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Priya Sugandhi G

Research Scholar, Department of
Foods and Nutrition, Post
Graduate and Research Centre,
College of Home Science,
ANGRAU, Rajendranagar,
Hyderabad, Telangana, India

Punyavathi

MSc. Students, Department of
Foods and Nutrition, Post
Graduate and Research Centre,
College of Home Science,
ANGRAU, Rajendranagar,
Hyderabad, Telangana, India

Leelavathi

MSc. Students, Department of
Foods and Nutrition, Post
Graduate and Research Centre,
College of Home Science,
ANGRAU, Rajendranagar,
Hyderabad, Telangana, India

Estimation of nutritive values and sensory evaluation of oat crisps for healthy heart

Priya Sugandhi G, Punyavathi and Leelavathi

Abstract

Heart disease is the leading cause of death in today's world. One way to reduce the risk of developing the disease is to lower serum cholesterol levels by making dietary changes. The ready-to-eat snack has been prepared in Acharya N.G. Ranga Agricultural University. The present study was done with the objective to produce highly nutritious snack for the benefit of heart patients which is based on Oats (*Avena Setiva L.*) as a major ingredient and Bengal gram flour, rice flour, gingelly seeds and moringa (*Moringa Oleifera*) were added to oats to give it a different flavor and texture.

Oats contain widespread of nutrients and health benefits and is a great source of soluble fiber like β -glucans which helps in effectively lowering the level of blood cholesterol. Soluble fiber changes the personality of immune cells, they go from being pro-inflammatory, angry cells to anti-inflammatory, heading cells that help us recover faster from infection. The daily dietary recommendation is 28 to 35 gr of total fiber, but most of the Food and Drug Administration's health claims are for insoluble fiber instead of soluble fiber.

The crisps were prepared by mixing oats, roasted Bengal gram flour, rice flour, gingerly seeds, blanched drumstick leaves and green chilies together with the addition of salt and water to make homogenous dough and pressed by hot plate machine (roti maker) for making crisps. Control was also prepared with the same ingredients except oats. Both products were tested for sensory evaluation using slightly modified five point hedonic rating scale by semi trained judges. The statistical analysis revealed that the mean scores obtained for this product were significantly higher than the control product and oat crisps were most acceptable than the control product. However, the slight bitterness in oat crisps due to Moringa leaves was found which not significant difference was. The results showed that the nutrients such as energy, fiber and protein content of the oat crisps were higher than the control product. Hence, 100gr of oat crisps intake per day meets 47% of daily requirements of dietary fiber and can makes heart healthy for normal and hypercholesteremic subjects.

Keywords: Healthy heart, nutritive values, oat crisps, sensory evaluation

Introduction

Oats are currently used as cereals, porridge and flaked products because of their positive health image related, among other constituents, to the high concentration of β -Glucans. Beta glucan is one of the soluble fiber which helps in effectively lowering the level of blood cholesterol. In India, oats is better known as "Jae." Oats that is not of Indian origin nowadays, it is gaining more and more importance in India due to nutritive value. Oats low in saturated fat, high in fiber and is very high in Manganese, Magnesium, Phosphorus, and Thiamine. Oats an important source of water soluble fiber have long been recognized as a potential cholesterol lowering dietary component. Soluble fiber changes the personality of immune cells, they go from being pro-inflammatory, angry cells to anti-inflammatory, heading cells that help us recover faster from infection [1].

The beneficial effects of oat products on the lipoprotein profile are ascribed to their soluble fiber compound, β -Glucan. β -Glucan from oats is a nonstarch polysaccharide that is composed of β (1,4) linked glucose units, which are separated every 2-3 units by a single β -Glucan from barley or yeast has also been shown to be hypocholesterolemic [2]. On January 1997, the US Food and Drug Administration approved the printing on food product packages of a health claim that a diet high in soluble fiber from whole oats (oat bran, oat meal and oat flour) and low in claim saturated fat and cholesterol may reduce the risk of heart disease [3]. A large number of reports on the nutritional qualities of drumstick leaves now exist in both the scientific and the popular literature. It is commonly said that moringa leaves contain more vitamin A than carrots, more calcium than milk, more iron than spinach, more vitamin C than oranges and more potassium than bananas and that the protein quality of moringa leaves rivals

Correspondence

Priya Sugandhi G

Research Scholar, Department of
Foods and Nutrition, Post
Graduate and Research Centre,
College of Home Science,
ANGRAU, Rajendranagar,
Hyderabad, Telangana, India

that of milk and eggs. These drumstick leaves are also rich sources of flavonols such as kaempferol and 3-Oquercetin. Crispiness and crunchiness are textural attributes often associated with the freshness of the natural top quality cooking food product and also these foods to be appealing and enjoyable [4].

In this study, less utilized leaves of moringa which are rich in micronutrients were incorporated in oat crisps otherwise they are mostly underutilized or go waste. The demand for functional food, health benefits of oats, drumstick leaves were taken into consideration in development of the oat based crisps. The purpose of the present study is to develop new variety of snack made with oats and providing it's basic nutrients which are needed for maintaining the healthy heart.

Materials and Methods

Procurement of raw materials

Oats, Bengal gram flour, rice flour, gingelly seeds, salt were purchased from the local stores. Green chillies were purchased from local vegetable market and moringa was obtained from kitchen garden.

Preparation of crisps

55gr of pressed Oats, 20gr of roasted Bengal gram flour, 10gr of roasted rice flour, 5gr of gingelly seeds, 5gr of chillies, 10gr of blanched moringa leaves and salt to taste were mixed with sufficient water to make a homogenous dough and made into small balls which were pressed in a hot plate (roti maker) till the brownish crisps were made.

Preparation of control

Control sample was prepared by using rice flour, Bengal gram flour, gingerly seeds, green chillies and salt. The preparation method was the same as the test sample.

Sensory evaluation

The prepared products were subjected to sensory evaluation by a selected panel of judges.

Selection of panelists

A panel of 10 semi trained judges were selected from the Department of Foods and Nutrition, Postgraduate & Research center, ANGRAU, Rajendranagar, Hyderabad for evaluating developed oat crisp products.

Development of Score card

Scorecard was prepared keeping the quality characteristics in view. A five point hedonic rating scale was adopted to score each attribute. Highest score (5) was assigned to most preferred characteristics and least score (1) to least desired characteristic.

Testing the product for acceptability

Freshly prepared oat crisp products were subjected to sensory evaluation in comparison with traditional crisps as control product.

Statistical Analysis

The mean scores and standard deviation of the replicates were calculated by data analysis in Microsoft excel sheets.

Results and Discussion

The results of sensory evaluation (Table-1) revealed that the oat crisps were most accepted by the panelists than the control product. The mean scores obtained for this product were

significantly higher to the scores of the control product. The overall acceptability of oat crisps was significantly higher than that of control product.

The accepted experimental oat crisp product along with the control was calculated for the nutritive values.

Table 1: The Mean sensory score of oat crisps

Attributes	Mean and Standard Deviation scores	
	Control	Test sample
Colour	4.5 ± 0.67	4.5 ± 0.5
Flavor	4 ± 0.7	4.3 ± 0.6
Taste	3.9 ± 0.7	4.2 ± 0.6
Texture	3.9 ± 0.7	4.3 ± 0.6
After taste	3.9 ± 0.7	4.1 ± 0.8
Overall acceptability	3.3 ± 0.44	4.2 ± 0.6

Note: values are expressed as mean ± SD

The data on nutritive value of the most acceptable oat crisps and control product is presented in Table-2. Results revealed that the energy content of the oat crisps (375 k.cal/100gr) was higher than that of control product (343 k.cal/100gr). And the fiber content of the oat crisps (13g/100g) was higher than that of control product (6.5µg/100g). The protein content of the oat crisps (16g/100g) was higher than that of the control product. Oat crisps meet 47% of daily requirements of dietary fiber.

Table 2: The main nutritive values of control and test sample

Nutritive value	Control	Test sample
Energy (k.cal)	343	375
Protein (gr)	10.3	16
Fiber (gr)	6.54	13

Based on estimated nutrients, the daily intake of 100gr of oat crisps keeps heart healthy for normal and hyper and hypo cholestremic subjects may be due to it's high fiber and protein which reduces the absorption of fat by the body. Similar studies also revealed by [5] who has studied nutritional composition and sensory evaluation of four different samples of cookies which were incorporated with different levels of oat bran by replacing wheat flour, i.e., 0% (T0), 10% (T1), 20% (T2), and 30% (T3) and keeping other all ingredients constant and concluded that oat bran can be incorporated in wheat flour with 20% level cookies are highly acceptable by the consumers as a value added foods. To prepare such value-added health food required by a particular segment of the population who are prone to fiber related problems and consider food as medicine.

Oats contain a high percentage of oat protein and balanced composition of amino acids which have proved them highly nutritive in comparison to other cereals [6, 7]. Another study concluded [8] that a meta-analysis of 12 trials that soluble fiber from oat products had a significant effect on total cholesterol concentrations. It was estimated that a daily consumption of 3gr soluble fiber lowered total cholesterol by 0.13mmol/l in non cholestremic persons and by 0.4mmol/l in hyper cholestremic persons. The free-radical scavenging properties might also be beneficial for the human body when oats and other antioxidant-rich foods such as fruits and vegetables are consumed [9, 10]. In the formation of an atherosclerotic lesion, it is mainly the oxidized form of LDL (oxLDL) that is engulfed by macrophages in the blood vessel wall [11]. Dietary antioxidants therefore offer the potential of limiting the atherosclerosis process.

Negligible but not significant bitterness was observed in oat crisps by sensory panelists may be because of mixing blanched Moringa leaves without drying in oat crisps although it dries while hot pressing of oat crisps. A study^[12] was done with the objective to assess the effect of different methods of drying (sun, shade and oven drying) on the nutritive value of the selected leaf with its fresh counterparts. The results showed significant increase ($p < 0.01$) in all the nutrients in the dried samples of the leaves making them a concentrated source of nutrients. Shade dried samples had highest nutrient retention followed by sun drying and oven dried samples but the difference was not statistically significant ($p > 0.05$). It has been suggested that the reduced blood pressure after oat intake results from reduced postprandial glucose and insulin levels^[13, 14]. In addition, some *in vitro* studies suggest that specific oat components can directly influence the endothelial cells and thereby contribute to lowering blood pressure by improving endothelial function.

Conclusion

An essential aspect of food texture is consumer perception. The low blood sugar is what will start up our cravings. The over production of insulin is what is going to slap that fat onto our body. Therefore the less we break down our foods, the less the glycemic reaction will be, the more stable our blood sugar will remain. And it has the potential to lowering the cholesterol. The present results demonstrated that oat crisps are most acceptable than control product. It also contain high amount of dietary fiber than the control product. The mean scores obtained for this product were significantly higher to the scores of the control product. The slight bitterness was observed in oat crisps which can be rectified through solar or shadow drying of Moringa leaves before making oat crisps. One of the single best decisions would be is to eat oats to maintain healthy heart. From a public health perspective, the ability of oats to reduce plasma (LDL) cholesterol and to reduce glycaemic response, in combination with its capacity to maintain endothelial function, and its possible anti-oxidative and anti-inflammatory actions, makes oat consumption a promising approach for the prevention of cardiovascular disease.

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