DOI: https://doi.org/10.54393/df.v5i03.140

DIET FACTOR
Journal of Nutritional & Food Sciences
https://www.dietfactor.com.pk/index.php/df
ISSN (E): 2789-8105, (P): 2789-8091
Volume 5, Issue 3 (July-Sep 2024)

Original Article

OPEN ACCESS

Development and Quality, Chemical and Sensory Evaluation of Nutritive Herbal Blend

Shanza Manzoor[1*], Muhammad Shahbaz[1], Muzaffar Ali Khan[2], Nighat Raza[1], Muhammad Sibt-E-Abbas[1], Hammad Naeem[3], Muhammad Hammad Ul Hassan[1], Ushna Momal[1], Ahmed Mujtaba[4] and Tahira Batool Qaisrani[5]

[1]Department of Food Science and Technology, Muhammad Nawaz Shareef University of Agriculture, Multan, Pakistan
[2]Department of Microbiology and Molecular Genetics, Bahauddin Zakariya University, Multan, Pakistan
[3]Post-Harvest Research Centre, Ayub Agricultural Research Institute, Faisalabad, Pakistan
[4]Department of Food Sciences and Technology, Hamdard University, Islamabad, Pakistan
[5]Department of Agricultural Engineering and Technology, Ghazi University, Dera Ghazi Khan, Pakistan

ARTICLE INFO

Keywords:

Herbal Blend, Antioxidant, Physiochemical Analysis, Consumer Acceptability

How to Cite:

Manzoor, S., Shahbaz, M., Khan, M. A., Raza, N., Sibt-E-Abbas, M., Naeem, H., Hammad Ul Hassan, M., Momal, U., Mujtaba, A., & Qaisrani, T. B. (2024). Development and Quality, Chemical and Sensory Evaluation of Nutritive Herbal Blend: Quality, Chemical and Sensory Evaluation of Nutritive Herbal Blend. DIET FACTOR (Journal of Nutritional and Food Sciences), 5(03). https://doi.org/10.54393/df.v5i03.140

***Corresponding Author:**

Shanza Manzoor
Department of Food Science and Technology, Muhammad Nawaz Shareef University of Agriculture, Multan, Pakistan
shanzamanzoor72@gmail.com

Received Date: 12th August, 2024
Acceptance Date: 23rd September, 2024
Published Date: 30th September, 2024

ABSTRACT

Herbal blends have obtained popularity due to their health benefits, good fragrance and antioxidant capacity. Herbal tea is a famous drink due to its low cost, attractive taste and aroma. **Objectives:** To assess the nutritional properties of herbal blends and to develop an herbal blend using locally available herbs. **Methods:** The developed herbal blend was 40% rose, 15% lemongrass, 15% Tulsi leaves, 10% cinnamon, 10% ginger and 10% fennel. Rose, Tulsi and lemongrass leave was dried in a hot air oven. All ingredients were ground. Then this prepared ground herbal mixture was subjected to proximate analysis for moisture, ash content, crude protein, crude fat and crude fiber. Afterwards, physiochemical and sensory tests of prepared tea were done to check the pH, colour and sensory evaluation of the tea. Then the developed tea was subjected to phytochemical and antioxidant activity assays to check total phenolic contents and 1,1-Diphenyl-2-picrylhydrazyl. Proximate analysis and physiochemical analysis of the product were done at regular intervals. **Results:** Sensory characteristics and consumer acceptability of mixed herbal blends as tea alternative was evaluated through the hedonic survey. Sensory scores were higher for the prepared herbal blend as compared to the control. **Conclusions:** It was concluded that the developed herbal blend possessed significant nutritional value and antioxidant activity, making it an attractive alternative to tea. Its pleasant taste and ability to stay stable over time indicate that herbs can be used to make healthy, inexpensive drinks. Further studies are required to enhance its functional applications.

INTRODUCTION

The herbal blend is the form of a mixture of leaves, seeds, and roots of various plants. Herbal tea is an infusion of a mixture of herbal blend or powder and hot water, commonly ingested for its remedial and invigorating properties, including inducing relaxation. Having the capacity to help with stomach-related issues; herbal teas often have purging properties and strengthen the immune system. Pakistan has a rich history of folk use of plants, with people, especially those living in remote villages, using indigenous plants as medicines, and this knowledge has been passed orally from generation to generation. Herbal tea is consumed all over the world. Fruits, roots, and seeds were also used by local and traditional practitioners for curing many diseases. The traditional medicinal usage of plants for curing human ailments is vital to indigenous communities in the northern parts of Pakistan, which is considered a valuable local sociocultural heritage [1]. Herbal blend provides a lot of information and contains material on several elements of ethno-pharmacological study. As a response to illnesses with several etiologies or

DOI: https://doi.org/10.54393/df.v5i03.140

by a potential multifunctional element of the mixture as opposed to the action of individual ingredients, one may study the significance of this blend in folk medicine. For decades, many herbal blends have been employed to improve health [2]. Although the study of this blend is extremely challenging, its results are encouraging. Awareness of the ingredients in this traditional blend can assist in making some new blends that can improve individuals' health [3]. The conventional medicinal use of plants for the treatment of human ailments is important to Indigenous families in the northern parts of Pakistan which is considered useful local sociocultural heritage [4]. In recent years, due to awareness of the health attributes of herbal tea in the modern world, its consumption has increased significantly. As people are taking a keen interest towards natural plant remedies, the consumption of herbal tea will also increase significantly. It will also increase in size of the market for herbal tea. Knowledge of the composition of these traditional blends can help develop new blends that can improve the health of citizens. The healthcare systems of many developing countries were based on traditional herbal remedies. About 80% of the human population depends on traditional ethno-remedies of plant origin, and three-fourths of the world population cannot afford modern medicines. The major player in the herbal tea industry in the whole world is South Africa. Their main products are their local rooibos tea and honey-bush teas. These two products have a very significant marketplace [5]. Studies on other herbal tea having ingredients other than rooibos and honey-bush are increasing at a high rate. So, there is a high potential for other herbal teas in the market.

This study aims to assess the physicochemical and sensory properties of herbal blends and to develop an herbal blend using locally available herbs.

METHODS

Some raw materials used in this research as cinnamon, dried ginger and fennel were purchased from the local market of Multan in a dried form but rose petals, lemon grass and tulsi were collected from the field of Muhammad Nawaz University of Agriculture Multan. Rose petals, lemongrass and tulsi leaves were washed thoroughly and dried in a hot air oven at the B block laboratory of the Muhammad Nawaz University of Agriculture Multan. Rose, lemongrass and tulsi leaves were washed first to remove the dirt and all types of other contaminants. Ginger, cinnamon and fennel which were collected from the local market also washed properly. This process is known as sedimentation. Then oven dry at 50°C until constant weight. After drying these dried herbs were ground by using a grinder. Then it was sieved into 40 mesh sieve and stored at 4°C until use. All the ingredients which were dried in a hot air oven, were mixed according to the research plan. Herbal tea blend (T1) has the following ingredients rose petal 40%, lemongrass 15%, fennel 15%, dried ginger 10%, cinnamon 10% and tulsi leaves 10%. A mixture of this natural herbal blend was ground in a powder form. This mixed herbal blend is packed in a tea pack then in a zipper bag and also stored in a jar. During the extraction of herbal tea factors which were must be considered were infusion temperature, length of infusion, type of water which is infused, the ratio of tea to water and the type of tea used. Herbal tea aqueous extract was made according to the developed research plan. It was prepared by steeping the already made treatment 2-gram sample in 200 ml distilled water at 95°C for 3 minutes in an Erlenmeyer flask covered with aluminium foil to prevent removal of all necessary phytochemicals on a water bath [6]. After exactly 3 minutes, an herbal infusion was made. Then this herbal infusion was filtered through Whattmann filter paper No 41 cooled to 20°C and stored at room temperature in a cool and dark place [7]. Market-available herbal tea was taken as control (To) and Treatment (T1) was the developed herbal tea blend (explained above). Storage study was done at 15-day intervals to check the quality of the prepared herbal tea blend. Proximate analysis (moisture content, ash content, crude fiber, crude protein and crude fat) of the product was done following the method of [8]. Total carbohydrates were determined by the subtraction of percentages of moisture content, crude protein content, crude fat content and total ash present in this herbal blend. pH is defined as the logarithm to the tenth of the base of H+ activity reciprocal. An electrolytic cell with two electrodes attached was standardized in a buffer solution of pH 4.0. Afterwards, the dipping of electrodes into test samples occurred. A voltage relative to the pH of the solution was developed and we directly read the pH of the test sample solution as shown by the instrument [8]. Total phenolic content is based on the reaction of the F.C. reagent with the test sample. It results in the formation of blue chromophores because of the reduction of phosphor-tungstic and phosphor-molybdic acid in an alkaline medium in the presence of phenolic compounds [9]. DPPH is a stable radical having a dark red colour and chemically is (1,1-Diphenyl-2-picrylhydrazyl). When any antioxidant scavenges its free radicals, its colour changes from red to yellow at 515 nm wavelength. DPPH reagent was prepared by dissolving 4 mg of DPPH in methanol. Then 50 µl of sample was added to 2ml of DPPH solution. Then mixture was shaken vigorously and allowed to stand in the dark at room temperature for 30 minutes. The absorption was measured at 515 nm wavelength in a UV-visible spectrophotometer [10]. For the determination of mineral content, 1 g powder of the sample was poured into a 100 ml beaker. Purposely, 7 ml HNO3 was poured into the beaker followed by leaving the sample overnight. Then the sample was taken and 3 ml HCIO4 was also poured and subjected the sample for digestion on a hot plate at a temperature of

DOI: https://doi.org/10.54393/df.v5i03.140

about 180ºC. The hot plate was turned off when about 2-3 ml sample left. After cooling, the digested sample was diluted with 100 ml distilled water. Dilution was done by adding the sample and distilled water followed by tilting the flask for the uniform mixing of supernatant. Dilution was done in a 100 ml plastic bottle. Then prepared sample was used for the mineral profile as potassium sodium and calcium on a flame photometer while heavy metals like iron and zinc were accessed by atomic absorption spectrophotometer. A triplicate sample was run for the determination of the mean by the following method [8]. A hedonic survey of consumer acceptability of the prepared herbal tea was conducted in the Department of Food Science and Technology, MNS University of Agriculture Multan. A total of 30 respondents, including students, lecturers, some industrial members and other staff members of the University, as well as family members, participated in the survey. The respondents were then asked about their degree of liking of the teas in terms of taste, aroma, colour, mouthfeel and overall acceptability, based on a 9-point hedonic scale Triplicate analyses were performed to ensure data reliability. Significant differences were assessed using ANOVA procedures [11]. The Completely Randomized Design (CRD) was computed using STATISTIX 8.1 software.

RESULTS

Mean values of moisture content of herbal blend at 0 days, 15 days and 30 days was approximately 7.27%, 7.38% and 7.47%. In this herbal blend rose and tulsi has more moisture content while other ingredients have less amount of moisture (Table 1).

Table 1: Mean Value of Moisture % of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	10.05 ± 0.28	7.29 ± 0.19	8.78 ± 0.22^a
15 Days	10.1 ± 0.2	7.38 ± 0.17	8.74 ± 0.18^a
30 Days	10.09 ± 0.23	7.47 ± 0.11	8.76 ± 0.17^a
Means	10.08 ± 0.23^a	7.3 ± 0.15^b	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mean values of ash contents of the herbal blend were 4.13%, 4.15% and 4.18% at 0 days, 15 days and 30 days. As ash content in cinnamon is very low 2.4% while lemongrass has more ash content which is 17.1% (Table 2).

Table 2: Mean of Ash Contents % of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	12.47 ± 1.29	4.13 ± 0.15	8.3 ± 0.72^a
15 Days	12.44 ± 0.60	4.15 ± 0.13	8.3 ± 0.36^a
30 Days	12.43 ± 0.66	4.18 ± 0.15	8.29 ± 0.4^a
Means	12.4 ± 0.85^a	4.1 ± 0.14^b	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mean values of crude protein contents in herbal tea at 0 days, 15 days and 30 days' storage were 6.36%, 6.19% and 6.06%. As protein contents in rose are low 2.5% while tulsi has more amount of protein which was 16.1% (Table 3).

Table 3: Mean of Crude Protein % of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	7.45 ± 0.05	6.36 ± 0.24	6.9 ± 0.14^a
15 Days	7.34 ± 0.09	6.19 ± 0.32	6.7 ± 0.2^a
30 Days	7.35 ± 0.07	6.06 ± 0.48	6.6 ± 0.27^a
Means	7.3 ± 0.1^a	6.2 ± 0.34^b	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

The mean values of crude fat contents of the herbal blend at 0 days, 15 days and 30 days' storage were 3.99%, 3.99% and 3.84% respectively. Rose has less amount of crude fat which was 0.6% while fennel has more crude fat which is 9.1% (Table 4).

Table 4: Mean of Crude Fat % of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	4.246667 ± 0.13	3.99 ± 0.28	4.1 ± 0.2^a
15 Days	4.203333 ± 0.10	3.99 ± 0.28	4.09 ± 0.19^a
30 Days	4.216667 ± 0.08	3.84 ± 0.22	4.0 ± 0.15^a
Means	4.2 ± 0.1^a	3.9 ± 026^b	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

The mean values of crude fiber contents of the herbal blend at 0 days, 15 days and 30 days' storage were 19.75%, 19.46% and 19.42%. As rose has a low amount of crude fiber 3% while crude fiber in tulsi leaves was 30% (Table 5).

Table 5: Mean Value of Crude Fiber % of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	24.26 ± 0.38	19.75 ± 0.88	19.54 ± 0.63^a
15 Days	24.23 ± 0.55	19.46 ± 0.60	21.8 ± 0.57^a
30 Days	24.11 ± 0.19	19.42 ± 0.46	21.7 ± 0.32^a
Means	24.2 ± 0.37^a	19.5 ± 0.64^b	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

The mean values of carbohydrate contents of the herbal tea sample are 73.31%, 73.27% and 73.18% at 0 days, 15 days and 30 days' storage respectively (Table 6).

Table 6: Mean of Carbohydrate % of Herbal Tea Sample

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	68.40 ± 0.10	73.31 ± 0.87	72.3 ± 0.48^a
15 Days	68.45 ± 0.08	73.27 ± 1.01	72.3 ± 0.04^a
30 Days	68.23 ± 0.20	73.18 ± 1.14	72.2 ± 0.67^a
Means	76.2 ± 0.19^a	68.3 ± 0.9^b	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mean values pH values of herbal tea at 0 days, 15 days and 30 days' storage were 6.21%, 6.23% and 6.28% respectively. According to the table, the highest pH value was found at 30 days of storage and the lowest pH value was observed at 15 days of storage (Table 7).

DOI: https://doi.org/10.54393/df.v5i03.140

Table 7: Mean pH Value of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	4.246667 ± 0.13	3.99 ± 0.28	4.1 ± 0.2[a]
15 Days	4.203333 ± 0.10	3.99 ± 0.28	4.09 ± 0.19[a]
30 Days	4.216667 ± 0.08	3.84 ± 0.22	4.0 ± 0.15[a]
Means	4.2 ± 0.1[a]	3.9 ± 026[b]	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mean values of the TPC value of herbal tea at 0 days, 15 days and 30 days' storage were 667.6, 667.47 and 667.44 mg GAE/g, respectively. According to the table, the highest TPC value was found at 1 day and the lowest TPC value was observed at 30 days of storage (Table 8).

Table 8: Mean of TPC Mg GAE/G of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	580.80 ± 0.72	667.6 ± 0.53	623.2 ± 0.62[a]
15 Days	579.43 ± 1.25	667.47 ± 0.38	623 ± 0.8[a]
30 Days	579.33 ± 1.15	667.44 ± 0.33	623 ± 0.74[a]
Means	579 ± 1.04[a]	667 ± 0.41[b]	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mean values of DPPH value of herbal tea at 0 days, 15 days and 30 days' storage were 80.13%, 79.96% and 79.93% respectively. According to the table, the highest DPPH value was found at 0-day storage and the lowest DPPH value was observed at 30 days' storage (Table 9).

Table 9: Mean of DPPH % of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	90.13 ± 2.30	80.13 ± 0.77	85.11± 1.5[a]
15 Days	89.2 ± 1.31	79.96 ± 0.86	84.4 ± 1.08[a]
30 Days	88.3 ± 1.52	79.93 ± 0.92	83.6 ± 1.21[a]
Means	88 ± 1.7[a]	79.8 ± 0.85[b]	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mineral analysis was done to assess quantities of minerals in the prepared herbal tea blends. It was found that treatment To had a higher value of calcium with a mean of 376 ± 4 mg/L and To also had a higher percentage of potassium with a mean of 419 ± 5 mg/L. T1 had slightly higher magnesium content with a mean value of 64 ± 0.5 mg/L as compared to To with a mean value of 63 ± 0.4 mg/L (Figure 1).

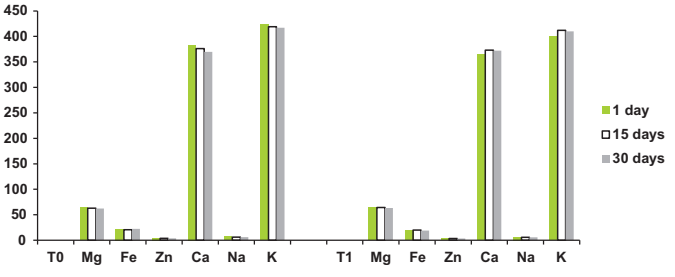

Figure 1: Mean for Minerals mg/L of Herbal Tea Sample

Herbal tea is a good source of iron (Fe), sodium (Na), zinc (Zn), potassium (K), magnesium (Mg), and calcium (Ca). The herbs are good dairy-free sources of calcium. One cup (166 grams) of tea contains about 2/3 of the calcium found in 1 cup of whole milk. The prepared products T0 and T1 were analyzed for mineral profiling. The mean values of the taste of tea were checked using a 9-hedonic scale at 1 day, 15 days and 30 days of storage. These showed the results at 1 day, 15 days and 30 days were 6.8533, 7.3600 and 6.9433, respectively. The highest taste score was found at 30 days' storage and the lowest taste score was recorded at day 1 (Table 10).

Table 10: Mean Value of Taste of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	5.55 ± 0.18	6.85 ± 0.60	6.2 ± 0.39[a]
15 Days	5.52 ± 0.19	7.36 ± 0.97	6.6 ± 0.52[a]
30 Days	5.43 ± 0.05	6.94 ± 0.34	6.2 ± 0.19[a]
Means	5.51 ± 0.14[a]	6.9 ± 0.6[b]	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mean values of the colour of tea at 1 day, 15 days and 30 days' storage were 7.1267, 7.6133 and 6.9900, respectively. The highest colour % was found in 15 days of storage and the lowest colour value was observed in 30 days of storage (Table 11).

Table 11: Mean Value of the Color of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	6.10 ± 0.35	7.12 ± 0.10	6.5 ± 0.2[a]
15 Days	5.97 ± 0.33	7.61 ± 0.16	6.79 ± 0.24[a]
30 Days	5.93 ± 0.11	6.99 ± 0.21	6.4 ± 0.16[a]
Means	5.95 ± 0.26[a]	7.24 ± 0.15[b]	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mean values of aroma of tea at 1 day, 15 days and 30 days' storage were 7.8900, 8.93 and 7.8767, respectively. The highest aroma was found in 15 days of storage. The lowest aroma was observed at 30 days' storage. (Table 12)

Table 12: Mean Value of Aroma of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	5.82 ± 0.15	7.88 ± 0.02	6.8 ± 0.08[a]
15 Days	5.73 ± 0.23	8.93 ± 0.42	7.1 ± 0.32[a]
30 Days	5.7 ± 0.3	7.8 ± 0.85	6.4 ± 0.15[a]
Means	5.75 ± 0.22[a]	8.2 ± 0.43[b]	

T_0=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mean values of mouth feel of tea at 1 day, 15 days and 30 days' storage were 6.0333, 6.7767 and 5.9533, respectively. The highest mouth feels were found at 15 days of storage. The lowest mouth feel was observed in 30 days of storage (Table 13).

Table 13: Mean Value of Mouth Feel of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	5.6 ± 0.36	6.03 ± 0.05	5.73 ± 0.20[a]

DOI: https://doi.org/10.54393/df.v5i03.140

15 Days	5.68 ± 0.45	6.76 ± 0.05	6.02 ± 0.60[a]
30 Days	5.44 ± 0.48	5.95 ± 0.50	5.6 ± 0.49[a]
Means	5.52 ± 0.43[a]	6.2 ± 0.43[b]	

T_o=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

Mean values of overall acceptability of tea at storage of 1 day, 15 days and 30 days were 7.3067, 7.5067 and 6.9667, respectively. According to the table, the highest overall acceptability was found at 15 days of storage and the lowest overall acceptability was observed during 30 days of storage. This acceptability of herbal tea was measured using a 9-hedonic scale (Table 14).

Table 14: Mean value of Overall Acceptability (%) of Herbal Tea

Storage Effects	T_0	T_1	Mean ± S.D
1 Day	5.89 ± 0.31	7.3 ± 0.726	4 ± 0.51[a]
15 Days	6.2 ± 0.34	7.5 ± 0.506	6 ± 0.42[a]
30 Days	5.82 ± 0.84	6.9 ± 0.566	4 ± 0.7[a]
Means	5.9 ± 0.48[a]	7.2 ± 0.59[b]	

T_o=Control, T_1=Herbal tea blend. Different letters 'a' and 'b' indicate significant difference

DISCUSSION

Analysis of variance of the proximate analysis indicated significant results among treatments. Proximate composition was measured with the highest amount of moisture content and ash content was measured at 30 days of storage. Moisture content was measured and the highest amount of moisture % was measured at 1 day of storage shown in table 1. Contrasting results were also measured in which they compared the proximate analysis of cinnamon and lemongrass for their nutritive value [12]. They noted that the moisture of cinnamon was 5.6% and lemongrass was 10.12%. The value of cinnamon was very close to the current study. The ash content was measured and the highest amount of ash % was observed at 1 day of storage shown in Table 2. Contrasting results were also analyzed by [12], they compared the proximate composition of dried and fresh tulsi leaves. The ash content of both fresh and dry samples was 3.57% and 22%, respectively. It was shown that drying increased the ash contents of dried dry leaves. The crude protein was measured and the highest value of protein % was observed at 1 day of storage shown in Table 3. Contrasting results were also found in which researchers determined the protein content of ten local herbs and spices [13]. Crude fat was measured and the highest value of fat % was measured at 1 day of storage shown in Table 4. Contrasting results were also measured in which they calculated the nutritional composition of cinnamon [14]. The fiber content was measured and the highest value of fibre % was observed at 15 days of storage shown in Table 5. Contrasting results were also measured in which they determined the proximate and mineral composition of tulsi varieties [15]. The carbohydrates were measured and the highest value of carbohydrates % was observed at 1 day of storage shown in Table 6. Contrasting results were also measured, which determined the proximate composition of lemongrass varieties [16]. They calculated that lemongrass contained 63% carbohydrates, lower than the current reported value. This may be due to seasonal and regional differences. Crude protein, crude fat and crude fiber were measured in the highest amount at 1-day storage. Carbohydrates also show high results at day 1 and low values at 30 days of storage [17]. Analysis of Variance of the phytochemical analysis indicated non-significant results of tea at different times [18]. The pH value was measured and the highest value of pH was observed at 30 days of storage shown in Table 7. Contrasting results were reported by [16], in which they carried out a comparative study of the pH value of some essential spices. Antioxidant activity was measured and the highest amount of TPC was measured at 30 days of storage. Contrasting results were also measured by [19], in which they studied the antioxidant activity of green cardamom E. cardamom. They used ethanoic extract from cardamom seeds to measure total phenolic contents and DPPH. Results revealed that the total phenolic contents of cinnamon were 2.47 mg GAE/g at a concentration of 25 microgram/ml. From TPC analysis, they concluded that cinnamon was a rich source of polyphenols. While DPPH was measured in the highest amount at 1 day indicating the synergetic effect of all ingredients in increasing antioxidant activity than alone ingredient. Contrasting results were also measured by [20], in which they compared the antioxidant activity of fennel and sage essential oils. They noticed that at a concentration of 200 µg/ml, fennel essential oil showed 100% radical scavenging activity than sage (50.34%). They concluded from their study that fennel essential oil had the highest value of DPPH, PV, TBA and BCB. They also concluded from their results that fennel and sage essential were powerful antioxidants in stabilizing the essential oil to a greater period than synthetic antioxidants such as BHT, PG and BHA. Minerals such as Ca, K, Mn and Fe show the highest values at 15 days of storage. Results of [21] for the mineral profile of herbal tea and close to the results of this study, a little difference is due to differences in ingredients. Sensory analysis showed highly significant results among treatments. Sensory evaluation was done with a 9-hedonic scale and five qualities attributed to taste, colour, aroma, mouth feel and overall acceptability. Taste evaluation's highest score was obtained at 30-day storage and the highest score of aroma, mouth feel and overall acceptability were given at 15-day storage while the highest colour was obtained at day 1 analysis [22]. The study was conducted by [23] to assess the sensory characteristics of flower tea. In terms of taste, herbal tea stored for 30 days achieved a higher score compared to flower tea. Aroma results showed that herbal tea had the highest aroma score observed at 15 days, then flower tea. In terms of colour, herbal tea scored higher, reaching the highest peak at 15 days compared to flower tea. However, overall acceptability was superior in herbal tea, particularly

DOI: https://doi.org/10.54393/df.v5i03.140

at 15 days while jasmine flower tea had the lowest acceptability score.

CONCLUSIONS

It was concluded that herbal tea is a very popular beverage and is now gaining popularity worldwide, due to its variety of teas including rose tea, cinnamon tea, lemongrass tea, tulsi tea ginger tea etc. It was a mixture of plant parts. That is made from dried herbs, flowers and spices. It is not considered a true tea plant Camellia sinensis. This tea was made up of 40% rose petals, 15% lemongrass, 15% tulsi leaves, 10% cinnamon, 10% fennel and 10% ginger. Analysis and sensory were done at 1 day, 15 days and 30 days of storage and the best result was found at 15 days' storage. The results of the current study indicated that results of 15 days of storage were best of in antioxidant activity. This could be due to the synergetic effect of all ingredients rather than individual ingredients to show the highest amount of antioxidant activity. The developed tea was liked by the majority of personnel due to being caffeine-free, having a good aroma and a lot of health benefits from all-natural ingredients.

Authors Contribution

Conceptualization: MS, HN
Methodology: SM, MS, MSEA, MHUGH
Formal analysis: SM, MS, MSEA, MHUH
Writing review and editing: SM, MAK, HN, UM, AM, TBQ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] Inayat-ur-Rahman IU, Aftab Afzal AA, Zafar Iqbal ZI, Hart R, Abd_allah EF, Abeer Hashem AH *et al*. Herbal Teas and Drinks: Folk Medicine OF THE Manoor Valley, Lesser Himalaya,Pakistan.Plants.2019;8(12):581.doi: 10.3390/plants8120581.

[2] Salha SY, Abdulsudi IZ, Lucy CM. Functional and Sensory Quality of Complementary Food Blended with Moringa Leaf Powder. European Journal of Nutrition and Food Safety.2023 Aug;15(9):13-24.doi: 10.9734/ejnfs/2023/v15i91332.

[3] Alam MJ, Huq AO, Prodhan UK, Talukder MU. Development of Fiber Enriched Herbal Biscuits by Incorporating Tulsi Leaves on Wheat Flour: A Preliminary Study on Sensory Evaluation and Chemical Composition. Research & Reviews: Journal of Herbal Science. 2013; 2(2): 1-5.

[4] Rashid S, Ahmad M, Zafar M, Sultana S, Ayub M, Khan MA *et al*. Ethnobotanical Survey of Medicinally Important Shrubs and Trees of Himalayan Region of Azad Jammu and Kashmir, Pakistan.Journal of Ethno pharmacology.2015May;166:340-51.doi: 10.1016/j.jep. 2015.03.042.

[5] Walters NA, de Villiers A, Joubert E, de Beer D. Improved HPLC Method for Rooibos Phenolics Targeting Changes Due to Fermentation. Journal of Food Composition and Analysis.2017Jan;55:20-9.doi: 10.1016/j.jfca.2016.11.003.

[6] Sharma R, Tandon D, Joshi VK, Attri S. Development and Evaluation of Different Beverages from Aloe Vera (L.) Burm. F. for Their Nutritional, Functional and Sensory Qualities. Indian Journal of Natural Products and Resources. 2015 Dec; 6(4): 278-282.

[7] Hasan M, Islam N, Haque A, Hossain M. Formulation and Senso-Chemical Evaluation of Palmyrah Palm (Borassus Flabellifer L.) Based Value-Added Products. Journal of Food Research.2022 Jul; 11(3): 36-46. doi: 10.5539/jfr.v11n3p36.

[8] Akhila A, Suneetha WJ, Kumari BA, Kumar JH, Sreenivasulu M. Development and Nutritional Analysis of Standardized Health Mix with Germinated Siddi Rice. Journal of Community Mobilization and Sustainable Development.2024 Jul; 19(3): 615-26.doi: 10.5958/2231-6736.2024.00151.X.

[9] Alam M, Alam M, Hakim M, Huq AO, Moktadir SG. Development of Fiber Enriched Herbal Biscuits: A Preliminary Study on Sensory Evaluation and Chemical Composition. International Journal of Nutritional Food Sciences.2014; 3: 246-50. doi: 10.116 48/j.ijnfs.20140304.13.

[10] Xiao Q, Mu X, Liu J, Li B, Liu H, Zhang B *et al.* Plant Metabolomics: A New Strategy and Tool for Quality Evaluation of Chinese Medicinal Materials. Chinese Medicine.2022Apr; 17(1): 45. doi: 10.1186/s13020-022-00601-y.

[11] Lakshan SA, Jayanath NY, Abeysekera WP, Abeysekera WK. A Commercial Potential Blue Pea (Clitoria Ternatea L.) Flower Extract Incorporated Beverage Having Functional Properties. Evidence-Based Complementary and Alternative Medicine. 2019; 2019(1): 2916914. doi: 10.1155/2019/29 16914.

[12] Saber JI and Eshra DH. Using Fennel Seeds and Their Oil As A Preservative And Functional Food to Produce Some Food and Drink Products to Alleviate Cough Symptoms. Alexandria Science Exchange Journal. 2019 Sep;40(July-September):406-14. doi: 10.21608/ asejaiqjsae.2019.44629.

[13] Abid SF and Bashir S. Comparative Proximate Analysis of Cinnamon and Lemongrass for Its

DOI: https://doi.org/10.54393/df.v5i03.140

Nutritive Value. Journal of Human Nutrition and Food Sciences.2019; 5:1-3.

[14] Jabeen S, Shah MT, Khan S, Hayat MQ. Determination of Major and Trace Elements in Ten Important Folk Therapeutic Plants of Haripur Basin, Pakistan. Journal of Medicinal Plants Research.2010 Apr; 4(7): 559-66.

[15] Yang EJ, Seo YS, Dilawar MA, Mun HS, Park HS, Yang CJ. Physico-Chemical Attributes, Sensory Evaluation and Oxidative Stability of Leg Meat from Broilers Supplemented with Plant extracts. Journal of Animal Science and Technology.2020 Sep; 62(5): 730. doi: 10.5187/jast.2020.62.5.730.

[16] Roni RA, Sani MN, Munira S, Wazed MA, Siddiquee S. Nutritional Composition and Sensory Evaluation of Cake Fortified with Moringa Oleifera Leaf Powder and Ripe Banana Flour. Applied Sciences. 2021 Sep; 11(18): 8474. doi: 10.3390/app11188474.

[17] Islam MZ, Tabassum S, Harun-ur-Rashid M, Vegarud GE, Alam MS, Islam MA. Development of Probiotic Beverage Using Whey and Pineapple (Ananas Comosus) Juice: Sensory and Physico-Chemical Properties and Probiotic Survivability During In-Vitro Gastrointestinal Digestion. Journal of Agriculture and Food Research.2021 Jun; 4: 100144. doi: 10.1016/j.jafr.2021.100144.

[18] Alshehry GA. Preparation and Nutritional Properties of Cookies from the Partial Replacement of Wheat Flour Using Pumpkin Seeds Powder. World Journal of Environmental Biosciences.2020;9(2-2020): 48-56.

[19] Ghadermazi R, Keramat J, Goli SA. Antioxidant Activity of Clove (Eugenia Caryophyllata Thunb), Oregano (Oringanum Vulgare L) and Sage (Salvia Officinalis L) Essential Oils in Various Model Systems. International Food Research Journal. 2017 Jul; 24(4): 1628.

[20] Majid A, Ahmad H, Saqib Z, Rahman IU, Khan U, Alam J *et al.* Exploring Threatened Traditional Knowledge; Ethnomedicinal Studies of Rare Endemic Flora from Lesser Himalayan Region of Pakistan.Revista Brasileira de Farmacognosia.2020Feb;29:785-92. doi: 10.1016/j.bjp.2019.03.005.

[21] Nwankwo CS, Okpomor EO, Dibagar N, Wodecki M, Zwierz W, Figiel A. Recent developments in the hybridization of the freeze-drying technique in food dehydration: A review on chemical and sensory qualities.Foods.2023Sep;12(18):3437.doi: 10.3390/foods12183437.

[22] Özcan MM, Ünver A, Uçar T, Arslan D. Mineral Content of Some Herbs and Herbal Teas by Infusion and Decoction.FoodChemistry.2008Feb;106(3):1120-7. doi: 10.1016/j.foodchem.2007.07.042.

[23] Hussain N, Ishak I, Harith NM, Kuan GL. Comparison of Bioactive Compounds and Sensory Evaluation on Edible Flowers Tea Infusion.Italian Journal of Food Science. 2019; 31(2). doi: 10.14674/IJFS-1071.