

DEVELOPMENT OF PROTEIN BASED SNACKS – A REVIEW ON WHEAT CHIPS

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Abstract: *Snack foods, notably chips, are widely enjoyed by people of all ages in the world. However, this commonly used potato chips, have resulted in various health issues of heart disease, cardiovascular issues etc., To overcome this issues, Wheat based chips are introduced. Wheat is a best energy source for humans since it is rich in carbohydrates. But it hasn't been used as a significant ingredient because its flavour and texture aren't the same as traditional potato chips. So wheat is used in conjunction with other ingredients to produce chips. This in turn, significantly affects the physical and nutritional properties of the chips as well as reduces the fat and water contents of the chips. Thus, this study analyses the methodology so far adopted to enrich the physical and nutritional properties of the wheat chip. It also compares the results of wheat flour chips made in combination with bromelain and papain which has great potential as a flour modification technology for producing wheat chips.*

Key Word: *Snacks, Wheat, Regression analysis, Protein rich food*

Introduction

Nowadays, Snacks are popular among all generations of people, particularly among adolescents and children. People of all ages eat chips as a snack [1]. They are, nevertheless, considered as unhealthy snacks due to their high content of fat, carbohydrate and salt. Overweight, obesity, diabetes and vitamin deficiencies are the symptoms of poor nutrient food consumption [2,3]. Obesity is a global health pandemic, according to the WHO. In 2016, more over 1.9 billion adults (ie.39 %) were overweight, and 41 million children below five years were overweight. Because of the rise in the dominance of obesity, cardiovascular disease may result. Hence, consumers' perceptions of their food choices have shifted, and are looking for healthy and nutritional snacks and foods [4,5].

A variety of materials were investigated to enhance the functional qualities of chips. When vitamin, mineral and other micronutrient deficiencies are identified as a public health issue, both maize and wheat flours can be utilized

with other micro nutrients to reduce vitamin/ mineral and other nutrient deficiencies. The purpose of this study is to assess the nutritional and health benefits of wheat chips and how to enrich the properties of wheat chips.

Wheat Chips

Wheat may be easily processed into chips, but it hasn't been used as a significant ingredient because its flavour and texture aren't the same as traditional potato chips. Wheat flour is mostly composed of carbohydrates (70–75 percent), water (14 %) and proteins (12%). Amylopectin and amylose levels present in starch are typically 25–28 percent and 72–75 percent, respectively. After hydration and mixing, the wheat proteins create a 3dimensional viscoelastic wheat flour dough. Gluten (includes glutenins and gliadins) and nongluten proteins are two types of proteins [6].

Gluten proteins are the essential part of wheat flour because they create a gluten network in viscoelastic form[7]. The quantity of glutenin subunits and macropolymer (GMP) determines the features of wheat based food like noodles, bread etc.,[8,9].

Cereal chips can be cooked in a variety of ways (frying, microwaving and baking).

Frying:

Most of the commercial chips are made by deep frying them at high temperature (ie. from140–190°C), resulting in a high oil content that can lead to obesity and abnormal conditions in a body. As a result, they have a detrimental impact on health conscious consumers who flavor low-calorie items [10]. Baked chips, on the other hand, have gained popularity among customers as a healthy alternative to fried chips. Baked chips with lower oil content are kept in dry air (140–190°C, 3–10 min) to meet customer demand of non fried snacks, particularly among those worried about diet and health[11].

Microwaving:

Microwaving is another way of manufacture that can be used. It can help you save time and energy while yet maintaining the nutritious value of food[12,13]. The food is cooked inside the microwaveoven, and the air around the meal condenses the water which is evaporated from the food during microwave cooking [14]. This method of cooking leads to less crispiness in the food. Hence, it is not utilised in industrial food production. However, the other types of commercial fruit or vegetable chips are often produced using a combination of dehydration and drying (osmotic) [15,16].

Thus, the quality of chips made using wheat can be enriched to provide rich protein snacks. Dan et al 2022 improved the quality of baked wheat chips by hydrolyzing proteases with wheat flour. The best performance of the proposed method was determined by texture determination and sensory evaluation after treating wheat flour with four distinct types of proteases. Similarly, the effect of protease enzymatic hydrolysis over the physicochemical parameters of flour was examined. This research proves the effect of proteases over wheat flour in snack foods. It also suggested bromelain has great potential in flour modification technology of wheat chips.

Nengah et al 2019 examined the influence of pregelatinizedtannia flour (PTF) with wheat flour ratio in the manufacturing of ladrang chips. PTF was made utilising a parboiling procedure, in which sliced tannia tuberis boiled for 10 minutes in 95°C hot water before drying. Then, it was dried at 70°C. After that, it was minced and sieved through a 60 mesh sieve. The composite flours (80:20, 70:30, 60:40, 50:50, 40:60, 30:70, 20:70) were made with varied ratios of PTF and wheat flour. Finally, it was processed into ladrang chips. From the results, it was found that the ratio of PTF to wheat flour had a substantial impact over the physical and nutritional features of the ladrang chips, but had no effect on the sensory properties. Increases in PTF composition resulted in higher fibre content, lower water and fat content in chips. The hardness and crispness of the ladrang chips can be improved by increasing the PTF component. The composite flour made with a 20:80 ratio of PTF and wheat flour generated better ladrang chips, especially in functional and physical qualities.

The properties of wheat chips such as physicochemical, bioactive etc., had been enhanced with potato peel flour (PPF) at different concentrations. The lipid ratio of the samples ranges from 45.57 - 27.46 g/100 g, and it is reduced

to about 40% (P < 0.05) when PPF was added to it. In the sample, where the chips are supplemented with 8 g/100 g PPF, the minimum and maximum hardness values were about 13.32 and 22.64 kg, respectively. The total phenolic content of the chips ranged from 364.7 - 1108 mgGAE/kg, and it rises considerably as the PPF increased. In addition, the samples' total dietary fibre content increased [19].

Wheat chips with a combination of 3 legume flours along wheat flour in the ratio 80:20 was carried out. The interactions between chickpea, pea and soy flour exhibits their effects over the sensory and physicochemical properties. In addition, ridge analysis was carried out to establish the suitable legume and flour mixture proportions based on the sensory qualities of chip samples. According to the general acceptability scores of chips, chickpea flour was revealed to be the most suitable proportion component. With the addition of soy flour, the protein level of the chips increased considerably[20].

The property of Wheat chips and flaxseed flour was analyzed in this study. Response surface topology was incorporated to investigate the effects of level of flaxseed, frying temperature, physicochemical, textural and sensorial properties, fatty acid composition of chips. The optimum levels of processing factors were determined via ridge analysis. To describe the effect of processing variables, predictive regression with appropriate coefficients of determination was employed. The presence of flaxseed flour increased protein content of the chips. Similarly, the rise in frying temperature reduces the hardness of the chips. Increased flaxseed resulted in a rise of unsaturated fatty acid, specifically omega-3 [21].

Spirulina powder, together with bengalgramme flour and wheat flour, can be used to make healthful snacks. Snacks containing up to 6% Spirulina showed sensory acceptability. Consumption of food which contains such supplements can help to improve the nutritional status and health of the people, particularly for the person who suffer from Malnutrition[22].

Response surface approach was utilised to determine the simultaneous effects of processing variables such as fibre level, frying temperature, and duration over the properties of chips like physicochemical, sensory and textural when enhanced with apple fibre. The optimum levels of processing factors were determined via ridge analysis. A predictive regression analysis have been carried. The apple fibre content if chips results in increased the dry matter, ash content, L, a, and b values of the samples. However, when the frying temperature is increased, hardness values gets reduced. The overall acceptance of apple fibre-enhanced chips dropped as the frying temperature increased, whereas wheat chips enriched with apple fibre which is fried at moderate temperatures had a higher acceptability[23].

The properties of chips was investigated using response surface approach. The flavour, odour, crispness, and general approval of the samples were also assessed. The sample supplemented with red lentil flour (50%) and baked at the maximum temperature had e highest antioxidant capacity, phenolic content and hydroxyl methyl furfural concentration. The addition of red lentil flour improved the resistant starch and protein content of the chips. The sample made with 50 % red lentil flour had lowest vitro glycemic index value.

The current research was carried out with the goal of producing wheat chips enhanced with pasta boiling water powder (PPBW). With the addition of pasta powder to boiling water, the pasting qualities of the chips changed. The inclusion of PPBW reduced the textural qualities of dough samples, however there were no variations between the 2nd and 3rd samples containing 10 and 20 percent PPBW. With the increase in PPBW from 33.78 to 22.19 percent, the oil content of the samples reduced. With the effect of PPBW, the number of pores and its size in chips gets decreased. The control samples had the highest overall acceptability score (5.64). PPBW can be utilised in the manufacture of chips as a coating material for snacks in the food sector [24]. Thus, the summarization of overall performance of the methodology adopted in making wheat chip is described in table 1.

TABLE1
SUMMARIZATION OF WORKS FOR ENRICHMENT OF WHEAT

Author details	Overall preference	Taste	Color
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Ahmed Kayacier 2014	6.0 ± 1.05a	5.80 ± 1.14a	5.60 ± 1.07ab
Ferhat Yuksel 2016	4.857 ± 1.03abcd	4.285 ± 0.99b	5.285 ± 1.20a
Ahmed Kayacier 2014	4.90 ± 1.994b	5.09 ± 1.62	4.90 ± 2.04a

TABLE 2
COMPARISON OF PHYSICAL AND NUTRITIONAL PROPERTIES OF WHEAT CHIPS

Sample	Protein	Carbohydrates	Ash	Water Moisture
Ladrang chips [18]	7.59	55.49	1.40	5.51
sorghum based chips [25]	35.7	-	-	7.4
Wheat Flour and Tapioca [26]	8.74	21.50	-	2.50
Wheat Flour and bromelain [17]	39.10	-	-	-
Wheat Flour and papain [17]	39.14	-	-	-
Wheat Flour and papain and bromelain	27.3	174.0	2.6	0.80

Table 2 depicts the comparative study of physical properties of wheat chips made with different combination. From the above survey, it is proven that chips made with papain and bromelain and wheat flour results in high carbohydrates snacks with less moisture content.

Conclusion

This study analysed the properties of wheat chips and its enrichment. The findings from the above survey revealed that the combination of effective flour materials with wheat flour results in enriched protein snacks for consumers. The physicochemical, sensory and textural aspects of wheat chips were modified in accordance with inclusion of suitable components with wheat flour. Furthermore, frying temperature and time had a significant impact formation of chips. However, the distribution of the oil fractions is moisture dependent.

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