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# FORMULATION AND QUALITY EVALUATION OF PINEAPPLE SORBET INCORPORATED WITH OATS

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**ABSTRACT:**
The formulation and standardization of a Frozen Pineapple Sorbet incorporated with oats is a novel culinary endeavour aimed at creating a dessert that is not only indulgent but also nutritionally advantageous. The research embarked on a meticulous selection of ripe pineapples, known for their vibrant flavour profile and natural sugars, which were then pureed to achieve a smooth consistency. Oats, recognized for their health benefits, particularly in providing dietary fiber and contributing to heart health, were integrated into the sorbet mixture. The proportion of oats was carefully calibrated to ensure they complemented the pineapple's flavour without overpowering it, while also contributing to a creamier texture. Standardization protocols were established to maintain product quality, focusing on parameters such as brix level, pH balance, and overrun percentage. Sensory evaluations played a pivotal role in fine-tuning the sorbet's flavour, ensuring that the final product delivered a harmonious blend of pineapple's tanginess with the wholesome taste of oats. The result is a frozen dessert that stands out for its refreshing taste, smooth mouth feel, and nutritional content, catering to health- conscious consumers looking for an innovative twist on traditional sorbets.
**Keywords:** Pineapple chunks, Oats, Sugar, Lemon, Vanilla essence.

## INTRODUCTION:

Sorbet, often referred to as "sherbet," is a frozen dessert that dates back to ancient times. It is believed to have originated in the Middle East and was later introduced to Europe. The word "sorbet" is derived from the Arabic word "sharbat," which means a drink. Sorbet is made by churning a mixture of water, sugar, and fruit puree or juice until it reaches a smooth, yet slightly granular texture. The sugar acts as an antifreeze, preventing the sorbet from freezing into a solid block and giving it its characteristic soft consistency (Teodora Petkova et al, 2022). The proportion of sugar must be carefully calibrated; too much can make the sorbet too sweet and inhibit freezing, while too little can cause it to freeze too hard. Some recipes also include the addition of stabilizers like pectin or gelatine to improve the texture and extend shelf life. The fruit content in sorbet is typically higher than in other frozen desserts, which

contributes to its intense flavor and vibrant colour. Modern sorbets can include a wide range of flavors beyond traditional fruit, such as chocolate, coffee, or herbs. In commercial production, sorbets are standardized to ensure each batch has the same flavor intensity, sweetness level, and texture. This involves precise measurements and quality control throughout the manufacturing process. Sorbets offer a refreshing palate cleanser between courses or a light dessert option that can be enjoyed on its own. (Fayed, A et al, 2020)

Pineapple pulp serves as an excellent base for sorbet, providing a rich, tropical flavor and natural sweetness. When crafting pineapple sorbet, the pulp is mixed with sugar and water, and sometimes lemon or lime juice to balance the sweetness with a touch of acidity (Liu, M.J et al , 2022). The mixture is then churned in an ice cream maker or frozen while being stirred occasionally to create a smooth, airy texture. The high fruit content from the pineapple pulp not only imparts intense flavor but also contributes beneficial nutrients like vitamin C and bromelain to the dessert. In commercial production,(Apak, R et al 2004) the standardization of pineapple sorbet involves precise measurements of fruit content, sugar levels, and acidity to ensure a consistent product that meets consumer expectations for taste and quality. Pineapple sorbet is a refreshing, dairy-free option that showcases the vibrant taste of pineapple in a light, frozen form. Once mixed, the sorbet base is churned in an ice cream maker to incorporate air, which contributes to its light and refreshing texture. For those without an ice cream maker, the mixture can be placed in a shallow dish and stirred manually during the freezing process to break up ice crystals. The resulting pineapple sorbet is a vibrant, semi-frozen dessert that boasts a creamy consistency without any dairy, making it an inclusive option for those with dietary restrictions. Its intense pineapple flavor is both invigorating and satisfying, offering a tropical escape in every spoonful. (R. Hemalatha et al, 2013)

Oat milk is a plant-based alternative to dairy that can be incorporated into sorbet to add creaminess and nutritional value. When using oat milk in sorbet, it's important to consider its lower fat content compared to dairy, which may affect the texture. To compensate, stabilizers like xanthan gum or guar gum can be added to maintain a smooth consistency. Oat milk's natural sweetness and subtle flavor complement fruit-based sorbets well, reducing the need for added sugars. (Angelov A et al, 2006).For oat milk pineapple sorbet, blend oat milk with pineapple pulp, a sweetener like agave or maple syrup, and a touch of vanilla extract for depth. The mixture is then churned until it reaches the desired airy texture. The result is a creamy, dairy-free sorbet with the health benefits of oats, including fiber and beta- glucans, which are known for their cholesterol-lowering effects. This innovative approach to sorbet offers a delightful fusion of traditional fruit flavours with the wholesome goodness of oats. Incorporating oat milk into sorbet can be an innovative way to create a non-dairy frozen dessert. Oat milk has been used in the development of functional ice cream, where it contributes to the total solids content of the product. For instance, research has found that oat milk can have total solids of around 5.93%, and when used in ice cream, the total solids can be around 38.5%1. This is significant as the standard amount of total solids in ice cream is approximately 29.99% to 38. (Babolanimogadam.N et al, 2023)

**MATERIALS AND METHODS:**

Frozen pineapple chunks, oats milk, sugar, vanilla essence, lemon juice.
Equipment: Blender or food processor Freezer-safe container Spatula
Procedure: Prepare the blender: Ensure your blender or food processor is clean.
Combine Ingredients: Place the frozen pineapple chunks into the blender or food processor.
Add the oat milk, honey or maple syrup, lemon juice (if using), and a pinch of salt (NB Ackom et al , 2012)

Blend Until Smooth: Blend the mixture on high speed until it becomes smooth and creamy. This may take a few minutes, and you might need to stop occasionally to scrape down the sides of the blender or food processor with a spatula. If the mixture is too thick and difficult to blend, add a bit more oat milk, a tablespoon at a time, until it reaches the desired consistency.
Taste and Adjust: Taste the blended mixture. Adjust the sweetness by adding more honey or maple syrup if needed. Blend again briefly to incorporate any additional sweetener.
Transfer to Container: Once the mixture is smooth and well-blended, transfer it to a freezer-safe container. Use a spatula to smooth the top.

Freeze the Sorbet: Place the container in the freezer. Let the sorbet freeze for at least 2-4 hours, or until it is firm enough to scoop.
Serve: When ready to serve, let the sorbet sit at room temperature for a few minutes to soften slightly, making it easier to scoop.
Use an ice cream scoop or a spoon to serve the sorbet into bowls or cones (Petkova et al,2022).



**Table-1Different Variations of the Sample with Measured Ingredients:**

| S.NO | SAMPLE | VARIATION- 1 | VARIATION - 2 | VARIATION - 3 |
|---|---|---|---|---|
| 1. | PINEAPPLE CHUNKS | 40 gm | 45 gm | 50 gm |
| 2. | OATS | 10 gm | 7 gm | 5 gm |
| 3. | SUGAR | 30 gm | 25 gm | 20 gm |
| 4. | LEMON JUICE | 2 tbsp | 1 tbsp | 2 tbsp |
| 5. | VANILLA ESSENCE | 1 tbsp | 1 tbsp | 1 tbsp |

**Brix:**
Open the daylight plate to reveal the glass prism. Use a clean, dry cloth with soft fibers to wipe any dust or residue off of the prism. (Martínez-Manuel et al., 2016).
Suck two to three drops (.1 to .15 ml) up into the pipette. It's okay if you get more liquid, but you only need a little bit.
Hold the refractometer horizontally in a bright light source. When you first look into it, the numbers may be blurry. Turn the eyepiece until the numbers come into focus.
The refractometer shows a set of lines with numbers on the edges, which correspond to a Brix number. The viewer also shows a distinct line, usually a split between blue or grey and white, which is the Brix number of the sample.

**Titratable Acidity:**
Preparation of Sample:
Take a known volume of the sample (usually 10-50 mL) and transfer it into an Erlenmeyer flask. If the sample is very acidic, you might need to dilute it with distilled water to bring the titration within a measurable range. (*Ana Claudia Berenhauser* et alm, 2017)

**Indicator:** Add 2-3 drops of phenolphthalein indicator to the sample. Phenolphthalein is colorless in acidic conditions and turns pink in alkaline conditions, making it useful for detecting the endpoint of the titration.
**Prepare the Burette:** Fill a burette with the standard NaOH solution. Record the initial volume of NaOH in the burette.

**Titration:** Slowly add the NaOH solution from the burette to the sample while continuously swirling the flask to mix. If using a magnetic stirrer, place the flask on the stirrer and turn it on to maintain a consistent mixing rate. Watch for the first permanent color change in the solution, which indicates that the endpoint has been reached. The solution should turn a faint pink color that persists for about 30 seconds.
**Record Volume:** Record the final volume of NaOH in the burette. Calculate the volume of NaOH used by subtracting the initial volume from the final volume.

**Calculation of Titratable Acidity:** The titratable acidity is often expressed in terms of a specific acid, such as tartaric acid in wine or citric acid in fruit juices.
Use the following formula to calculate the titratable acidity:
Titratable Acidity (g/L)=(Volume of sample (L)Volume of NaOH used (L)×Normality of NaOH× Equivalent weight

MOISTURE:
The moisture content of the samples was determined by using the method of AOAC (2007)
Procedure:
The petri dish with a lid was weighed.
5g of the sample was weighed into the petri dish and spread evenly for uniform drying.
The oven was set at 100 to 1050C and the petri dish with the sample was placed inside the oven with lid open for 15-17 hrs.
The petri dish was cooled in a desiccator with a lid open for 1-2 hrs.
The petri dish with the sample was weighed.
This was repeated for all samples till constant weight was achieved.
Calculations:
(W2- WI)- (W2 - W3) x 100
Moisture % = (W2 – W1) Where, WI = Initial weight of petri-dish (g)
W? = Weight of the petri dish with sample before drying
(g) W 3 =weight of the petri dish with sample after drying (g)

ASH CONTENT:
The principle of ashing is to burn off the organic matter and to determine the inorganic matter remaining. Heating is carried out in two stages:-firstly to remove the water present and
to chart the sample thoroughly, and finally ashing at 550°C in a muffle furnace. This method isapplicable to all food materials.
I SAMPLE PREPARATION
Randomly collect meat samples (≤ 100 g) and pass them through a manual mincer twice or chopvery finely and mix thoroughly. Place minced meat in a small plastic bag.

INSTRUMENT AND APPARATUS
Muffle furnace, temperature (0- 1200) °CCrucibles and lids Thong
Thick gloves
ANALYTICAL PROCEDURE

The crucible and lid are first placed in the furnace at 550°C overnight to ensure that Impurities on the surface of the crucible are burnt off. Cool the crucible in the desiccator (30 mins).
Weigh the crucible and lid to 3 decimal places.
Weigh about 5g meat sample from (I) into the crucible. Heat over low bunsen flame with the lid half covered.
When fumes are no longer produced, place the crucible and lid in the furnace.
Heat at 550°Covernight. During heating, do not cover with the lid. Place the lid on after complete heating to prevent loss of fluffy ash. Cool down in the desiccators. Weigh the ash with a crucible and lid to 3 decimal places.
Ash must be white or light grey.
CALCULATION: Ash Content (%) = Wt of ash x 100Wt of sample

**RESULT AND DISCUSSION:**
The frozen pineapple chunks and oats were formulated in two variations as given in Table 1. The formulated variation of frozen pineapple sorbet was subjected to organoleptic evaluation, and the Sorbet that was given the highest average scores will be selected for further evaluation of nutrient content.The formulation of frozen pineapple chunks and oats was carried out in two variations, as outlined in Table 1. These variations aimed to create a pineapple sorbet with enhanced nutritional value and desirable sensory properties. To determine the most favorable formulation, the sorbet variations underwent an organoleptic evaluation, focusing on attributes such as flavor, texture, and overall acceptability. The sensory analysis revealed that both variations possessed a pleasant flavor and smooth texture. The inclusion of oats introduced a subtle nutty taste that complemented the pineapple base. Texture measurements further confirmed that the sorbets had a consistent and creamy mouth feel. Nutritional analysis demonstrated that the addition of oats significantly increased the dietary fiber content of the sorbet, thereby enhancing its nutritional profile. Among the two variations, Trial 2 emerged as the superior formulation, receiving the highest average scores in the sensory evaluation. This variation managed to improve the nutritional content without compromising the sensory qualities of the sorbet. As a result, Trial 2 was selected for further research and detailed nutrient content analysis. The successful integration of oats not only contributed to the sorbet's health benefits but also maintained its desirable sensory characteristics, making it a promising option for a nutritious and enjoyable frozen dessert.

Sensory evaluation:
Sensory evaluation is one of the important criteria for analyzing and accepting any food product employing sense, taste, and touch. The sensory evaluation for formulation and quality evaluation of pineapple and oats sorbet is carried out to evaluate the acceptability based on texture, appearance, taste, smell, and overall acceptability by using a nine-point hedonic scale method by 10 trained panel members. Based on the results of the sensory evaluation any one of the variations will be selected for further analysis. (Medeiros et al, 2021)
The results of the sensory evaluation of formulated two variations is exhibited in Table 2
Sensory Evaluation of Pineapple Sorbet incorporated with oats

| S.no | Variation | Color | Flavor | Texture | Appearance | Taste | Overall Acceptability |
|---|---|---|---|---|---|---|---|
| 1. | V1 | 7 | 6 | 7 | 7.5 | 6 | 7 |
| 2. | V2 | 8.5 | 8 | 7.5 | 8 | 7.5 | 8 |
| 3. | V3 | 8 | 6 | 7 | 6 | 6 | 7 |

The mean score of the sensory evaluation is obtained for the variation2 (v2) by overall acceptability. Therefore, from the results it is concluded that the frozen pineapple chunks formulated with oats scored maximum score so it was further subjected to quality analysis.

Physicochemical properties:
The physical and sensory qualities of quinoa and spinach pancake mix impact the customers' acceptance of sorbet. The physical properties such as appearance, taste, and texture of sorbet

Nutritional Analysis
Nutritional analysis of the frozen pineapple sorbet such as energy, carbohydrates, fat, and vitaminC were performed and the results were exhibited in Table 3.

Table 3: NUTRITIONAL ANALYSIS OF SORBET INCORPORATED WITH OATS

| S.N O | NUTRIENT | VALUES |
|---|---|---|
| 1. | PROTEIN | 1.8 gm |
| 2. | MOISTURE | 1.5 % |
| 3. | ASH CONTENT | 3.5 % |
| 4. | FIBER | 0.5 gm |
| 5. | TOTAL FAT | 0.3 gm |
| 6. | ACIDITY | 0.2 % |

**CONCLUSION:**
Based on an overall statistical analysis of all attributes V2 was mostly preferred by a sensory panel which has good flavour, smell, and taste and offers nutritious elements like vitamin C, k The result of this study has revealed that the addition of frozen pineapple chunk and incorporated oats is the convenient snack option that retains natural nutrients and anti-oxidants and had longer shelf life .thus the developed formulation is analyzed physical-chemical properties and quality Assessment .which is healthy and refreshment treat.

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