

Development of an Anthocyanin Rich Vegetable Soup Mix

AYESHA IMRAN BUTT¹, NATALIA MALIK², SHAZIA TAHSEEN³, NADIA AKRAM⁴, FASIHA ILYAS⁵, MAHNAZ NASIR KHAN⁶

^{1,2,4}Nutritionist

³Associate Professor Obstetrics & Gynaecology, Rahbar Medical & Dental College, Lahore

^{4,5}Consultant Nutritionists, Kinnaird College, Lahore

Correspondence to Dr. Shazia Tahseen Email: drshaziaimran2013@gmail.com, Cell: 0300-4454797

ABSTRACT

Background: Anthocyanins are colored pigments that are present in plant based foods. They are basically a subcategory of flavonoids that promote health inducing benefits such as anti-cancer, anti-inflammatory, anti-diabetic and anti-obesity effects. With advancement in technology, people have transitioned towards fatty, high caloric, ready to eat fats foods.

Aim: To develop an anthocyanin rich vegetable powder; to develop a vegetable soup mix from dehydrated powder to assess the organoleptic properties of vegetable soup mix and to evaluate consumer acceptability of soup mix.

Methods: This study was carried out in Kinnaird College, Food Sciences Laboratory and the sensory evaluation was conducted on a 9-point hedonic scale by the expert panelists of Food Sciences and students of Kinnaird College. Firstly, the vegetables were selected based upon consumption and their preparation rate.

Results: The study showed that consumers did accepted our product on the basis of aroma, consistency, flavor, colour, texture, taste and its overall acceptability; however each vegetable had its own acceptable ratio; for brinjal and purple cabbage it was 25%, but for tomato, turnip it was 20%. Thereafter, qualitative analysis for the presence of anthocyanins was carried out using UV-spectroscopy; as the wavelength absorbance was greater than 200nm, it confirmed the presence of anthocyanins in all four soup mixes.

Conclusion: Therefore, this study is based on developing an efficient, effective and easy to use anthocyanin rich product for the purpose of increasing the consumption of anthocyanin rich vegetables; which would also be taste effective for the consumers.

Keywords: Anthocyanins, flavonoids, dehydration, spectroscopy, AOAC, OMA,

INTRODUCTION

Anthocyanins are colored pigments that are present in different plant based foods. It is a subcategory of flavonoids; flavonoids is a compound that imparts health inducing benefits on a human body such as anti-cancer, anti-inflammatory, anti-diabetic, anti-obesity effects, as well as in improving the overall appearance and attractiveness of the food. Reviewing different surveys conducted in the past show that people in Pakistan tend to spend more on fish, meat and rice as compared to vegetables. The reason is the low taste acceptability rate of vegetables. Specifically, the vegetables rich in anthocyanin are neglected due to their undesirable bitter taste. Therefore, the study has been focused in the development of a tasteful and easy to use anthocyanin rich vegetable product so that the consumers can get their desirable taste and advantage of the health and nutrition properties of anthocyanin at the same time.

METHODS

The study was an experimental research based on the development of four anthocyanin rich vegetable powder to be incorporated for making soups. This study was carried out in Kinnaird College, from year 2018 to 2019, at the Food Sciences Laboratory and the sensory evaluation was conducted on a 9-point hedonic scale by the expert panelists of Food Sciences and students of Kinnaird College. Firstly, vegetables were selected on the basis of

their preparation and consumption rate; these included Turnip, Brinjal, Tomato and Purple cabbage. In this research, vegetables were used in dehydrated form, in particular; vegetable powder. The dehydration process was carried out under clean and proper setting at PCSIR (Pakistan Council of Scientific and Industrial Research). Thereafter, all the ingredients were incorporated in specific ratios to form a soup mix; these included the vegetable powder, tapioca powder, maize flour and spices. Then, the product was standardized by following product standardization guidelines by USDA. The final product was then evaluated to confirm the presence of anthocyanins by using UV-Spectroscopy using Official Methods of Analysis (OMA) under AOAC international's premier methods program.

Statistical analysis: The sensory evaluation of all the four type of vegetable soup mix (tomato, turnip, brinjal, purple cabbage) modified at different levels 15%, 20% and 25% were evaluated by the expert panelist using 9-point hedonic scale which was the represented in form of bar charts using Microsoft Excel software program, presenting their mean and standard deviation. Before that variance analysis was carried out using one way-ANOVA on SPSS; which showed that all values were significant as they were less than the p value that is 0.05. Thereafter the mixture with the most favored results was selected and was again evaluated by the expert panelist as well as students of Kinnaird College considering them as the expected consumers three times, using the 9-point hedonic scale, to standardize it. The sensory attributes that were assessed included aroma, flavor, color, consistency, texture, taste and overall acceptability. A radar chart was formed on

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Microsoft excel 2013 software. The radar chart depicted that the product received the same acceptance, for all three times it was developed.

RESULTS

The sensory evaluation of all soups prepared by soup mix modified at different levels 15 %, 20 % and 25 % were evaluated by the expert panelist using 9-point hedonic scale. Thereafter the mixture with the most favored results was selected and was again evaluated by the expert panelist using a 9-point hedonic scale three times to reconfirm its standardization. The sensory attributes that were assessed included appearance, aroma, consistency, flavor, taste, color, texture, and overall acceptability. The overall acceptability of brinjal soup mix was 7.64(STD±0.45), overall acceptance of turnip soup was 6.60(STD±0.55), overall acceptance of tomato soup was 6.60 (STD±0.55), overall acceptance of purple cabbage was 7.64 (STD±0.46).

Table 1: Mean and standard deviation of brinjal soup mix

Parameters	Test 1	Test 2	Test 3
Aroma	7.04±0.62	7.60±0.42	6.90±0.55
Consistency	7.20±0.76	7.62±0.41	6.80±0.55
Flavour	7.22±0.30	7.60±0.42	6.80±0.55
Color	7.12±0.76	7.62±0.42	6.70±0.55
Texture	6.86±0.50	7.64±0.42	6.70±0.55
Taste	6.80±0.45	7.62±0.42	6.70±0.55
Overall Acceptance	7.10±0.22	7.60±0.42	6.60±0.55

Table 2: Mean and standard deviation of turnip soup mix

Parameters	Test 1	Test 2	Test 3
Aroma	7.04±0.62	7.60±0.42	6.90±0.55
Consistency	7.20±0.76	7.62±0.41	6.80±0.55
Flavour	7.22±0.30	7.60±0.42	6.80±0.55
Color	7.12±0.76	7.62±0.42	6.70±0.55
Texture	6.86±0.50	7.64±0.42	6.70±0.55
Taste	6.80±0.45	7.62±0.42	6.70±0.55
Overall Acceptance	7.10±0.22	7.60±0.42	6.60±0.55

Table 3: Mean and standard deviation of tomato soup mix

Parameters	Test 1	Test2	Test 3
Aroma	7.04±0.62	7.60±0.42	6.90±0.55
Consistency	7.20±0.76	7.62±0.41	6.80±0.55
Flavour	7.22±0.30	7.60±0.42	6.80±0.55
Color	7.12±0.76	7.62±0.42	6.70±0.55
Texture	6.86±0.50	7.64±0.42	6.70±0.55
Taste	6.80±0.45	7.62±0.42	6.70±0.55
Overall Acceptance	7.10±0.22	7.60±0.42	6.60±0.55

Table 4: Mean and standard deviation of purple cabbage soup mix

Parameters	Test 1	Test2	Test 3
Aroma	7.14±0.22	7.32±0.30	7.60±0.38
Consistency	7.10±0.22	7.34±0.24	7.64±0.41
Flavour	7.10±0.22	7.34±0.20	7.70±0.20
Color	7.12±0.27	7.32±0.04	7.64±0.23
Texture	7.06±0.13	7.34±0.26	7.70±0.41
Taste	7.06±0.68	7.34±0.32	7.74±0.24
Overall Acceptance	7.22±0.30	7.36±0.23	7.64±0.45

The presence of anthocyanin was detected by performing spectroscopy, using UV- visible spectrophotometer. If the absorption of UV rays comes between 200-700nm that means anthocyanin are present. This test was performed for all four soup

mixes. The results were positive for anthocyanin for all the four vegetable soup mixes with a peak wavelength of 350nm.

Table 5: Qualitative analysis of anthocyanin

Vegetables	Wavelength (nm)	Peak (a.m.u.)
Brinjal	350	1.18
Purple cabbage	350	0.385
Tomato	350	1.59
Turnip	350	0.409

The nutritional composition of the soup mixes were analysed by using USDA food composition database. In this analyses we determined the macronutrients; carbohydrate, protein and fat content as well as the fiber content. The analysis showed that. Fat averagely ranged from 0.1-0.2, with brinjal and tomato having 0.2g, turnip and purple cabbage with 0.1 g of fat. Moreover brinjal contained the maximum fiber content that is 3g. However the overall fiber content varied from 1.5-3g in all the soup mixes.

Table 6: Nutritional composition of brinjal soup mix per serving (25g)

Carbohydrates	4.8 g
Proteins	1 g
Fats	0.2 g
Fiber	3 g

Table 7: Nutritional composition of turnip soup mix per serving (25g)

Carbohydrates	6 g
Proteins	0.9 g
Fats	0.1 g
Fiber	1.8 g

Table 8: Nutritional composition of tomato soup mix per serving (25g)

Carbohydrates	3.5 g
Proteins	0.9 g
Fats	0.2 g
Fiber	1.5 g

Table 9: Nutritional composition of purple cabbage soup mix per serving (25g)

Carbohydrates	7 g
Proteins	1.4 g
Fats	0.1 g
Fiber	2.1 g

DISCUSSION

Anthocyanin is a group of flavonoids which contribute in lowering the oxidative stress in body by eliminating free radicles. That is the reason why they have anti-microbial, anti-viral, anti-inflammatory and anti-carcinogenic properties. Along with the health benefits, these compounds are also used as natural coloring agents in industries (Khoo, 2017). Anthocyanin are predominantly present in the skin of fruits and vegetables but it is also present in the flesh in case of red fruits (Martin J., Navas, M., Moreno A., & Asuero, A., 2017). According to a survey, people in Pakistan consume very low amounts of vegetables. To be exact, 14% of the population in Punjab and Sindh, 12% in KPK and 15% in Balochistan (Kausar & Ijaz 2014). Hence, to put it briefly, development of a product by utilizing the vegetable powder from the dried vegetables is the main concept of our study. In particular, to develop a vegetable product, rich in anthocyanin especially for people who do not consume enough vegetables due to rapid globalization and due to their busy routines and lack of taste development for anthocyanin rich vegetables. This research used spectrometry for analyzing the content of anthocyanin but, this method is used to analyze many other contents too for e.g., it can also be

used to analyze the sugar content in food products. (Buchholz, 2018)

Moreover, it was observed that consistency of the soup has a tendency to change by altering the serving size of the instant powder. Furthermore, results parallels with the sensory results of moringa mushroom vegetable soup hence validating our serving size and proportion of nutrients. The results were compared with another research in which a vegetable soup powder was prepared by adding moringa leaves, mushrooms and soy flour. The results differ in a sense that our research had more anti-oxidant contents as compared to the other research. Moreover, we used anthocyanin rich vegetables instead of moringa leaves, herbs instead of mushrooms and tapioca and maize flour instead of soy flour. (Farzana, 2017)

We also compared our research with another research in which a vegetable soup mix made up of amaranth was made for the nourishment of adolescents. This soup was rich in iron and proteins and our research include soups rich in anti-oxidants along with a different target group (Tumuhimbise, 2018).

The results of this study cannot be generalized because of its limitations as the study did not consider other anthocyanin rich fruits and vegetables and focused on the development of a vegetable soup mix from four anthocyanin rich vegetables; brinjal, turnip, tomato, purple cabbage. Plus, the soup prepared from soup mixes were evaluated over their organoleptic properties using a 9 point hedonic scale.

CONCLUSION

The intake of vegetables in Pakistan is very low i.e., 100g out of 250g, which is the recommended amount (Khokar, 2014). Considering the results of a recent report, if a

population follows the daily recommended guidelines for fruits and vegetable servings, the estimated average intake of anthocyanin would be increased to 11mg/day which is quiet sufficient to prevent heart related complications (Wallace, 2018).). Hence, the focus was primarily to consider the provision of a convenient and quick nutritious source especially rich in flavonoids, in particular anthocyanin. In a nutshell, the study is based on the development of a vegetable product mix; rich in anthocyanin and easy to use for the consumers who do not have time to prepare their food at home because of their busy lives. Hence, it is a convenient and nutritious product considering the busy daily monotony of time.

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