

## Research Article

# Quality evaluation of peach jam prepared by incorporation of *Aloe vera* gel

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### Citation

Wasif Ali, Asia Latif, Muhammad Mazahir, Azher Mehdi, Shaukat Bashir and Muhammad Asim. Quality evaluation of peach jam prepared by incorporation of *Aloe vera* gel. Pure and Applied Biology. Vol. 10, Issue 4, pp935-944. <http://dx.doi.org/10.19045/bspab.2021.100097>

Received: 05/10/2020

Revised: 15/12/2020

Accepted: 25/12/2020

Online First: 02/01/2021

### Abstract

This research work was conducted to evaluate the sensual characteristics of peach and *Aloe vera* gel (*Aloe Barbadensis Miller*) blended jam. Different proximate and sensory parameters such as total soluble solids, moisture content, crude protein, crude fiber, crude fat and ash content were analyzed. Results revealed that the maximum score for proximate analysis was found in jam sample Treatment<sub>3</sub> (Crude protein 0.42, ash content 0.40, Crude fats 0.15, Crude fiber, 1.26, carbohydrates 62.77, and total calories 254.15 Kcal). The sensory attribute result showed that sample T<sub>3</sub> was remarkable as compared to other treatments (color 7.6, flavor 7.8, taste 7.8, texture 7.7, and overall acceptability 7.7). Based on sensual acceptability it was concluded that virtuous quality of jam can be made by incorporating 85% Peach + 15% *Aloe vera* gel blend.

**Keywords:** *Aloe vera*; Blend; Jam; Peach; Sensory analysis

### Introduction

Peach (*Prunus persica L.*) belongs to the family Rosaceae and genus Prunus. It is assumed to be the “Queen” of fruits, and having exceptional status, following the apples in allure. It is an incredible fruit, comprises scrumptious flavor, a superior glance of color and contains extremely healthy nutrients. It is a wealthy source of vitamins A, C and also contains potassium and fiber. Their chemical make-up includes 10.0-21.5% dried material, 5-12% carbohydrates, 0.4-1.3% protein, 0.2-0.7% pectin, 0.6-0.86% minerals and vitamins [1]. It has anti-aging possessions and also assists in detoxification, absorption and cellular healthiness [2]. Peach also contains Carotenoids that have

essential properties regarding human health [3], antioxidant activity [4], obstruction from heart illnesses [5], cancer [6], eye diseases [7] as well as pro-vitamin A activity.

Enormous food products were made from peach fruit. Every product is different in terms of taste, texture and flavor. People like the diverse products of peach by their choice of selection. Peach fruit is consumed in many forms such as in the form of the original fruit, as mash, mousse also smoothies, for instance; topping for yogurt, ice cream, cereals, pancakes, or waffles, a filling for pies, tarts, and cobblers. In Pakistan, the surrounding is quite encouraging for peach production. The total production of peach was 56,137

tons in 2016-17, covering a total area of 14024 Hectares. Area (hectares) under peach production was in Punjab 39, KPK 6330 and Balochistan 7655 (Government of Pakistan, 2017).

*Aloe vera* (*Aloe Barbadensis* Miller.) is a plant species of genus aloe, family Liliaceae, and contains more than 300 species. There are two fractions of *Aloe vera* leaf; Gel and latex. In *Aloe vera*, the gel is apart from which a majority of people are well-known. It is present in the central portion of the *Aloe vera* leaf; it is an odorous and transparent fluid. Whenever a leaf of *Aloe vera* was chopped, aloe latex leaks from it. It was yellow in shade and has a bitter taste [8]. In consuming *Aloe vera*, the gel was the most secure portion. *Aloe vera* gel is clear as crystal mucilaginous jelly-like material, conveying the parenchymatous cells of salubrious, contribute around 70% (70 g gel/100 g pulp) from the mash by mechanical expulsion [9]. The gel has an exceptionally excessive water content of about 99%–99.5% [8], remaining are soluble solids 0.5%–1%. The pH range of gel acidity of 4.4–4.7 [10]. The gel is incorporated with antioxidant vitamins, for instance, vitamin A, C, E, B1, B3, B3 (riboflavin) as well as also choline and folic acid. A few scientists recommended that there was the tiniest amount of vitamin B12, which was typically accessible from the animal source. The gel additionally contains saponins (around 3%); this may contribute purifying and cleaning properties of the gel [11]. The *Aloe vera* gel also consists of enzymes, that includes bradykinesia, cellulose, carboxypeptidase, catalase, amylase, and oxidase [12].

*Aloe vera* gel is also utilized for curative purposes. Previously stated benefits of *Aloe vera* gel incorporate curing burn wounds, immunizing fresh-cut injury, defense of skin harm from x-rays, lung cancer, inertia problem along with the dropping of blood sugar. Therapeutic uses of *Aloe vera* gel includes cut injury healing [13], anti-inflammatory action

[14], effects on immune system [15], moisturizing and anti-aging agent [16], antitumor activity [17], laxative effects [18]. Medicinal use of *Aloe vera* includes cosmetic & skin protection application [19], antiseptic [20], anti-diabetic [21], anticancer properties [22]. A study based on antimicrobial activity of *Aloe vera* includes antibacterial [23], antifungal [24], and antiviral activity [25].

*Aloe vera* was utilized as a constituent for functional groceries, fundamentally in the improvement of hale and energetic beverages and drinks like tea [26]. *Aloe vera* is incorporated in food products like bread [27], mixed fruit jam [28], Yogurt [29], and cheese [30]. The jam is a partially firm product, prepared from the entire fruit or portion of fruit, mixed with sweetening agents (such as sucrose), with or without the addition of water and cooked to the endpoint; where it attains a unique structure. Generally, fruits are preferred for the preparation of jam. According to the standard specification devised by the U.S.A. food drugs and Cosmetics Act, the jams should be prepared with not less than 45 parts of fruit juice and 55 parts of sugar (w/w) or other optional sweetening ingredients. The formula for preparing fruit jam was difficult with several variables that influence the excellence of finishing the product. The constituent of fruit jam consists of fruit mash, sugar, pectin, as well as citric acid; which was used to bring the pH into a preferred zone [31].

*Aloe vera* gel is rich in nutritional and functional attributes but its oral utilization is negligible due to various factors such as awful after-taste effect and off-flavor, thus it is mainly used for external use only [19]. The main purpose of this research work was to evaluate the quality attributes of peach and *Aloe vera* gel jam samples to identify the best acceptable blend ratio (peach and *Aloe vera* gel) among different concentrations. The Present study helped to explore that spectacular fruit jam can be made from *Aloe vera* gel with different

fruit blends.

### Materials and Methods

The research was conducted in the Department of Food Technology, Institute of Food and Nutrition Sciences, Pir Mehr Ali Shah, Arid Agriculture University Rawalpindi, Pakistan. Best Quality of peach fruit was purchased from district Swat, Khyber Pakhtunkhwa, Pakistan and transported to the laboratory. The research was conducted in the Department of Food Technology, Institute of Food and Nutrition Sciences, Pir Mehr Ali Shah, Arid Agriculture University Rawalpindi, Pakistan. The best quality of peach fruit

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### Preparation of sample

Fresh as well as mature leaves of *Aloe vera* were rinsed and by removing the external part of the leaf with a sharp blade, Gel was extracted from the interior part. The blend was stored in a cool place at 4-8°C. Peach fruit was rinsed to eradicate the dirt from the exterior. After that, the peach was peeled and pits were removed. Jam was prepared from a different concentration of peach pulp and *Aloe vera* gel as showed in (Table 1).

**Table 1. Treatment Applied in this research work**

Ingredients	Samples				
	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
<i>Aloe vera</i> Gel %	00	05	10	15	20
Peach Pulp %	100	95	90	85	80
Sugar (g)	500	500	500	500	500
Pectin (g)	05	05	05	05	05
Citric Acid (g)	05	05	05	05	05
Sodium Benzoate (g)	02	02	02	02	02

### Proximate analysis

The jam samples were analyzed for physicochemical properties such as total soluble solids, moisture content, crude protein, crude fiber, fat and ash content by using standard methods of AOAC, 2005 [32].

### Energy contents

Total energy was calculated in Kilocalories (Kcal) and determined by utilizing the following formula [33].

$$\text{Calories (Kcal/g)} = (\% \text{ protein} \times 4) + (\% \text{ carbohydrate} \times 4) + (\% \text{ fat} \times 9)$$

### Sensory evaluation

The jam sample was sensory assessed for flavor, taste, texture and overall acceptability utilizing 9 points hedonic scale as performed by [34]. A board of seven qualified judges was selected, which includes, teaching faculty and postgraduate scholars.

### Statistical analysis

The data was analyzed and interpreted by using analysis of variance technique,

comparison of means and other relevant statistical tools [35].

### Results and Discussion

Different test methods were performed to determine the nutritional and sensory attributes of all the *Aloe vera* jam samples. Proximate Analysis includes total soluble solids, moisture content, crude protein, crude fiber, fat and ash content. Sensory parameters consist of color, flavor, taste, texture and overall acceptability. The resulted values are recorded in (Table 2-4) and statistically investigated using One-way ANOVA analysis of variance, utilizing software Minitab 18. The outcomes were discussed as follows

### Physiochemical parameters

#### pH

pH is a scale used to specify the acidity of a solution. As, acidic solutions have a lower pH, while basic solutions have a higher pH. The pH of food products has a significant factor in making jam; it assists in the development of an ideal gel and taste

of jam. Low pH in food products prevent microbial growth thus it increases the shelf life, while higher pH value decreases the shelf life due to microbial deterioration [36]. The highest pH content in the jam sample was recorded in sample T<sub>0</sub> (3.51) while the lowest pH was observed in sample T<sub>4</sub> (3.05), as given in Table No.02. The pH increases with the addition of *Aloe vera* gel which is acidic; consequently, increases the pH of jam. No critical impact was recorded on the pH of a jam by adding Pectin. Previously research study revealed that the pH of strawberry jam ranges from 3.20 to 2.91 [37]. Similarly, Roselle reported that the pH of the jam was between 2.82 to 3.7 [38].

#### **Moisture content**

Moisture content is the amount of moisture in the sample. In the shelf life of jam, moisture is an indispensable parameter. The high moisture content of jam makes it susceptible to microbial [36]. During this study, the moisture content varied from 29.2 to 36.23%. The highest moisture content was observed in sample T<sub>4</sub> (36.23%), while the lowest moisture content was recorded in sample T<sub>0</sub> (29.2%). A significant increase in moisture of jam was reported because of the addition of *Aloe vera* gel in a jam; which contains 98% of water. Previously study revealed that the moisture content in Sapodilla jam was reported between 36.44 to 32.53% [39]. Similarly, the moisture content in the strawberry jam was recorded between 25.78 to 29.67% [40].

#### **Ash Content**

Ash material refers to minerals like calcium, phosphorus, and iron. However, the largest number of minerals has genuinely moderate instability at peak temperatures; some are unstable and might be partly lost, e.g., iron and zinc. Commonly, lower ash content demonstrates that the food item is certifiably not a rich origin of minerals. High Ash content reduced the shelf life of jam, because of the utilization of minerals by microbes for their development [41].

Statistical results showed that there was a significant difference ( $p > 0.05$ ) between all the jam samples. Ash content calculated in the present study varied from 0.53% to 0.37%. The highest content of ash was found in sample T<sub>0</sub> while the lowest value of ash content was found in sample T<sub>4</sub>. The content of ash in jam samples was significantly decreased with a decrease of peach concentration in jam. As the ash content in peach is very low. Previously study is correlated with our results, stated that the ash content in Cola and strawberry jam was ranged from 0.3% to 0.6% [42].

#### **Total soluble solids (Brix°)**

Sugar content also refers to the total soluble solid or index of sweetness. In most cases, it is correlated with the maturity and ripeness of fruits [43]. It is the major considerable ingredient in jam, which helps in shelf-life prolonging of a jam [44]. Statistical calculations revealed that there was a non-significant difference between jam samples T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub>. However, these jam samples showed a significant difference ( $p < 0.05$ ) from jam sample T<sub>4</sub>. Results regarding total soluble solids of such jam samples ranged from 65.2° to 67.1° Brix as given in (Table 2). The result disclosed that a high level of soluble solids was observed in sample T<sub>1</sub> (67.1° Brix) while the lowest level was found in sample T<sub>3</sub> (65.2° Brix). To retard the microbial growth; the total soluble solid of the jam was maintained in the preferred zone. According to earlier research, the total soluble solids value in strawberry and black-plum jam was in the range of 66.12° to 68.8° Brix [45].

#### **Crude protein**

Protein is composed of amino acids, which are organic compounds, made of carbon, hydrogen, nitrogen, oxygen or sulfur. Amino acids are the building block of proteins, and proteins are the building blocks of muscle mass. The high protein content in jam shows a higher level of nutritional value. The statistical result showed that there was a significant difference ( $p > 0.05$ ) among all the jam

samples. Results regarding the protein content of such samples varied from 0.56% to 0.38% and are given in (Table 3). A higher level of protein was found in jam sample T<sub>0</sub> (0.56%) and the lower value was found in sample T<sub>3</sub> (0.42%). The protein content in jam was significantly decreased due to minimizing the peach content in jam and maximizing the *Aloe vera* gel content. An earlier study reported that the average mean of protein content in mixed fruit jam samples (*Aloe vera*, pineapple, and mango) were about 0.6% [28].

#### **Crude fats**

Dietary fats are not a source of energy; it acts as structural building blocks of the body, it transports the fat-soluble vitamins, involved in vital physiological processes in the body, and is indispensable for several important biological functions including growth and development. The low-fat value also decreases the caloric value of the food product. The minimum amount of fat is good for human health, especially those underweight control programs. The mean result regarding the fat content of such jam samples range from 0.12% to 0.17%, as presented in (Table 3). The result showed that a high level of fat content was 0.17% (sample T<sub>1</sub>). While the lowest level of fat was found as 0.12% (sample T<sub>3</sub>). *Aloe vera* gel does not affect fat content because, in *Aloe vera* gel, fats are found in trace amounts. The average crude fat content in guava and papaya jam was 0.19% [46].

#### **Crude fiber**

Fiber is a type of carbohydrate that the body cannot digest. Though most carbohydrates were broken down into sugar molecules, fiber cannot be broken down into sugar molecules and passes through the body undigested. The fiber content of jam secures the colon mucous film by excluding malignant growth, causing elements from the colon [47]. The fiber content of such jam samples ranged from 1.03% to 1.83% (as mentioned in (Table 3). The highest value of fiber

content was observed in sample T<sub>0</sub> (1.83%), while the lowest value was 1.03% in sample T<sub>3</sub>. The significant difference in fiber content was due to the addition of *Aloe vera* gel in a jam, which is very low in fiber content.

#### **Carbohydrates**

Carbohydrates are the sugars, starches, and fibers found in fruits, grains, vegetables, and milk products. Gigantic carbohydrate content in jams can be related to the enormous occupancy of sugar content. Fruit jams are significant in the eating routine of every age people, as they supply rapid energy. During the analysis of carbohydrate content in such jam samples, it was observed that the mean carbohydrates values ranged from 67.86% to 62.31% as given in (Table 3). The result substantiated that the highest value of carbohydrate content was recorded in sample T<sub>0</sub> (67.86%), while the lowest value was observed in a sample T<sub>3</sub> (62.31%). Carbohydrates level was significantly decreased with the addition of *Aloe vera* gel content in jam; as *Aloe vera* gel has very low carbohydrate content. Earlier study reveals that carbohydrate content in grape and papaya jam varies from 62.10% to 67.16% [48, 49].

#### **Calories**

Calories are defined as the energy released from carbohydrates, fats, and proteins. Greater calories in jam products raise the threat of diabetes. Statistical calculations revealed that there was a non-significant difference ( $P < 0.05$ ) between jam samples. The result of this study showed that the total calories found in the jam were in the range of 251.93 to 275.28 Kcal as mentioned in (Table 3). The mean result of all jam samples was investigated, the maximum calories were found in sample T<sub>0</sub> (274.33 Kcal) and the minimum calories were found in sample T<sub>3</sub> (250.33 Kcal). Earlier investigation elaborates that total calorie in grape and marolo jam range from 266.13 to 273.89 Kcal [50, 47].

#### **Sensory evaluation**

Sensory assessment of the jam was performed with a group of 12 specialists. The panelist consists of randomly selected staff and students (both males and females). The five samples were exhibited for the hedonic scale examination, average sums of color, flavor, taste, texture and overall compliance were presented in (Table 4). The judges evaluated the jam

sample by utilizing nine-fact hedonic values; 1-9. Start from extremely poor to Excellent [34]. The panelist scored the sample for four sensory attributes e.g. color, flavor, texture, and overall acceptability. The quality attributes were analyzed from the average sum of three assessments.

**Table 2. Mean of Moisture, pH, Ash, TSS (°Brix) of the peach and *Aloe vera* blended jam**

Treatments	Moisture	pH	Ash	TSS (°Brix)
T0	29.03±1.86A	3.51±0.10A	0.53±0.02A	66.96±0.97A
T1	31.91±1.41A	3.39±0.07A	0.47±0.01B	67.13±0.81A
T2	33.38±1.68AB	3.32±0.05AB	0.44±0.01C	66.23±0.40A
T3	34.98±1.63B	3.15±0.22BC	0.40±0.01D	65.26±0.45AB
T4	35.77±0.93C	3.05±0.10C	0.36±0.00E	66.93±0.40B

**Table 3. Mean of Protein, Fat, Carbohydrates, Fibre, Calories of peach and *Aloe vera* jam**

Treatments	Protein	Fat	Fibre	Carbohydrates	Calories
T0	0.56 ± 0.01A	0.17±0.00 A	1.83±0.1 1A	67.86±1.96A	275.28±7.74A
T1	0.51 ± 0.01B	0.16±0.00 AB	1.66±0.1 5A	65.26±1.59AB	264.62±6.27AB
T2	0.47 ± 0.01C	0.16±0.01 BC	1.40±0.1 0B	64.15±1.74BC	259.91±6.87BC
T3	0.42 ± 0.1D	0.15±0.00 C	1.26±0.0 5B	62.77±1.71BC	254.15±6.79BC
T4	0.38 ± 0.01E	0.12±0.00 D	1.03±0.0 5C	62.31±0.87C	251.93±3.51C

**Table 4. Mean of Color, Flavor, Taste, Texture, Overall acceptance of the peach and *Aloe vera* jam**

Treatment	Color	Flavour	Taste	Texture	Overall acceptance
T0	5.66±0.57C	7.33±0.57C	7.16±0.28AB	6.66±0.57 C	6.70±0.26C
T1	6.66±0.57A BC	7.50±0.50BC	7.33±0.57AB	6.33±0.57 B	6.95±0.26C
T2	7.33±0.57A B	7.66±0.57AB	7.50±0.50AB	7.50±0.50 AB	7.50±0.00A B
T3	7.66±0.57A	7.83±0.76A	7.83±0.28A	7.83±0.28 A	7.79±0.25A
T4	6.33±0.57B	7.16±0.76B	6.83±0.76B	5.66±0.57 D	6.49±0.21D

### Color

Color is a significant attribute concerning the buyer's sentiment. There was a significant difference in jam sample T<sub>0</sub>, and T<sub>4</sub>, and a non-significant difference

(P<0.05) between jam samples T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub>. During this study, the color means range from 5.66 to 7.66. The high score was recorded from jam sample T<sub>3</sub> (7.66). However, in jam sample T<sub>0</sub>, low score was

recorded (5.66). Earlier study reveals that the change in color affects the score of the jam [51].

#### **Flavor**

The flavor is the sensual imprint, which is estimated primarily by the chemical sanities of mouth-feel and aroma. The Flavor is connected with the aroma of jam. There was a significant difference ( $P < 0.05$ ) in jam sample  $T_0$ , and  $T_4$ , and a non-significant difference between jam samples  $T_1$ ,  $T_2$ , and  $T_3$ . The mean flavor ranges from 7.16 to 7.83. The higher average value was noted in jam sample  $T_3$  (7.8). However, the lower level was recorded in jam sample  $T_4$  (7.16). The significant score was recorded due to a higher concentration of *Aloe vera* gel and the lower concentration of peach content.

#### **Taste**

Taste is the first sensory attribute for accepting or rejecting any food product. There was a non-significant difference ( $P < 0.05$ ) among the jam samples. The highest average level was recorded in jam sample  $T_3$  (7.8) and the lowest average level was recorded in jam sample  $T_4$  (6.8). The significant score was recorded due to the remarkable concentration of *Aloe vera* gel in the jam. The significant and non-significant trend was also recorded in the taste of apple and sapota jam [52, 53].

#### **Texture**

Texture comprises the characteristics of a jam; judges analyzed it by its appearance or by contact. It's the first physical attribute of the food product. Good texture of jam has a firm, semi jell like texture without free liquid. There was a non-significant difference between jam samples  $T_2$  and  $T_3$ . However, a significant difference was recorded between jam samples  $T_0$ ,  $T_1$ , and  $T_4$ . The highest average value was recorded in jam sample  $T_3$  (7.8). However, the lowest value was recorded in jam sample  $T_4$  (5.6). The lowest score was recorded due to *Aloe vera* gel's higher concentrations; as *Aloe vera* gel contains 98% of water. A significant and non-significant trend in the texture

possessions of strawberry and apple jam was recorded [54, 55].

#### **Overall Acceptance**

Following the ANOVA table, it was clear that there was a significant difference ( $p < 0.05$ ) within jam samples; excluding jam samples  $T_2$  and  $T_3$ , which have a non-significant difference concerning the overall satisfactoriness of the jam trials. The mean score for overall acceptability of jam samples ranges from 6.49 to 7.79. The maximum average level was recorded in sample  $T_3$  (7.7). However, the minimum value was recorded in sample  $T_4$  (6.5). The total result showed that sample  $T_3$  scored higher in overall acceptability. This means that the panelists have accepted the jam sample  $T_3$  for consumer's acceptability. Same results were observed in the study of Jain, Jain, and Nema, who reported selective diffraction in overall acceptability in guava and papaya jam [56].

#### **Conclusion**

It was concluded from the study that the combination of *Aloe vera* gel in peach jam enhanced the quality of jam. The overall result shows that jam sample  $T_3$  scored higher in overall acceptability. The jam sample  $T_3$  generates fewer calories as compared to other treatments, which is good for human health especially for those who were underweight control programs. The treatment ( $T_3$ ) incorporated with 15 percent *Aloe vera* gel and 85 percent of peach pulp were categorized as the finest quality jam in sensual and nutritional attributes than the rest of treatments, by the judges for consumers and industrialization of such kind of functional food product. It is recommended that the *Aloe vera* gel could be incorporated in a product like jam with other fruit pulp (e.g. Mango, Strawberry, Blackberry etc) and investigates the physicochemical changes during storage.

#### **Authors' contributions**

Conceived and experiments designed: A Latif, Performed the experiments: W Ali & M Asim, Analyzed the data: W Ali &

M Mazahir: Contributed reagents/materials/ analysis tools: S Bashir & A Mehdi, Wrote the paper: W Ali & A Mehdi.

### Acknowledgements

The first author extremely acknowledged supervisor for their support, guidance and cooperation throughout the research. All authors were thankful of IFNS Arid Agriculture University Rawalpindi for support and providing research environment. All the authors have equal contribution for planning of research work, arrangement of laboratory facilities, statistical analysis and support to finalize the research goals. The authors have no conflict of interest.

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