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Development, analysis and sensory evaluation of jelly drinks from orange concentrate

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Abstract
Jelly drinks is a food product that uses gelling agent to form jelly texture that can be consumed using a straw. Generally, jelly drinks in the market contain synthetic sweeteners, coloring and flavoring agents, as well as low in nutrients content, therefore it needs to be developed in order to obtain more-healthy product. The aims of this research were to determine the best formula of jelly drinks with orange concentrate and determine the nutritional properties and evaluate the sensory of this jelly drinks. During jelly drinks production using gelling agent, the best results were obtained by using 82.22% Water, 0.096% Sodium benzoate, 15.0% Sugar, 0.025% Salt (NaCl), 0.0225% Jelly powder, 0.18% Potassium citrate, 0.20% Citric acid, 2% Orange Concentrate, 0.019% Color, and 0.24% Flavor.
Overall analysis shows that orange jelly concentrate which are produced including its color, flavor, structure, is really good and it's dissolved smoothly in the mouth, increase sweet test and delight the sensory panelist.

Keywords: jelly drinks; flavor; antioxidant activity; dietary fiber; sensory

Introduction
Orange is a special variety of citrus. Citrus fruits are popular for their fragrance, due to the presence of flavonoids and limonoids in the rinds [7]. Citrus fruits are major sources of bioactive materials including antioxidants such as ascorbic acid, flavonoids and phenolic compounds that are essential for human nutrition [5]. Citrus fruits are important source of folic acid, vitamin B (thiamine), potassium, phosphorus, calcium, iron, magnesium, sodium and sulphur [8]. The flesh of orange is orange to orange red, moderately sweet and sour, and rich in flavor [1]. Each 100 ml of juice contains 8-11.5g of sugar, 0.8-1.4g of acid, and 9-14% of soluble solids. It is rich in vitamin C, which can inhibit the formation of pigment particles in the skin. Nassar *et al*. (2008) suggested that 15% of orange peel and pulp could be incorporated as an ingredient in making biscuits, as they are a suitable source of dietary fiber with associated bioactive compounds [9]. The average daily requirement of dietary fiber is 21–25g per day for women and 30–38g per day for men [2]. It is also called sweet orange, to distinguish it from the related citrus and aurantium, referred to as bitter orange. The orange peel, with the nature and flavor of sweet and bitter, has better effect in relieving cough and reducing sputum than tangerine peel. It is a good medicine for treating cold, cough, loss of appetite, and distending pain in chest and abdomen. In this experiment, orange was used as raw material for the production of jelly drinks. Colored beverages or drinks, iced drinks, jelly or agar and meatball soup have been categorized as unhealthy food for years [6]. Generally, children suffer from vitamin C deficiency for low quantity consumption of vegetables and fruits than required. Vitamin C is less stable and water- soluble [3]. Therefore, producing beverages by utilizing this vitamin can be greatly beneficial. One of the major potential products for this concept is jelly drink [10]. Jelly drinks is a gel-based semi solid beverage product, popular among women and children because of its crystal appearance, bright color, soft and smooth taste, as well as sweet and moist flavor, and it is also a healthy food with low heat and high dietary fiber. Jelly drinks are made from hydro colloid compounds by the addition of sugars, jelly powder, acids, and with or without other food additives.
Different thickeners have a great influence on the quality of the jelly. It generally contains minimum 65 percent of total soluble solids. It is an anti-aging and beauty supplement drink. Generally, jelly drinks in the market contain low in nutrients content, therefore it needs to be developed in order to obtain healthier product by adding orange concentrate. The aims of this study were to determine the best formula of jelly drinks with orange.
Considering the above circumstance, the objectives of this study are as follows:
1. Developing the process of jelly drinks.
2. Chemical analysis of the jelly drinks.
3. Sensory evaluation of the jelly drinks.

Materials and Methods
Sample collection
Fresh oranges were purchased from a local market and transported to the industry. They were washed properly for removing the outer dust and peeled out. All other ingredients were purchased from commercial sources or directly from the suppliers, keeping the same specification in all experiments.

Materials
Ingredients of orange jelly drinks are: jelly powder, citric acid, potassium citrate, sodium benzoate, water, sugar, salt, Color (E-110: sunset yellow), orange concentrate, and orange flavor.

Process flow chart of orange jelly drinks

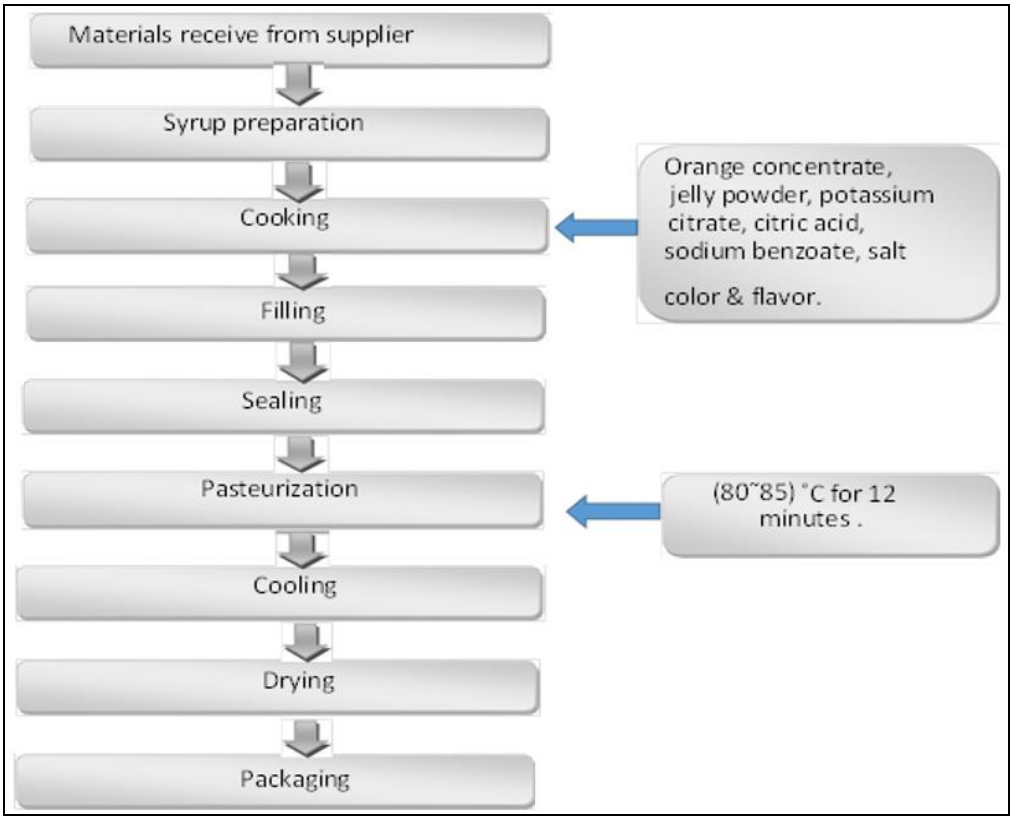

Fig 1: Process flow chart of orange jelly drinks

Methods

Syrup preparation

Jelly drinks were prepared using sugar syrup. The sucrose was added to the purified water and heated until dissolved, then strained and sufficient purified water was added to produce the desired weight or volume. Excessive heating in the preparation of syrup must be avoided to prevent inversion of sucrose, with increase tendency to fermentation. Specific gravity of syrup is important.

Procedure

At first water and sugar was taken as a 2:3 ratio into syrup preparation tank. Then blended properly with steam pressure 1.5~2.0kg/cm² and 70-80°C temperature. Blending time was 60 minutes and maintained the final brix at (60 ± 0.5) °Bx. Then the syrup was filtered by fine filter (SS net with RD cloth) through filter press (9-12 pcs RD cloths) to remove black particle and other foreign particle.

Fig 2: Orange jelly drinks syrup preparation and cooking tank

Cooking

All the ingredients were weighted as per recipe. Then syrup, water and fresh orange concentrate was taken in cooking tank and blended few minutes and Sodium benzoate was added. Then jelly powder, citric acid, potassium citrate, and potassium sorbate were added. All the ingredients were mixed. Steam pressure 0.5~1.5 kg/cm² and 80-85°C temperature were maintained. After 30-35 minutes, brix of the mixture was checked. When we got our desired concentration then color and flavor were added. We filtered the batch by SS net and transferred this into the reserved tank.

Filling

After cooking the batch it was passed to the filling machine through pipe line and kept in the poly propylene cup by filling valve. During filling, temperature were maintained at 80-85^{O}C. It is a multifunctional high-speed full automatic machine specially designed for liquid or semi- liquid (such as water, milk, yogurt, olive oil, fruit juice, tomato sauce, honey) to be filled and sealed. High quality, high stability, long service life. All the parts of machine are made of food grade stainless steel.

Fig 3: Orange jelly drinks filling & sealing machine

Sealing
After filling the product, sealing is very important. Products are sealed by lid foil which is called primary packaging. For jelly drinks product, sealing temperature we were applied between 200- 220^{O}C. Many operations and businesses need to ensure that they seal their items and products securely and safely for public consumption and safe use – no matter where they may be used. Using the correct impulse heat sealer to ensure a safe and sealed package is essential to ensuring that your company offers a product that will stay secured within transit and for various other purposes.

Pasteurizing
For increasing the product's longevity pasteurization is very important. Pasteurization is a process in which water and certain packaged and non-packaged foods (such as milk and fruit juice) are treated with mild heat. We used 80-85^{O}C temperature for 15 minutes to eliminate pathogens and extend shelf life. The process is intended to destroy or deactivate organisms and enzymes that contribute to spoilage or creates risk of disease, including vegetative bacteria, but not bacterial spores.
Features of pasteurizing machine:

- Frame and support constructed with Stainless Steel
- Molds cup carrier Aluminum Alloy
- Stainless steel panel with PLC and servo motor control and touch screen
- Variable speed adjustment via servo speed controller
- Chain stainless steel

Fig 4: Orange jelly drinks sterilization tunnel

Cooling
After pasteurized, the product was passed into the cooling tank, where it was cooled at 38±2°C by normal water for 4 to 5 minutes.

Drying
After being cooled by normal water the product was sent to the drying stage where it was dried by air blower for 4 to 5 minutes.

Packaging
Jelly drinks product is packed using plastic tray with pop polyethylene wrapping to protect the outer dust and others particle. It creates an attractive outlook for consumers.

Chemical Analysis
Determination of p^{H} level
The pH of Jelly product is determined electrometrically using a pH meter.

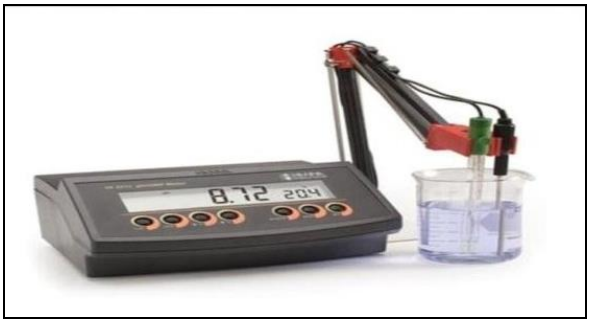

Fig 5: pH meter

100ml sample was taken in a beaker then pH was checked by using digital pH meter. Kept record of the pH meter reading value.

Determination of Acidity
Firstly, 10g sample was taken with 2-3 drops of Phenolphthalein in a beaker. After that Titration was done against 0.1N NaOH until pink color.
Calculation:
Acidity % = BR × Strength of sodium hydroxide (NaOH) 0.225 × Equivalent weight of citric acid (64.04) ×100/Sample weight × 1000

Determination of ^{O}Brix
50ml sample was taken in a beaker. Sample chamber of refractometer was opened. Few drops orange drink sample was taken into refractometer sample chamber (prism). The reading from refractometer shows the brix as percentage.

Fig 6: Refractometer

Sensory evaluation of jelly drinks
For sensory evaluation of sensory data three different types of Jelly drinks were evaluated for color, flavor, texture, taste and overall acceptability by a panel of 10 testers. The panelists were briefed before evaluation. Three types of Jelly drinks were presented as randomly coded sample to the 10 panelists. The test panelists were asked to rate the different jelly drinks presented to them on a 9 point hedonic scale with the ratings of: 9 = Like extremely; 8 = Like very much; 7 = Like moderately; 6 = Like slightly; 5 = Neither like nor dislike; 4 = Dislike slightly; 3 = Dislike moderately; 2 = Dislike very much and 1 = Dislike extremely.

Results and Discussion
Formulation of orange jelly drinks
Orange jelly drinks are prepared from different recipe using jelly powder. Orange jelly drinks were formulated and chemical composition were determined. The acceptability

and proximal chemical composition were evaluated through sensory evaluation and chemical testing procedure. The quality of jelly drinks product depends on quality of modified starch— as starch is the essential ingredients, it is important to choose high-quality starch.One of the most important characteristics of the starch quality is gel strength. Gel strength of starch depends on gum quality.

Gel strength of starch must not less 700 g/m²; otherwise product texture will not get actual form, which contributes to the development of product quality.

Chemical Analysis

The chemical composition of jelly drinks was analyzed and mentioned in the below table 3.1.

Table 1: Chemical analysis of jelly drinks

Characteristic	Control	Sample-1 (2% orange concentrate)	Sample-2 (3% orange concentrate)	Sample-3 (5% orange concentrate)
Brix (^{O}Brix)	16	16	16	16
Acidity (%)	0.27	0.31	0.36	0.40
pH	4.6	4.0	3.85	3.78

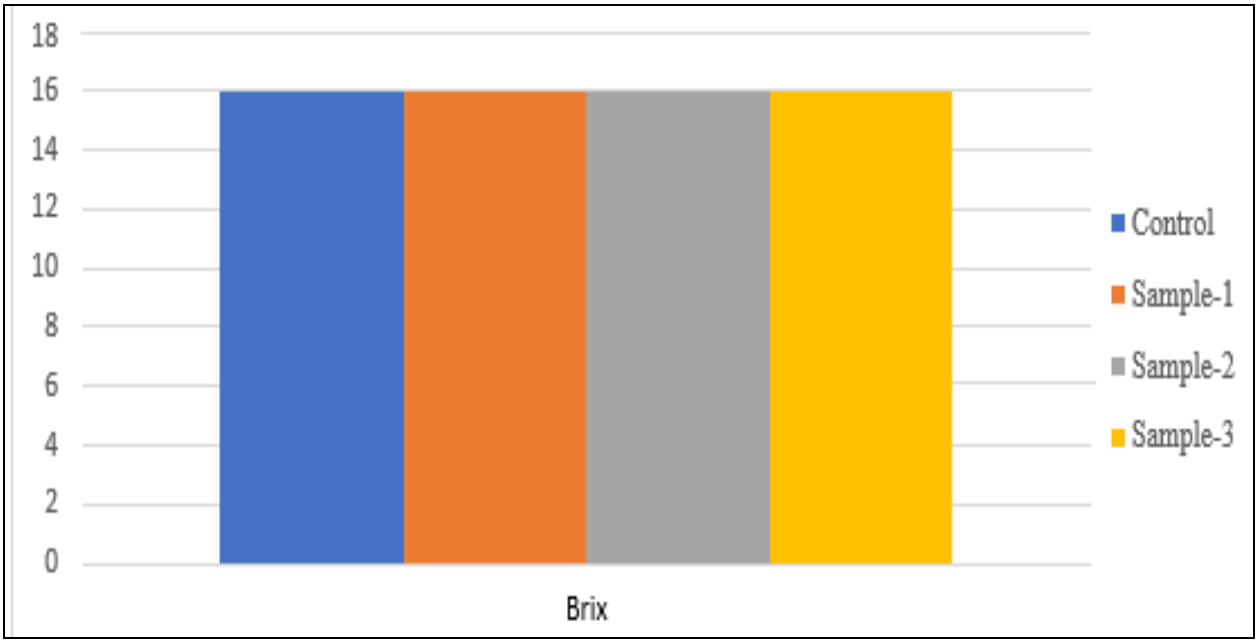

Fig 7: Comparison of ^{O}Brix

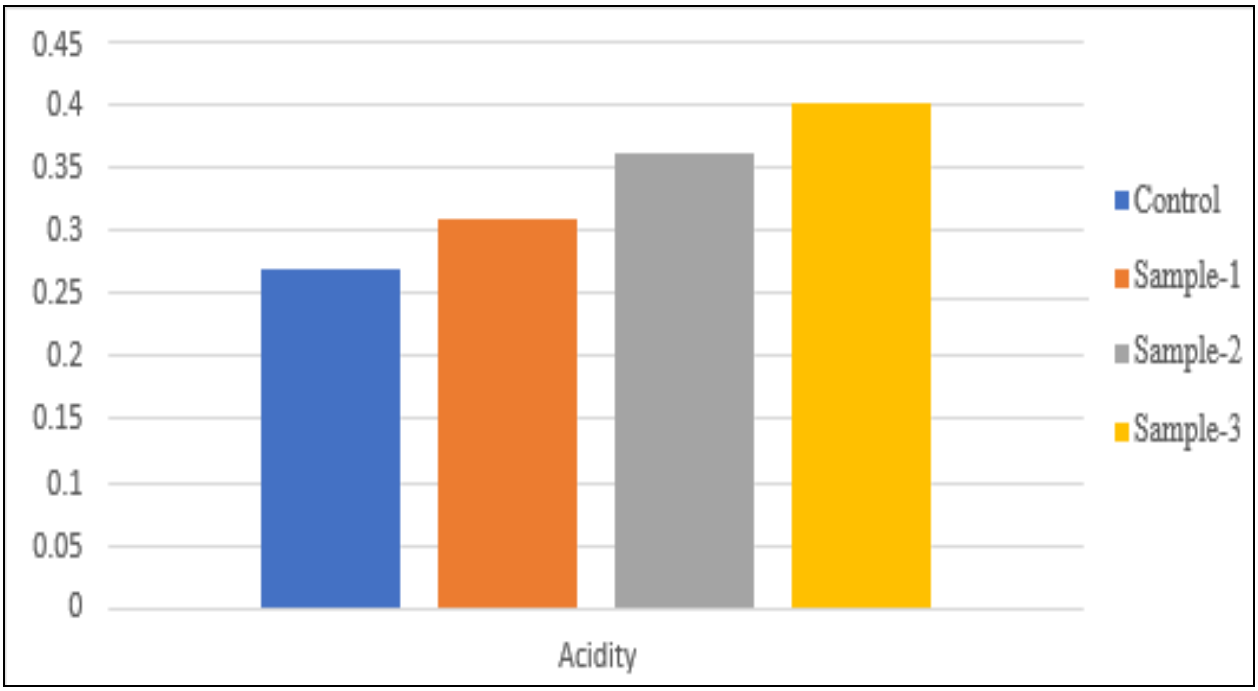

Fig 8: Comparison of Acidity (%)

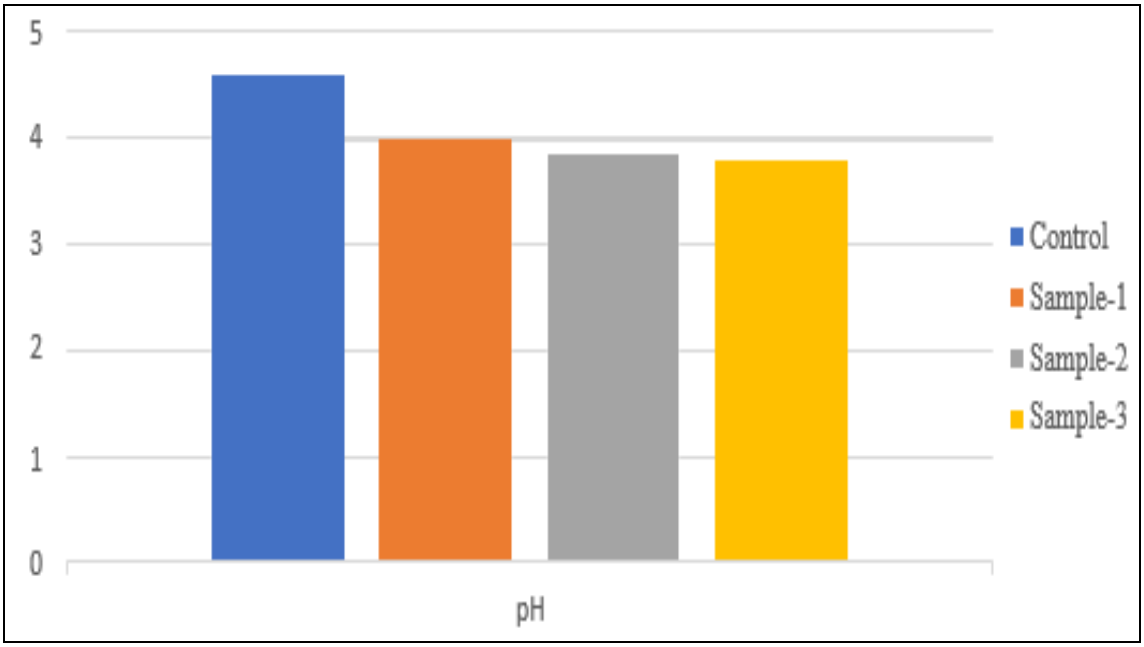

Fig 9: Comparison of pH

Here, we have taken three samples considering on percentage of orange concentrate. These are S1 (2.0% orange concentrate), S2 (3.0% orange concentrate) and S3 (5.0% orange concentrate). Above tables are declared that in all products ˚Brix is same but different in others parameters like as pH and acidity. When we increased the orange concentrate in batch, we observed that the pH value decreased and acid value generally increased. On the other hand, when we decreased the percentage of orange concentrate, generally the acidic value decreased and the pH value increased. The increase in p^H during storage was also observed (Eugenia dysenterica DC). The values of pH of approximately 3.2 were important to prevent the crystallization of saccharide and to balance the gel formed whereas the increase in this parameter may have caused the destabilization of pectin gel.

Sensory evaluation

The sensorial properties were determined by trained panelists and the results of the sensory analysis of orange jelly drinks samples are presented. The panelists scored showing their degree of preference in respect of color, flavor, texture, taste and overall acceptability of the Jelly drinks. In particular, quality of Jelly drinks product containing 2% orange concentrate appeared to be much higher in comparison with other samples. In fact, the production parameter of jelly drinks were established based on the orange concentrate presenting good results color, flavor, texture and taste. Sample S1 secured the highest score and was best suited for taste among the all sample.

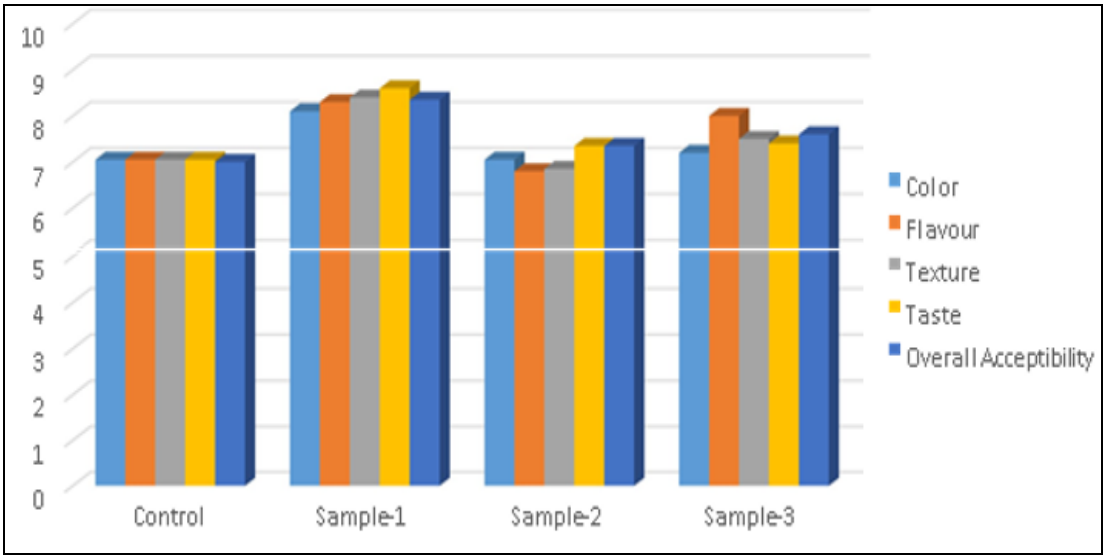

Fig 10: Sensory evaluation of jelly drinks

For overall acceptability preference showed that color, flavor, texture and taste is liked extremely, so the results obtained in the experimental step highlighted that the overall quality of Jelly drinks enriched with the required orange concentrate had a score below or close to acceptability threshold for most of the examined sensorial attributes. Therefore, in order to improve the sensorial quality of Jelly drinks with 2% orange concentrate were

used in the experimental step.

Conclusion

The study demonstrates that using the orange concentrate and reduce water percentage product quality are remarkably improved such as color, flavor texture, taste and mouth feel. Orange jelly drinks prepared by adding orange concentrate 2% and sugar syrup cooking by 85°C temperature after cooling, drying product are packaged. We took four samples P, S1, S2, S3 particularly 0%, 2%, 3% & 5% orange concentrate. Overall sample analysis report of sample S1 which are produced with 2% orange concentrate best results and others parameters respectively Brix: 16, pH: 4.0 and acidity: 0.31.

As per evaluation of four (04) samples overall it can be concluded that sample S1 which has been used 2% orange concentrate is better as compared with sample P, S2, S3 because sample S1 color, texture, flavor is good and has low acidity and pH.

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