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DEVELOPMENT & CHARACTERIZATION OF NACHOS INCORPORATED WITH BEET GREENS

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ABSTRACT

Background: Snack foods with desirable qualities including low fat, cholesterol, sugar and calorie content, are poised to register robust growth and support market expansion. Increasing health consciousness along with craving for snack foods is anticipated to result in dynamic demand for low-fat, no-fat, low-sugar, no- sugar, low- carbohydrate, no- carbohydrate, and low- calorie snack foods. The present study was conducted to develop nachos incorporated with beetgreens, soybean flour and wheat flour. Beetgreens is well known to have many nutritional properties which could be easily explored by incorporating it in food products. It is important as it has high content of iron, vitamin C, K, A and B_6.

Methods: The experimental nachos were made using beetgreens alone and beetgreens incorporated with dried fenugreek leaves (kasoori methi). All the samples were analyzed for their physiochemical characteristics and also analyzed sensorially. Chi-square test was used to determine the significant difference among samples wrt different parameters.

Results: The results revealed a significant difference in taste between all three samples ($p<0.05$). However, there was no discernible difference in overall acceptability ($p>0.05$), suggesting that the developed snack food could be brought to market shelf without any remarkable difference among different snack foods which are previously developed.

Conclusion: Beet green leaves were however not explored before. This study envisaged to bring forth the idea of its incorporation into food products and thereby developing healthy snacks.

Key words: Beet green, iron, vitamin A rich, snack foods, etc.

INTRODUCTION

The word snack food in general indicates energy-high, limit nutrient-deficient food (carbohydrate, salt, and fatty acids) such as cakes, cookies, chips and other salty snacks, as well as sugar-sweetened beverages **[1]**.

Healthy snacking works on the wellbeing, by battling the weight gain, control mood and temper, curbs cravings, growth brain power and gives the energy need for the whole day **[2]**.

Many people are working professionals, as a result of which they are becoming increasingly dependent on snack foods to meet their dietary necessities. Most often, snack foods do not provide enough nutrients required by the body. In latest years, the demands for functional food have increased interest in nutrition and disorder prevention. Nutrient dense ingredients might be a superb opportunity to junks in an effort to provide a wholesome snacking alternative **[3]**.

Nachos are triangle, curved shaped snack foods. They are made by using different vegetables, flour, leaf, salts in addition with other ingredients. In the market there are so many various types of nachos available like banana chips. Doritos, lay's, apple chips, pringles, ruffles, spinach chips etc.

Snack food comprises of the one of the indispensable component of a food sector. To meet changing client tastes and expectations, designing snack foods is a difficult task nowadays, as well as the illusive something to look for precise that is appealing to a diverse group of human begins. The majority of snacks producers utilise some type of even as a source of snack ideas for the current generation and include changes viz improve snack's fitness image. As a result, there is a lot of puffing and popping the use of enhance technologies are methods, that could accomplish some of these goals. These method are used since hundred of years a handiest, cheaper and fastest traditional approach of dry warmness utility for coaching of weaning meals formulations and geared up-to-consume snacks merchandise, popping and puffing **[4]**.

Iron deficiency anaemia (IDA) is the greatest nutritional deficiency on the planet. It may impair the physical and cognitive development of children and teenagers as well as produce diminished work capacity in adults. There is evidence that iron insufficiency without anaemia affects adolescent girl's cognition, it may impair the physical and cognitive development of children and teenagers as well as produce diminished work capacity in adults. IDA has been linked to poor cognitive development in children and may have an influence on visual and auditory skills **[5]**.

Anemia caused by a lack of iron required to create healthy red blood cells is known as iron deficiency anaemia. Iron deficiency

anaemia is give rise to reduction of iron in the diet either a continual loss of blood or a addition of the two **[6]**.

At large, the most common cause of iron deficiency anaemia is a diet with inadequate iron bioavailability but in enlarged nation reduced absorbent of iron and loss of blood are the most common causes. Reduced iron absorption is caused by atrophic gastritis and malabsorption diseases, particularly celiac disease **[7]**.

Beet greens (Beetroot leaves), are filled with important nutrient that assist body's immune system and help give a boost to bones. Beet green inexperienced are an outstanding herbal supply of fibre and are packed with antioxidants, It is wealthy in nutrients like vitamin C, K, A and B_6. They have zero fat and low density lipoprotein cholesterol. The super supply of potassium, that's essential to our coronary heart and digestive tract, beet greens veggies additionally contain magnesium to maintain normal nerve and muscle functions. Beet greens include excessive ranges of nitrates which improve blood health and help decrease blood strain. It contains vitamin A (Beta-Carotene) and lutein important for enhancing eye health. They're also high in iron (they have a higher iron content than spinach), vitamin K, B_6, magnesium and potassium. They're also a good source of dietary fibre (iron in beetroot leaves is 2.57mg in 100g whereas in spinach leaves is 0.81mg) **[8]**.

METHODLOGY

Study objects Three variations of nachos were developed by using standardized recipe. Sample-A contained no beet green leaves (hence was also termed as 'control'), Sample-B had beet green leaves incorporated whereas Sample-C contained both beetngreen leaves along with dried fenugreek leaves (kasoori methi) (as a flavour enhancer).

Methodology The major purpose of the study was to develop healthy snack alternative for the population and also to add variety to the market shelf.

The methodology comprised of the following phases:

PHASE 1: Procurement of raw materials

PHASE 2: Development & standardization

PHASE 3: Sensory evaluation phase

PHASE 4: Conduction of physico-chemical tests

PHASE 5: Statistical analysis of data

Phase 1: Procurement of raw materials

The Beet greens were procured from Gurugram Vatika City market. Colour, smell, taste and adulteration were some of the quality standards that were kept in mind. Every step of the procedure, such as selection, purchase, collecting, and processing were meticulously performed. Whereas, wheat flour & soybean flour were

procured from RBR Store, Shahdara Market, Delhi.

Phase 2: Development & Standardization

Nachos were developed incorporating beetgreens using two compositions, beetgreens nachos and beetgreens with kasoori methi respectively. One control sample was also developed (without beet green incorporation).

All the samples were developed in the Food & Nutrition Laboratory in the Department of Nutrition & Dietetics, Manav Rachna International Institute of Research & Studies. The samples were maintained under optimum storage temperatures. During the development of nachos, several materials were used that are described below:

The composition & steps for the developed samples is described as below:

Ingredients	Sample A (control)	Sample B	Sample C
Wheat flour	50g	50g	50g
Soybean flour	50g	50g	50g
Beetgreens	-	60g	60g
Dried fenugreek leaves (kasoori methi)	-	-	1/2tbs

Beet greens leaves were firstly washed and then ground to a fine paste

↓

Wheat flour and soybean flour were added to the above mixture (along with the spice mixture)

↓

Soft dough was prepared out of the mixture. The dough was allowed to rest for 15 min

↓

Nachos were prepared using triangle shaped cutter

↓

Lastly air fried at 120°C at 10 min.


1. Fine paste of beet greens


2.Added the paste in flours and added a some spices and make a soft dough

3. Nachos was prepared using triangle shape cutter.

4.Lastly air fried at 120° degree at 10 min. And after that nachos will be ready to eat.

Phase 3: Sensory evaluation phase

Sensory evaluation was done for the products on the basis of 9 point hedonic scale. The sensory attributes of quality of food are measured to determine consumer acceptance/preference in order to manufacture an acceptable and effective product at maximum production economy. The sensory attributes include appearance (color, size, shape,), kinesthetic (texture. consistency, and viscosity), and flavour (taste and odour). All the samples were

presented to panellists in a blinded manner. The panellists were asked to rate the acceptability score on a 9-point scale, ranging from 'like extremely' to 'dislike extremely'. The results were analysed for preference with data from large untrained panel.

A total of 50 panellists were selected from the Department of Nutrition and Dietetics, MRIIRS.

PHASE 4: Physico-chemical Tests

The tests were performed as per the standardized protocols. Energy (IS: 14433:2007 (2018)), protein (IS: 7219: 1973 (2015)), total fat (IS: 4684: 1975 (2015)), carbohydrate (IS:1656: 2007 (2018)), dietary fibre (AOAC 985.29), sodium (SIMA/STP/F/005), iron (SIMA/STP/F/005), vitamin-A (SIMA/STP/F/024), vitamin-C (SIMA/STP/F/013). The results for were then compared with that of control sample.

RESULTS

The results of physico-chemical analysis are depicted below:

PARAMETERS	SAMPLE A	SAMPLE B	SAMPLE C
Energy(kcal/100)	389	386	384
Protein (g/100)	46.4	47	46
Carbohydrate (g/100)	6	5	5
Total Fat (g/100)	37	37	38
Dietary Fiber (g/100)	3	4	4
Sodium (mg/100)	1108	1293	1347
Iron (mg/100)	7	8	8
Vitamin-A (mcg RAE)	3	5	14
Vitamin-C (mmol)	0.051	0.051	0.056

The results for sensory acceptability are depicted as under:

Table 3.1: Appearance acceptability scores of developed nachos

Appearance				
Parameter	Sample A (control)	Sample B	Sample C	Chi-square
	No. (%)	No. (%)	No. (%)	p- value
Like Extremely (9)	34(68%)	30(60%)	22(44%)	0.141^{NS}
Like Very Much (8)	12(24%)	17(34%)	24(48%)	
Like Moderately (7)	4 (8%)	3(6%)	4(8%)	
Like Slightly (6)	0(0)	0(0)	0(0)	
Neither Like nor Dislike (5)	0(0)	0(0)	0(0)	
Dislike Slightly (4)	0(0)	0(0)	0(0)	
Dislike Moderately (3)	0(0)	0(0)	0(0)	
Dislike Very Much (2)	0(0)	0(0)	0(0)	
Dislike Extremely (1)	0(0)	0(0)	0(0)	

***The percentage is depicted in the parenthesis. Sample A - Control nachos, Sample B – Beet greens nachos, Sample C - Beet greens nachos + dried fenugreek leaves; ^{NS}- Not significant (at 0.05 level of significance)**

Table 3.2 Aroma acceptability score of developed nachos

Aroma				
Parameter	Sample A (control)	Sample B	Sample C	Chi-square
	No. (%)	No. (%)	No. (%)	P- value
Like Extremely (9)	15(30%)	17(34%)	14(28%)	0.613 ^{NS}
Like Very Much (8)	21(42%)	26(52%)	24(48%)	
Like Moderately (7)	10(20%)	7(14%)	10(20%)	
Like Slightly (6)	3(6%)	0(0)	2(4%)	
Neither Like nor Dislike (5)	1(2%)	0(0)	0(0)	
Dislike Slightly (4)	0(0)	0(0)	0(0)	
Dislike Moderately (3)	0(0)	0(0)	0(0)	
Dislike Very Much (2)	0(0)	0(0)	0(0)	
Dislike Extremely (1)	0(0)	0(0)	0(0)	

***The percentage is depicted in the parenthesis. Sample A - Control nachos, Sample B – Beet greens nachos, Sample C - Beet greens nachos + dried fenugreek leaves; ^{NS}- Not significant (at 0.05 level of significance)**

Table 3.3 Taste acceptability score of developed nachos

Taste				
Parameter	Sample A (control)	Sample B	Sample C	Chi-square
	No. (%)	No. (%)	No. (%)	p- value
Like Extremely (9)	20(40%)	27(54%)	18(36%)	0.022**
Like Very Much (8)	18(36%)	23(46%)	25(50%)	
Like Moderately (7)	10(20%)	0(0)	6(12)	
Like Slightly (6)	2(4%)	0(0)	1(2)	
Neither Like nor Dislike (5)	0(0)	0(0)	0(0)	
Dislike Slightly (4)	0(0)	0(0)	0(0)	
Dislike Moderately (3)	0(0)	0(0)	0(0)	
Dislike Very Much (2)	0(0)	0(0)	0(0)	
Dislike Extremely (1)	0(0)	0(0)	0(0)	

***The percentage is depicted in the parenthesis. Sample A - Control nachos, Sample B - Beet greens nachos, Sample C - Beet greens nachos + Dried fenugreek leaves; ** The p value is significant (p < 0.05)**

Table 3.4: Texture acceptability score of developed nachos

Texture				
Parameter	Sample A (control)	Sample B	Sample C	Chi-square
	No. (%)	No. (%)	No. (%)	p- value
Like Extremely (9)	24(48%)	27(54%)	21(42%)	
Like Very Much (8)	20(40%)	21(42%)	26(52%)	
Like Moderately (7)	4(8%)	2(4%)	3(6%)	
Like Slightly (6)	2(4%)	0(0)	0(0)	
Neither Like nor Dislike (5)	0(0)	0(0)	0(0)	0.386 NS
Dislike Slightly (4)	0(0)	0(0)	0(0)	
Dislike Moderately (3)	0(0)	0(0)	0(0)	
Dislike Very Much (2)	0(0)	0(0)	0(0)	
Dislike Extremely (1)	0(0)	0(0)	0(0)	

***The percentage is depicted in the parenthesis. Sample A - Control nachos, Sample B - Beet greens nachos, Sample C - Beet greens nachos + dried fenugreek leaves; NS- Not significant (at 0.05 level of significance)**

Table 3.5: Overall acceptability score of developed nachos

Overall Acceptability				
Parameter	Sample A (control)	Sample B	Sample C	Chi-Square
	No. (%)	No. (%)	No. (%)	p- value
Like Extremely (9)	25(50%)	30(60%)	19(38%)	
Like Very Much (8)	21(42%)	19(38%)	29(58%)	
Like Moderately (7)	4(8%)	1(2%)	2(4%)	
Like Slightly (6)	0(0)	0(0)	0(0)	
Neither Like nor Dislike (5)	0(0)	0(0)	0(0)	0.142 NS
Dislike Slightly (4)	0(0)	0(0)	0(0)	
Dislike Moderately (3)	0(0)	0(0)	0(0)	
Dislike Very Much (2)	0(0)	0(0)	0(0)	
Dislike Extremely (1)	0(0)	0(0)	0(0)	

***The percentage is depicted in the parenthesis. Sample A - Control nachos, Sample B - Beet greens nachos, Sample C - Beet greens nachos + dried fenugreek leaves; NS- Not significant (at 0.05 level of significance)**

SUMMARY AND CONCLUSION

The present study was conducted to develop nachos incorporated with beetgreens, soybean flour and wheat flour. Beetroot (*Beta vulgaris L.*) leaves belong to the *Chenopodiaceae* family. Beet greens are leafy young tops of beetroot plant. It is loaded with more vitamins, minerals and antioxidants. It has vivid red coloration. Beetroot is usually called beet, chard, spinach beet, sea beet, garden beet, white beet and Chukander (in Hindi). It has very medicinal residences which provide a few advantageous effects in the human body.

Hence, three variations were prepared. Sample A (control) was made by wheat flour and soybean flour, Sample B was made by adding beet greens and Sample C was made by adding beet greens and dried fenugreek leaves (kasoori methi). In all the 5 parameter sample B (with beet greens) showed better result as compared to sample A (control) and sample C (beetgreens + dried fenugreek leaves).

The product was evaluated using a 9-point hedonic scale for sensory evaluation. In order to produce a product that is both acceptable and effective while maximising manufacturing efficiency, Consumer acceptance/preference is determined by measuring the sensory aspects of food quality. Appearance (colour, size, form), kinesthetic (viscosity, consistency and texture) All of these sensory properties include smell, taste, and texture.

Data obtained from the sensory evaluation was analysed using chi-square test. The results showcased a significant difference among the taste of all the three samples ($p < 0.05$) indicating Sample-C to be liked mostly because of the presence of dried fenugreek leaves which acted as a flavouring agent. Whereas an overall acceptability showed no significant difference ($p > 0.05$) suggesting a possible market for the developed nachos. It also

indicated that the consumer would not find any significant difference in the overall acceptability hence making its market more relatable to its counterparts already available in the market. With regard to physico-chemical analysis and sensory evaluation results, sample B could be recommended because of its sound composition as well as consumer acceptability scores. Beet green leaves were however not explored before. This study envisaged to bring forth the idea of its incorporation into food products and thereby developing healthy snacks.

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Conflict of Interest: None

Ethical Approval: The study was ethically approved by the Ethical Committee of faculty of Allied Health Sciences, Manav Rachna International Institute of Research & Studies, Faridabad, Haryana.

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