



Product Development and Nutritional Evaluation of Value Added Product Incorporated with Spirulina Powder, Soya Flour and Rice Flour

KEYWORDS

Spirulina powder, soya flour, Rice flour

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ABSTRACT The present study was undertaken to develop spirulina powder based chaklis. Variants were being prepared by using soya flour and rice flour. Spirulina powder, soya flour and rice and sesame seeds are the rich sources of protein. Yet they are not consumed by large number of population instead of their nutritional quantity. The study was divided into five phases, the first phase included procurement of raw material spirulina powder, soya flour, rice flour, sesame seeds, cumin seeds, oil and spices. The second phase includes development of spirulina chakli & its variants with different proportions of other ingredients. The third phase includes sensory evaluation by trained and untrained panelists. The fourth phase includes the proximate analysis of the chakli and its variants, which revealed that sample T2 (containing spirulina powder 20gm, soya flour and rice flour) has high protein i.e. 18.02gm and 6.27gm for standard sample (containing wheat flour and rice flour). The CHO content was 19.65gm for sample T2 and 23.65gm for standard sample. The fat content was 1.10gm for sample T2 and 1.26gm for standard sample. In the last phase statistical analysis of sensory evaluation revealed that sample T2 (containing spirulina powder 20gm, soya flour and rice flour) and standard sample was more acceptable with mean composite overall acceptability score of 17.47 ± 0.99 and 17.47 ± 1.36 . Sample T1 have a mean score of 15.67 ± 1.59 . On the basis of the present study it can be concluded that sample T2 (containing 20gm of spirulina powder, 50gm of Soya flour and 30gm of Rice flour). The moisture content was found to be 2.48 percent per 50gm, ash content 1.70gm per 50gm, protein content 18.02gm per 50gm, fat content 1.10gm per 50gm, Carbohydrate content 19.65gm per 50gm, energy content 448.6kcal per 50gm and fibre content 2.87gm per 50gm. Sample T2 was best acceptable among all two variation, with highest score for each attribute like taste, texture, appearance, colour, mouth feel and overall acceptability. It was also more nutritious than the standard product in terms of protein content.

INTRODUCTION

Spirulina are multicellular and filamentous blue-green microalgae belonging to two separate genera Spirulina and Arthrospira and consists of about 15 species. (1) Spirulina is a rich source of protein, containing more than 60% digestible vegetable protein. It also has high concentrations of b-carotene, vitamin B12 (mainly pseudo-B12), iron, γ -linolenic acid. These make Spirulina a good whole food alternative to isolated vitamin and minerals. With its multiple nutritional properties, Spirulina may be used as therapeutic supplement for the management of various nutritional and metabolic disorder. (2, 3)

Fat-free (defatted) soyabean meal is primary, low cost, source of protein. Soya vegetables oil is another valuable product of processing the soya bean crop. For example, soya bean products such as textured vegetable protein (TVP) are important ingredients in many meat and dairy analogues. (4)

Rice flour (also rice powder) is a form of flour made from finely milled rice. It is distinct from rice starch, which is usually produced by steeping rice in lye. Rice flour is particularly good substitute for wheat flour, which causes irritation in the digestive systems of those who are gluten-intolerant. Rice flour is also used as a thickening agent in recipes that are refrigerated or frozen since it inhibits liquid separation. (5)

Chakli is a savoury snack from India. It is a spiral shaped, pretzel-like snack with a spiked surface. Chakli is typically made from flours of rice, bengal gram (chickpea) and black gram (udad daal). It has several variations, de-

pending on the types and proportion of flours used. Murukku, a similar snack typically made without the Bengal gram flour, is also sometimes called "chakli". (6)

MATERIAL AND METHODS

The study was divided into 5 phases. Phase 1 include procurement of the spirulina powder, soya flour, rice flour, sesame seeds and oil from the local store. In phase 2 development of the chakli and its variants with spirulina powder and soya flour was done. In first variation 10gm of spirulina and 60gm of soya flour was incorporated and in second variation 20gm of spirulina and 50gm of soya flour was incorporated. In third phase sensory evaluation of the chakli and its variants was done with 9 point hedonic scale with 20 untrained panel members and composite score card with 15 trained panel members. In fourth phase proximate analysis of the chakli and its variants was done. The last phase was statistically analysis. Mean, standard deviation and ANOVA was used for analysis.

RESULTS AND DISCUSSION

The present study was conducted to develop a nutritious chakli incorporated with spirulina powder, soya flour and rice flour. The results were compared with the standard chakli and its variants with spirulina powder and soya flour.

Table 1: Mean acceptability score of attributes between the samples: Chakli by Composite scoring card

PARAMETERS	STANDARD	T1	T2	P _{value}	f _{value}
Appearance*	18.07±1.22	16.67±1.40	17.07±1.28	0.05	0.58

Texture*	7.93±0.70	7.27±1.27	7.73±1.17	0.01	4.29
Color*	8.33±1.35	7.33±1.18	7.73±1.03	0.00	5.30
Taste*	18.13±1.60	16.07±1.53	17.60±0.99	0.38	0.96
Aroma*	8.00±1.20	6.87±0.83	7.33±0.98	0.001	8.41
Mouth-feel*	8.20±1.21	6.80±0.94	7.73±0.96	0.001	8.12
Overall Acceptability*	7.65±1.14	6.50±1.15	7.40±0.99	0.42	0.004

*Significance $p < 0.05$

- (a) Standard Sample T0 (50gm wheat flour, 50gm Rice flour)
 (b) SAMPLE T1 (10gm Spirulina powder, 60gm Soya flour, and 30gm Rice flour)
 (c) SAMPLE T2 (20gm Spirulina powder, 50gm Soya flour, and 20gm Rice flour)

Table 1 shows mean acceptability score of attributes be-

tween the samples: Chakli by hedonic scoring. In appearance, standard was most acceptable i.e. 18.07±1.22, T1 was least acceptable i.e. 16.67±1.40. There was significant difference between the groups. In texture, standard was most acceptable i.e. 7.93±0.70, T1 was least acceptable i.e. 7.27±1.27. There was significant difference between the groups. In color, standard was most acceptable i.e. 8.33±1.35, T1 was least acceptable i.e. 7.33±1.18. There was significant difference between the groups. In taste, standard was most acceptable i.e. 18.13±1.60, T1 was least acceptable i.e. 16.07±1.53. There was significant difference between the groups. In aroma, standard was most acceptable i.e. 8.00±1.20, T1 was least acceptable i.e. 6.87±0.83. There was significant difference between the groups. In mouth-feel, T2 was most acceptable i.e. 8.20±1.21, T1 was least acceptable i.e. 6.80±0.94. There was significant difference between the groups. In overall acceptability, standard was most acceptable i.e. 7.65±1.14, T1 was least acceptable i.e. 6.50±1.15. There was significant difference between the groups.

Table 2: Proximate analysis of standard and spirulina and soya flour variants chaklis

Parameter	StandardM ±SD	T 1(Sample)M±SD	T2(Sample)M±SD	P Value(ANOVA TEST)
MOISTURE (g)	3.80±0.26	2.33±0.11	2.48±0.06	0.001
ASH (g)	2.26±0.15	1.87±0.06	1.7±0.1	0.056
ENERGY(Kcal)	466.1±1.0	376.43±0.70	371.3±0.81	0.007
PROTEIN(g)	6.25±0.15	12.71±0.65	18.27±0.54	0.001
FAT(g)	1.20±0.14	1.23±0.15	1.1±0.2	0.001
CARBOHYDRAT(g)	35.9±1.52	23.45±1.26	19.58±0.54	0.008
CRUDE FIBRE(g)	1.25±0.07	1.85±0.06	2.99±0.28	0.021

*Significance $p < 0.05$

CONCLUSION

The present study was undertaken with a view to develop the spirulina powder chaklis and also study the functional properties change in the chakli by the addition of the spirulina powder and soya flour. Sensory evaluation revealed that sample T2 was significantly ($p < 0.05$) more acceptable with the mean overall acceptability score of 17.47±0.99 out of 20 whereas mean score of sample T1 was found to be 15.67±1.59 respectively. Proximate analysis of the chakli revealed that sample T0 has 6.27gm protein, Sample T1 has 12.65 gm protein and sample T2 has 18.02gm protein respectively. Sample T2 (20gm Spirulina powder, 50gm Soya flour and 30gm Rice flour) was best acceptable among the two variation, with highest score for each attribute like taste, aroma, colour, mouth feel, appearance and overall acceptability. It was also more nutritious than the standard product in terms of protein content.

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