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Research Article

Incorporation of Okra Seeds in Biscuits based on Its Physical, Chemical and Sensorial Analysis

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ABSTRACT

Bakery products are extensively consumed by all age. Okra seeds are source of the protein content and other macronutrients. Okra Seed Powder OSP incorporated in the main formulation in biscuits with various percentages such as 10%, 12%, 14% and 16%.in the cultured we study that the rheological and physiochemical characteristics of the biscuits change after the incorporation of different percentages of (OSP) such as 10%, 12%, 14% and 16% and the higher percentages incorporation of OSP showed the significance changes in the final product. Sensorial and rheological properties the physiochemical properties of 16% OSP also high due to high protein in okra seeds.

Key words: Okra seeds powder (OSP), Rheological properties, Solvent retention capacity (SRC) and protein content, Barky products

INTRODUCTION

Okra (*Abelmoschusesculentus*) is one of the most widely known and utilized species of the family Malvaceae and an economically important vegetable crop grown in tropical and sub-tropical parts of the world. This crop is one of the most widely known to be rich in high quality protein especially with regards to its content of essential amino acids relative to other plant protein sources. Hence, it plays a vital role in the human diet. Okra also contains carbohydrates and vitamins and plays a vital role in human diet. They also contains little amount of vitamins minerals such as (vit A, vit C,and vit E)and minerals (iron ,Ca, Mg,Zn) (Spyridon Petropoulos *et al* 2017)*(*Pavlos A. Karakoltsidis, 1975) and also little quantity of saturated fats & zero cholesterol level. Bakery products are becoming prominent day by day because of their taste, color, easy to digest nature, easy availability at reasonable cost. Among bakery products, biscuits/cookies are of great importance due to its longer shelf life. The main purpose this study that biscuits available in market are made from wheat flour which lacks in good quality protein & dietary fiber content (Oluyemisi Elizabeth Adelakun, 2016). Okra seeds powder (OSP) which is highly rich in protein (Uhiara *et al* 2014), can be used with wheat flour as a blend. Using blend of okra seeds flour & wheat flour also enhance the sensorial properties of the biscuits. Okra also contains carbohydrates and vitamins and plays a vital role in human diet. It contains non starch polysaccharides like, cellulose, hemicelluloses, pectin polysaccharides, oligosaccharides, resistant starch, and lignin by which proper digestion process and physiochemical impact on human body. Okra is best source of dietary fiber, having content about 3.2gm/100 gm.

MATERIALS AND METHODS

Okra seeds were collected from a seed store, grinding was done in order to produce flour from seeds. Different kind of analysis was done to explore characteristics of okra seeds flour. All the basic ingredients required for biscuits were purchased from imtiaz supermarket. Whereas Okra and xanthan gums were purchased from local mart.

Physiochemical Testing

Solvent Retention Capacity (SRC)

Deionized water, sucrose, sodium carbonate and lactic acid were used in this experiment50% and 5% respectively By AACC 1994-5611 solvent retention capacity was performed.

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$$\%SRC = \left[\frac{Gel\ weight}{Flour\ weight} \times \left(\frac{86}{100 - \%\ flour\ moisture}\right) - 1\right] \times 100$$

End quality analysis

Spread ratio

The spread ratio was determined by the method of AACCI Method *10-50.05*, the total diameter and thickness were measured in centimeter with the help of a Vernier Caliper. The cookies were rotated at an angle at 90° Cookie spread was determined from the diameter and thickness, using the following formula:

Spread=D/T

Weight: Weight of the biscuits was determined by Ayo *et al* 199.

Moisture content: Moisture content of biscuit was determined by (*AOAC Method* 925.10).

Ash content: Ash content of finish good was determined by (AOAC *942.05*).

Ash content % = final weight – initial weight/initial weight * 100

Phytochemical Screening: Phytochemical screening was determined by Prashant Tiwari, *et al.,* 2011.

2,2-diphenyl-1-picrylhydrazyl (DPPH):

DPPH assay for antioxidant activity was carried out according to the method (José Garcia *et al.,* 2012).

Protein content

The protein content were estimated by Method of [ISO 8968 /IDF 20-1; 20-3] 2014.Weigh 2gm biscuits sample for each batch and placed in tubes and added samples into tubes followed by addition of H_2SO_4 and Kjeldhal tablets followed by addition of allowed the samples were to digest for 3 hours then distilled the liquid sample with NaOH and Boric acid solution. Titrate the sample with HCL by using methyl orange and methyl blue.

Calculated the results were as follows:

Nitrogen % = X (ml HCL sample - ml HCL blank) X normality HCL gm. of sample.

RESULTS

End quality of biscuits

Diameter and thickness when compared to control with that showed no difference however biscuits made up of using 12% and 14% of the okra seeds flour. Biscuits made up of 16% okra seeds flour blended with wheat flour showed increase in Dimensional properties of biscuits.

Sensorial properties of biscuits

The 16% OSP incorporated in the wheat flour, formulation showed high sensorial acceptability such as appearance, color and texture of that were using 16% okra seeds powder as compared to other.

Solvent Retention Capacity Analysis (SRC)

SRC test is highly beneficial in qualitative and quantitative analysis of flour as it evaluates flour functionality and rheological properties. The results are showed in Table 3. sucrose SRC values are increasing while Lactic acid and Na CO_3 are decreasing as addition of Okra seeds Powder is increasing. It shows pentosan has increased while water absorption remains same.

Nutritional analysis of biscuits

Nutritive analysis of a product is one of the major values in product development as it defines the amount of various nutrient contained in a product. As it is described by many researchers that okra seeds are a rich source of protein so increasing the concentration of okra flour in biscuits showed higher protein concentration, moisture content was reduced and ash content was increased by increasing the okra flour concentration in biscuits, showing mineral contents are increasing.

Table 1: Mean and SD values in diameter, weight, thickness and spread ratio.

S.no	Weight(gm.)	Diameter(mm)	Thickness (mm)	Spread Ratio
Control	6.43 ± 0.1244	30.95 ± 0.6763	3.56 ± 0.49799	8.6228 ± 0.880
12%	6.492 ± 0.3588	32.60 ± 0.5833	5.06 ± 0.2607	6.44 ± 0.35777
14%	6.488 ± 0.1678	35.188 ± 0.930	5.76 ± 0.3435	6.118 ± 0.5849
16%	6.55 ± 0.3499	35.7 ± 0.8215	6.18 ± 0.2167	7.736 ± 0.7061

Note: Mean ± SD results are the average of 3 replicas for each analysis; data followed by different letters in the same column are significantly different ($p \leq 0.05$).

Table 2: Sensorial Evaluation Of Various Percentages of OSP.

S.no	Appearance	Color	Texture	Flavor	Aroma	Overall acceptability
Control	8.7±0.483	8.5±0.550	8.8±0.337	8.3±0.788	8.2±0.634	8.4±0.685
12%	7.7±0.632	7.5±0.598	8±0.471	7.8±0.788	7.8±0.4743	7.7±0.353
14%	8.2±0.790	8.4±0.760	8.2±0.950	8.1±0.747	8.4±0.699	8.3±0.674
16%	8.2±0.754	7.6±0.747	8±0.623	8.3±0.529	8.3±0.654	8.3±0.632

Note: Mean ± SD results are the average of 3 replicas for each analysis; data followed by different letters in the same column are significantly different ($p \leq 0.05$).

Table 3: Effect of Different Solvents in Composite Flour of Different Percentages.

Samples	Lactic Acid	NaCO3	Water	Sucrose
Control	42.66666±1.15	24.933±0.901	22.66±0.577	17.8333±1.040
12%	25.5666±0.513160	23.33±0.577	10.63±0.55	21.52±0.5011
14%	25.9666±0.950438	22.813±0.7379	22.33±1.527	22.66±0.5773
16%	26.66±0.57735	23.37±0.5	23.37±0.5486	23.8666±0.90184

Note: Mean ± SD results are the average of 3 replicas for each analysis; data followed by different letters in the same column are significantly different ($p \leq 0.05$).

Table 4: Nutritional Analysis of Biscuits

Samples	Moisture content (%)	ASH content (%)	Protein content (%)
Control	1.97±0.05	4.766±0.680	9.933±0.25166
12%	1.8166±0.02	7.0533±0.593	10.3±0.1
14%	2.22±0.2198	7.51±0.5657	11.71±0.75
16%	1.833±0.15	7.9166±0.2753	12.82±0.75

Note: Mean ± SD results are the average of 3 replicas for each analysis; data followed by different letters in the same column are significantly different (P≤0.05).

Table 5: Phytochemical Screening of Okra Seeds Flour

Phytochemical	Observation	Result	Mark
PHYTOSTYROL	No red ring appears	Absent	-------
PHENOL	Bulky white ppt.	Present	+++
TERPENOIDS	No color appears	Absent	--------
FLAVANOIDS	No green color appears	Absent	--------
SAPONINS	Foam appear	Present	+++
GLYCOSIDES	Green and brown color appear	Present	+++

Table 6: Sedimentation on Different Percentages of Composite Flour Sample

Sample	Sedimentation (Ml)
control	12.733±0.6429
12%	11±1
14%	15.966±0.68
16%	17.61±0.5729

Phytochemical screening

Phytochemical Screening is used for the evaluation of plant-based metabolites which acts as an antioxidant. Okra Seeds flour showed high antioxidant activity due to the presence of phenols, saponins and glycosides as shown in Table 5.

Effect of sedimentation

Sedimentation test shows the strength of gluten network in flour which shows strength in baking performance. Higher sediment shows the strong network of gluten whereas low sediment shows the weak network of gluten. Therefore, the different ratio of OSP mixing in the respective formulation of biscuits had produced the various amounts of sediments. The 16% OSP consisting flour as compared with the other two percentages as 12% 14% is slightly better than highest percentages incorporation in the final product. The increase in the gluten strength will be directly proportional to the sediments. Increasing the okra flour concentration showed increased value of sedimentation.

DISCUSSION

Okra is an important vegetable crop. Due to its benefits for health the industry was used it as a food supplement. Many investigators showed that okra seeds are rich source of protein, dietary fiber and some other macro and micronutrients, it can be utilized by food industries to increase the overall value of the product. In the present study different concentrations of okra seeds flour (12%, 14% and 16%) were used in biscuits manufacture to enhance. Nutritional, and sensorial properties of biscuits. It was observed that 16% okra seeds flour when blended with wheat flour showed maximum desirable properties that resulted in the increased diameter and thickness, sensorial properties, nutritive value and antioxidant activity. Many plant-based compounds were also found in the evaluation of okra seeds flour such as phenols, saponins and glycosides. These plant-based compounds acts as an antioxidant agents. Sweeteners which play an important role in imparting flavor in food products. We used sucral in replacement of sucrose as this sweetener shows zero calorie value. Using sucral made our product beneficial for the diabetic people.

Maintaining shelf life of product is also an important factor, we observed the shelf life of our biscuits in different packaging material i.e. aluminum foil and low-density polyethylene bags. Biscuits that were packed in polyethylene bag showed sogginess early as there was no use of butter paper in the baking of these biscuits. Biscuits that were packed in aluminums foil and glass jars remained fresh for almost 2 months. It has been also reported by many researches that aluminum foil has good barrier properties against moisture, oxygen, gases and volatile compounds that may result is the oxidation of nutrients that are present is food. Oxidation of nutrients results in the deterioration of food product which directly effects on the shelf life of a food product. Aluminums foil acted as the best packaging material as it keeps the product fresh for a longer time period and keeps the aroma and other sensory attributes of food product fresh**.**

Conclusions

Okra Seeds due to its various health benefits can be utilized by food industries for nutritional Enhancement. The nutritional and compositional profile has widely been explored and approved for supplementation. We conclude from the study that OSP also rich phytochemical such as (phenols, saponins and glycosides), protein and minerals as far as another hand the 16% of OSP showed the excellent physiochemical and rheological properties. The okra seed powder found to be best supplement in order to enrich bakery products to get new range of nutritive /nutraceuticals product with high beneficial for human health.

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