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Proceeding

Development and Quality Evaluation of Dehydrated Kiwi Candy

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Abstract: Kiwi fruit is a member of the "Actinidiaceae" family, with over 76 species and cultivars with a wide range of sensory attributes. The kiwi fruit is one of the most popularized fruits in the world, and it is high in nutrients such as vitamins, phytochemicals, and minerals. Candies have a low nutritional value, because of their principal constituents, which include gelling agents and sugar. In comparison to conventional candy, the goal of this project is to make a natural and healthful dehydrated candy utilizing fresh kiwi fruit. The fruits were grabbed from the local market of Faisalabad. Two types of dehydrated kiwi candies were prepared (T1: peeled and T2 unpeeled). In the last step, the sweets were kept in a dehydrator at 50 degrees Celsius for 24 hours. Candy's physiochemical, color measurements and sensory characteristics were assessed. In all physio-chemical and sensory evaluations, the unpeeled candy produced the best results. The unpeeled candy's TSS value, titratable acidity, pH, and vitamin C content was 77.9°, 0.36%, 4.5, and 37mg respectively. Unpeeled candy has a slightly dark color as compared to peeled candy and color values L*, a* and, b* were 43.89, 0.43 and, 11.34 respectively. Candy's sensory study employing a 9-point hedonic scale reveals the highest consumer acceptability in terms of flavor, scent, mouth feel, and texture.

Keywords: Kiwi fruit; kiwi candy; peeled candy

1. Introduction

Kiwifruit (*Actinidia deliciosa*) is found to be a highly nutritious fruit due to its high vitamin C content and high antioxidant capacity due to a diverse array of phytonutrients such as flavonoids, carotenoids, lutein, phenolics, and chlorophyll [1].

One of the most popular fruits is kiwifruit on the international market, because of its excellent nutritional and therapeutic value as well as its numerous health benefits. It is native to China and was transplanted in New Zealand in the year 1904 when it became one of the most recent fruit crops to attain international recognition and economic significance. With a yearly output of over 1.066 million metric tons (38.7% of global production) With an estimated planting area of 180,000 hectares (58% of total global planting area), China is presently the world's leading kiwifruit producer. Kiwifruit juice, vinegar, wine, yogurt, jelly, and jam are all popular kiwifruit products in addition to fresh consumption. The kiwifruit is extremely nutritious and therapeutic and has several health advantages, such as anti-diabetic properties, anti-inflammatory properties, cardiovascular protective characteristics, laxative activity, and antibacterial activities. Kiwifruit, vinegar, juice, and wine were shown to be high in terms of vitamin C and polyphenols, with strong biological activity, although jam and dried kiwifruit slices included addi-

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tional mineral elements. Kiwi fruits have an extremely limited shelf life due to their high perishability. The production of jams subjected to a thermal procedure, such as pasteurization, is a viable option for extending the shelf life and storage period [3]. Green kiwifruit contains protein (1.14g), fat (0.52g), carbohydrates (14.7g), fiber (3g), sugars (9g), ash (0.61), water (83.1g), calcium (34mg), iron (0.31mg), magnesium (17mg), phosphorus (34mg), potassium (312mg), vitamin C (80-120mg) and provide 255kj energy per 100g [2].

Water is dominant constituent in fruits and its withdrawal prevents harmful physiochemical and microbial reactions, resulting in extended storage time. Hence, dehydration technique enables to preserve fruits and their products, extending their shelf life, reducing their weight and volume, thus minimizing the packaging, storage and transportation cost. Therefore, modified the flavor and texture properties and resulting new product with maintained or even improved final quality [4].

Therefore, the aim of this study was to make a natural and healthful dehydrated candy utilizing fresh kiwi fruit and sensory evaluation of kiwi candy to check consumer acceptance.

2. Material and Methods

2.1. Procurement of raw material

Fresh, mature, and healthy kiwi fruits were grabbed from the local market of Faisalabad and transported in corrugated soft board cartons to the Ayyub Agriculture Research Institute (AARI). Pectin, citric acid, sugar, sodium benzoate, and other necessary equipment such as glass bottles, blender, saucepan, spoons, weight scale, stirrers, and so on were used to prepare candies. All chemicals used of analytical grade (Sigma Aldrich, Germany).

2.2. Ingredients concentration

- Kiwi: 1kg
- Sugar: 1kg
- Water: half liter
- Chemicals:
- Calcium chloride: 1g
- Citric acid: 4g
- Potassium meta-bi sulphate (KMS): 1g
- Sodium benzoate: 1g

2.3. Preparation of raw material

After washing and cleaning of fruits, half kiwi fruit were peeled and half remained unpeeled. After that we cut the kiwi fruit into slices and dipped in calcium chloride solution for 5 minutes.

2.4. Preparation of kiwi candies

The two types of kiwi candies were prepared. Both types of sliced kiwi fruit were dipped in citric acid and KMS solution for 15-20 minutes. After that they were dipped in sugar syrup (1kg sugar was added in 1 litter of water) for 15 minutes. Brix of sugar syrup was 65. Then kiwi was blanched and placed in cloth and kept in hot water for 3 to 4 minutes. Then placed it in dry paper towel to drain out excess water. Placed in dehydrator at 50°C for 24 hours. Kiwi was removed from dryer next day, cooled and was ready to pack in jars [5]. As Figure 1.

Figure 1. Preparation of the two types of kiwi candies; and Kiwi was removed from dryer next day, cooled and was ready to pack in jars.

2.5. Analytical experiments

The prepared peeled and unpeeled candies are tested for their physiochemical measurements and color values. Total soluble solids measured with the refractometer, firstly refractometer was calibrated and then sample was prepared by dissolving candy into distilled water followed by mixing and filtration. Then refractive index was measured to calculate the candy TSS [6]. The pH of candy was measured with pH meter [7]. Vitamin C contents was determined by using 2, 6-Dichlorophenol-Indophenol visual Titration Method [8]. Color measurements were measured according to the CIE Lab system (L*, a*, b*) using digital colorimeter [9]. Data was statistically analyzed.

3. Results and Discussion

The developed dehydrated (peeled and unpeeled) kiwi candy was subjected to physio-chemical analysis and color measurements.

The comparison is as Table 1.

Table 1. The developed dehydrated (peeled and unpeeled) kiwi candy was subjected to physio-chemical analysis measurements.

Samples	TSS (Brix)	Acidity (%)	pH	Vitamin C
Peeled candy	71.450 ± 0.04	0.0823 ± 0.002	4.1100 ± 0.01	30.040 ± 0.03
Unpeeled candy	77.950 ± 0.02	0.3643 ± 0.004	4.55 ± 0.001	37.877 ± 0.15

Values expressed as the mean ± standard deviation derived from triplicate samples (n= 3) ($p< 0.05$).

The color measurements were as Table 2.

Table 2. The developed dehydrated (peeled and unpeeled) kiwi candy was subjected to color measurements.

Samples	L*	a *	b*
Peeled Candy	50.343 ± 0.02	3.2667 ± 0.01	22.233 ± 0.02
Un-Peeled Candy	43.857 ± 0.03	0.4633 ± 0.03	11.363 ± 0.02

Values expressed as the mean ± standard deviation derived from triplicate samples (n= 3) ($p< 0.05$).

Based on the results obtained, the study successfully achieved the goals of developing and evaluating the quality of dehydrated kiwi candy. The physio-chemical analysis provided insights into the candy's TSS (Brix), acidity, pH, and vitamin C content, while the color measurements (L*, a*, b*) allowed for a comprehensive evaluation of its visual characteristics. By comparing the peeled and unpeeled candy, the study examined the impact of different processing methods on the candy's sensory evaluation and consumer acceptance. The higher vitamin C content and slightly darker color of the unpeeled candy indicated its superior quality. Therefore, the study effectively demonstrated the development of dehydrated kiwi candy and evaluated its quality through various parameters, contributing to the understanding of this product's potential in the market.

4. Scope and limitations

After analyzing the physio-chemical and color measurements of the developed dehydrated kiwi candy, it is important to acknowledge the scope and limitations of the study. The scope of this research paper focuses on comparing the peeled and unpeeled candy in terms of TSS (Brix), acidity, pH, vitamin C content, and color measurements (L*, a*, b*). The study provides valuable insights into the sensory evaluation and consumer acceptance of the candies, highlighting the preference for the unpeeled candy due to its higher vitamin C content and slightly darker color. However, it is essential to acknowledge the limitations of this study. Firstly, the analysis was conducted on triplicate samples, which may not fully represent the entire population. Secondly, the study only considered the physio-chemical and color aspects, without examining other factors such as texture or shelf life. Additionally, the research was conducted within a specific timeframe and location, which may limit the generalizability of the findings. Future studies could explore a wider range of factors and conduct experiments in different settings to further validate these findings.

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Conflicts of Interest: The authors declare no conflict of interest.

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