

SHORT ARTICLE

Enhancing micronutrient content of beverage powder by incorporating malted finger milletJaya Tripathi¹, Alka Gupta², Ranu Prasad³, Vinita Puranik⁴^{1,4}Centre of Food Technology, University of Allahabad, Allahabad, ^{2,3}Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, India

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Abstract

Introduction: There is growing interest in the role of the micronutrients in optimizing health, and in prevention or treatment of disease. Micronutrients play a central part in metabolism and in the maintenance of tissue function, an adequate intake therefore is necessary. **Rationale:** This research work was concerned with the development of micronutrient especially calcium rich instant health beverage powder from malted finger millet (*Eleusine coracana*) and gurhal powder (*Hibiscus rosa-sinensis*). **Aims & Objectives:** In this study attempts have been made to investigate that whether the extruded malted finger millet flour and hibiscus flower powder has improved the nutritional and phytochemical quality of instant health beverage powder without deteriorating their sensory properties and whether it can be a supplement for calcium deficit sedentary women. **Materials and methods:** Instant health beverage powder was prepared by adding malted and extruded finger millet with glucose, hibiscus flower powder, citric acid and vanilla essence. All the ingredients were mixed well. Prior to consumption this powder was dissolved in water and stirred well manually. Further Instant health beverage powder was assessed for nutritional composition. **Results:** Results shows that beverage powder has very high content of protein (12.25 %) and calcium (96.5 %) along with highly beneficial nutraceutical properties as compared with the health drinks available in market, it is because of enhanced antioxidant activity resulted due to the incorporation of gurhal leaf powder and malting of the finger millet. **Conclusion:** This study may prove as a potential step to utilise malted finger millet as a supplement for calcium deficit women. The nutritional composition was found sufficient enough to meet approximately one fourth of RDA of Protein and Calcium as prescribed by NIN, India for sedentary women who are the main sufferers of calcium deficiencies in various life stages like pregnancy, lactation and menopause.

Key Words

Beverage Powder; Calcium deficiency; Finger Millet; Gurhal Flower; Sedentary Women

Introduction

Neutraceutical beverages represents one of the fastest annual growing markets worldwide, reaching a compound annual growth rate of 13.6% between 2002 and 2007 (Heckman et al., 2010). Finger millet is a minor millet used in the preparation of infant food and health foods as raw and as well as malted forms. It is basically used for preparation of flour, pudding, porridge and roti (Chaturvedi and Srivastava, 2008). With the changes in scenario of utilization of processed products and awareness of the consumers about the health benefits, finger

millet has gained attention because of its components (Wadikar et al., 2007). The malted and fermented finger millet flour are extensively used in preparation of weaning food, instant mixes, beverages and pharmaceutical products (Rao and Muralikrishna, 2001).

Natural antioxidants like phenolic compounds and flavonoids which are secondary plant metabolites present in food products of plant origin (Helle and Bertelsen, 1995; Yeh and Yen, 2003) can trap the free radicals directly or scavenge them through a series of coupled reactions with antioxidant

enzymes (Rao *et al.*, 1996). Gurhal (*Hibiscus Rosa-Sinensis*) a well-known member of the family Malvaceae, *Hibiscus rosa-sinensis* grows as an evergreen herbaceous plant. A native to tropical and sub-tropical regions, this plant is extensively cultivated as an ornamental plant.

Aims & Objectives

To investigate that whether the extruded malted finger millet flour and hibiscus flower powder has improved the nutritional and phytochemical quality of instant health beverage powder without deteriorating their sensory properties and whether it can be a supplement for calcium deficit sedentary women.

Material and Methods

Raw materials: Finger Millet in a single lot was procured from local market of Allahabad, India. Hibiscus flowers used in this instant health beverage powder were obtained from Department of botany, University of Allahabad. Chemicals used for analysis were of AR grade and purchased from Science Corporation, Allahabad, India.

Preparation of Malted Finger Millet Flour: The soaking period (16 hours), germination temperature (310c) and germination period (48 hours) was optimized for malting. The Optimized finger millet was then dried in hot air oven at 500c for 24 hours. Vegetative parts were removed by rubbing and then were ground to power followed by storing in air-tight containers at refrigeration temperature.

Preparation of Gurhal Flower Powder: The fresh hibiscus flowers were washed thoroughly and were then dried in hot air oven at 500 c for 3-4 hours till the moisture percentage remains 6-7 % followed by grinding to powder and were stored in air tight containers (Singh *et al.* 2007).

Chemical Analysis: The proximate composition, Calcium and iron content of instant health beverage powder was determined by AOAC (2007), for estimation of Total Phenolic content, Folin-Ciocalteu method was adopted Singleton *et al.* (1999). The Radical Scavenging Activity was estimated by DPPH method given by De Ancos *et al.* (2002).

Beverage Preparation: Instant Health Beverage Powder (22 g) was added with glucose (20 g), hibiscus flower powder (0.25g), citric acid (0.1 g) and vanilla essence (0.5 g). All the ingredients were mixed well. Prior to consumption this powder was dissolved in 168 ml of water and stirred well manually (Jesus *et al.* 2012).

Results & Discussion

Flour Preparation

The use of extruded and autoclaved malted finger millet flour was done since the extrusion process is accompanied by pre-gelatinization of starch granules, resulting in loss of the molecular order and the complete degradation of polymers with the formation of highly soluble fragments. Therefore, suspensions of flours precooked by extrusion will have a low tendency to form lumps, since starch granules have been modified showing high swelling capacity under both cold and hot conditions, which makes extruded flours highly recommended for preparation of instant food products (Vasanthan *et al.*, 2001) such as beverages.

Compositional analysis of ingredients of Instant Health Beverage Powder

From the results, inferences can be drawn that Instant health beverage powder have higher amount of protein, calcium, TPC and DPPH content as compared to same of malted finger millet or hibiscus powder only. Udeozor and Linda (2012) also studied on development of health drink from tiger-nut and soybean and found the increment in amount of calories, protein and fat content.

Comparison of Nutrient content of Instant Health Beverage Powder and RDA of Sedentary Women as given by NIN

Instant Health Beverage Powder was compared with Recommended Dietary Allowances (RDA) of sedentary women as given by National Institute of Nutrition of India. On the basis of results it can be concluded that cereal beverage powder fulfil 20.54 % of energy requirement of RDA of a sedentary women whereas protein and fat requirements are fulfilled 20.41 % and 8.90 % respectively. As far Calcium content is considered, this cereal beverage powder mix fulfils approx. 25 % of requirement of calcium which is highly beneficial for sedentary women specially who face bone related problems in menopausal phase. Jesus *et al.* (2012) also did the similar study on development of nutraceutical beverage from extruded whole maize and chick pea flours and found that the one serving of beverage developed covers 26.36% and 17.65% of the daily protein requirements for children 1-3 and 4-8years old, respectively.

Conclusion

It can be concluded from results that incorporating malted finger millet and hibiscus flower powder led

to an increase in nutritional content specially calcium and antioxidants as like total polyphenols and radical scavenging activity in the beverage powder and this instant health beverage powder could be used for health promotion and disease prevention as an alternative to beverages with low nutritional / nutraceutical value.

Recommendations

1. This instant health beverage powder could serve as a supplement for the population suffering from calcium deficiency diseases.
2. This beverage powder can compete with other health drinks available in market in terms of nutritional and phytochemicals content.

Relevance of the study

The present study focuses on use of processed i.e. malted finger millet in development of beverage powder because it is evident from studies that malting enhances the micronutrient content of foods.

Authors Contribution

JT: Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content; Final approval of the version to be published. AG: Final approval of the version to be published. RP: Final approval of the version to be published. VP: drafting the article or revising it critically for important intellectual content

References

1. Jesus *et al.* Nutraceutical Beverage from a High Antioxidant Activity Mixture of Extruded Whole Maize and Chickpea Flours, Euro. Int. J. of Sci. and Tech. 2012; 1(3):1-14
2. Gopalan, C., Ramasaatri, B.V. and Balasubramanian S.C. Nutritive value of Indian Foods. Hyderabad: National Institute of Nutrition. 2011.
3. Heckman, M. A., Sherry, K. and Gonzalez de Mejia, E. Energy drinks: an assessment of their market size, consumer

demographics, ingredient profile, functionality, and regulations in the United States. Comp. Reviews in Food Sci. and Food Safety. 2010; 9:303-317.

4. Chaturvedi, R. and Srivastava, S. Genotype variations in physical, nutritional and sensory quality of popped grains of amber and dark genotypes of finger millet. J. Food Sci. and Tech. 2008; 45: 443-446.
5. AOAC. Official Methods of Analysis. 18th edition. Washington, DC: Association of official Analytical Chemists; 2007.
6. Singh *et al.* Preparation of Value added products from dehydrated bathua leaves (*Chenopodium album* Linn.). Nat. Prod. Rad. 2007; 6(1). 6-10
7. Wadikar, D. D., Premvalli, R. S., Satyanarayanswamy, Y S. and Bawa, A. S. Lipid profile in finger millet. J. Food Sci. and Tech. 2007; 44: 79-81.
8. O'zer, E. A., Herken, E. N., Guzel, S., Ainsworth, P., and İbanoglu, S. Effect of extrusion process on the antioxidant activity and total phenolics in a nutritious snack food. Int. J. Food Sci. and Tech. 2006; 41:289-293.
9. Yeh C.T., Yen G.C. Effects of phenolic acids on human phenolsulfotransferase in relation to their antioxidant activity. J. Agric. Food Chem. 2003; 51: 1474-1479.
10. De Ancos, B., Sgroppo, S., Plaza, L., and Cano, M. P. Possible nutritional and health-related value promotion in orange juice preserved by high-pressure treatment. J. Sci. Food and Agri. 2002; 82:790-796.
11. Vasanthan, T., Yeung, J., and Hoover, R. Dextrinization of starch in barley flours with thermo-stable alpha-amylase by extrusion cooking. Starch/Stärke. 2001; 53:616-622.
12. Bock, M.A. Handbook of Cereal Science and Technology. 2nd edition. New York: Marcel Dekker Inc; 2000.
13. Singleton, V.L., Orthofer, R., Lamuela-Raventos, R.M. Analysis of total phenols and other oxidation substrates and antioxidants by means of Folin-Ciocalteu reagent. Methods Enzymol. 1999; 299:152-178.
14. Rao M.V., Paliyath G., Ormrod D.P. Ultraviolet- band zone induced biochemical changes in antioxidant enzymes of *Arabidopsis thaliana*. Plant Physiol. 1996; 110: 125-136.
15. Helle L.M., Bertelsen G. Spices as antioxidants. Trends Food Sci. Technol. 1995; 6: 271-277.
16. Alam, M.M., Siddiqui, M.B. and Hussain, W. Treatment of diabetes through herbal drugs in rural India. Fitoterapia. 1990; 61: 240-242.
17. Pal A.K., Bhattacharya K., Kabir S.N., Prakash A. Flowers of *Hibiscus rosa-sinensis*, a potential source of contraceptive agent: II. Possible mode of action with reference to anti-implantation effect of benzene extract. Contraception. 1985; 22: 517- 29.

Tables

TABLE 1 COMPOSITIONAL ANALYSIS OF INGREDIENTS FOR INSTANT HEALTH BEVERAGE POWDER

Particulars	Hibiscus powder	Malted finger millet flour	Beverage Powder
Moisture %	4.6	7.82	1.12
Protein %	22.75	10.50	12.25
Fat %	2.39	2.48	1.78
Fibre %	1.25	3.16	3.67
Ash %	0.44	3.66	2.97
Calcium (mg/100 g)	0.84	386	96.5

Iron (mg/100 g)	0.38	4.6	1.15
TPC (mg/100g)	54.36	124	118
DPPH %	93.35	47.78	43.66

TABLE 2 COMPARISON OF NUTRIENT CONTENT OF INSTANT HEALTH BEVERAGE POWDER AND RDA OF SEDENTARY WOMEN AS GIVEN BY NIN

Particulars	Beverage powder	RDA (Sedentary Women)	RDA % fulfilled by Powder Drink
Energy (Kcal/ 100 g)	385.14	1875	20.54
Protein %	7.00	50	20.41
Fat %	0.3	20	8.90
Carbohydrates	88.61	100	31.50
Calcium (mg/100 g)	96.5	400	24.12
Iron (mg/100 g)	1.15	30	3.83

Figures

FIGURE 1 FLOW SHEET FOR PREPARATION OF FLOUR FOR INSTANT HEALTH BEVERAGE POWDER

