International Journal of Applied Home Science *RESEARCH ARTICLE*
Volume 2 (3&4), March & April (2015) : 107-113 ISSN : 2394-1413
Received : 27.02.2015; Revised : 07.03.2015; Accepted : 15.03.2015

Development and comparative nutritional analysis of Spirulina fortified cookies for malnourished children and women

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ABSTRACT

Introduction: Spirulina is a blue green algae having very good nutritional value. It also has many therapeutic properties such as hypocholestrolemic, antiviral and antiglutagenic effects. Due to its high Phytonutrients and pigment content it is used for preparing functional foods. The use of spirulina as a protein complement in populations with food shortages is considered as feasible as it presents several advantages when compared with other agricultural products, in the same area the spirulina produces 20 times more proteins than soya, recently spirulina acquired significant importance. Spirulina typically contains about 60 per cent protein, it is a good source of vitamin B_{12}, copper and it contains iron. Spirulina protein is low in calories. There are 3.9 calories per gram of protein found in spirulina, which can be compared to 65 calories per gram of protein in beef. **Method:** Cookies were prepared by mixing spirulina powder along with other ingredients by the researcher. A control sample was also prepared. Both the cookies were assessed for their nutritional content. **Result:** After analysis, it was found that cookies fortified with spirulina were significantly high in various nutrients. The spirulina fortified cookies contained 2.55 per cent moisture, 6.25 per cent proteins, 20.43 per cent fat, 1.18 per cent crude fibre, 4.07 per cent ash, 288.98 per cent calcium, 115.92 per cent phosphorus and 3.94 per cent iron whereas control samples contained 2.77 per cent moisture, 4.49 per cent proteins, 17.59 per cent fat, 0.68 per cent crude fibre, 3.08 per cent ash, 214.15 per cent calcium, 54.34 per cent phosphorus, 1.87 per cent iron, respectively. **Conclusion:** Better quality of spirulina fortified cookies would prove to be a good supplement for malnourished children and specially undernourished women in India. Women suffering from various deficiency disorders, especially when they are at pre-menopausal stage, also others like lactating women could benefit from the consumption of these cookies on a daily basis.

Key Words : Malnourished children, Women's health, Phytonutrients, Functional food

INTRODUCTION

"Let food be your medicine and medicine be your food" said Hippocrates 2500 years ago. The philosophy of food as medicine is more relevant today than ever before.

Malnutrition continues to be a major public health problem throughout the developing world. Malnutrition is consequently the most important risk factor for the burden of disease in developing countries. India has a higher prevalence of child malnutrition, which manifests as stunting and underweight problems in children. India is home to about one third of all malnourished children in the

Cite this Article: Fatima, Ammatul and Srivastava, Sangita (2015). Development and comparative nutritional analysis of Spirulina fortified cookies for malnourished children and women. *Internat. J. Appl. Home Sci.,* **2** (3&4) : 107-113.

world.

Women's health involves women's emotional, social, cultural, spiritual and physical well being, and is determined by the social, political, cultural and economic context of women's lives, as well as by biology. Every woman should be provided with the opportunity to achieve, sustain and maintain health, as defined by the woman herself, to her full potential.

Phytonutrients are nutrients derived from plant material that have been shown to be necessary for sustaining human life. Health and nutrition are the most important contributory factors of human index measure in any country. India is passing through the phase of economic transition while the problem of under nutrition continues to be a major problem.

Functional food is a food where a new ingredient has been added to a food and the new product has an additional function. It is a Natural or processed food that contains known biologically-active compounds which when in defined quantitative and qualitative amounts provides a clinically proven and documented health benefit, and thus, an important source in the prevention, management and treatment of chronic diseases of the modern age.

Spirulina, now named Arthrospira, is a microscopic and filamentous cyanobacterium that has a long history of use as a safe food lacking toxicity. Recent interest on potential health effects and nutritional benefits of Spirulina are mainly due to its chemical composition, which includes proteins (the highest content of any natural food, 55%-70%), carbohydrates, essential amino acids, minerals (especially iron), essential fatty acids, vitamins, and pigments. Persistent under nutrition throughout the growing phase of childhood leads to a short stature in adults. Spirulina is one of the great super foods. It is approximately 65 to 71 per cent complete protein in its natural state. This is higher than virtually any other unprocessed food. Addition of a healthy amount of complete protein in our diet is very important. Spirulina is a nutrient rich super food for super health. Super foods can be defined as foods that have health benefits and disease preventing properties over and above their usual nutritional value. It is the most nutritious concentrated whole food source found in nature.

Hypothesis:

– The fortified food products have a higher nutritional value compared to control samples.

– The fortified food products will find acceptance by people in terms of taste and appearance compared to control samples.

– The spirulina fortified food products will be rich in iron, calcium and phosphorus, thus it will be beneficial for women's health and other deficiency diseases.

Objectives :

1. To effectively develop the spirulina enriched cookies and control sample.
2. Nutritional Analysis of all nutrients present in the cookies
3. Comparison of the controlled sample with the fortified cookies.

METHODOLOGY

The study will carried out in four phases

Procurement of spirulina :

Spirulina powder was purchased from ''S V AGRO Foods Company'' New Delhi.

Development of value added cookies:

Most acceptable value added addition level of spirulina powder *i.e.* 10 per cent was incorporate into the cookies with other ingredients.

a) To effectively develop the control sample.

b) To effectively develop the spirulina fortified cookies.

Organoleptic evaluation:

The develop value added cookies was standardised using composite scoring evaluation with the help of experts. The develop value added cookies along with control sample served to the experts for organoleptic evaluation.

Nutritional evaluation :

Prepared cookies were analyzed for moisture, protein, fat, fibre, ash, phosphorus, calcium, iron, alcoholic acidity, pH, peroxide content.

Take 500 g wheat flour + 50 g butter and mix it well

⇩

Add 200 g ground sugar

⇩

Prepare the soft dough and add 1 tsp of baking powder

⇩

Add 10 g elaichi and cinnamon powder into it and kneaded again

⇩

Cut the dough into round shape and bake the cookies properly.

Flow chart 1 : Showing development of control sample

Take 500 g wheat flour + add 50 g Spirulina powder and mix it well

⇩

Add 200 g grinded sugar + 50 g butter into it

⇩

Prepare the soft dough and add 1 tsp of baking powder.

⇩

Add 10 g elaichi and cinnamon powder into it and kneaded again

⇩

Cut the dough into round shape.

⇩

Bake the cookies at 180^0 F until turns it turns golden brown.

Flow chart 2 : Showing development of spirulina fortified cookies sample

RESULTS AND DISCUSSION

Organoleptic evaluation:

Fig. 1 reveals that both the samples were subjected to organoleptic evaluation by the experts and the results were noted. Spirulina fortified cookies were falling into the liked, disliked or neither like nor dislike.

Study revealed that the study of cookies from a total of 50 human experts, who has judge the biscuits. 64 per cent liked the biscuits and 24 per cent disliked the biscuits and 12 per cent did not give a comment.

Shelf life study :

Under the present study shelf life of both the products was judged on the basis of their

Table 1 : Results of both the samples

Sr. No.	Test parameter	Results (control sample)	Results (spirulina fortified cookies)	Unit
1.	Moisture	2.77	2.55	%
2.	Proteins	4.49	20.43	%
3.	Fat	17.59	16.25	%
4.	Fibre	0.68	1.18	%
5.	Ash	3.08	4.07	%
6.	Calcium	214.15	288.98	Mg/100 g
7.	Phosphorus	54.34	115.92	Mg/100 g
8.	Iron	1.87	3.94	Mg/100 g
9.	Alcoholic acidity	0.24	0.30	%
10.	Ph	7.035	6.035	-
11.	Peroxide value	0.987	0.755	Meq/Kg

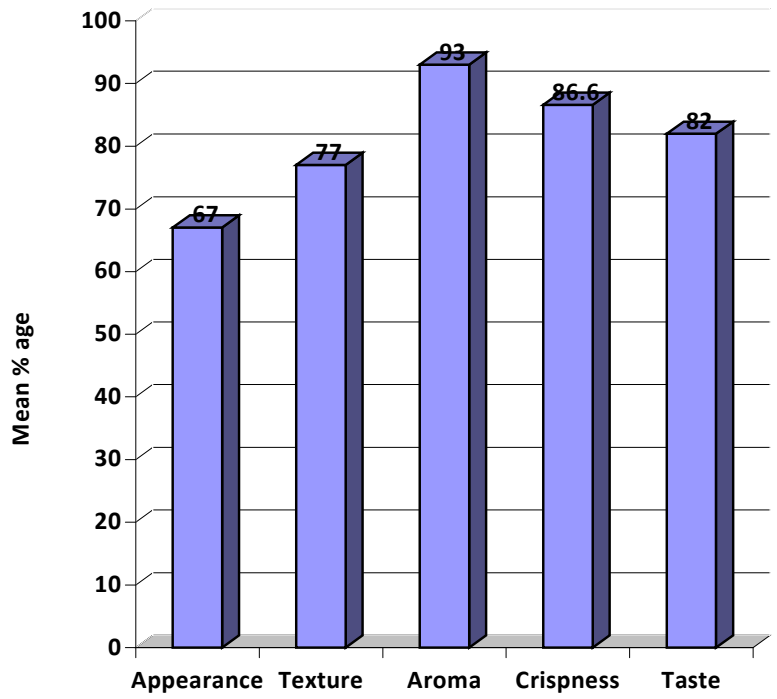

Fig. 1 : Graph showing sensory evaluation of spirulina fortified cookies through composite scoring

Table 2 : Acceptability of cookies

Study spirulina fortified cookies	Patient	
	N	%
Liked	32	64%
Unlike	12	24%
neither	6	12%

* persons could not tell

organoleptic evaluation, during the storage period of three months, under normal condition by the researcher.

Nutritional evaluation:

Table 1 show that the data of nutritional contents of fortified biscuits was higher than control sample.

Conclusion:

The present work reveals that spirulina fortified cookies prepared from spirulina at 10% were well accepted on organoleptic parameters and the most acceptable product was found in satisfactory range during storage period. The results show that developed cookies were very much nutritious and their nutritional value is much greater than control samples. Thus this valuable product possess great extrusion potential with higher acceptability on organoleptic parameters thus better quality of spirulina fortified cookies brings considerable advantages among the community.

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