ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 09, pp.38526-38529, September, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

NUTRITIONAL CONTENT EVALUATION OF SPIRULINA INCORPORATED LITTLE MILLET COOKIES

***,[1]Padma, A. and [2]Rajendran, R.**

[1]Research Scholar, Research and Development Centre, Bharathiar University Coimbatore-641046
[2]Principal and Professor, PSG College of Arts and Science, Coimbatore

ARTICLE INFO

Article History:
Received 17th June, 2016
Received in revised form
18th July, 2016
Accepted 20th August, 2016
Published online 30th September, 2016

Key words:

Spirulina powder,
Little millet cookies,
Nutrient analysis,
Sensory qualities,
Physic-chemical properties.

ABSTRACT

The high protein content of Spirulina (*Spirulina platensis*), a blue green algae has several therapeutic properties. The present study was made to explore the availability and easy use of Spirulina to people especially to the children and elders who need protein supplement. Hence the study focused on incorporating spirulina powder with little millet flour (*Panicum miliare*) in the preparation of cookies. The physico-chemical properties, texture profiles and sensory qualities of the prepared cookies are evaluated. Cookies were standardized with little millet flour and spirulina powder at different levels of incorporation. Along with the ingredients in the standard recipe, spirulina powder was incorporated at various percentages with little millet flour. Result of organoleptic evaluation showed that 8 % spirulina powder with 75% little millet flour was highly acceptable, with score for overall acceptability being 8.5 than the control cookies. Protein, fibre and iron content of the standardized cookies were found to be 14.6, 6.92g and 4.28mg/100g respectively than the control cookies. The shelf life of the product was better in plastic containers (600G) than propylene bags (200G) up to 30 d.

Citation: Padma, A. and Rajendran, R. 2016. "Nutritional content evaluation of Spirulina incorporated little millet cookies", *International Journal of Current Research*, 8, (09), 38526-38529.

INTRODUCTION

Spirulina *(Spirulina platensis*) is a multicellular and filamentous blue-green cyanobacteria. It can grow in water, can be harvested and processed easily. In certain countries a small section of the population has been eating naturally grown algae harvested from lakes Becker (1986). It has significantly high micro- and macro-nutrient contents. In many parts of the world, it is used as human food and as an important source of protein. Lately, it has garnered significant popularity in the human health food industry. It is used as protein supplement and as human health food in parts of Asia. Spirulina is a low-fat, low-calorie, cholesterol-free source of easily digestible vegetable protein containing all the essential amino acid (Srilaxmi 2001). It is an excellent source of essential amino acid, protein quality, vitamins, minerals and fatty acids (Khan, 2005). It has many therapeutic properties such as hypocholestrolemic, immunological, antiviral and antiglutagenic effects (Mark, 2007). Spirulina can be consumed in the form of either dry powder, tablets, or flakes. Spirulina is also rich in potassium and sodium.

****Corresponding author: Padma, A.***
Research Scholar, Research and Development Centre, Bharathiar University Coimbatore-641046.

It also has significant amounts of magnesium, phosphorus, iron, and calcium, traces of zinc, copper, manganese and selenium (Khader, 2001). It is used as a treatment for a range of metabolism and heart health issues, including weight loss, diabetes and high cholesterol, according to the National Institutes of Health (NIH). Spirulina is also recommended as an aid for various mental and emotional disorders, including anxiety, stress, depression and attention deficit-hyperactivity disorder. Millets are one of the oldest food grains known to mankind and possibly the first cereal grain used for domestic purposes. Millets have immense health benefits also valued for natural antioxidants and are gaining importance as complete nutrient source. They are good sources of protein, dietary fibre, energy and minerals when compared to rice. Minerals are also involved in several metabolic functions of human body (Moure *et al.,* 2001). Each 100g sample of dried spirulina powder contain protein 57.47g, fat.53g, carbohydrate 23.90g, energy 290 Kcal, vitamin 10.10g, fibre 3.60g, minerals 2.80g, calcium 117mg, and iron 25.50mg. Spirulina can be consumed in the form of either dry powder, tablets, The nutrient content of little millet flour contain protein 7.70g, fat 4.70g, carbohydrate 67.00g, energy 34.10Kcal,calcium 17.00mg, fibre 12.20g, and iron 9.30mg. Considering the nutrient values of little millet flour and spirulina powder the present study aims at bringing them together in cookies so that it would help especially

children and elderly to supplement their regular food. Nutritional analysis and shelf life study were also carried out.

MATERIALS AND METHODS

Procurement of raw materials

Spirulina powder was purchased from Emmar Export S/F.No.628/1, Somayampalayam (P.O), Coimbatore-108 and other ingredients viz., wheat flour, icing sugar, baking powder, fat, corn flour and vanillin powder having standard quality have been procured from local market at Coimbatore. The little millet flour and spirulina powder used were cleaned by sieving through a 60 mesh sieve. Both spirulina powder and little millet flour were mixed at various proportions 5 - 10% as indicated in Table 1. The supporting ingredients added to the little millet flour were wheat flour fat, icing sugar, baking powder, corn flour, and vanillin powder. All the ingredients were mixed with the little millet flour and the dough was prepared. The dough was rolled into uniform sheet of desired size (thickness of 0.6cm and 4cm diameter) and was cut into circular shapes using cookies cutter and baked in an oven at 180°C for 15 minutes. The baked cookies are cooled for 2-3hrs. The cookies were packed in thermally sealed Poly propylene bags (200G) and plastic container (600G). The cookies were stored for one month at room temperature and relative humidity of 65%-85%. Based on the scores of sensory evaluation, the T_5 combination was found to be highly acceptable than the other combinations.

Evaluation

The cookies were analyzed for the texture profiles, organoleptic parameters and nutritional qualities for 10 days during the storage period of 30d.

Texture Profile

The textural parameter of cookies viz., force, distance and time have been determined using the texture analyzer (TA-XT2, Stable Micro Systems. Model: Texture Export Version 1.22, Survey, UK) following Bourne *et al.* (1966).

Physical properties including diameter, thickness, spread ratio were calculated as per the methods described by the AACC (1969).

Organoleptic Evaluation

The Spirulina incorporated cookies were evaluated for their sensory attributes by a panel of 25 trained members using 9 point hedonic scale Watts *et al.* (1989). The mean of sensory scores for attributes *viz*. colour and appearance, flavour, texture, taste, and overall acceptability were recorded.

Nutrient Analysis

The nutrient composition viz., protein, fat, fibre, carbohydrate, and minerals viz., calcium were analysed by AOAC (2005) methods in triplicate.

RESULTS AND DISCUSSION

In the present study, effort was taken to develop Spirulina powder incorporated little millet flour cookies and study its suitability to formulate cookies. The physico-chemical properties, sensory characteristics and storage quality of the developed products were evaluated. The Formulation of the little millet flour based cookies were done by the standard procedure incorporating at different levels ranging from 5% to 10%. Table1 shows the incorporation levels of the ingredients.

Physical properties of cookies

The physical properties of spirulina powder incorporated cookies are compared with that of little millet flour cookies (Table 2). Fig 1 compares the dough weight and cookies weight in both cases of study. Fig 2 highlights the physical properties of the cookies. It was observed that the dough T_1 was 173g (control) which was higher than the T_5 - 175 g. The height of the little millet based cookies before and after baking was 0.5 and 0.6 respectively. The final weight of the cookies was 170g for T_1 and 172g forT_5 and number of cookies was 25 in T_1 and 26 in T_5.

Table 1. Formulation of Spirulina incorporated little millet cookies

Ingredients (g)	Control T0	Incorporation levels					
		5 T1	6 T2	7 T3	8 T4	9 T5	10 T6
Little millet flour	75	75	75	75	75	75	75
Spirulina powder	-	5	6	7	8	9	10
Wheat flour	25	20	19	18	17	16	15
Icing sugar	30	30	30	30	30	30	30
Baking powder	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Fat	50	52	54	56	58	60	62
Corn flour	1	1	1	1	1	1	1
Vanillin powder	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Table 2. Physical properties of cookies

Characteristics	Little millet flour cookies (T_0)	Spirulina powder Incorporated (T_4)
Dough weight (g)	182	200
Height before baking (cm)	0.5	0.6
Height after baking (cm)	0.6	0.7
Breadth (cm)	3.6	3.8
Spreadability (cm)	0.2	0.4
Final output (g)	190	220
No. of cookies	19	22
Hardness / Compression (Kg f)	0.95 ± 0.03	0.98 ±0.04
Stickiness (g)	25.47 ± 0.87	24.01 ±0.87

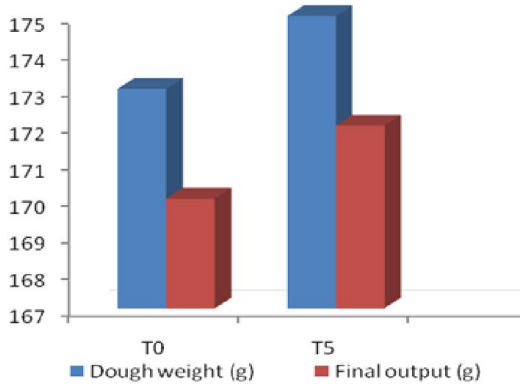

Fig. 1. Dough weight and final output of the cookies

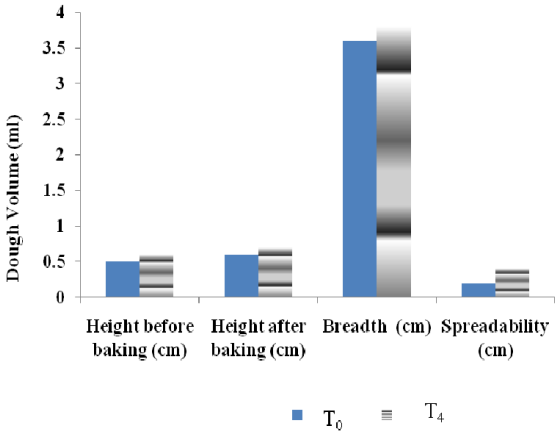

Fig. 2. Physical properties of the cookies

Table 3. Nutrient changes in little millet based cookies

Nutrients (g/100g)	Little millet flour				Little millet flour + Spirulina powder			
	Polypropylene		Plastic container		Polyp1ropylene		Plastic container	
	0th day	30th day	0th day	30th day	0th day	30th day	0th day	30th day
Moisture	8.24	8.36	8.24	8.31	8.45	8.55	8.45	8.49
Carbohydrate	66.85	66.82	66.85	66.84	65.74	64.35	65.74	65.00
Protein	6.25	6.22	6.25	6.24	12.36	12.23	12.36	12..31
Fat	21.87	21.83	21.87	21.86	20.24	20.15	20.24	20.18
Crude fibre	2.65	2.61	2.65	2.64	5.62	5.37	5.62	5.41
Ash	0.90	0.87	0.90	0.89	0.89	0.84	0.89	0.85
* Calcium	15.73	15.69	15.73	15.72	27.56	27.41	27.56	27.50
* Iron	4.03	4.00	4.03	4.02	6.98	6.71	6.98	6.92

* (mg / 100g)

Table 4. Sensory evaluation of the cookies

Parameter	Little millet flour				Little millet flour + Spirulina powder			
	Polypropylene		Plastic container		Polypropylene		Plastic container	
	0th day	30th day	0th day	30th day	0th day	30th day	0th day	30th day
Colour and appearance	8.5	8.3	8.5	8.4	8.8	8.5	8.8	8.7
Taste	8.6	8.4	8.6	8.5	8.7	8.5	8.7	8.6
Flavour	8.6	8.3	8.6	8.5	8.8	8.4	8.8	8.7
Texture	8.6	8.2	8.6	8.4	8.7	8.5	8.7	8.6
Overall acceptability	8.4	8.1	8.4	8.2	8.6	8.4	8.6	8.6

Sensory evaluation of little millet based cookies

The sensory evaluation scores of control and Spirulina incorporated little millet flour cookies were evaluated on 0th d and 30th d of storage and the mean score was presented in Table 4.

The effect of Spirulina incorporated little millet flour cookies on texture properties such as hardness and stickiness was studied. It was observed that the incorporation of spirulina powder increased the hardness of the cookies, whereas decreased stickiness.

Nutrient composition of the cookies

The nutrient analysis of the Spirulina incorporated little millet flour cookies was done in fifteen days interval in the storage period of 30d. Table3 shows the results of the Nutrient analysis. The moisture content of the Spirulina incorporated little millet flour cookies were increased from 8.45g to 8.49 in plastic container P_2 during the storage period of 30d. for overall acceptability being 8.5 than the control cookies. Protein, fibre and iron content of the standardized cookies were found to be 12.31; 5.41g and 6.92mg/100g respectively than the control cookies.

Conclusion

The results of the study indicated that mixing 8g of Spirulina powder with 75g of little millet flour (Treatment T_5) was found to be superior in nutritional value, physico-chemical properties, texture profiles and sensory qualities. The present study revealed that spirulina incorporated little millet cookies were nutritious and highly acceptable (8:75) upto 30^{th}d considerably in plastic based on the physical characteristics of the dough, sensory and nutritional characteristics of the cookies. Therefore, results suggest that there is a great scope for use and marketing of value added cookies using spirulina powder with little millet flour.

REFERENCES

AACC, 1969. Methods of analysis. 7th Edition .American Association of Cereal chemists St. Paul, Minesota.

AOAC, 1995. Association of Ofiicial Analytical Chemists:Ofiicial Method of Analysis.16t Edition. Arlington, V.A:AOAC

Khader, V. 2001. *Textbook of Food Science and Technology,* New Delhi. Directorate of Information and Publication of Agriculture, Indian Council of Agriculture

Khan, Z., Bhadouria, P., Bisan, P. S. 2005. Current pharmaceutical biotechnology. *Nutritional and Therapeutic Potential of Spirulina.* 6 : 373 – 379

Mark, F. Mc Carty, 2007. Clinical potential of Spirulinas: A source of phycocyanoblin. *Journal of Medicinal Food,* 10(4): 566 – 570.

Moure, A., Cruz, J, Franco, D., Domoanguez, J., Sineiro, J., Domoanguez, H., Nuana, M., Parajoa, J., 2001. *Natural antioxidants from residual sources*. *Journal of Food Chemistry* (72)/ 145-171/:

Srilakshmi, B. 2001. *Food Science.* 2nd Edition. Delhi: New Age International Limited Publishers.

Watts, B.M., Jlimaki, G.L and Elias, L.G. 1989. Basic sensory methods for food evaluation. *International Development Research Centre* (IDRC).Ottawa, Canada p 1-16.

****