSS) and acidity standards. It focuses on the formulation, production, physicochemical characteristics and sensory evaluation of the beverage. The Folin-Ciocalteu method (Singleton & Rossi, 1965) <sup>[2]</sup> which assessed the Total Phenolic Content (TPC) of the beverage was used to evaluate the potential antioxidant activity of the beverage. The results demonstrated a health-conscious refreshing carbonated drink that meets regulatory guidelines was prepared.

**Keywords:** Kiwi, pineapple, carbonated beverage, FSSAI regulations, TSS, acidity, bisleri soda, citric acid, total phenolic content

### Introduction

The beverage industry has witnessed an increasing consumer preference for healthier, functional drinks, particularly those made from fruit-based ingredients (Sharma & Kumar, 2019) <sup>[3]</sup>. The refreshing characteristics and natural appeal have made carbonated beverages made from fresh fruit juices popular, catering to the high demand. Kiwi and pineapple are two such tropical fruits which are known for their unique flavor and nutritional value are ideal choices for making a carbonated beverage.

This study studies the development of a carbonated beverage using kiwi and pineapple while complying to the Food Safety and Standards Authority of India (FSSAI) regulations (FSSAI, 2020) <sup>[1]</sup> and maintains Total Soluble Solids (TSS) and acidity levels accordingly. These two fruits are selected for their flavor profile, health benefits and characteristics provided when combined.

### Material & Methods

#### 1. Ingredients

- **Kiwi Juice:** Extracted from fresh ripe kiwis.
- **Pineapple Juice:** Extracted from fresh pineapples.
- **Bisleri Soda:** Used as the source of carbonation.
- **Citric Acid:** Added to adjust the acidity and balance flavor.
- **Sweetener (optional):** Sugar.



Fig 1: Raw Material – Kiwi used for beverage preparation



Fig 2: Raw Material – Pineapple used for beverage preparation

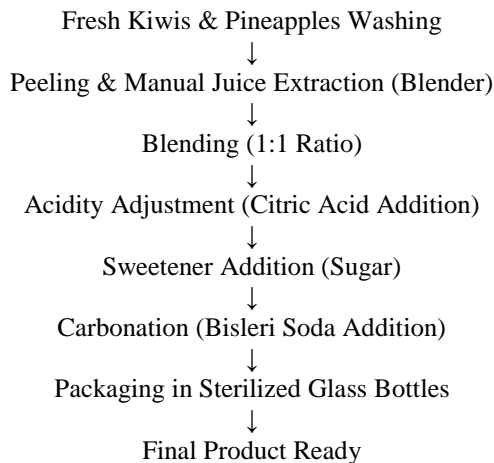
#### 2. Equipment

- **Blender:** For Juice extraction.
- **pH Meter:** For measuring the beverage's acidity (pH).
- **Refractometer:** For determining the Total Soluble Solids content.
- **TPC Test Kit:** For measuring Total Phenolic Content using the Folin-Ciocalteu method.
- **Spectrophotometer:** To measure absorbance during TPC analysis and for clarity test.
- **Pipette:** Used for calculating titratable acidity
- **0.1 N NAOH:** Used for calculating titratable acidity
- **Phenolphthalein Indicator:** Used for calculating titratable acidity

#### 3. Beverage Formulation Process

1. **Juice Extraction:** Fresh kiwis and pineapples were washed, peeled, and juiced were extracted manually using a blender.
2. **Blending:** The juices were mixed in a 1:1 ratio to create a uniform juice blend.
3. **Acidity Adjustment:** Citric acid was added to adjust the pH and balance the flavour of the beverage.
4. **Sweetener Addition:** A natural sweetener (sugar) was added, to balance the acidity and provide a pleasant taste.

5. **Carbonation:** Bisleri soda was added to the juice blend to introduce carbonation.
6. **Packaging:** The final beverage was packaged in sterilized glass bottles under hygienic conditions.



#### Different test Perform

1. **pH Test:** The pH of the beverage was measured using a calibrated digital pH meter (Chopra & Singh, 2018) [5]. This ensured that the acidity levels of the beverage complied with FSSAI guidelines.
2. **Acidity Test:** The acidity of the beverage was measured using a titration method. A 10 mL sample of the beverage was titrated with 0.1 N sodium hydroxide using phenolphthalein as an indicator. The results were expressed as percentage citric acid (Sharma & Kumar, 2019) [3].
3. **Clarity Test:** The clarity of the beverage was assessed using a spectrophotometer (Sharma & Kumar, 2019) [3]. A sample of the beverage was placed in a cuvette, and the absorbance was measured at 600 nm to evaluate turbidity and transparency levels.
4. **Total Soluble Solids (TSS) Test:** The Total Soluble Solids (TSS) content of the beverage was measured using a handheld refractometer. A drop of the beverage sample was placed on the refractometer prism, and the TSS was recorded in degrees Brix (FSSAI, 2020) [1].

5. **Total Phenolic Content (TPC) Test:** The Total Phenolic Content of the kiwi and pineapple carbonated beverage was determined using the Folin-Ciocalteu method (Singleton & Rossi, 1965) [2]. This method measures the total concentration of phenolic compounds responsible for antioxidant activity.

#### Results and Discussion

**1. Sensory Evaluation** The sensory characteristics of the beverage reflect the consumer trend towards functional drinks with balanced flavor profiles (Sharma & Kumar, 2019) [3].

#### 2. Physicochemical Analysis

**pH Test:** The pH of the beverage was found to be 3.2, ensuring it met the acidity requirements for carbonated beverages and providing a balance between flavor and shelf-life stability (FSSAI, 2020; Chopra & Singh, 2018) [1, 5].

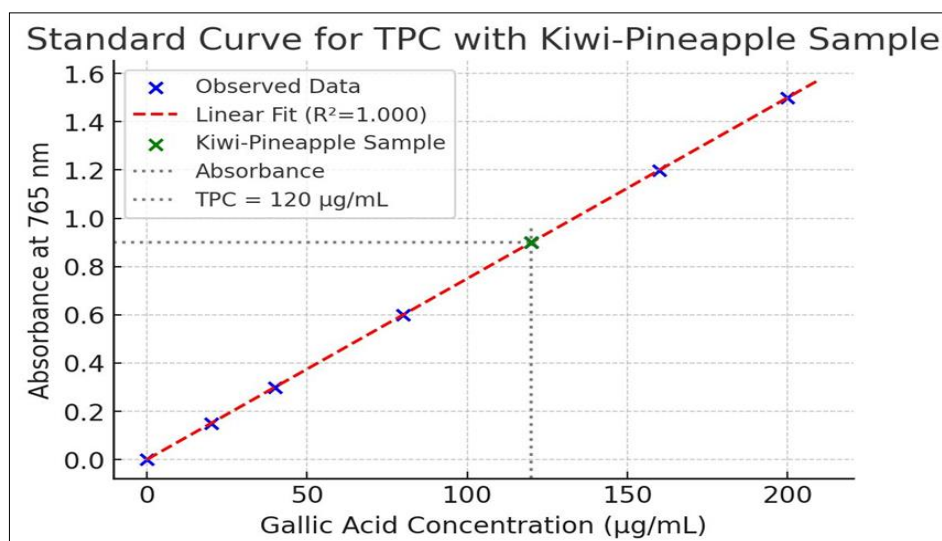
**Acidity Test:** The titration method revealed an acidity level of 0.45%, expressed as citric acid. This value aligns with FSSAI guidelines for fruit-based beverages and contributes to the tartness and flavor stability of the product (Sharma & Kumar, 2019) [3].

**Clarity Test:** The beverage exhibited low absorbance values at 600 nm, indicating excellent clarity and absence of turbidity, which are essential for consumer acceptance and product quality (Sharma & Kumar, 2019) [3].

**TSS Test:** The TSS content of the beverage was recorded as 12 degrees Brix, which is within the acceptable range for fruit-based carbonated beverages as per FSSAI standards (FSSAI, 2020) [1]. This level ensures a balanced sweetness and contributes to the overall mouthfeel of the beverage.

**3. Total Phenolic Content (TPC) Test:** The TPC of the beverage was determined to be 120 mg GAE/L, indicating notable antioxidant properties as assessed by the Folin-Ciocalteu method (Singleton & Rossi, 1965) [2].

**4. Total Phenolic Content (TPC) Standard Curve and Analysis:** To quantify the antioxidant potential of the beverage, a standard curve was developed using Gallic Acid as the reference phenolic compound. Absorbance was measured at 765 nm using the Folin-Ciocalteu method. The standard curve showed excellent linearity with an  $R^2$  value of 1.000.



**Fig 3:** Standard Curve for TPC with Kiwi-Pineapple Sample.

From the graph, the TPC of the beverage sample was interpolated to be approximately 120 µg/mL, which is equivalent to 120 mg GAE/L. This high TPC suggests substantial antioxidant activity, likely contributed by the

bioactive compounds present in both kiwi and pineapple, such as vitamin C, flavonoids, and phenolic acids (Bhattacharya et al., 2018; Lutz et al., 2015) [6, 7].

**Table 1.** Result Table

Test	Result / Observation	Details / Remarks
pH Test	3.2	Meets acidity requirements for carbonated beverages; ensures flavor balance and shelf-life stability (FSSAI 2020; Chopra & Singh, 2018) [1, 5]
Acidity Test	0.45% (as citric acid)	Aligns with FSSAI guidelines; contributes to tartness and flavor stability.
Clarity Test	Low absorbance at 600 nm	Indicates excellent clarity and absence of turbidity; essential for consumer acceptance and product quality (Sharma & Kumar, 2019) [3]
TSS Test	12° brix.	Within acceptable range as per FSSAI standards; ensures balanced sweetness and contributes to mouthfeel (FSSAI, 2020) [1]
Total Phenolic Content	120 mg GAE/L	Indicates notable antioxidant properties using Folin-Ciocalteu method (Singleton & Rossi, 1965) [2]
TPC Standard Curve	R <sup>2</sup>	Excellent linearity in standard curve using Gallic Acid as standard; absorbance measured is at 765nm.

These results indicate that the beverage not only provides refreshment but also contributes to health through its antioxidant properties. Antioxidants play a crucial role in neutralizing free radicals, thus helping reduce the risk of chronic diseases (Prior et al., 2005) [8]. Therefore, the developed kiwi-pineapple carbonated beverage can be considered a functional drink with potential nutraceutical value.

### Conclusion

A kiwi and pineapple carbonated beverage has been successfully developed following FSSAI regulations, including TSS maintenance, acidity and pH levels (FSSAI, 2020) [1]. Sensory evaluations gave a fresh flavor and TPC analysis shows antioxidant benefits (Singleton & Rossi, 1965) [2]. The beverage is a healthy alternative to common soft drinks, catering to consumer demand for functional products (Kumar & Verma, 2021) [4].

### Reference

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