Collaboration for SDG best practice:

1. Olive Oil Production:

Faculty and students from the University of Poonch Rawalakot participated in the "Pak International Gala," organized in collaboration with the Pakistan Oil Seed Department, with the goal of increasing olive oil production per acre. At the event, researchers from both Pakistan and the international community shared their findings and expertise on enhancing olive oil production. The UPR team aims to collaborate with various stakeholders to boost olive production in Azad Jammu and Kashmir.

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کشمیر دھرتی

راولاکوٹ

چیف ایڈیٹر: عابد صدیق

جلد 02	جمعرات 30 نومبر 2023ء 15 جمادی الاول 1445ھ 17 مگھر 2080	صفحات 04 / قیمت 20 روپے	شمارہ نمبر 224

جامعہ پونچھ طلبہ کی قومی نمائش میں شرکت آزاد کشمیر میں زیتون کاشت پر تبادلہ خیال

نمائش کا اہتمام آئل سیڈ ڈیپارٹمنٹ نے زیتون درخت کے عالمی دن پر کیا، غیر ملکی سائنسدانوں نے مقالات پیش کیے

کم زرخیز زمینوں کی آباد کاری کیلئے کسانوں کو تکنیکی معاونت فراہم کرنا ہوگی، ڈاکٹر شاہد اقبال، طلبہ اور اساتذہ کی واک

اسلام آباد(دھرتی نیوز)جامعہ پونچھ راولاکوٹ کی فیکلٹی آف ایگریکلچر کے طلبہ اور اساتذہ نے اسلام آباد میں پاکستان آئل سیڈ ڈیپارٹمنٹ کے زیر اہتمام "پاک آلیو نیشنل گالا" 2023ء میں شرکت کی۔ آلیو گالا میں قومی اور بین الاقوامی سائنسدانوں نے تحقیقی مقالات پیش کئے ۔(بقیہ 23 صفحہ 03 پر)

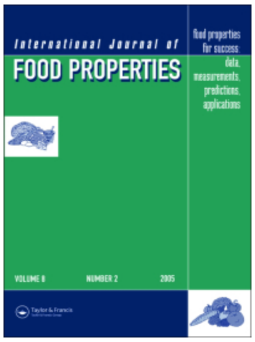
اسلام آباد، جامعہ پونچھ کی فیکلٹی آف ایگریکلچر کے طلبہ کا پاک آلیو نیشنل گالا میں ڈاکٹر شاہد اقبال اور دیگر کے ہمراہ گروپ فوٹو

بقیہ 23

نمائش میں شریک جامعہ پونچھ کے اساتذہ پروفیسر ڈاکٹر شاہد اقبال، ڈاکٹر محمد ریاض نے ملکی اور غیر ملکی محققین سے آزاد کشمیر میں زیتون کی کاشت اور سائنسدانوں کی معاونت پر تبادلہ خیال کیا۔ماہرین نے آزاد کشمیر کی زیتون کی کاشت کیلئے موزوں قرار دیتے ہوئے ہر ممکن تعاون کی یقین دہانی کرائی۔طلبہ نے زیتون پر عصر حاضر میں ہونیوالی تحقیق سے استفادہ حاصل کیا جبکہ طلبہ نے نمائش میں موجود زیتون سے تیل کشید کرنے والی مشینری،زیتون سے بنی اشیاء خوردونوش،زیتون کی کاشت کیلئے استعمال ہونیوالی کھادوں،کیڑے مار ادویات نے گہری دلچسپی کا اظہار کیا۔نمائش میں چیف لائبریرین خورشید قاسم نے بھی شرکت کی۔نمائش کے اختتام پر زیتون کی کاشت کے حوالے سے آگاہی واک کا انعقاد کیا گیا۔ڈاکٹر شاہد اقبال اعوان نے اظہار خیال کرتے ہوئے کہا کہ آزاد کشمیر کی کم زرخیز زمینوں کی آبادکاری کیلئے زیتون کی کاشت اہم سنگ میل ثابت ہوگی۔انھوں نے کہا کہ کسانوں کو زیتون کی کاشت کی جانب راغب کرنے کیلئے آگاہی اور تکنیکی معاونت فراہم کرنا ہوگی۔

2. Dried Pear Slices

The University of Poonch Rawalakot, in collaboration with King Faisal University and Kampala International University, Kampala, Uganda, conducted a research study on the quality attributes of dehydrated pear (Pyrus communis L.) affected by conventional and novel blanching techniques. The project, funded by the Deanship of Scientific Research (DSR) at King Faisal University under project no. GRANT 3888, aimed to assess how different blanching methods and blanching times influence the quality of dried pear slices. Since pears are available only seasonally, producing high-quality dried pear slices is a valuable commodity. In the study, pears were prepared, sliced, and subjected to three blanching methods: traditional hot water blanching, steam blanching, and microwave blanching, each with varying durations. After blanching, the slices were cooled and placed on filter papers to dry. The dried slices were then analyzed for chemical properties, including sugars, total soluble solids, titratable acidity, ascorbic acid, Brix/acid ratio, ash content, and moisture content. Sensory evaluations of color, taste, texture, and overall acceptability were conducted using a 9-point hedonic scale.



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Quality attributes of dehydrated pear (*Pyrus communis* L.) as affected by conventional and novel blanching techniques

Imtiaz Hussain[a], Zaheer Ahmad[b], Nagina Rafique[a], Saiqa Bashir[a], Faima Atta Khan[c], Fahad Al-Asmari[d], Bilal Fazil[a], Sadaf Oranab[e], Muhammad Abdul Rahim[c], and Chinaza Godswill Awuchi[f]

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ABSTRACT

A study was conducted to assess the impact of different blanching methods and blanching time on the quality of dried pear slices. Pears are only available seasonally, making the production of high-quality dried slices a valuable commodity. The pears were prepared and sliced before being blanched using three different methods: traditional blanching with hot water, blanching with steam, and microwave blanching for varying lengths of time. After blanching, the slices were cooled and then placed on filter papers to dry. The dried slices were then evaluated for chemical properties, such as sugars, total soluble solids, titratable acidity, ascorbic acid, Brix/acid ratio, ash content, and moisture content. Sensory properties such as color, taste, texture, and overall acceptability were also evaluated using a 9-point hedonic scale. The data generated were analyzed using a two-way analysis of variance (ANOVA) to determine the significant differences between variables. The results showed that the blanching method used had a non-significant effect ($p < .05$) on the chemical properties of the pear slices, such as total sugars (reducing and non-reducing), total soluble solids, titratable acidity, ascorbic acid, Brix/acid ratio, ash content, and moisture content. However, there was no significant effect on the sensory properties of color, texture, taste, and overall acceptability. In conclusion, blanching is an effective technique for preventing microbial growth and chemical and enzymatic reactions that can lead to the deterioration of dried pear slices. It also helps to remove moisture without adversely affecting the physicochemical and sensory quality attributes of the final product.

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Pears; traditional blanching; sensory analysis; nutritional evaluation

Introduction

Pears have a long history of cultivation and are considered one of the earliest fruits cultivated on Earth. According to Ahmed et al.,[1] pears are the second most commonly cultivated and consumed fruit in temperate regions and have a crucial role in the local economy. People enjoy

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pears not only for their delicious taste but also for their excellent nutritional profile, as they are a good source of macro and micronutrients, vitamin C, and dietary fiber.[2,3] According to the USDA,[4] a medium-sized fresh pear, weighing 100 g, consists of 15.46 g of carbohydrates, 0.38 g of protein, 9.80 g of sugars, 0.12 g of fat, and is a good source of vitamins, including 4.20 mg of vitamin C, and minerals, such as 11.00 mg of magnesium, 119.00 mg of potassium, 0.10 mg of zinc, 7.00 mg of iron, and 83.71 g of moisture content.

For the past 2000 years, many Asian countries have used pear fruit traditionally to treat diseases, such as relieving constipation, cough, alcoholism, and moistening the lungs. In Pakistan, pears are mainly produced in Khyber Pakhtunkhwa, the hills of Kashmir, and some areas of Punjab province. The total farming area under pear cultivation in Pakistan is approximately 1820 ha, with a production of 16,569 tons.[5] Pear fruit is commonly consumed fresh, but it can also be processed into various products, such as jam, jelly, juice, wine, and dehydrated slices. During the processing of pear fruit into dehydrated products, pretreatments are necessary, and hot water blanching is one of them.

Blanching is a heat treatment used to improve the shelf life of various food materials before further processing. While blanching is commonly used in vegetable processing as a pretreatment, limited research has been done on its utilization in fruit processing. Hot water blanching is the most common treatment, followed by steam blanching. This treatment delays enzymatic activity, which can reduce color, texture, and flavor characteristics in food materials. The heat absorbed by the food material during blanching directly affects the sensory and nutritional characteristics of the food. Blanching is a commonly used technique for preserving fruits and vegetables, which involves the use of a specific time–temperature combination to prevent enzymatic activity. It is important to avoid excessive time and temperature as it can result in the softening and degradation of flavor in the food material. Different preservation techniques, such as freezing, canning, sterilization, and drying, are used to process fruits and vegetables into various products to prolong their shelf life and enable storage. The nutrient loss associated with each technique varies. Prior to freezing and drying, fruits are typically subjected to boiling water or steam to reduce enzymatic activity that can adversely affect their quality attributes during storage. It also helps to remove moisture without adversely affecting the physicochemical and sensory quality attributes of the final product. Blanching is a technique used to soften tissues and break down peptic substances in cell walls and middle lamella. However, it has been reported that blanching can cause a loss of nutrients ranging from 13% to 60%. Short periods of high temperature blanching cause less damage compared to longer periods of lower temperature blanching. The use of both heat and water during blanching can lead to a loss of water-soluble nutrients, minerals, and vitamins in the food material. Foods that have been blanched are generally lower in water-soluble vitamins and nutrients due to leaching and degradation in the blanching water. Additionally, small pieces of fruits and vegetables lose more ascorbic acid compared to larger pieces.[6]

The Poonch Division of Azad Jammu and Kashmir is known for producing various seasonal fruits, such as pear, plum, peach, and apricot, which are typically available during the summer season. These fruits are highly nutritious, containing valuable functional and bioactive compounds, as well as enzymes that make them perishable. Unfortunately, the enzymatic and biochemical activities in these fruits can cause sensory quality issues, such as off-colors and off-flavors, and reduce their nutritive value. To combat this, pretreatments are applied prior to processing in order to delay the spoilage of these perishable fruits. These pretreatments can also help reduce the amount of packaging materials required, as well as lower weight, volume, and transportation costs. The choice of pretreatment methods is based on minimizing the loss of essential nutrients and quality characteristics in the fruits. It is necessary to create value-added products from pear fruit to reduce the wastage of this seasonal fruit. Therefore, this research plan was proposed to investigate the impact of pretreatment by water blanching, steam blanching, and microwave blanching on the biochemical and sensory quality of pear slices to know the community's acceptance of these products. By developing processed products from pears, food, and nutritional security can be ensured, and commercially viable products can be created, generating income for poor farming communities and potentially serving as a longterm poverty alleviation strategy. The aim of this study is to assess the effects of different blanching methods for variable times, on the quality of dehydrated pear fruit slices, including nutrient retention and sensory attributes.

Materials and methods

Fresh pears (*Pyrus communis* L.) were bought directly from the fruit market located in Rawalakot City and then transported to the laboratory of the Department of Food Science and Technology at the University of Poonch Rawalakot.

Preparation of pear slices

The fruit was washed under running water at room temperature, and a whole pear was peeled using a vegetable peeler. The pear was then cut into quarters by removing the cores and stems, and each quarter was sliced into 1/2-inch pieces.

Blanching of pear slices

Three methods were used to blanch fruit samples, namely microwave oven, conventional, and steam Pear slices were blanched with six treatments in triplicate at a constant temperature or power level, varying the time from 0 to 10 min as follows: $\mathbf{T_0}$ = control, $\mathbf{T_1}$= blanching for 2 min, $\mathbf{T_2}$= blanching for 4 min, $\mathbf{T_3}$= blanching for 6 min, $\mathbf{T_4}$= blanching for 8 min, and $\mathbf{T_5}$= blanching for 10 min.

Water blanching (conventional method)

Samples weighing 500 g were placed in a Pyrex beaker with a capacity of 2000 mL. These samples were then blanched by exposing them to hot water at a constant temperature of 100°C for varying lengths of time ranging from 0 to 10 min, with increments of 2 min. After blanching, the samples were drained and quickly cooled on ice. They were then dried using filter paper.

Steam blanching

Here, 500 gram sample of sliced pears underwent blanching using a locally designed steam generator that utilized 500 mL of distilled water and heated it to generate steam at 105°C. The samples were subjected to different treatment times ranging from 0 to 10 min, with a 2-min difference between each treatment. After blanching, the samples were drained and cooled quickly on ice. The blanched material was then analyzed to evaluate its physical and chemical characteristics, as well as to conduct a sensory quality evaluation.

Microwave blanching

Slices (500 g) of pears were subjected to microwave heating at a constant power level (100%) for varying duration of 0–10 min, with intervals of 2 min. The pear slices were placed in a 2000 mL Pyrex beaker and covered with a glass dish, and 1000 mL of distilled water was added before blanching using a commercial NGM-2320 device with a power rating of 1400 W. After blanching, the samples were drained and rapidly cooled on ice before being placed on filter papers for drying.

Physical evaluation of pear fruit

In accordance with Method No. 10–53 of AACC,[7] an evaluation was conducted to assess the physical attributes of pear fruit, including fruit size, weight, and slice–waste ratio.

Chemical analysis

The moisture content of pear slices was analyzed following the procedure outlined in the AACC[7] method. The ash content was determined using the method described in AOAC.[8] To estimate the total sugar and reducing sugar content of the samples, Lane and Eynon's method as described in Ranganna[9] was used. The titratable acidity of the pear slices was determined according to the KC and Rai[10] method. Total soluble solids of the pear slices were estimated using a digital hand-held refractometer (Atago PAL-1, Shibakoen, Minato-ku, Tokyo, Japan). The ascorbic acid content was measured using the 2, 6 dichlorophenol indophenol titration method suggested by AOAC.[11] Brix/acid ratio was calculated by dividing the percentage of TSS by the percentage of titratable acidity of the pear slices, and the value was expressed to the nearest first decimal place, as recommended by Ranganna.[12]

Sensory properties

The product was subjected to various pretreatments and subsequently tested for sensory evaluation in order to determine the consumer's acceptability. Sensory attributes (such as color, taste, texture, and overall acceptability) were assessed by using nine points hedonic scale ranging from dislike extremely (01) to like extremely (09) as described by Meilgaard et al.[13] with the help of 10 semi-trained food technologists selected those who was familiar with fruit product from Department of Food science and Technology, Rawalakot, University of Poonch. Samples were served in clean, transparent, and labeled petri plates with secret three digit codes and presented to the assessors in random order.

Statistical analysis

The data analysis involved taking three measurements of each sample and presenting the results as means and their corresponding standard deviations. To determine if there were significant differences between the variables being studied, a two-way analysis of variance (ANOVA) was conducted. The significance of the differences was determined using the Least Significant Difference (LSD) method at a probability level of $P < 0.05$.

Results and discussion

Pear is among the oldest grown fruits and has waste potential in order to manage its huge annual yield by converting it into valuable nutritious products of economic importance. Therefore, the presented study was planned, and results are presented. The physical features of fruits, such as their size, weight, and shape, play a crucial role in the design and development of specialized equipment for various tasks such as harvesting, handling, processing, and storage. Fruit size, particularly its length and width, is a significant quality indicator that greatly affects the success of its cultivation. The average size of pear fruits grown in Rawalakot, Azad Jammu and Kashmir was found to be 19.04 cm with a moisture content of 84.8% which was almost in consistent with the findings of Hussain et al.[14] reported 80.17% to 86.67% moisture content in different pear genotypes from Gilgit Baltistan region and length of pear fruit from 40.10 to 87.50 mm which was far below our investigated values. Fruit weight is another important characteristic, including the mass of the skin, pulp, seeds, and other components. The mean weight of pear fruits was observed to be 197.7 g which was supported by an investigation by Abbas et al.[15] who revealed that the weight range from 79 g to 205 g of different pear varieties collected from Soon valley, Kashmir, Pakistan. The slice waste ratio is a crucial economic parameter focused on by food processors, and the mean value of pear slices indicated that the waste ratio was 77%, meaning that only 23% was actually usable. These physical features are also used in designing efficient conveyor, storage systems, grading, sorting, and separating fruits during processing (Table 1).

Table 1. Physical characteristics of pear fruit.

Fruit Size (cm)	Fruit Weight (g)	Slice-Waste Ratio (%)
19.04	197.7	77

Table 2. Effect of blanching method on total sugars (%) of dehydrated pear slices.

Time of Treatment	Water Blanching	Steam Blanching	Microwave Blanching
To	28.73 ± 0.025	28.73 ± 0.031	28.7 ± 0.030
T1	28.65 ± 0.040	28.66 ± 0.035	28.67 ± 0.025
T2	28.57 ± 0.045	28.62 ± 0.031	28.58 ± 0.025
T3	28.51 ± 0.045	28.48 ± 0.035	28.51 ± 0.035
T4	28.29 ± 0.045	28.28 ± 0.045	28.3 ± 0.035
T5	28.09 ± 0.060	28.07 ± 0.031	28.11 ± 0.040

T_0 = Control, T_1 = blanching for 2 min, T_2 = blanching for 4 min, T_3 = blanching for 6 min, T_4 = blanching for 8 min, T_5 = blanching for 10 min.

Table 2 presents the results of the total sugar content analysis in fruits and fruit products, which are essential nutrients for taste and flavor enhancement. The study found a significant ($p < .05$) variation in total sugar content based on blanching technique and treatment means at different times. The total sugar content was observed to increase with longer blanching times. The mean values for water blanching, steam blanching, and microwave blanching were similar at 28.65 ± 0.04%, 28.66 ± 0.04%, and 28.65 ± 0.03%, respectively. Analysis of variance indicated a significant effect ($p < .05$) on the reducing sugar content of blanched pear slices at different times. The study observed an increasing trend in reducing sugar content over time. Blanching foodstuff using wet heat treatment resulted in a significant loss of low molecular weight sugars such as mono- and di-saccharides and micronutrients into the blanched water. Furthermore, after blanching, the concentration of reducing sugars decreased. A reduction in the range of sugar concentration was expected during the blanching process due to the leaching out of reducing sugars. The results of the reducing sugar concentration are presented in Table 3, which shows a gradual decrease in concentration as blanching time increased. However, the blanching time had a less significant effect on the reducing sugar concentration. The effect of blanching treatments reducing sugar content on blanched and dried mango was studied by Gulzar et al.[16] and he reported significant effect of blanching techniques and treatment on dried pear while blanching time had no significant effect on concentration of reducing sugars which is in line with our investigations.

Non-reducing sugars such as sucrose and trehalose, which have glycosidic bonds between their anomeric carbons and exist in a cyclic form, cannot be converted to an open-chain form with an aldehyde group. The blanching technique and treatment means showed a significant ($p < .05$) effect on the non-reducing sugar content at different blanching times. A decreasing trend was observed in the non-reducing sugar content at different blanching times. Table 3 presents the results of the study. The maximum mean values for water blanching, steam blanching, and microwave blanching were recorded during the entire blanching process, as shown in Table 4. Our findings are consistent with those of Gulzar et al.,[16] who reported significant differences in total sugars, reducing sugars, and non-

Table 3. Effect of blanching method on reducing sugars (%) of dehydrated pear slices.

Time of Treatment	Water Blanching	Steam Blanching	Microwave Blanching
To	19.3 ± 0.055	19.3 ± 0.061	19.32 ± 0.035
T1	19.21 ± 0.070	19.22 ± 0.060	19.18 ± 0.055
T2	19.15 ± 0.055	19.14 ± 0.070	19.15 ± 0.060
T3	19.08 ± 0.070	19.08 ± 0.075	19.09 ± 0.060
T4	18.87 ± 0.060	18.58 ± 0.474	18.88 ± 0.050
T5	18.7 ± 0.055	18.69 ± 0.067	18.68 ± 0.070

T_0 = Control, T_1 = blanching for 2 min, T_2 = blanching for 4 min, T_3 = blanching for 6 min, T_4 = blanching for 8 min, T_5 = blanching for 10 min.

Table 4. Effect of blanching method on non-reducing sugars (%) of dehydrated pear slices.

Time of Treatment	Water Blanching	Steam Blanching	Microwave Blanching
To	9.35 ± 0.060	9.35 ± 0.066	9.367 ± 0.045
T1	9.23 ± 0.070	9.237 ± 0.065	9.247 ± 0.055
T2	9.133 ± 0.075	9.14 ± 0.070	9.147 ± 0.065
T3	9.047 ± 0.065	9.057 ± 0.055	9.063 ± 0.050
T4	9.27 ± 0.504	8.953 ± 0.065	8.963 ± 0.055
T5	8.86 ± 0.070	8.87 ± 0.060	8.857 ± 0.070

T_0 = Control, T_1 = blanching for 2 min, T_2 = blanching for 4 min, T_3 = blanching for 6 min, T_4 = blanching for 8 min, T_5 = blanching for 10 min.

reducing sugars among different treatments, blanching techniques, storage durations, and their interactions. The content of reducing sugars increased significantly ($p < .05$) for both mango cultivars during storage, which could be attributed to the slow conversion of starch and non-reducing sugars into reducing sugars. The decrease in total sugar content of the dried mango slices suggests the possibility of browning and biochemical reactions, as reported by Sra et al.[17]

The total soluble solids (°Brix) content is an important quality characteristic for many types of fruit, as it measures the amount of solid compounds in dried fruit products after moisture removal. In the study, three treatment techniques were applied for different durations, resulting in a statistically significant variation in the total soluble solids content of pear slices. The results showed that the longer the processing time, the lower the total soluble solids content, while in the case of microwave balancing, the increase in time duration of blanching increases the TSS content. Table 5 displays the mean values of the total soluble solids for each treatment, revealing that water blanching had the highest mean value retention of total soluble solids (13.74 ± 0.065), followed by microwave blanching (13.72 ± 0.066) and steam blanching (13.69 ± 0.065). Our findings are in accordance with the previously reported study by Adetoro et al.[18] who reported a significant effect of blanching treatment on hot air-dried pomegranate, and the study revealed a higher total soluble solid content in un-blanched treatment and a decrease in TSS content with increasing treatment time, which is due to leaching of nutrients during longer exposure duration.

Titratable acidity refers to the measurement of the total concentration of acid in a food, which is determined through a thorough titration of intrinsic acids using a standard base. Titratable acidity is considered to be a more reliable indicator of the impact of acid on flavor than pH. In the study, it was observed that there was a significant variation ($p < .05$) in titratable acidity among different treatments at different times after blanching (as shown in Table 6). The water blanching treatment was found to result in the greatest loss of titratable acidity compared to other blanching techniques at various times during the blanching process. The findings indicate that water blanching, steam blanching, and microwave blanching resulted in mean values of 0.28 ± 0.025%, 0.29 ± 0.030%, and 0.29 ± 0.025%, respectively. This suggests a decrease in the titratable acidity of blanched dried pear slices, which may be due to the loss of acids during the processing. A similar significant decline ($p < .05$) in total acidity was observed by Gulzar et al.[16] during the storage of blanched and dried mangoes. This decline in acidity could be attributed to the biochemical-binding interaction of acids with other components.

Table 5. Effect of blanching method on total soluble solids of dehydrated pear slices.

Time of Treatment	Water Blanching	Steam Blanching	Microwave Blanching
To	13.8 ± 0.080	13.77 ± 0.066	13.78 ± 0.050
T1	13.74 ± 0.065	13.69 ± 0.065	13.72 ± 0.066
T2	13.66 ± 0.066	13.62 ± 0.065	13.65 ± 0.045
T3	13.58 ± 0.060	13.51 ± 0.065	13.53 ± 0.060
T4	13.61 ± 0.070	13.5 ± 0.183	13.57 ± 0.050
T5	13.56 ± 0.085	13.53 ± 0.075	13.58 ± 0.026

T_0 = Control, T_1 = blanching for 2 min, T_2 = blanching for 4 min, T_3 = blanching for 6 min, T_4 = blanching for 8 min, T_5 = blanching for 10 min.

Table 6. Effect of blanching method on titratable acidity (%) of dehydrated pear slices.

Time of Treatment	Water Blanching	Steam Blanching	Microwave Blanching
To	0.313 ± 0.035	0.32 ± 0.030	0.32 ± 0.020
T1	0.287 ± 0.025	0.29 ± 0.030	0.293 ± 0.025
T2	0.25 ± 0.020	0.27 ± 0.030	0.27 ± 0.020
T3	0.213 ± 0.015	0.247 ± 0.025	0.25 ± 0.020
T4	0.18 ± 0.010	0.217 ± 0.025	0.23 ± 0.020
T5	0.167 ± 0.006	0.193 ± 0.025	0.21 ± 0.020

T_0 = Control, T_1 = blanching for 2 min, T_2 = blanching for 4 min, T_3 = blanching for 6 min, T_4 = blanching for 8 min, T_5 = blanching for 10 min.

The study aimed to evaluate the ascorbic acid content in pear slices that underwent blanching and drying. The results were expressed as the percentage of retained ascorbic acid in comparison to the fresh pear fruit. Significant differences ($p < .05$) in ascorbic acid content were observed in pear slices with increasing blanching time within each blanching method. The maximum loss of ascorbic acid was observed in microwave blanching (7.71 ± 0.100%) followed by water blanching (7.63 ± 0.220%) and steam blanching (7.52 ± 0.230%) as shown in Table 7. The decreasing trend in ascorbic acid content was attributed to its sensitivity to heat and light. Overall, microwave blanching was found to be the most unsuitable pretreatment for fruit blanching based on our study. Mandliya et al.[19] findings support the loss of ascorbic acid content in gooseberries with increasing microwave blanching time due to its heat-labile nature. Studies conducted by Wang et al.[20] and Xanthakis et al.[21] have also revealed that an increase in microwave power level and blanching time resulted in a significant decrease in ascorbic acid content, as it is sensitive to heat. Similar declining trends were observed in water dropwort by Liu et al.,[22] and green beans by Ruiz-Ojeda et al.[23] Additionally, Minh et al.[24] reported a reduction in Vitamin C content with increasing blanching time in conventionally blanched and dried papaya fruits.

The results of ash content are presented in Table 8. The ash content of blanched pear slices using three different techniques is 3.76 ± 0.038% for water blanched, 3.70 ± 0.085% for steam blanched, and 3.73 ± 0.060% for microwave blanching did not show any significant difference with increasing blanching time. This finding is consistent with the results reported by Gulzar et al.[16] for infra-red and microwave blanched mango cultivars. However, there was a significant difference in the mean ash

Table 7. Effect of blanching method on ascorbic acid (%) of dehydrated pear slices.

Time of Treatment	Water Blanching	Steam Blanching	Microwave Blanching
To	7.713 ± 0.210	7.61 ± 0.210	7.623 ± 0.106
T1	7.633 ± 0.230	7.527 ± 0.220	7.713 ± 0.100
T2	7.6 ± 0.220	7.5 ± 0.201	7.603 ± 0.101
T3	7.543 ± 0.220	7.453 ± 0.215	7.613 ± 0.096
T4	7.467 ± 0.235	7.413 ± 0.205	7.53 ± 0.105
T5	7.42 ± 0.210	7.293 ± 0.215	7.347 ± 0.181

T_0 = Control, T_1 = blanching for 2 min, T_2 = blanching for 4 min, T_3 = blanching for 6 min, T_4 = blanching for 8 min, T_5 = blanching for 10 min.

Table 8. Effect of blanching method on ash content (%) of dehydrated pear slices.

Time of Treatment	Water Blanching	Steam Blanching	Microwave Blanching
To	3.787 ± 0.045	3.767 ± 0.040	3.77 ± 0.050
T1	3.763 ± 0.038	3.707 ± 0.085	3.73 ± 0.060
T2	3.703 ± 0.050	3.627 ± 0.060	3.727 ± 0.029
T3	3.623 ± 0.075	3.62 ± 0.046	3.63 ± 0.050
T4	3.577 ± 0.060	3.52 ± 0.070	3.55 ± 0.050
T5	3.507 ± 0.071	3.473 ± 0.055	3.48 ± 0.050

T_0 = Control, T_1 = blanching for 2 min, T_2 = blanching for 4 min, T_3 = blanching for 6 min, T_4 = blanching for 8 min, T_5 = blanching for 10 min.

content *(p < .05)* among the different blanching techniques and treatments, as well as for the interaction of blanching and drying.

The study compared the moisture content of dried pear slices that underwent different blanching methods: water, steam, and microwave. Results in Table 9 show that the mean scores for moisture content varied among the three methods, with water blanching having a mean score of 22.88 ± 1.09%, steam blanching with a mean score of 21.78 ± 0.611%, and microwave blanching having a mean score of 20.95 ± 0.617%. The study also found that there was an increase in moisture loss from pear slices as blanching time and drying time increased. This may be due to the conversion of water molecules into vapors, which is more pronounced with higher power density and longer drying time in a microwave oven. The results showed that no significant effect of treatments on the moisture content of pear slices was observed. This finding is in consistent with a study by Gulzar et al.[16] on dried mangoes, which also found no significant effect of blanching technique on the moisture content of the fruit.

Blanching methods on sensory properties

In total, 13 sensory attributes were evaluated for dried mango slices of both cultivars after a storage period of 6 months. The organoleptic scores did not vary significantly with treatments and blanching techniques. The color and appearance of any food product is usually considered one of the important attributes of product quality characteristic which can influence the choice of consumer in purchasing of that food product. Blanching is an effective technique for retaining the color of dried foods by inhibiting the peroxidase enzymes. The effect of three different blanching techniques on the color of pear slices was evaluated. The values of color of blanched dried pear slices are presented in Figure 1 by Hedonic scale. The maximum mean value for color was observed for water blanching (6.0 ± 1.0) followed by steam blanching (6.6 ± 1.52) and microwave blanching. No significant difference of means (*p < .05*) was observed among the blanching techniques and treatments as well as for the interaction of blanching and drying for color properties. Loss of color was observed due to the pigment degradation during heat treatment; blanching can have both direct and indirect effects. This result is in agreement with the findings of Minh et al.[24] who reported that the hedonic response of color loss by convective drying of blanched papaya due to the destruction of pigment may occur by heat. Similar results were reported byRuiz-Ojeda & Peñas[23] in green beans, and in sweet corn by Popalia & Kumar.[25] Mandliya et al.[19] also reported the loss of color in hot water blanched and microwave blanched gooseberries due to extended exposure time.

The sensory results of taste parameters are presented in Figure 1. The hedonic response for water blanching (4.0 ± 1.0), steam blanching (4.6 ± 0.57), and microwave blanching (7.0 ± 1.00) was observed. There was no significant difference of means (*p < .05*) among the blanching techniques and treatments as well as for the interaction of blanching and drying was observed for taste parameters. Thermal processing of food impacts the positive and negative taste attributes of foodstuffs.[26]

The texture of the pear slice products showed a non-significant difference among the blanching techniques as well as blanching treatments. For texture, all samples received mean scores between 3.3 and 7.0 as shown in Figure 1. The maximal reading for water blanched dried pear slices was

Table 9. Effect of blanching method on moisture content (%) of dehydrated pear slices.

Time of Treatment	Water Blanching	Steam Blanching	Microwave Blanching
To	21.33 ± 0.965	21.4 ± 0.874	21.02 ± 0.950
T1	21.94 ± 0.531	21.04 ± 0.930	21.02 ± 0.565
T2	21.67 ± 1.149	21.78 ± 0.611	20.95 ± 0.617
T3	22.28 ± 1.115	21.5 ± 0.652	21.83 ± 0.363
T4	22.39 ± 1.186	21.36 ± 0.805	21.86 ± 0.525
T5	22.88 ± 1.090	21.16 ± 0.930	21.75 ± 0.535

T_0 = Control, T_1 = blanching for 2 min, T_2 = blanching for 4 min, T_3 = blanching for 6 min, T_4 = blanching for 8 min, T_5 = blanching for 10 min.

recorded 4.0 ± 1.0, for steam blanched pear product was 4.6 ± 0.57, and microwave blanched was 7.0 ± 1.00. The statistical analysis of the data shows non-significant differences of means ($p < .05$) among the blanching techniques and treatments as well as for the interaction of blanching and drying for texture characteristics. Microwave blanching technique for treatment was most preferred by panelists as compared to other blanching techniques. Sensory data are plotted in Figure 1 to show trends and patterns of quality attributes. Textural studies of hot water blanched and microwave blanched gooseberries have been reported by Mandliya et al.[19] who reported more chewiness in microwave blanched products as compared to hot water blanched berries. The mean sensory acceptability scores for water blanching (4.0 ± 1.0), steam blanching (4.6 ± 0.57), and microwave blanching (7.0 ± 1.00) are presented in Figure 1. The results from the sensory evaluation of blanched dried pear slice revealed that there was no significant difference ($p < .05$) between slices prepared using three blanching techniques in terms of all the attributes. The compression graph is plotted in Figure 1

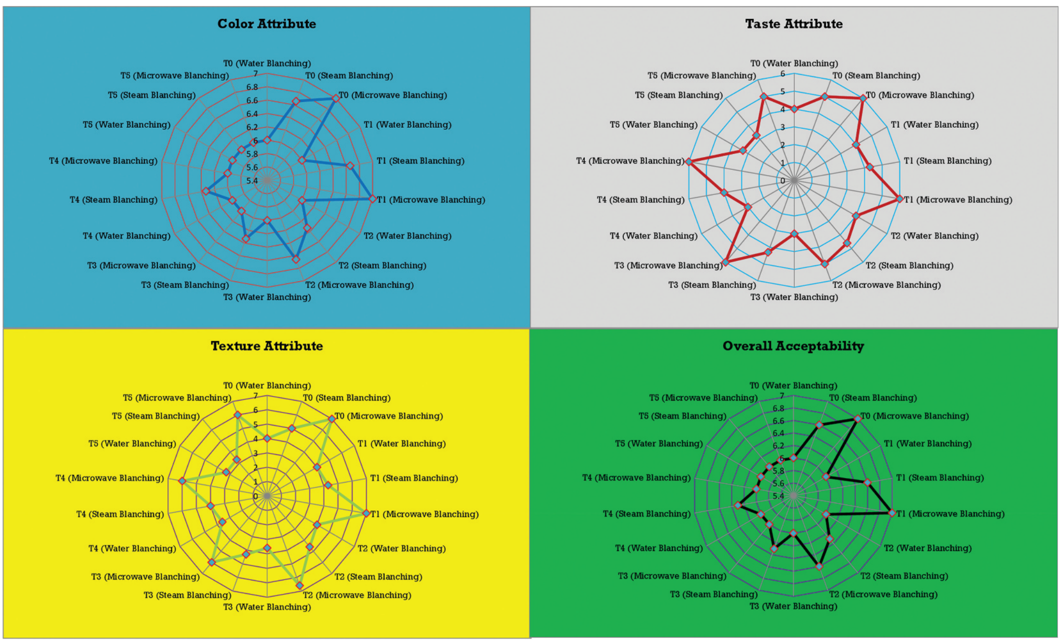

Figure 1. Sensory properties of blanched and dehydrated pear slices.

Conclusion

The results of the present study indicated that microwave blanching treatment was significantly better than other commonly used blanching methods such as hot water and steam blanching. The processing treatment using microwave blanching technique was found to be the most effective, with better values for all quality attributes. Additionally, this technique resulted in minimum loss of nutrients. Based on these findings, it can be concluded that all treatments demonstrated better physicochemical and organoleptic quality attributes and were considered healthier.

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I.H. performed the methods and investigation. Z.A. and N.R supported for conceptualization, funding acquisition, and writing of original draft. S.B. and F.A.K. helped in writing of this manuscript. While S.Q., M.A.B., F. A., and C.G.A. helped in software. M.A.R., I.H., and N.R. supported in the analysis and supervision of research work.

Data availability statement

Although adequate data have been given in the form of tables, all authors declare that if more data are required then the data will be provided on a request basis.

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