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Preparation of Fruits and Vegetable Residue Flour in the Development of Biscuits and Nachos

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ABSTRACT

A rich source of Functional compounds is found with food residues, which are usually wasted. In this study, fruits and vegetable residue (FVR) flour was developed and evaluated. The application of FVR flour as nutritional, cheaply available, inexpensive raw material, for the development of Nachos and biscuits were studied. FVR flour with its numerous health benefits offers lot of scope for future food industry. The present work was based on development of FVR flour generated from the food pulp and vegetable residues and minimize the wastage. The main objective of this study is to standardize and develop the product FVR flour from the fruit and vegetable residue, which are used in the treatment of several diseases and other conditions. This study is carried out to use some selective fruits such as – raw papaya, apple and guava residue flour with multigrain atta and vegetable such as – amla, carrot, moringa residue flour with chickpea flour for the preparation of biscuits and nachos. The microbiological stability 60 days and consumer acceptance are analyzed, the organoleptic acceptability of the prepared food product averaged around 6-7 and are extremely liked and accepted. For packaging of the product, aluminized aseptic bag's is used which protect the products against physical, chemical, biological and environmental factors.

Key words: Food development, Organoleptic evaluation, Consumer acceptance, Fruit residual flour, Vegetable residual flour. Fruits and vegetable residue

Fruits and vegetables are universally promoted as healthy. The dietary guidelines recommended you make one-half of your plate fruits and vegetable, it includes a diverse group of plant foods that vary greatly in content of energy and nutrients. Now days, food industry is marked by the high volume of waste produced. According to the recent research conducted by FAO, about 1.3 billion tons of food has been wasted worldwide per year, which represents one-third of the total food industry production [1]. Over the past two decades, literature has discussed the problem of waste generated by the food industry and the possibility of re-use them as raw material food products [2]. Additionally, fruits and vegetable supplies dietary fibre and fibre intake is linked to lower frequency of cardiovascular disease and obesity. It also supplies vitamins and minerals to the diet and source of phytochemical, that function as antioxidants, phytoestrogens and anti-inflammatory agents and through other protective mechanism [3]. Fruits and vegetables are extensively processed for the beverage manufacture

generating a large amount of residue which is frequently discarded, exploit problems. Classically, the outer layers and ultimatum of fruits and vegetables are removed during processing, mainly by peeling and pressing [4].

In this way, the drying and its subsequent transformation in to flour can be a viable alternative to storage and it as snacks like biscuit and nachos. The application of Fruits and vegetable residue (FVR) as raw material for the development of new food products has demonstrated commercial significance, considering worldwide interest in sustainable development of the food industry, reduction of food wastes and also the development of new functional foods [5-6]. The demand for healthy, nutritious and safe food is growing worldwide, and a balanced food intake is the correct way to prevent or even remedy health problems, such as obesity, diabetes, constipation, malnutrition, cardiomyopathy and others, which largely originate from dietary mistake. Biscuits and nachos meet this trend and are elaborated from the mass of fruits and vegetable residue flour are a source of vitamins, minerals nutrient, fibre and protein etc. These products use a verity of ingredients and to various segments of consumers obsessed about a healthy life. Their sensory attributes added to the demand for health benefits have enabled the development of biscuits and nachos from the FVR flour, which are also nutritional and functional [7].

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This article provide a brief overview of the research opportunities in the rising nutraceutical food area, with an emphasis on fruits and vegetable derived products, based on recent research in the fruits and vegetable based food area. A structured approach for developing FVR flour included their technical challenges and their associated solutions during food design. In this context, the main idea of this work was to develop bear on and functional food products based on the residue generated from the beverage production industry. This residue was processed in to flour (FVR) and incorporated with different levels in to Biscuits and nachos.

MATERIALS AND METHODS

Plant materials

In this study, the following species of fruits are used; guava (*Psidium guajava*), raw papaya (*Carica papaya*), apple (*Malus domestica*). The following species of vegetables are used; amla (*Phyllanthus emblica*), carrot (*Daucus carota*), moringa (*Moringa oleifera*), spinach (*Spinacia oleracea*), capsicum (Capsiceae), mint (*Mentha sp.*), ginger (*Zingiber officinale*), garlic (*Allium sativum*). All species are purchased from a local supermarket (BBA University, Vidya Vihar, Rae Bareli Road, Lucknow) and are taken to the laboratory for immediate use. Fruits and vegetables are properly washed in flowing water, after they are sanitized for 30 minutes in a bath containing 200 ppm of sodium hypochlorite (NaClO) before rinsing in flowing water again.

Equipment's and technologies

Dehydrator, mixer, weighing machine, measuring cup, sieve, whisker, OTG, rolling pin, fridge etc

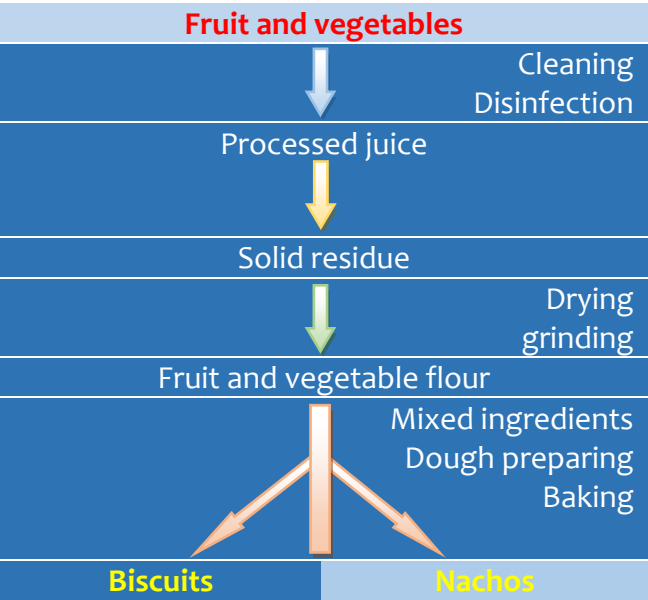


Fig 1 Flow diagram for the fruit and vegetable residue flour, biscuit and nachos production

Methods

FVR flour processing

The FVR is dried in a drying dehydrator/oven with air renewal and circulation at 65°C for 6 hours. Then, the dehydrated residue was ground using a food processor for 5 minutes and dried out for 1 hour at 90°C before grinding once more for 1 minute. Flour samples were stored at room

temperature (RT) in aluminium aseptic bags until further analysis. The flow diagram of the FVR flour production is showed in the (Fig 1).

Table 1 Formulation of biscuits and nachos added with fruit and vegetable residue flour

Ingredients (g Kg ⁻¹)	Biscuit formulation	Nachos formulation
Fruit residue flour	250 g	
Vegetable residue flour	-	250 g
Multigrain atta	500 g	-
Butter	250 g	-
Milk	250 ml	-
Sugar	50 g	-
Dry fruits	50 g	-
Tutti-fruity	10 g	-
Brown sugar (powdered)	50 g	-
Chickpea flour (sattu)	-	250 g
Corn flour	-	100 g
Black pepper-cumin powder	-	One pinch
Red chilli powder	-	One pinch
Refined oil	-	250 ml
Salt	-	According to taste

Biscuit preparation

Biscuits are one of the oldest bakery snack consumed by all age group regularly. Because of its acceptability in all age group, longer shelf life, better taste and its composition as snacks it is consider as a good product of for protein fortification and other nutrient improvement. The fruit residue flour is incorporated with multigrain at ta in the proportions of 80:20. The ingredients were mixed thoroughly in a kitchen aid mixer. The dough is then placed on a cutting board, rolled out until consistent thickness and textures. Biscuits are weighed and cut into desirable shape and size. The shaped dough pieces are then baked at 180°C for 40 minutes. Once baked, the biscuits are allowed to cool, packaged in aluminium aseptic bags, sealed and stored in cool and dry place.

Nachos preparation

The vegetable residue flour is incorporated with chickpea flour (sattu) and corn flour in the proportion of 50:30:20 are modified with ginger-garlic powder added along with oregano and mint-coriander leaves for flavor improve and acts as a good source of antioxidants. The ingredients are mixed gently and make a soft dough along with lukewarm water. The dough is then covered with muslin cloth and placed rest for 30 minutes at room temperature. Nachos are cut into desired shape and size. The shaped nachos pieces are then baked at 180°C for 30-40 minutes. Once baked, the nachos are allowed to cool, packaged in aluminium aseptic bags, sealed and stored in cool and dry place.

Consumer acceptability

A total of 50 consumers were recruited from BBA university, Lucknow, India to evaluated the biscuits and nachos. These consumers consisted of both genders between the ages of 23-55. Biscuits and nachos samples are presented on odourless white plastic plates at RT with three-digit random number codes. These samples are rated for overall

acceptability, appearance, colour, taste and texture. Evaluations are conducted using a nine-point hedonic scale to determine the degree of liking (9= like extremely, 5= neither like nor dislike, 1= dislike extremely). the purchase intent are measured on a five-point scale (from 5 = definitely would buy to 1 = definitely would not buy).

Statistical analysis

Overall acceptability was evaluated by the use of statistical method which includes formula for average and standard deviation based on the scores provided by the members for deciding the better variant on the basis of sensory qualities. The formula is as follows:

$$s = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n - 1}}$$

Where s stands for standard deviation, xi stands for value in the data set, \bar{X} stands for mean, n stands for number of values in the data set.

RESULTS AND DISCUSSION

The composite flour (FVR) is produced from the solid residue based on the entire exploitation of several fruits and vegetables. The total weight of this residue is approximately 1kg, after processing it is reduced by approximately 100g of flour [8]. Therefore, the FVR flour production provided a 10% yield [9]. The processed flour presented a maximum particle size of 27µ, being completely retained on the first mesh.

Evaluation of consumer acceptability

The FVR flour are obtained from the solid residue generated from the beverage processing industries mostly. The consumer acceptance of this product is previous studied and showed a good sensory acceptance, averaging around 9 for the general appearance [10]. The consumer acceptance of Biscuit did not differ significantly ($p<0.05$). The evaluation of the consumer acceptance is also performed after 0,30,60 days of storage. Although without significant differences, the global rate of acceptance increased after the storage period, probably due to an improvement of texture. All attributes presented higher rates for sweet biscuit and salty nachos. Accordingly, the sweet biscuit presented a higher purchase potential of 5.3, with approximately 70% of consumers appointing between “definitely” and “probably would buy”, than the salty nachos with a score of 3.4, where about 50% selected these options [11-13]. The consumer acceptance of Nachos formulation did not significantly differ($p<0.05$), only taste attribute of the biscuits differed from the other samples. It could be attributed to the lower sugar content and the higher cereal content within its formulation, impacting negatively to the flavor and texture. Although without significant difference, the biscuit averaged slightly better for colour, appearance and texture and the nachos sample obtained the highest rate for taste [14-16]. The nachos presented also the greatest purchase potential of 7.3, with 83% of consumers indicated “certainly would buy” or “probably would buy”. this result may be attributed to the originality of this product, differing from the commercial types in the market [17]. The biscuit obtained higher purchase intention, of about 60% [18-20]. Taking all results

together, incorporation of FVR flour in the different formulations did not significantly impacted consumer acceptance ($p>0.05$). the sensory attributes averaged around 9 (“liked slightly”), demonstrating that the FVR containing products did not have particularly high consumer ratings.

Distribution of sample

- T₁: Biscuit
- T₂: Nachos

Table 2 Sensory quality of biscuits (n=10) and nachos (n=10) containing fruit and vegetable residue flour

Sensory attributes	Biscuit formulation	Nachos formulation
Appearance	6.5 ± 0.33	6 ± 0.14
Taste	7.5 ± 0.16	5.5 ± 0.40
Aroma	8 ± 0.48	7 ± 0.13
Texture	7.5 ± 0.35	8 ± 0.18
Overall acceptance	7.5 ± 0.24	8 ± 0.16

Values are means ± standard errors. For each product, mean values followed by different letters within the same line differ significantly($p<0.05$). Refer to table 1 for biscuit and nachos formulation.

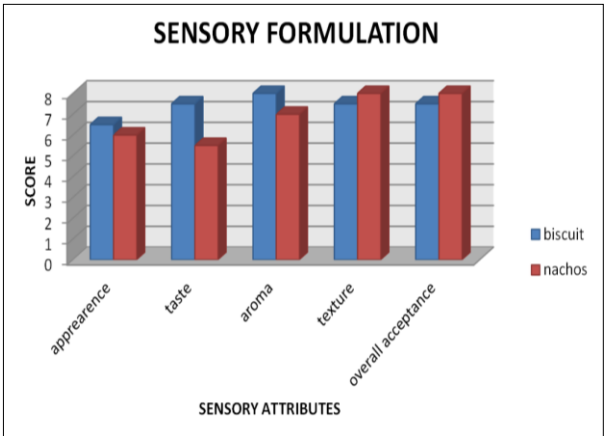


Fig 2 Graphical representation of parameters - appearance, taste, aroma, texture and overall acceptability

CONCLUSION

This study reported a feasible and sustainable food processing without waste generation. Results showed that the high fibre, protein and mineral contents and are potentially suitable for use in food applications as a new-calorie and functional raw material. The designed products presented high fibre content, reasonable consumer acceptance. This research promotes the reducing food waste since whole plant tissues have been used leading to the maximum exploitation of food raw materials. This product would be used by diabetic, CVD, thyroid, obesity and gastrointestinal diseases. The FVR flour-based biscuit and nachos are cheap in cost and can be used daily to overcome deficiency of nutrients.

Conflict of Interest

We have no known conflict of interest to disclose concerning this article.

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