

Research Article



Nutritional Assessment of Basil Seed and its Utilization in Development of Value Added Beverage

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Abstract | Basil seeds are used not only as pharmaceutical plant but also for culinary purpose. The current study has been undertaken to develop a nutritious, healthy and value added drink. Proximate, mineral analysis, total polyphenol content and mineral analysis of basil seeds was conducted. Result revealed that basil seeds are not only good source of fiber and protein but they provide appreciable amount of minerals and phenolic compounds. Swollen basil seeds were used to prepare beverage at three supplementation levels i.e. 0.2, 0.3 and 0.4%. Sensory evaluation of basil seed drink revealed that 0.3% basil seeds supplemented drink was liked most in term of taste, texture and over all acceptability whereas 0.4% basil seeds supplemented drink were least liked as compared to other treatments. It was concluded that basil seed could be supplemented in different food products for the preparation of value added, healthy and nutritious diets.

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Introduction

Basil (*Ocimum basilicum* L.) is native plant of tropical regions. It belongs to genus *Ocimum* which comprises between 50 and 150 species of herbs and shrubs (Paton et al., 1999). It is one of endemic plant which is used not only as pharmaceutical plant but also used as culinary herb (Naghibi et al., 2005). Seeds of basil have been used as traditional medicine for treatment of dyspepsia, ulcer, diarrhea and other illness. Many parts of Asia basil seeds are used to prepare traditional beverages (sharbat) and many ice desserts like falooda (Hosseini-Parvar et al., 2010). Basil seeds are used as diuretic, antipyretic, antispasmodic and stomachic (Alcicek et al., 2004). Basil seeds are black in color and with oval shape and are

good source of fiber. When seeds of basil are soaked in water they swell up and produce gelatinous mass because poly saccharide layer is present on outer epidermis wall of seed (Azoma and Sakamoto, 2003). Two major fractions of poly saccharides has been reported from basil seeds, glucomannan (43%) and (1-4)-linked xylan (24.29%) and a minor fraction of glucan (2.31%) (Hosseini Parvar et al., 2010). Suitability of basil seed gum in model system has been reported recently (Bahram-Parvar and Razavi, 2012).

Recent epidemiological studies have strongly suggested that consumption of certain plant materials such as seeds, leaves, fruits and roots may reduce the risk of chronic diseases related to oxidative stress on account of their antioxidant activity and promote general

health benefits (Ramarathnam et al., 1995). Phenolic compounds present in plant parts have been reported to have multiple biological effects such as antioxidant activity, antimutagenic, antitumor and antibacterial properties (Pietta et al. 1998). Essential oil extracted from basil leaves and seeds have antimicrobial and antioxidant properties. Physical and chemical composition of Indian and Iranian basil seeds has been reported by Mathews et al. (1993) and Razavi et al. (2009). Basil seeds were used as thickening and stabilizing agent because of their high polysaccharide contents or these were usually processed into essential oil products in many studies (Rafe et al., 2012) while information about phenolic profile of basil seeds is limited. So phenolic content estimation of basil seeds is necessary to find relation of basil seed with health promoting functions, as antioxidant capacity of phenolic compounds protect the cell from free radicals which cause damage (Zhang et al., 2013).

In recent years, due to busy life styles peoples diet demand and pattern has been changed. They tend to consume delicious, readily available and affordable foods. Intake of such foods many diseases have been found in new generation due to low fiber intake and less nutritious components (antioxidant and minerals) in ready made food products (NHMRC, 2006). Food scientists and technologists are doing efforts to develop nutritious and healthy foods with suitable sensory characteristics. Until now many research and studies have been conducted on enrichment, supplementation and value addition of food products such as bakery, dairy and beverages (Alqahtani et al., 2014; Caleja et al., 2015; Hajmohammadi et al., 2016; Paquet et al., 2014; Pentikainen et al., 2014). Carboxymethyl cellulose (CMC) is used in most of beverage as stabilizer and it is obtained from drying the stem exudates of Asiatic species of alkali-cellulose. This hydrocolloid is suitable as stabilizers due to its some properties such as high viscosity at low concentration, good suspension and low cost (Arinaitwe and Pawlik, 2014).

Beverage is an excellent media to intake nutrients inside body, because it is consumed all over the world to quench thirst and to meet water requirement of body. This study was designed to assess the nutritional composition of basil seeds and their utilization in beverages so that nutritional requirement of consumers can be met by economical way. Basil seeds are easily available and cheaper source of micronutrients.

Materials and Methods

Present research project was conducted at Food Science and Product Development Institute, National Agricultural Research Center, Islamabad. Raw materials such as basil seeds, sugar, lemons, CMC and Citric acid were purchased from the local market of Islamabad. Chemicals for analysis were purchased from Sigma Aldrich (Seelze, Germany) and Lab-Scan (Dublin, Ireland) available in the local market.

Chemical analysis of basil seed

Proximate composition such as moisture, ash, crude fat, crude protein and crude fiber of basil seeds was determined according to the procedures given in AOAC (2000). For moisture determination samples were dried in oven at 130°C for 60 minutes. For ash determination samples were placed in muffled furnace at 550°C to burn out all carbon compounds leaving in organic part (ash). Fat was determined by fat extraction unit by using n. Hexane. For fiber determination, samples were treated with 1.25% Sulphuric acid and Sodium Hydroxide solution. After filtration of digested material it was washed with hot water and then ignited. By calculating loss of weight after ignition, crude fiber contents were determined. Protein contents were determined by using kjeldhal unit.

Total phenolic contents of basil seed

Total phenolic contents were measured by using Folin–Ciocalteu colorimetric method (Singleton et al., 1999) spectrophotometrically with some modifications. Extraction of sample (5g basil seeds) was carried out by using ethanol. One mL of 10% (v/v) Folin–Ciocalteu reagent in distilled water was mixed with sample extract. After 6min, 2.0 mL of a 20% sodium carbonate solution was added. The mixture was placed at 30 °C for 60 min. Absorbance was determined at 765nm. Gallic acid was used as standard and the total phenol content was expressed as mg GAE/g of sample.

Mineral analysis of basil seeds

Mineral contents were measured by atomic absorption spectrophotometric method according to method given in AOAC (2000). Sample was ashed at 550 °C in furnace. Then digestion of dry ash was carried out by adding 6M HCL and 0.1 M HNO₃ at equal ratio. After dilution, mineral contents were measured by using atomic absorption spectrophotometric method.

Preparation of basil seed beverage

Basil seeds were purchased from local market and cleaned carefully to remove stones, stalks and dust. Seed preparation was done by using modified method based on earlier studies (Razavi et al., 2009). Seeds were soaked in water at 50°C for 20 min with water/seed ratio of 50:1. Frequent stirring was done. Then by using perforated container, swollen seeds were separated.

For preparation of hydrocolloid solution 2g CMC powder was dissolved in distilled water at 70°C for 2 hour with continuous stirring by magnetic hot plate. 1 liter water, 140 g sugar, 2 g salt, 2mL lemon extract, 1g sodium benzoate were mixed together to prepare beverage for all treatments. Swollen basil seeds were added according to treatment as shown in Table 1. This mixture was pasteurized and hot filled in 250 mL bottles.

°Brix and titratable acidity

The pH was determined by a digital pH meter, °Brix was measured by Abbe refractometer and Titratable acidity of the sample was determined according to the standard method of AOAC (1999).

Sensory evaluation of basil seed beverage

Sensory evaluation of basil seed drinks were evaluated for sensory characteristics such as color, appearance, flavor, mouth feel and overall acceptability at 17±5°C by expert panel of 20 judges (12 females and 08 males) from NARC. The evaluation was done in sensory evaluation laboratory by a panel with normal lights on 9-points Hedonic Scale (Land and Shepherd, 1988).

Statistical analysis

Results were statistically analyzed by using analysis of variance technique (ANOVA). The difference in means was evaluated by the Least Significant Design. This analysis was done by using statistic 9.0 software (Analytical software, Tallahassee, FL).

Result and Discussion

Proximate composition of basil seeds

Proximate composition of basil seeds in given in Table 2 Basil seeds contain 9.19% moisture, 17.32% crude protein, 9.68% crude fat, 5.80% ash, % fiber and % carbohydrates.

Results of the present study are comparable with the work of Razavi et al. (2009) who reported that the chemical composition of Indian basil seeds was differed with Iranian basil seeds. They reported that the range of moisture content (5-9%), protein (14-20%), fat (13-23%). ash (5-7%) and carbohydrates (47-63%) in Indian and Iranian basil seeds. In Iranian basil seeds protein and fat contents were significantly higher while moisture and ash contents were lower than Indian seeds. Changes in proximate composition of the present study might be due to change in soil chemistry, climate condition and different agricultural practices (Mathews et al., 1993). Hajmohammadi et al. (2016) also determined the chemical composition of basil seeds who used swollen basil seeds for enrichment of fruit based beverage.

Table 1: Treatment plan for 1 liter of beverage

Treatments	Raw basil seed (g)
T ₁	2
T ₂	3
T ₃	4

T₁= Beverage with 2g basil seeds; T₂= Beverage with 3g basil seeds; T₃= Beverage with 4g basil seeds

Table 2: Proximate composition of Basil seeds (% wet basis)

Moisture	9.19±0.45
Protein	17.32±1.12
Fat	9.68±0.67
Fiber	7.11±0.39
Ash	5.80±0.11
Carbohydrates	50.9±0.35

Table 3: Total phenols(mg GAE/g) and mineral contents (ppm)

Total phenols	63.78±1.75
Fe	22.74±1.01
Zn	15.81±0.93
Mg	315.53±2.15
Mn	10.11±0.87

Total phenol and mineral contents of basil seeds

Total phenolic contents in basil seeds are 63.78±1.75 mg GAE/g as shown in Table 3. Standard calibration curve for total phenols has also been shown in Figure 1. Our findings are different from previous findings of Shen et al. (2015), which might be due to change in soil chemistry. Mineral contents of food

have nutritional importance as far as body physiology concerned. Deficiency of micronutrient is prevailing around the world. High Mg contents may boost bone development and strength also effective against heart stroke. Zinc has also been linked with alleviating hyperglycemia in diabetics. Fe is important as part of blood (Fallon and Enig, 2001).

Mineral contents in basil seeds have been reported in Table 3. Basil seeds and leaves are good source of minerals. Mg contents were found in high amount (315.53±2.15) as compared to other determined minerals. Agunbiade et al. (2015) has reported mineral contents in basil seeds and leaves. Mlitan et al. (2014) also studied mineral contents of basil from Libya but change in mineral concentration was observed between our and their findings which might be due to varietal differences and soil chemistry.

°Brix and acidity of basil seed drink

Titrate acidity and °Brix of basil seed drinks have been shown in Table 4. There was no significant change in °Brix and acidity of beverage. These results are in agreement with other previous studies (Jabbar et al., 2014; Saeeduddin et al., 2015).

Table 4: °Brix and Acidity of beverage

Treatment (T)	°Brix	Acidity
T ₁	12.9±0.09	0.168±0.01
T ₂	12.7±0.05	0.160±0.03
T ₃	12.5±0.07	0.155±0.01

T₁= Beverage with 2g basil seeds; T₂= Beverage with 3g basil seeds; T₃= Beverage with 4g basil seeds

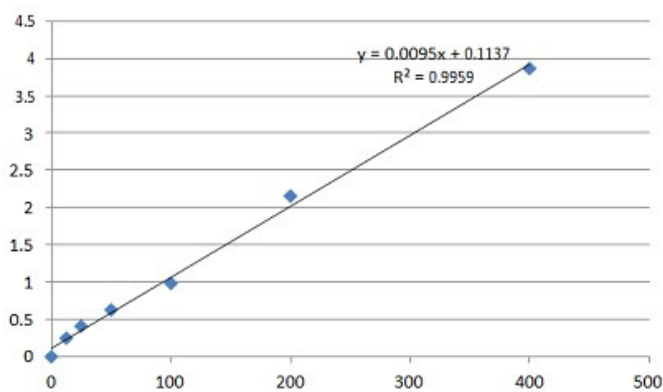


Figure 1: Total phenol standard calibration curve

Sensory evaluation of basil seed beverage

Effect of seed ratio on sensory parameters (color, flavor, taste, texture and overall acceptability) of drink is presented in Figure 2. All treatment were in accept-

able range but T₂ secured high sensory scores in term of color (7.63± 0.29), flavor (7.43±0.41) taste (7.50± 0.32) texture (8.01± 0.45) and overall acceptability (8.11±0.37) followed by T₁ and T₃. Reduction in desirability of taste flavor and texture with increase in seed ratio was also reported by Hajmohammadi et al. (2016). It might be due to decrease in total soluble solids of drink because seeds had previously swollen in water and had amounts of water inside and between them.

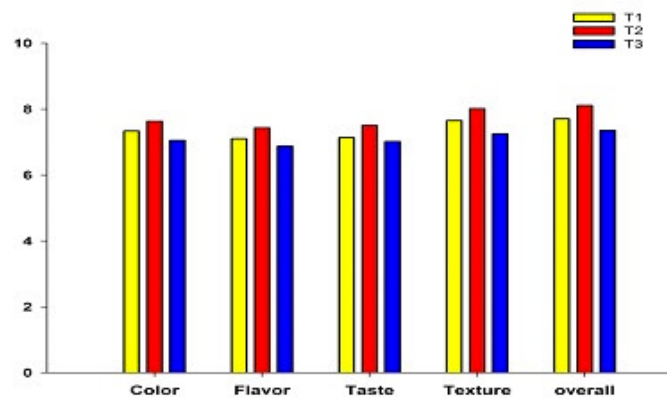


Figure 2: Sensory Evaluation of Basil Seed Beverage (T₁= Beverage with 2g basil seeds, T₂= Beverage with 3g basil seeds, T₃= Beverage with 4g basil seeds)

Conclusion

Our findings revealed that basil seeds are good source of micronutrients and have antioxidant potential which is highly beneficial for human health. Swollen basil seeds in beverage also showed good sensory scores (T₂) in beverage which shows it would be acceptable by consumers too. Therefore, further studies should be conducted about polyphenol composition and vitamins to better understanding of nutritional importance of basil seed.

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Authors' Contributions

Masooma Munir and Aqsa Qayyum: Executed research plan

Amer Mumtaz and Nouman Siddiqui: They have participated in research analysis

Naeem Safdar: wrote abstract

Saeeda Raza: reviewed the manuscript.

Sahar Shibbli and Saiqa Bashir: Helped in drafting the manuscript

Sohaib Afzal: Statistical analysis

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