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Effect of Spirulina as a Nutritional Supplement in Malnourished Children

Home Science

KEYWORDS : Malnutrition, spirulina, organoleptic quality, value added products.

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ABSTRACT

Malnutrition, a state of poor nutrition is one of the crucial public health problems in large areas of the world. Individuals, who consume fewer than three balanced meals a day, do not get the recommended intake of fresh fruits and vegetables, are on restricted diets or are regularly subject to intense physical activity. This is a challenging problem put for worth in front of the Nutritionists, Food scientists and Technologists. Spirulina is found to be the best alternative dietary supplement to the malnutrition. Spirulina is a safe food with absolutely no side effects. To overcome such problems, an attempt has been concentrated on enhancing the organoleptic quality of spirulina through supplementation (biscuit form). Nutrition policies can be taken to overcome the malnutrition problem among children by concentration on the alternative dietary supplements.

Introduction:

In today's fast-paced society, there are many opportunities for our body functions to become imbalanced malnutrition among the vulnerable sectors of the population is one of the crucial public health problems in large areas of the world. Malnutrition can be described as an under nutrition health condition caused by insufficient or improper diet or by the poor absorption of food and excessive loss of essential food nutrients. India is home to more than 230 million undernourished people, the highest number for any other country in the world. More than one quarter of the global population of malnourished people live in India. It is estimated that 43% of children fewer than five years in India are underweight. Protein energy malnutrition and micronutrient deficiency leading to early growth failure often can be traced to poor maternal nutritional and health care before and during pregnancy, resulting in intrauterine growth retardation and children born with low birth weight, while significant progress has been achieved over the past 30 years in reducing the proportion of malnourished children in developing countries.

To overcome the problems obtained as a result of under nutrition, the need of nutrient –rich foods came into existence. One of such food which constitutes the most remarkable concentration of nutrients is "spirulina" which combat malnutrition undernourishment, and protein deficiencies. The name of spirulina is actually derived from the Latin word for 'helix" or "spiral", by denoting the physical configuration of the organism when it in fact forms swirling, microscopic strands. It is a one-celled form of algae that thrives in the warm, alkaline fresh water bodies. The term spirulina refers to a large number of cyan bacteria or blue-green algae. It first appeared on the earth more than 3.5 million years ago. Spirulina is incorporated in many supplements, since it is so rich in beta-carotene, other nutrients and protein. As little a ten grams a day brings rapid recovery from malnutrition, especially for infants. It improves the hemoglobin levels both with the animal models as well as in humans. Apart from contributing the required iron, spirulina also supplies folic acid and vitamin b12 needed by anemic persons making it as a wholesome nutritional support. More than that, the micro nutrients and enzymes present also contribute to the better assimilation of the nutrition from the food ingested thus making it as a bio-enhancer. Spirulina supplements are available in powder, flakes, capsule and tablet forms. In spite of being highly nutrient rich, many people find unpleasant because of their cost and strong flavor. To overcome or get rid from such problems spirulina was incorporated into the food products by developing spirulina biscuits.

Today ready to eat processed foods with better shelf life, satisfying taste, ease portability, and with high nutritional quality has increased throughout the world because of growing urbanization and increased employment of women in industrial and public sectors. Bakery products are the most important items that can satisfy all requirements. The word "biscuit" is derived from Latin word "BISCOTUS" meaning twice cooked with product in a hot air oven and then transferring it to a cooler oven to complete the drying process. Biscuits are made from wheat flour. Wheat is the only grain, which will yield flour capable of being made in to a low density baked product which is consumed at fine uniform cells and has soft elastic texture(Oxford university press,2009).India is a popular country in the whole world to provide healthy foods to all its inmates becomes a challenge. Thus "spirulina", a natural food with all its dense nutrients was selected to incorporate in biscuits because they are accepted by all categories of population.

Materials and methods:

Refined wheat flour, sugar, fat, baking powder, milk and vanilla essence were taken. In that spirulina powder were incorporated for the preparation of crunchy and yummy biscuit making. Ingredient compositions of the spirulina biscuits were carried out in 4 different trails (Trail 1, Trail 2, Trail 3 and Trail 4) based on sensory scores which were presented in table 1.

Table 1 : Different compositions of spirulina biscuits:

S. No	Ingredients	Trail 1	Trail 2	Trail 3	Trail 4
1.	Spirulina Powder(gms)	1	1.5	2	2.5
2.	Refined wheat flour(gms)	45	45	45	45
3.	Sugar(gms)	20	20	20	20
4.	Fat(gmss)	20	20	20	20
5.	Milk(ml)	14	13.5	13	12.5
6.	Baking powder	A pinch	A pinch	A pinch	A pinch
7.	Vanilla essence (drops)	4	4	4	4

Nutrient rich Spirulina biscuit containing 2.5 gms of spirulina powder, refined wheat flour (45 gms), sugar (20 gms), fat (20 gms), milk (12.5 ml) baking powder a pinch, last but not the least vanilla essence 4 drops were added to enrich the quality and also improve the taste and flavor of the biscuit.

The sensory attributes of standardized spirulina biscuit were evaluated by two age groups that means 20-30 years and 30-40 years with 8 panel judges to assess its overall acceptability by using rating scale with 5 point hedonic scale. Sensory evaluation is a scientific discipline used to measure, analyze and interpret reactions to those characteristics of foods and materials as they are perceived by the senses of smell, taste (Anongous, 1995) which were clearly given in the table 2 below.

Table No: 2: Organoleptic evaluation of the spirulina biscuit with 5 point hedonic scale by different age groups.

S. No.	Sensory Attributes	Trail-1		Trail-2		Trail-3		Trail-4	
		20-30	30-40	20-30	30-40	20-30	30-40	20-30	30-40
1.	Color	3.4	3.5	3.6	3.6	3.8	3.5	4.1	4.0
2.	Taste	4.1	4.1	4.0	3.8	4.1	4.0	4.2	4.1
3.	Texture	4.2	4.0	4.0	4.1	4.0	4.0	4.2	4.2
4.	Flavor	3.8	3.9	4.0	4.0	4.1	4.0	4.4	4.3
5.	Mouth feel	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.2
6.	Appearance	4.0	4.2	3.8	3.9	3.6	3.8	3.8	3.6
7.	Overall acceptability	4.0	3.9	4.0	3.8	4.2	4.0	4.3	4.2

Score card was prepared to analyze the sensory attributes of the developed product via appearance, color, texture, flavor, mouth feel and overall acceptability. Developed score card for testing the acceptability of spirulina biscuits were tabulated in the table 3.

Table No:3 Developed score card for acceptability:

S. No.	Sensory Attributes	Trail-1	Trail-2	Trail-3	Trail-4
1.	Color				
2.	Taste				
3.	Texture				
4.	Flavour				
5.	Moutth feel				
6.	Appearance				
7.	Overall acceptability				

Results and discussion:

In the overall sensory scores fourth trail were higher among the other ingredient compositions. The intension was to incorporate maximum possible quantity of spirulina mixture in the making of biscuit to get good taste. It was observed that sensory scores given by the panel judges aged 20-30, 30-40 yrs people for all sensory attributes i.e. it changes from 3.4, 3.5 to 4.1, 4.0 for color and it was obtained by incorporation of spirulina in it. Simultaneously for taste it ranges from 4.1, 4.1 to 4.2, 4.1 were coded by maximum panel judges. For texture it is 4.2,4.0 to 4.2,4.2 and coming for flavor it is 3.8,3.9 to 4.4,4.3 and for mouth feel ,appearance it is 4.3,4.2 to 3.8,3.6 were accepted by the panel judges and coming to the overall acceptability it is 4.0,3.9 to 4.3,4.2 like this all the sensory scores changes from one attribute to the other attribute respectively for the good acceptability of the product. Nutrient composition of the standard product "Spirulina biscuits" (100gms) were calculated by using nutritive values of Indian foods by Gopalan etal(2004).Essential nutrients such as protein , energy, carbohydrates, fat, minerals, crude fibre,riboflavin ,thiamine,niacin,vitamin A, iron were calculated and presented in table 4.

Table No 4: Nutritional values for spirulina biscuit.

S. NO.	Nutrients	Nutritive value
1.	Calories(k.cal)	448.49
2.	Protein(g)	7.17
3.	Carbohydrate(g)	54.24
4.	Fat(g)	22.7
5.	Sodium(g)	10.9
6.	Minerals(g)	0.53
7.	Crude fiber(g)	0.22
8.	Calcium(mg)	68.76
9.	Phosphorous(mg)	148.68
10.	Iron(mg)	9.21
11.	Carotene(mg)	377.25
12.	Thiamine(mg)	255.16
13.	Riboflavin(mg)	2.52
14.	Niacin(mg)	16.62

Conclusions:

Spirulina has potential for being a wonder food supplement and several leading organizations have praised its beneficial effects. It is the richest nutrient and complete food source found in the world. It contains over 100 nutrients more than any other plant grain or herb. The important healths benefits of spirulina are strengthening immune system have anti biotic, anti cancer and anti diabetic properties. Hence value added biscuits were developed by incorporating spirulina powder. The value addition improves its organoleptic properties as well as nutritional and health benefits for mal nourished children.

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