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Development And Sensory Chractarization Of Beetroot Powder (Beta Vulgaris) Incorporated Buns And Explore Its Uses Against Hypertension

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Abstract

Hypertension is a silent killer as it the root cause of numerous deadly diseases. Due to its fatality various treatment approaches are employed for its treatment. Among the functional foods, beetroot is considered beneficial in lowering blood pressure and this effect is allocated due to high concentrations of inorganic nitrate in beetroot. Beetroot (Beta Vulgaris) is rich in various essential nutrients and exhibits numerous positive effects on health. These include the antioxidants in the form of natural phytochemicals. Betalain is the bioactive pigment in beetroot. The goal of this current study was the development of beetroot supplemented buns and determine the beneficial nutrients present in it. The fresh beetroot was dried in the oven and then crushed into fine powder for use in the development of food products. The beetroot was used at different rate. Initially beetroot powder was subjected to antioxidant and proximate analysis. Later beetroot supplemented buns were subjected to sensory evaluation and proximate attributes. According to results, beetroot powder contains a significant amount of antioxidant, moisture, crude fat and crude protein. Supplemented buns were subjected to sensory evaluation and it was found that T6 treatment gained maximum number in all sensory attributes due to the fact that T6 contain more beetroot powder compared with other treatments.

Keywords: Hypertension; Beetroot powder; Nutrition; Antioxidant, Supplemented buns

Introduction

High blood pressure medically known as hypertension is a major health problem worldwide. Hypertension is the main cause for the development of heart related issues and stroke. People who have uncontrolled hypertension are at 3-folds more risk for developing heart diseases than the normal individuals (Lawes et al., 2008). Many dietary factors such as excessive salt consumption and alcoholic intake, Eating less fruits and vegetables and lifestyle with less physical activity could increase the chances of hypertension. The deficiency of certain minerals and vitamins like folic acid, riboflavin, vitamin C and vitamin D are considerable risk factors for developing hypertension (McCartney et al., 2015). Beetroot lowers the risk of blood pressure, it enhances the stamina of exercise, increases muscle power of people with dementia, Helps in maintaining healthy weight. Reduce cholesterol in body etc. Beet root (Beta Vulgari) belongs to Chenopodiaceae family has been used extensively for treating atherosclerosis, vascular dysfunction, cardiac issues and diabetes (Affourtit et al., 2015). Beetroots are available throughout the year. Beetroots are beneficial for health main benefits it contains no fat, very few calories and it has a great amount of fiber. Beetroots quality can be improved by the air temperature range which should be between 10 and 18 ºC. white color irngs can be developed by increased amount of rainfall, increased temperature and more use of fertilizer. Germination of beetroot is best at 10 to 30 ºC soil temperature, minimum can be 5 ºC, and maximum can be 35 ºC. Beets need 2 weeks of cold temperature around 4 to 10 ºC or longer for flower production.

Dietary nitrate lowers blood pressure via the enterosalivary nitrate-nitrite-nitric oxide (NO) pathway (Bondonno et al., 2015). Blood pressure has consistently been shown to be lower (Siervo et al., 2011). This suggests that increasing dietary nitrate consumption, which is abundant in green leafy vegetables and beets (Beta vulgaris), might help to reduce the risk of other illnesses including cardiovascular disease (Kapil et al., 2015). Beetroot is an antioxidant and nutrient enriched vegetable, due to its nutritional content it exhibits the properties of functional food. Carbohydrates in the form of starch, glucose and fiber, fats like saturated, unsaturated and polyunsaturated fatty acids in small amounts, many essential and non-essential amino-acids in small amounts are also present in beetroot. It contains flavonoids, saponins, nitrates, carotenoids, polyphenols, certain minerals like sodium, potassium, zinc, iron, copper, magnesium, various vitamins. It also contains pigments like betacyanins and betaxanthins that contribute to red-violet and yellow-orange colors respectively (Panghal et al., 2007).

Beetroot has anti-inflammatory effect. Beetroot contains betalains as active ingredient (Slavov et al., 2013). It reduces homocysteine concentration which helps in maintaining the platelet functioning and homeostasis (Machha and Schechter, 2009). It helps in keeping gut healthy, strengthening immune system (Miraj, 2010).

It reduces inflammation and oxidative stress. It improves cerebrovascular function as it generates nitric oxide which relaxes the vessels and boosts blood flow (Wylie et al., 2013). It contains good amount of iron in it thus helps to treat anemia by reactivating red blood cells and aids in blood purification (Coles, 2012). Also, the copper in it promotes the availability of iron to body. Beetroot exhibits anti-cancer effect as it has saponins, betalains that insulates injured tissues, it also prevents the tumor cell proliferation. Beetroot reduces the level of bad

cholesterol. Due to the presence of B-vitamins, magnesium and folate it promotes the proper nervous-system functioning (Székely et al., 2016).

Objectives:

1. To determine the nutritional Profile of beetroot powder.
2. Formulation and sensory evaluation of beetroot supplemented buns by using different concentration of beetroot powder
3. To determine the Proximate Profile of Beetroot supplemented buns with best treatment

Methodology

The University of Faisalabad conducted research to assess the nutritional profile of beetroot powder in order to produce a healthy product. Beetroots were purchased at a local market in Faisalabad, washed, peeled, grated, and sun dried for three to four weeks. Following that, the dried beetroots were milled into a fine powder, which was then analyzed for proximate analyses. Beetroot powder was also used to make buns, which is a culinary product.

Proximate Analysis: The moisture content, crude fat, crude protein, crude fibre, total ash, and nitrogen free extract of beetroot powder samples were assessed using the AOAC techniques (2006).

Moisture Content: The moisture content is evaluated using AOAC guidelines (2006). The samples were weighed and then put in an Air Forced Draft Oven at 105°C until the weight remained consistent.

Crude Protein: The crude protein % figure was obtained using the Kjeldahl technique in accordance with AOAC guidelines (2006).

Crude fat was measured by putting 3 g of each sample into the Soxhlet Apparatus with ethanol as the solvent (AOAC, 2006).

Crude Fiber: According to the AOAC recommendations, crude fibre was defined as the weight loss during the ignition process (1990).

Total Ash Content: The total ash content was determined using the direct incineration method according to the AOAC standards (2006)**.**

Buns preparation: The recipe below was used to make buns with various treatments (To, T1, T2, T3, T4, T5, and T6) as specified (Table 1). The materials were precisely weighed, and the contents were completely combined and kneaded until a dough was produced. The dough was left at room temperature for 30 minutes. The dough was divided into six portions and used to produce one bun without beetroot powder (control buns) and five sets of buns, with the treatment of 1, 2 ,3 4 ,5 and6 grams respectively shown in table, each weighing 40 grammes. Preheat the oven to 200 degrees Fahrenheit for 15 minutes. Bake buns at 180 degrees Celsius for 15 to 20 minutes, then cool for half an hour before storing.

Table: 1 Treatment plan with different level of beetroot powder

Treatments	Percentage of flour	Quantity of beetroot powder
To	100	0
T_1	99	1g
T_2	98	2g
T_3	97	3g
T_4	96	4g
T_5	95	5g
T_6	96	6g

Sensory Evaluation: Separate booths were set up for each panelist with white light and mineral water to neutralize flavor, and a sample of product was delivered in plates during the assessment procedure at the University of Faisalabad. The panelists were asked to rate the product's quality by using a 9-point hedonic scale to score the criteria. A trained panel assessed the appearance, texture, taste, color, fragrance, flavor, aftertaste, sponginess, and overall acceptability of beetroot powder-based buns (T0=0g, T1=1g, T2=2g, T3=3g, T4=4g, T5=5g, T6=6g) and found to be treatment T6 is best treatment and acceptable than all other treatments.

Proximate Analysis: The moisture content, crude fat, crude protein, crude fibre, total ash, and nitrogen free extract of beetroot powder of bun with best treatment samples were assessed using the AOAC techniques (2006).

Total phenolic and total flavonoid content were determined using folin ciocalteu activity, and total flavonoid content was determined using spectrophotometry with alumin chloride colorimeter activity (Igara, Omoboyowa et al. 2016).

Statistical Analysis: Data was subjected to statistical analysis using statistix. 8.1. software.

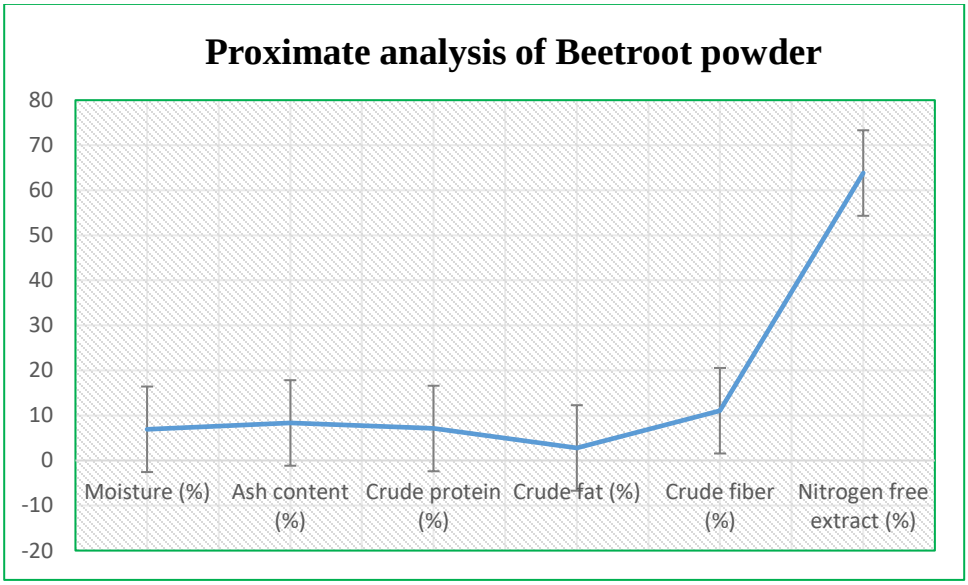
Results and discussions

According to statistics from various national and regional surveys, hypertension is common in developing countries, particularly in urban areas, and awareness, treatment, and control rates are low. Several hypertension risk factors appear to be more common in developing countries than in developed countries. The current study was conducted at the University of Faisalabad in a clean environment. Beetroots were procured from the Faisalabad local market.

Proximate Analysis: Proximate analysis is a crucial criterion for determining the nutritional content of food. As a result, food stability is dependent on its proximate composition in terms of processing and storage, therefore a sample of beetroot powder was subjected to several analytical techniques for moisture ash, crude protein, crude fibre, and crude fat analysis. When food producers distribute their goods to end customers, they must ensure that they comply with applicable laws and legal declaration requirements, as well as the safety characteristics of the final products, which needs "proximate analysis."Beetroot powder was analytically processed to determine their moisture content which was 6.92%, ash content 8.33%, crude fat 2.78% which is very low, crude protein 7.1%, crude fibre 11.05% and nitrogen free extract 63.82% these were found according to the protocols cited in

AOAC (2006) respectively. Proximate analysis basically shows the nutritional profile of food product. Mean and standard deviation of proximate analysis is shown below in figure 1. The data depicts that with the increase in beetroot powder, proximate features were also enhanced. Proximate are a deconstruction of a human-consumable good into its primary constituents utilised in the examination of biological materials. They are an excellent estimate of the contents of packaged edible foods and may be used to verify nutritional panels at a low cost. The addition of beetroot powder had a significant impact on the proximate features of buns (Nowacki et al., 2015).

Figure: 1 Proximate analysis of Beetroot powder

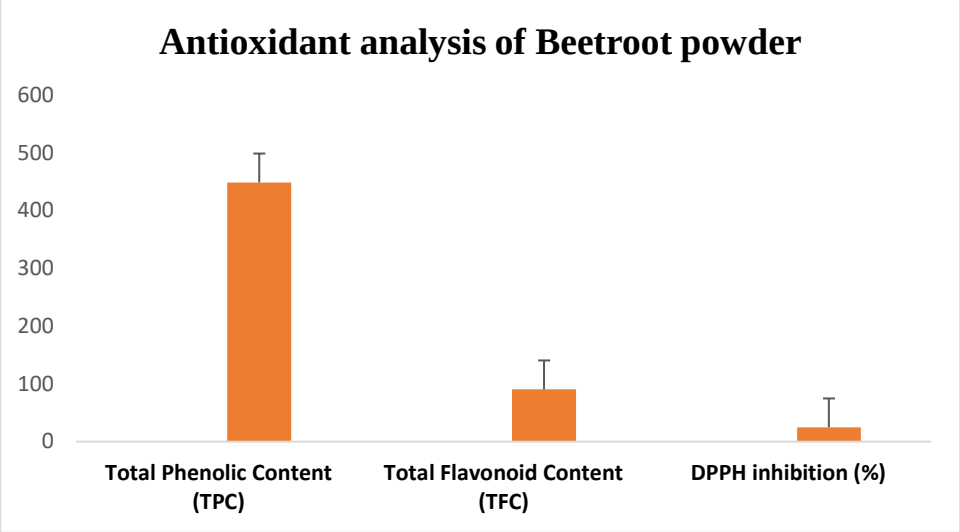


Antioxidant features of beetroot powder;

Antioxidants are substances that may protect your cells from free radicals, which have been related to heart disease, cancer, and other ailments. Free radicals are formed when your body breaks down food or is exposed to cigarette smoke or radiation. A substance that protects cells from the damaging effects of free radicals (unstable molecules made by the process of oxidation during normal metabolism). Cancer, heart disease, stroke, and other ageing disorders may all be linked to free radicals. Beetroot powder was subjected to antioxidant analysis, and it was found that they contain a handsome amount of total penolic content, total flavonoid content and DPPH. Total phenolic content was 448.78 mg/L, Total flavonoids were 90.57 mg/L and DPPH was 24.78% (Figure 2).

Antihypertensive drugs, such as enriched fortified buns with antioxidant properties, appear to be the most successful treatment for hypertension so far, since they can decrease blood pressure by affecting molecular processes involved in vascular function and oxidative state regulation (Digiesi et al., 2001).

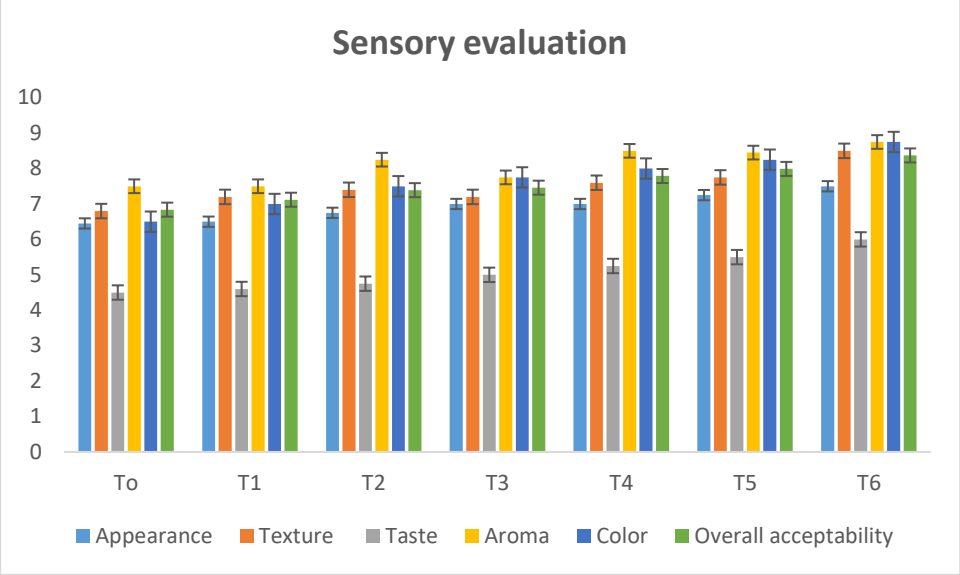
Figure 2. Antioxidant analysis of beetroot powder



Sensory analysis is a research field that uses laboratory design and quantitative analytic methods to analyses consumer goods via the use of human senses. Panels of human evaluators evaluated the beetroot powder and its many sensory characteristics for discipline. A trained panel of judges evaluated the beetroot powder for different treatment (T0, T1, T2, T3, T4, T5, T6) with respect to appearance, texture, taste, aroma, color and overall acceptability using a 9-hedoinc scale. Figure 3 showed the results of sensory evaluation of beetroot powder. With respect to appearance maximum number was given to T6 (8.75), followed by T5 (7.99), T4 (8) and minimum was in To control treatment To (6.8). Similar trend was observed in texture where maximum number was given to T6, followed by T5, T4, T3, T2, T1 and To. T6 obtained 8.5 marks using the 9-hedonic scale.

Aroma was a bit different with respect to each treatment. According to the judges, aroma of T6 treatment was best recorded with a mean value of 8.75 ± 0.78 and aroma value was recorded minimum in To control with a value of 7.5 ± 0.56. The data in terms of overall acceptability showed that treatment with more beetroot powder gained maximum numbers of 8.37 ± 1.21, followed by T5 (7.99 ± 0.47), T4 (7.79 ± 1.05), T3 (7.46 ± 0.28), T2 (7.39 ± 1.78), T1 (7.12 ± 0.68) and To (6.84 ± 0.78). Data regarding sensory evaluation showed that addition of beetroot powder had a significant relation with the taste, aroma, color and overall acceptance of enriched beetroot powder buns (Yashwant, 2015).

Figure: 3 Sensory evaluation of buns with various level of beetroot powder Supplemented buns



Proximate attributes of beetroot powder buns

Data regarding proximate features of prepared buns is depicted in Table 2. Maximum moisture was recorded in T6 where maximum beetroot powder was added (88.78 ± 1.34[a]). Highest ash content was observed in T6 (1.45 ± 1.15), followed by T5, T4, T3, T2, T1 and To (0.89 ± 0.56). Protein and fiber content were measured and found maximum in treatment where more beetroot powder was added. The minimum protein and fiber were recorded in control treatment where beetroot powder was not added. This increase/decrease is directly linked with the quantity of beetroot powder added, as they originally contain moisture, fat, protein, and fiber.

Table: 2 Proximate attributes of beetroot powder buns

Treatments	Moisture (%)	Ash (%)	Protein (%)	Fiber (%)
To	84.42 ± 0.45	0.89 ± 0.56	0.89 ± 0.89	1.12 ± 0.78
T1	87.25 ± 0.56	0.92 ± 0.75	0.95 ± 0.45	1.56 ± 1.04
T2	88.64 ± 0.89	0.97 ± 0.89	0.99 ± 1.12	1.78 ± 1.18
T3	85.45 ± 1.01	1.04 ± 0.98	1.12 ± 0.78	1.88 ± 1.65
T4	87.45 ± 0.89	1.12 ± 1.05	1.45 ± 0.59	1.98 ± 1.24
T5	79.45 ± 1.24	1.28 ± 1.12	1.58 ± 1.45	2.08 ± 0.89
T6	88.78 ± 1.34	1.45 ± 1.15	1.67 ± 1.56	2.35 ± 1.79

Conclusion

Beetroot is good source of betalain, which makes it potential source for exploration and value addition in different food. Beets and beetroot powder have been linked to several health benefits, including increased blood flow, lower blood pressure, and better athletic performance. Sensory results showed that the treatment T_6 (6g) has the best possible acceptability. Beetroot powder enhanced the color and acceptability of buns due to its attractive brown color and increased nutritive value. It could be finally concluded that Beetroot powder is a good

source of carbohydrate, fiber and protein, fiber is good for reduction of blood pressure which decreases the risks of CVD and other heart problems. Beetroot supplementation had a stronger effect on both systolic and diastolic blood pressure than inorganic nitrate. Beetroot supplemented buns also have significant impact on human health due to their significant level of antioxidant level like total phenolic content and total flavonoid content. Beetroot powder could be used as a natural source against hypertension due to its strong sensory, proximate and antioxidant behavior.

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