Int.J.Curr.Microbiol.App.Sci (2017) *6*(3): 1888-1896

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 3 (2017) pp. 1888-1896**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.603.214

Nutritional Evaluation of Cookies Enriched with Beetroot (*Beta vulgaris* L.) Powder

Murlidhar Ingle*, M.P. Ingle, S.S. Thorat, C.A. Nimbalkar and R.R. Nawkar

Department of Food Science and Technology, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri District, Ahmednagar (Maharashtra) 413 722, India
**Corresponding author*

Keywords

Cookies, Beetroot, Protein, Crude fiber, Color, Hardness.

Article Info

Accepted:
24 February 2017
Available Online:
10 March 2017

A B S T R A C T

Fruits and vegetables are important constituents of the diet and provide significant quantities of nutrients, especially vitamins, minerals and fiber. Beetroots (*Beta vulgaris* L.) are a rich source of potent antioxidants and minerals including magnesium, sodium and potassium. It contains betaine, which is important for cardiovascular health. Beetroots are low in calories (about 45 Kcal per 100 g) and have zero cholesterol. The study was conducted to improve the nutritional qualities of cookies with incorporation of different levels of beetroot powder i.e. 0, 5, 7, 10, 15 and 20 %, and examined for its physical and chemical composition. The proximate composition of cookies enriched with beetroot powder from 5 to 20% indicated that protein was increased from 7.39 to 9.12 %, crude fibre 0.95 to 1.90 % and ash content 0.93 to1.89 %. The incorporation of beetroot powder in cookies lowered the lightness (L*) and yellowness (b*) but increased redness (a*) of cookies. The hardness of the cookies was increased with increasing the level of beetroot powder. Sensory evaluation of cookies concluded that the cookies prepared with addition of 10% beetroot powder were more acceptable as compared to others.

Introduction

The bakery industry is one of the largest organized food industries all over the world and in particular biscuits and cookies are one of the most popular products because of their convenience, ready to eat nature, and long shelf life (Sindhuja *et al.* 2005). Cookies are widely consumed baked products which can be served as breakfast to bedtime snack. Cookies are appreciated for their taste, aroma, convenience, and long shelf stability due to low moisture content. Recently, increasing consumer demand for healthier foods has triggered the development of cookies made with natural ingredients exhibiting functional properties and providing specific health benefits beyond those to be gained from traditional nutrients (Hai-Jung Chung, 2007).

Beetroot (*Beta vulgaris* rubra) is an important raw material of plant origin with proven positive effects on the human body. They can be eaten raw, boiled, steamed and roasted. Red beetroot is a rich source of minerals (manganese, sodium, potassium, magnesium, iron, copper). Beetroot contains a lot of antioxidants, vitamins (A, C, B), fiber and natural dyes. Red beetroot is also rich in phenol compounds, which have antioxidant properties. These colorful root vegetables help to protect against heart disease and

certain cancers (colon cancer) (Kavalcova *et al.*, 2015).

Beetroots are rich in other valuable compounds such as carotenoids (Dias *et al.*, 2009), glycine betaine (de Zwart *et al.*, 2003), saponins (Atamanova *et al.*, 2005), betacyanins (Patkai *et al.*, 1997), folates (Jastrebova *et al.*, 2003), betanin, polyphenols and flavonoids (Vali *et al.*, 2007). Therefore, beetroot ingestion can be considered a factor in cancer prevention (Kapadia *et al.*, 1996).

The fresh beetroots are exposed to spoilage due to their high moisture content and needs preservation. One of the preservation methods ensuring microbial safety of biological products is drying and dehydration (Mathlouthi, 2001). Dried beetroots can be consumed directly in the form of chips as a substitute to traditional snacks (Aro *et al.*, 1998), or after easy preparation as a component of instant food (Krejcova *et al.*, 2007). Decreasing the moisture content of fresh foods to make them less perishable is a simple way to preserve these foods.

Foods with high nutritional value are in great demand for proper functioning of body systems and potential health benefits. As a result, value-added foods or functional foods with higher level of dietary fiber and antioxidant have been developed, especially in bakery products such as cookies. The incorporation of composite flour into traditional wheat based food products provided additional nutrients from non-wheat material and improved the nutritional value of the products (De Ruiter, 1978).

The utilization of beetroot powder with wheat flour in bakery products has not been studied extensively. Therefore, the research was designed to evaluate the effect of substitution of wheat flour with different levels of beetroot powder on the physico-chemical and sensory properties of the cookies.

Materials and Methods

The present research work was carried out in department of food science and technology, MPKV Rahuri, during 2014-16.

Raw materials

Fresh green, well matured and healthy beetroots were obtained from the local market of Rahuri, Dist. Ahmednagar. The ingredients for cookies such as wheat flour, fat, sugar, ammonium bi-carbonate and sodium bi-carbonate were used from, pilot bakery unit of the department of food science and technology, MPKV Rahuri.

Processing of beetroot powder

Fresh beetroots were washed, blanched, peeled and reduced to size (1-3 mm) using sharp knife. These slices were dried in tray dryer at 60-65 ^{O}C for about 7-8 h. The dried beetroot slices were subjected to grinding in grinder. Then ground material was passed through 60 mesh sieve and packed in HDPE bags, sealed and stored for further use.

Preparation of cookies

Beetroot cookies were prepared by substituting refined wheat flour with beetroot powder (BGP). Various blends were prepared using refined wheat flour and beetroot powder in the ratio of 100:0; 95:5; 93:7; 90:10; 85:15; 80:20. The cookies were prepared using procedure as suggested in Fig. 1.

Physical characteristics

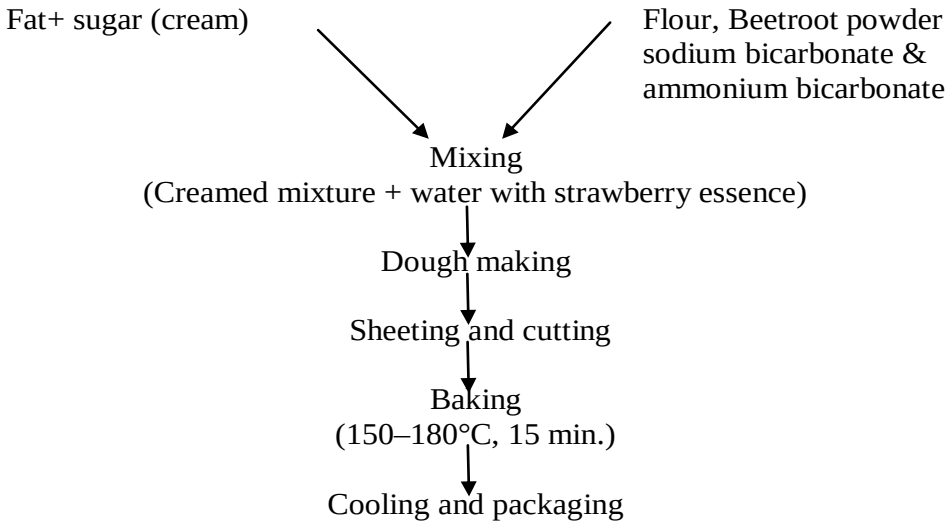
The physical characteristics of cookies such as diameter, thickness, spread ratio were measured as described in the A.A.C.C. (2000) methods.

Sensory evaluation of cookies

The cookies were evaluated by panel of 10 semi-trained judges. Nine-point Hedonic

Scale and Score Card method were used for evaluation of sensory characteristics of different cookies (Amerine *et al.*, 1965).

Fig.1 Method for preparation of cookies



Texture measurement

Texture of cookies was evaluated by a universal texture analyser (AG X, Shimadzu Japan, capacity 2500N (Jacob and Leelavathi, 2007).

Colour measurement

Surface color of cookies was determined by measuring tristimulus L* (brightness), a* (redness), b* (yellowness) and Hue (H) values with a colorimeter (CIELAB) (Nezhad and Butler, 2009).

Proximate composition

Proximate analysis of cookies for moisture, crude protein, crude fat and ash content were determined according to the AOAC (2000) standard methods. The carbohydrate content was determined by subtracting the sum of the values (per 100 g) for moisture, total ash, crude fat, crude fibre and crude protein from hundred. The calorific value (Kcal per 100g) of sample was calculated by summing up the product of multiplication of per cent crude protein, crude fat and carbohydrate present in the sample by 4, 9, and 4, respectively (Mudambi *et al.*, 1989).

Statistical analysis

All results were statistically analysed by using CRD (Panse and Sukhatme, 1967).

Results and Discussion

Proximate composition

Moisture content of control cookies was 2.57% and that of cookies containing beetroot powder increased from 2.88 to 5.26 %. Crude protein content of control was 10.19 % and that of cookies containing incremental levels of beetroot powder increased from 7.39 to 9.12 % (Table 1). Ash content of the cookies containing incremental levels of beetroot powder was increased from 0.84 to 1.89 % which was significantly higher than that of control. Crude fiber content of cookies was significantly increased from 0.95 to 1.90 % with addition of beetroot powder up to 20%. Crude fat and carbohydrates contents were decreased from 23.42 to 21.08 %, 62.98 to 62.65 respectively with addition of beetroot

powder. The difference in moisture content between samples might be due to the high fiber content in beetroot. More hydroxyl groups of cellulose in fiber were able to bind with free water molecules through hydrogen bonding and thus resulting in greater water holding capacity (Rosell *et al.*, 2001). Results showed that higher amount of beetroot powder substituted into formulation resulted in increased protein and fiber content in cookies in accordance with the findings of Uthumporn *et al.* (2015), Pinki and Awasthi (2014) and Jenkins *et al.*, (2003).

It is revealed that with increased level of beetroot powder in cookies, there was increase in calcium, phosphorous and iron content of cookies with decrease in zinc content and calorific value of cookies.

The calcium content of cookies increased from 30.12 to 51.51, phosphorous content increased from 151 to 520, iron content was increased from 1.13 to 2.89 and zinc content decreased from 0.77 to 0.35 with increased level of beetroot powder in cookies. Results showed that higher amount of beetroot powder substituted into formulation resulted in increased minerals content in cookies in accordance with the findings of Uthumporn *et al.*, (2015), Hai-Jung Chung (2007) and Pinki and Awasthi (2014).

Texture analysis of cookies

It was revealed that the hardness of cookies was found to increase from 57.88 N to 73.44 N with addition of beetroot powder (Table 3). The increased hardness may be attributed to dilution of wheat proteins with beetroot proteins and fiber. There was positive correlation of fiber and protein contents with the hardness value of cookies (Piazza & Masi, 1997). The increase in cookies hardness was observed with increased fiber substitution (Arora & Camire, 1994). This was in consistent also with the result obtained as eggplant flour used in cookies as an important source of fiber (Jenkins *et al.*, 2003). The dough prepared from high-absorption flour resulted in hard texture (Noda *et al*. 2000). Drisya *et al.*, (2015), reported that there was significant increase in the dough hardness with addition of DMKLP.

According to Collar *et al.*, (2007), addition of fibers affected the mechanical properties like increased hardness and decreased cohesiveness of dough. Nandeesh *et al*., (2011) also reported increased biscuit dough hardness and decreased in cohesiveness, springiness and adhesiveness with addition of 30 % differently treated wheat brans. Therefore, high fiber content in beetroot powder was evident to produce cookies with hard texture.

Table.1 Chemical composition of beetroot powder incorporated cookies

Treatments*	Moisture (%)	Protein (%)	Fat (%)	Carbohydrates (%)	Ash (%)	Crude fiber (%)
T_0	2.57	10.19	23.42	62.98	0.84	0.95
T_1	2.88	7.39	22.56	66.24	0.93	0.95
T_2	3.07	7.54	22.25	66.17	0.97	1.05
T_3	3.79	8.79	21.79	64.49	1.14	1.13
T_4	4.92	8.80	21.54	63.46	1.28	1.36
T_5	5.26	9.12	21.08	62.65	1.89	1.90
SE ±	0.21	0.18	0.08	0.10	0.06	0.03
CD @5%	0.62	0.52	0.24	0.30	0.17	0.08

* Indicates proportion of wheat flour: beetroot powder; T_0 (100:0), T_1 (95:5), T_2 (93:7), T_3 (90:10), T_4 (85:15) and T_5 (80:20).

Table.2 Effects of beetroot powder on micro-nutrient of cookies

Treatments*	Calcium mg/100g	Phosphorous mg/100g	Iron mg/100g	Zinc mg/100g	Calorific value (kcal)
T_0	30.12	151	1.13	0.77	509.76
T_1	33.24	381	1.40	0.55	504.18
T_2	37.65	413	1.74	0.54	501.22
T_3	**41.51**	**467**	**2.11**	**0.43**	**495.41**
T_4	44.32	495	2.52	0.40	491.05
T_5	51.51	520	2.89	0.35	486.13
SE ±	0.821	2.687	0.045	0.011	0.204
CD @ 5%	2.438	4.985	0.135	0.033	0.606

* as suggested in Table 1.

Table.3 Effect of different levels of beetroot powder on textural characteristics of cookies

Treatments*	Force Max (N)	Break Force Sensitivity (N)	Max Displacement Force (N)
T_0	57.88	55.44	20.49
T_1	62.26	62.20	39.73
T_2	68.02	65.48	26.25
T_3	**68.38**	**68.26**	**10.89**
T_4	72.75	70.56	14.24
T_5	73.44	72.33	16.36
SE ±	0.177	0.052	0.083
CD @5%	0.527	0.154	0.246

* as suggested in Table 1

Table.4 Physical parameters of beetroot powder incorporated cookies

Treatments*	Weight (g)	Diameter (mm)	Thickness (mm)	Spread ratio
T_0	9.48	43.26	10.29	4.20
T_1	9.58	45.12	10.58	4.26
T_2	9.67	45.38	10.70	4.24
T_3	**9.72**	**45.91**	**10.69**	**4.29**
T_4	9.84	46.08	10.80	4.27
T_5	10.20	46.43	11.17	4.16
SE ±	0.10	0.38	0.06	0.089
CD @5%	0.29	1.14	0.17	NS

* as suggested in Table 1.

Table.5 Effect of different levels of beetroot powder on color characteristics of cookies

Treatments*	L*	a*	b*	C*	H*
T_0	68.783	4.677	22.853	23.255	78.334
T_1	56.770	5.698	15.341	16.386	69.122
T_2	56.536	5.913	14.607	15.805	68.200
T_3	**56.337**	**5.931**	**14.225**	**15.409**	**67.191**
T_4	52.128	5.949	11.387	11.706	59.404
T_5	51.354	7.747	10.131	11.117	56.504
SE ±	0.502	0.064	0.055	0.142	0.060
CD @5%	1.492	0.189	0.163	0.411	0.178

* as suggested in Table 1

Table.6 Effect of different levels of beetroot powder on sensory characteristics of cookies

Treatments*	Colour and appearance	Texture	Flavour	Taste	Overall acceptability
T_0	8.19	7.74	7.67	7.83	7.80
T_1	7.39	7.60	7.66	7.66	7.56
T_2	7.67	7.61	7.66	7.68	7.59
T_3	**8.20**	**7.85**	**7.77**	**8.29**	**8.27**
T_4	7.30	7.45	7.35	7.47	7.52
T_5	6.40	6.51	6.63	6.56	6.41
SE ±	0.169	0.042	0.083	0.095	0.094
CD @5%	0.502	0.126	0.246	0.281	0.279

* as suggested in Table 1.

Physical characteristics of cookies

There were no significant differences in the diameter and thickness of the cookies among those containing up to 7.0% beetroot powder and the control (Table 4). However, significant differences were found with higher levels of beetroot powder. Larger diameter and lower thickness values were observed as the level of beetroot powder substitution increased. The incorporation of beetroot powder affected cookie expansion by lowering gas retention compared to control. The spread ratio of cookies made with beetroot powder was significantly lower than that of control. Chung and Kwon (1999) reported that cookies made with yam powder exhibited a reduction in size and thickness as the content of yam powder increased. It was reported that the spread ratio of cookies prepared with bamboo leaves powder decreased with increased amount of powder (Lee *et al.*, 2006). Cho *et al*., (2006) also reported that the addition of sea tangle powder lowered the spread ratio of cookies. The cookies with larger spread or diameter were considered more desirable (Fimney *et al.*, 1950).

Colour measurement

The data presented in Table 5 illustrated that control cookies had significant difference in terms of L* (lightness), a* (redness), b*

(yellowness), C (chroma) and h (hue) values compared to all other cookies made by substitution with beetroot powder. The lightness value of control cookies was 68.783 and those of beetroot powder cookies decreased from 56.770 to 51.354, indicating that lightness decreased with the reduction in the proportion of wheat flour because of the loss of white color of the flour. The redness value of control cookies was 4.677 and those of beetroot powder cookies was increased from 5.698 to 7.747, showing more reddish color than control. The yellowness value of control cookies was 22.853 and cookies substituted with different levels of beetroot powder decreased from 15.341 to 10.131. Hue refers to a term that describes the pure spectrum color without tint or shade. The increased level of substitution of beetroot powder significantly reduced the hue value.

Uthumporn *et al.,* (2015) observed decreased lightness value of cookies as the substitution level of fiber into formulation was elevated. Control cookies had significant difference in b* and C* values compared to other cookies. The differences in color could be due to uneven exposure of cookies' surface area to high baking temperature and colored compounds formed from chemical reactions such as caramelization and Maillard reaction (Purlis & Salvadori, 2007). Borrelli *et al.*, (2003) reported that the reaction between protein and carbohydrate was responsible for the brown colour. Nyam *et al.*, (2014), reported that the 'L' value was significantly decreased with the incorporation of roselle seed powder in the formulations.

Sensory evaluation: The treatment with 10 % replacement of maida with beetroot powder (T_3) obtained higher average score for color and appearance (8.20) with minimum score by treatment with 10 % replacement of maida with beetroot powder (T_5) (6.40). The treatment T_3 obtained highest score for texture and grain (7.85), flavor (7.77), taste (8.29) and overall acceptability (8.27) as compared to control T_0 treatment (Table 6). The surface colour was darker as the level of beetroot powder increased.

Therefore, replacing up to 10% wheat flour with beetroot powder resulted in good acceptability of cookies. The color and appearance of cookies is a function reducing sugars, as these reducing sugars during baking caramelized to produce brown color of cookies. Light brown color of cookies was achieved with 10% of beetroot powder.

In conclusion nutritional analysis revealed that the increased substitution level of beetroot powder up to 10 % increased the nutritional content (crude protein, crude fiber and minerals) when compared to control cookies. Beetroot powder also provided greater overall acceptability but increased the hardness value of cookies.

For the colour properties, the substitution of beetroot powder reduced the L* and H (hue) value but increased the a* value. Overall, it can be concluded that the substitution of wheat flour with beetroot powder up to 10% into the formulation of cookies enhanced the nutritional value of cookies.

References

A.A.C.C. 2000. Approved Methods of the American Association of Cereal Chemists, 10th Ed., AACC, St. Paul, MN, USA. pp. 914-918.

A.O.A.C. 2000. Official Methods of Analysis. 17th edn. Association of Official Analytical Chemists, Gaithersburg, MD, USA.

Amerine, M.A., Pangborn, R.M. and Rosseler, E.B. 1965. Principle of Sensory Evaluation of Food. Academic Press New York. pp: 350-376.

Aro, A., Amaral, E., Kesteloot, H., Rimestad,

A. and Thamm, M. 1998. Trans fatty acids in french fries, soups, and snacks from 14 European countries: The transfer study. *J. Food Composition and Analysis*, 11: 170-177.

Arora, A. and Camire, M.E. 1994. Performance of potato peels in muffins and cookies. *J. Food Res. Int.,* 27: 15–22.

Atamanova, A., Brezhneva, T.A., Slivkin, A.I., Nikolaevskii, V.A., Selemenev, V.F. and Mironenko, N.V. 2005. Isolation of saponins from table beetroot and primary evaluation of their pharmacological activity. *Pharma. Chem. J.,* 39(12): 650–652.

Borrelli, R.C., Mennella, C., Barba, F., Russo, M., Russo, G.L., Krome, K. and Fogliano, V. 2003. Characterization of coloured compounds obtained by enzymatic extraction of bakery products. *Food and Chem. Toxicol.,* 41: 1367–1374.

Cho, H.S., Park, B.H., Kim, K.H. and Kim, H.A. 2006. Antioxidative effect and quality characteristics of cookies made with sea tangle powder. *Korean J. Food Culture*, 21: 541-549.

Chung, K.M. and Kwon, C.S. 1999. Properties of cookies added of flour and chinese yam powder. *Food Sci. Biotechnol.,* 8: 341-343.

Collar, C., Santos, E. and Rosell, C.M. 2007. Assessment of the rheological profile of fibre-enriched bread doughs by response surface methodology. *J. Food Engi.,* 78: 820–826.

Czernohorsky, K. and Hooker, R. 2010. The Chemistry of Baking, Vi-Food-D-Baking, pp: 1-8.

De Ruiter, D. 1978. Composite flours. Advances in cereal science and technology (pp. 349–381).

De Zwart, F.J., Slow, S., Payne, R.J., Lever, M., George, P.M., Gerrard, J.A. and Chambers, S.T. 2003. Glycine betaine and glycine betaine analogues in common foods. *Food Chem.,* 83:197–204.

Dias, M.G., Camoes, M.F.G.F.C. and Oliveira, L. 2009. Carotenoids in traditional Portuguese fruits and vegetables. *Food Chem.,* 113: 808–815.

Drisya, C.R., Swetha, B.G., Velu, V., Indrani, D. and Singh, R.P. 2015. Effect of dried Murraya koenigii leaves on nutritional, textural and organoleptic characteristics of cookies. *J. Food Sci. Technol.,* 52(1): 500–506.

Fimney, K.F., Morris, V.H., Yamazaki, W.T. 1950. Micro versus macro cookie baking procedures for evaluating the cookie quality of wheat varieties. *Cereal Chem.,* 27: 42-49.

Hai-Jung Chung. 2007. Quality Attributes of Cookies Prepared with Tomato Powder. *J. Food Sci. Nutr.,* 12: 229-233.

Jacob, J. and Leelavathi, K. 2006. Effect of fat-type on cookie dough and cookie quality. *J. Food Engi.,* 79: 299–305.

Jastrebova, J., Witthoft, C., Grahn, A., Svensson, U. and Jagerstad, M. 2003. HPLC determination of folates in raw and processed beetroots. *Food Chemi.,* 80: 579–588.

Jenkins, DJ.,. Kendall, C.W., Marchie, A., Faulkner, D.A., Wong, J.M., De Souza, R. and Connelly, P.W. 2003. Effects of a dietary portfolio of cholesterol-lowering foods vs lovastatin on serum lipids and creactive protein. *JAMA*, 290:502–510.

Kapadia, G.J., Tokuda, H., Konoshima, T. and Nishino, H. 1996. Chemoprevention of lung and skin cancer by Beta vulgaris. beet) root extract. *Cancer Lett.,* 100: 211–214.

Kavalcova, P., Bystricka, J., Tomas, J., Karovicova, J., Kovarovic, J., Lenkova, M. 2015. The content of total polyphenols and antioxidant activity in red beetroot. *Potravinarstvo*, 9(1): 77-83.

Krejcova, A., Cernohorsky, T. and Meixner, D. 2007. Elemental analysis of instant soups and seasoning mixtures by ICP-OES. *Food Chem.,* 105: 242-247.

Lee, J.Y., Ju, J.C., Park, H.J., Heu, E.S., Choi, S.Y. and Shin, J.H. 2006. Quality characteristics of cookies with bamboo leaves powder. *Korean J. Food & Nutr.,* 19: 1-7.

Mathlouthi, M. 2001. Water content, water

activity, water structure and the stability of food stuffs. *Food Control*, 12: 409–417.

Mudambi, R. and Sumati, R.S. 1989. *Food Sci.*, New Delhi Wiley Eastern Ltd.

Nandeesh, K., Jyotsna, R. and Venkateswara, R.G. 2011. Effect of differently treated wheat bran on rheology, microstructure and quality characteristics of soft dough biscuits. *J. Food Processing and Preservation*, 35(2):179-200.

Nezhad, M.H. and Butler, F. 2009. Effect of flour type and dough rheological properties on cookie spread measured dynamically during baking. *J. Cereal Sci.*, 49: 178–183.

Noda, Y., Kneyuki, T., Igarashi, K., Mori, A. and Packer, L. 2000. Antioxidant activity of nasunin, an anthocyanin in eggplant peels. *Toxicol.*, 148: 119–123.

Nyam, K.L., Sod-Ying Leao, Chin-Ping Tan and Kamariah Long. 2014. Functional properties of roselle. Hibiscus sabdariffa L.) seed and its application as bakery product. *J. Food Sci. Technol.*, 51(12): 3830–3837.

Patkai, G,. Barta, J. and Varsanyi, I. 1997. Decomposition of anticarcinogen factors of the beetroot during juice and nectar production. *Cancer Lett.*, 114: 105–106.

Piazza, L. and Masi, P. 1997. Development of crispness in cookies during baking in an industrial oven. *Cereal Chem.*, 74: 135–140.

Pinki and Pratima Awasthi. 2014. Sensory and nutritional evaluation of value added cakes formulated by incorporating beetroot powder. *Int. J. Food and Nutritional Sci.*, 3(6): 145-148.

Purlis, E. and Salvadori, V.O. 2007. Bread browning kinetics during baking. *J. Food Engi.*, 80: 1107–1115.

Rosell, C.M., Rojas, J.C., Benedito, D.B., Nobhan, G.P. and Truswell, A.S.C. 2001. Influence of hydrocolloids on dough rheology and bread quality. *Food Hydrocolloids*, 15: 75–81.

Sindhuja, A., Sudha, M.L. and Rahim, A. 2005. Effect of incorporation of amaranth flour on the quality of cookies. *Eur. Food Res. Technol.*, 221: 597–601.

Uthumporn, U., Woo, W.L., Tajul, A.Y. and Fazilah, A. 2015. Physico-chemical and nutritional evaluation of cookies with different levels of eggplant flour substitution. *J. Food*, 13(2): 220-226.

Vali, L., Stefanovits, B.E., Szentmihalyi, K., Febel, H., Sardi, E., Lugasi, A,. Kocsis, I. and Blazovics, A. 2007. Liver-protecting effects of table beet. Beta vulgaris var. Rubra) during ischemia-reperfusion. *Nutri.*, 23: 172–178.

How to cite this article:

Murlidhar Ingle. 2017. Nutritional Evaluation of Cookies Enriched with Beetroot (*Beta vulgaris* L.) Powder. *Int.J.Curr.Microbiol.App.Sci.* 6(3): 1888-1896.
doi: https://doi.org/10.20546/ijcmas.2017.603.214