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ORIGINAL ARTICLE **OPEN ACCESS**

Development And chemical- Sensory Analysis of Vegetable Crackers made with pearl millet Flour

Shruti V. Sawant[1]and Geeta M.Kulkarni*
Dept. of Food Processing and Packaging, YashavantraoChavan Institute of Science, Satara , Maharashtra 415001.
**Corresponding author E-mail : geetakul4103@gmail.com*

ABSTRACT
The largest food processing sector In India is the bakery sector, which ranks second in the production of biscuits. All age groups most frequently consume bakery goods. Because they are readily available and ready to eat with longer shelf lives, bakery products are in more demand in today's society. Crisp baked goods are called crackers. These have a long shelf life and are lightweight. Millets are becoming more popular today. The major materials utilised in the production of pearl millet vegetable crackers are spinach leaves, rice flour, oats flour, and pearl millet flour. Since entire grains cannot be used to make these crackers, a ratio of rice and oats flour is used to produce soft, crunchy, and light crackers.Due to its high fibre content and capacity to alter food texture, it offers additional dietary fibre. Crackers were made using a variety of flours (Pearl millet flour, Oats flour, Rice flour), as well as varying proportions of spices (Green chile, Black pepper, and Carom seeds).Vegetable cracker made with pearl millet flour because pearl millet is nutritious and healthy millet. It has its own aroma and flavour . Using millet makes product gluten free also. To make cracker we use Baking Technique which was making cracker so Healthy. Because Frying process makes cracker much more oily and unhealthy also.. The Vegetable Cracker made with pearl millet flour thus obtained was analyzed for Physico-chemical properties such as moisture(1.19%), ash(6.66%), fat(14.06%), crude fibers (0.99%), protein(12.68%). Organoleptic analysis was carried out including sensory attributes like color, flavor, taste, texture and appearance to check the overall Acceptability of the products. Finally, Healthy and baked Vegetable cracker are made with pearl millet flour with High Quality and Good Nutrition and this is suitable for all age groups.
Keyword : *Crackers, pearl millet Flour, spinach,*

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INTRODUCTION

Crackers A wide range of goods are characterised by savoury flavours and a crispy, open texture. A cracker is a baked food that is flat, dry, and often made with flour. Before baking, flavourings or seasonings, including salt, herbs, nuts, or cheese, can be included into the dough or sprinkled on top. Crackers are frequently marketed as a wholesome and practical method to eat a staple food or cereal grain. The so-called "docking" holes are a common feature in several crackers. [1].To prevent too big air pockets from accumulating in the cracker during baking, holes are pounded into the dough. Crackers often have low to no sugar and moderate amounts of fat (10–20%). For the completed product to maintain the crisp and brittle but delicate cracker texture, low moisture level is crucial. Most crackers have 2% moisture in them. Savoury crackers are popular on the global market. After baking, the crackers' surface or the dough itself is added with the proper Flavouring agents[2].

One of the major food processing industries in India is the bakery sector. In terms of biscuit production, India is second to the United States. Every age group consumes bakery goods. They are becoming more and more popular as processed meals since they are easy to use, ready to eat, and have a long shelf life. A group of baked goods with a crunch include crackers. The baked product can be referred to as a cracker if it has a cereal foundation, with the proportion of cereal should be at least 60% and the differentiating element being a low moisture content of 1% to 5%. Compared to other baked goods, crackers often contain more fat and have a longer shelf life[3].

Among all millets, pearl millet/bajra (*Pennisetum glaucum*) is the one that is grown the most in India. It is ideally suited for semi-arid zones of farming. It is a coarse cereal grain that is very nutrient-dense. Compared to other major grains like rice, wheat, and maize, it has higher protein content and a better amino acid balance. Additionally, it has a lot of fat, dietary fibre, and minerals like iron and zinc[4].It offers high quantities of lipids, high-quality, well-balanced proteins, and a variety of phenolic compounds that are good for your health. It is well known to be more nutrient-dense than the majority of other

cereals. Along with being gluten-free, Antioxidant, anti-carcinogenic, hypocholesterolemic, hypoglycemic, and antiulcerative characteristics are all present in pearl millet. Pearl millet can be used to make infant and snack foods, bakery goods, and other foods because it has all these essential nutrients and health-promoting qualities[5].

An edible plant known as spinach (*Spinaciaoleracea*) is adored for both its flavour and nutritional worth. Vegetables like spinach contain lutein and β-carotene. Lutein is utilised as an antioxidant in the food industry and is thought to lower the risk of numerous cancers, heart disorders, and eye diseases. β-carotene, a chemical well known for its capability to turn into vitamin A in the body, is a good source in spinach. Numerous studies demonstrate that lutein and β-carotene both have antioxidant activity and aid in the prevention of several non-contagious chronic illnesses. Carotenoids and other phytochemicals have so been introduced to functional foods[5].

The oats, also known as *Avenasativa,* are members of the poaceae family. Oats are a good source of phytic acid, phenolic acid, avenantramides, and antioxidant vitamin E (tocols). Oats is widely used in human nutrition and is a great source of cellulose, a variety of B-glucans, and arabinoxylans. The amount of protein, lipids (unsaturated fatty acids), vitamins, antioxidants, phenolic compounds, and minerals is relatively high. The apiaceae family includes the carom seed, *Trachyspermum ammi*, in its botanical makeup (Umbelliferae), 17.1% is protein. Fat - 21.8% 7.9% mineral Fiber-21.2% carbohydrate content: 24.6%, Additionally, it contains niacin, calcium, thiamine, riboflavin, phosphorus, and iron. healthcare property Antibacterial, antifungal, germicidal, and anaesthetic activities are present in carom seeds[6].

The other kind of rice flour Is created by breaking up regular raw or parboiled rice grains. The flour made from parboiled rice is simply a flour that has already been cooked. Because it lacks gluten and its doughs do not readily absorb baking gases, it has different baking qualities from wheat flour. However, there is a consistent basic demand for rice flours to be used in infant feeds, breakfast cereals, and snack foods[7].(Rice Flours in BakingBor S. Luh& Yuan-Kuang Liu). The carom seed, *Trachyspermum ammi*, has the botanical name *Trachyspermum* and is a member of the Apiaceae (Umbelliferae) family. Bishop Weed, Ajwain Carom, Caraway, and Thymol are some of the common names for the seeds. The seeds also contain calcium, thiamine, riboflavin, phosphorus, iron, and niacin. Healthcare property Antibacterial, antifungal, germicidal, and anaesthetic activities are present in carom seeds[8].

Belonging to the Piperaceae family is black pepper (*Piper nigrum*). It is grown for its dried fruit, which is used as a spice and flavouring. There are several applications for black pepper in the food processing sector, in the kitchen, in perfumery, in conventional medicine, and even in cosmetics. The volatile oil and alkaloid piperine, which give pepper its pungency and flavour, are highly prized. The main component of pepper oleoresin is piperine (Chemistry of Spices Edited by Villupanoor A. Parthasarathy Book) [9].

The Objective of this study is was To standardise the product preparation process based on textural and sensory properties., To improve the product's nutritional value., To make the regular snacks healthier. , To make the traditional food ingredients more enticing and palatable.

MATERIAL AND METHODS

Materials:

Raw material:

Pearl millet flour (Bajari), Spinach Leaves, Oats flour, Rice Flour, carom seed, Black pepper seed, Green chilli, Salt ,Oil.

Raw materials Collection:

Pearl millet flour (Bajari), Spinach Leaves, Oats flour, Rice Flour, carom seed, Black pepper seed, Green chilli, Salt, Oil , Were Acquired from Local Market , Retail Stores in Satara.

Chemicals, processing and analytical equipment's :

The different chemical, equipment and instruments required for this study were made available from the Department of Food Processing and packaging, Yashwantrao Chavan Institute of science,Satara.

Methods

Processing of Raw material:

Pearl millet Flour, Rice flour, Oats Flour :

Grains are milled in Flour mill and flours take for processing are sieve with size-2.

Spinach Leaves :

Fresh and Clean Spinach Leaves was taken and blanch for 1 min. After Blanching Spinach was Grind to make smooth paste.

Formulation Of Cracker :

Table 1: Ingredients for Making pearl millet cracker with vegetable (spinach) .

Ingredients	Sample 2(gm)
Pearl millet Flour	20
Oats Flour	20
Rice Flour	20
Spinach	20
Green chilli	5
Carom seed	3
Black pepper seed	1
Salt	2
Oil	29ml
Water	5ml

Preparation of Cracker :

Ingredients including oil, carom seeds, black pepper seeds, green chilies, pearl millet flour, spinach leaves, oat flour, rice flour, and green chilies were mixed and moulded into dough before resting for a short while. After the dough has been sheeted to a thickness of about 1mm and cut into squares using a cutter or knife, docking is carried out. baked for 10 to 15 minutes at 150 °C. The baked crackers are placed in metallized polyethylene bags after cooling to room temperature.

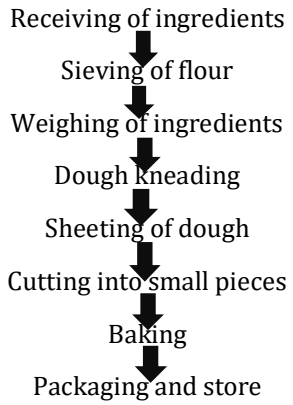

Figure 1: Flow Diagram for Preparation of Pearl millet crackers.

Determination of Proximate Composition

The proximate composition of the samples was determined using the standard methods described in the (AOAC.). The Hot air oven method, Acid- alkali hydrolysis method, Soxhlet method, Kjeldhal method, Muffle furnace were used for determining of moisture, fiber, fat, protein, Ash. All Proximate analysis study were carried out at Department of Food Processing and packaging.

Determination of Moisture Content

Moisture content of the Vegetable Cracker Made with Pearl millet flour was estimated by using A.O.A.C. [12].

Determination of Ash Content

The sample was weighed into a clean with one (1) gram. Pre-weighed, dry crucible The crucible was moved into a muffle furnace and kept at 550°C for five hours. Ashing persisted until white or light grey ash was obtained. The crucible was weighed after cooling in desiccators. It was determined how much ash there was.

Determination of protein

The protein content of the product was evaluated by using Kjeldhal method. The Nitrogen Content of the sample was determined by Digesting. Distillation and Titration against the working standard and the amount was multiplied by a factor of 6.25. Methods described in A.O.A.C. (1990) [13].

Determination of Fat

Fat Content of the product was evaluated by using the Soxhlet Method described in A.O.A.C manual [13].

Estimation of carbohydrate content:

The Carbohydrate (%) was determined by difference i.e. Subtracting from 100 (Ranganna, 1986)[14].

Determination of Crude fiber

Crude Fiber was evaluated by Acid-Alkali Hydrolysis method described in A.O.A.C Anonymous, [15].

RESULT AND DISCUSSION

The nutritional and health benefits of spinach, pearl millet flour, oat flour, and rice flour are added, enhancing the product's value in addition to its nutritional benefits. The crackers get the fibre component through the combination of spinach oat flour and pearl millet flour. When compared to normal crackers, the fat content is likewise significantly lower. Overall, by creating crackers using spinach, rice flour, oat flour, and pearl millet flour, the nutritious value is increased.

Sensory Assessment:

Sensory assessment Using a 9-point hedonic scale, a semi-trained panel of academic staff members assessed the prepared product's sensory attributes, including appearance, colour, flavours, taste, texture, and general acceptability. The product was evaluated using a 9-point hedonic scale, with a score of 9 denoting "like extremely" and a score of 1 denoting "dislike exceedingly" The sensory score card contained a comment about the acquired results.

On the basis of Sensory assessment sample 2 was selected, as standard product Formulation in a Nutrition perspective and Sensory Also.

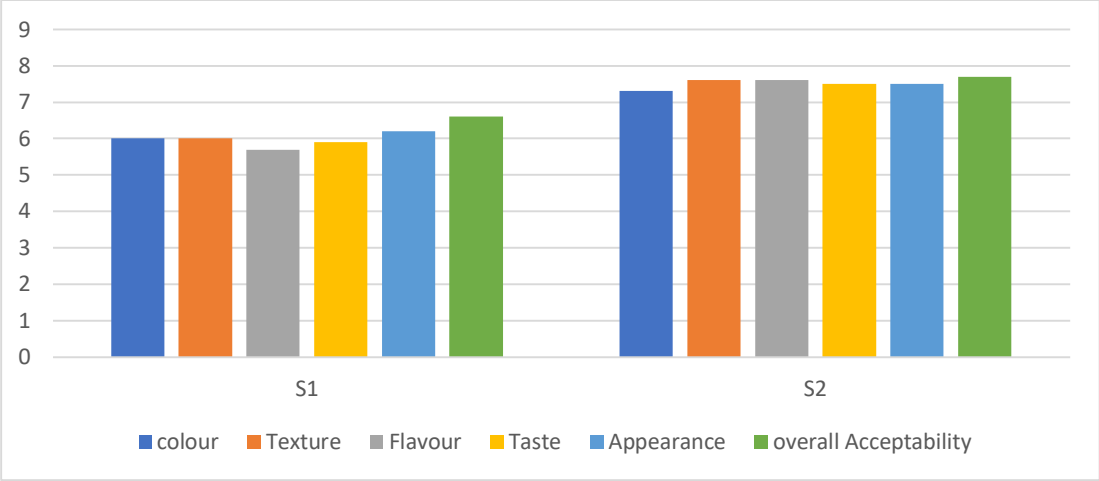

Figure 2: Sensory Evaluation Representation.

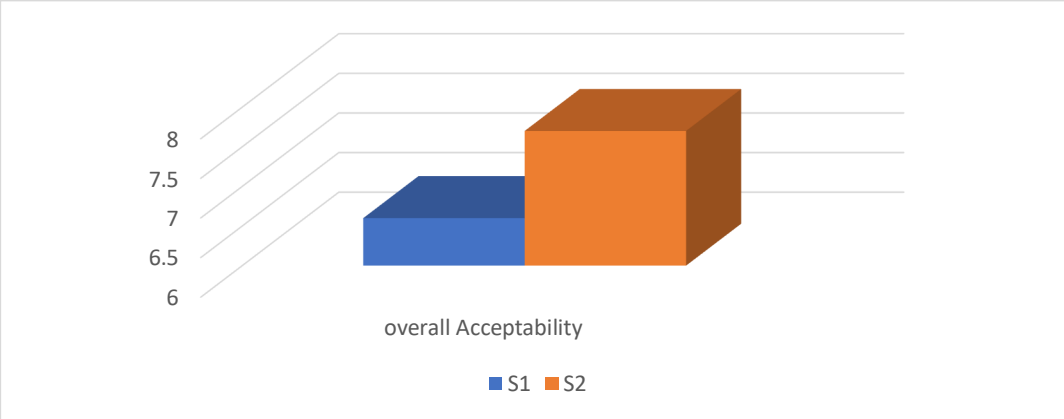

Figure 3: overall Acceptability of Product sample

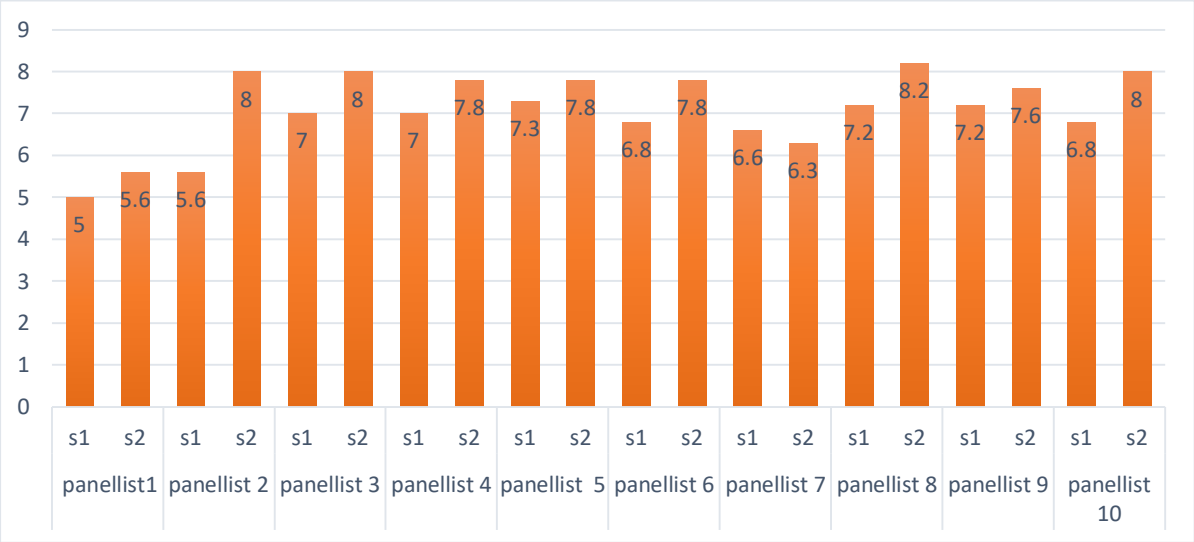

Figure 4: sensory Evaluation data of semi Trained panel

Quality Analysis: Result of sample 2

Parameter	Result
Moisture	1.19%
Protein	12.68%
Fat	14.06%
Carbohydrate	64.42%
Ash	6.66%
Fiber	0.99%

Figure 4:pearl millet cracker with vegetable spinach.

Carbohydrates: The carbohydrate in crackers comes from the flour. Average carbohydrate content in regular crackers is 72-78%but in this sample it is 64.42% (snack crackers).
Protein: The crackers developed with Pearl millet flour, Oats flour, Rice Flour and Spinach contains12.68% protein .
Fat: The fat content in the crackers ranges from 14.06% in the sample 2. The fat used for Grease the baking tray also adds to the fat percentage variation.
Ash: Ash indicates minerals such as mineral content 6.66% of sample 2. vegetable cracker made with Pearl millet flour.
Moisture: Compared to other baked goods, crackers have a lower moisture content. Baked crackers for snacks. Crackers are light, crisp, and have a low moisture content since the most moisture is evaporated during baking. The 1.19% moisture content of vegetable crackers made from Pearl millet makes them more storable. The shelf life is extended by appropriate and functional packaging that regulates moisture absorption.

CONCLUSION

The aim behind the study of Nutrition and sensory Evaluation of Pearl millet flour cracker made with vegetable spinach is To Use Traditional Cereal Grain which is highly Nutritious but it was not consume because of it's taste and mainly when Pearl millet's product get prepared its structure become get hard . So mostly this Cereal get neglected. These cracker were prepared by baking Process in Oven at 150°C for 10 -15 min. . To make cracker we use Baking Technique which was making cracker so Healthy. Because Frying process makes cracker much more oily and unhealthy also. The Vegetable Cracker made with pearl millet flour thus obtained was analysed for Physico-chemical properties such as moisture (1.19%), ash (6.66%), fat(14.06%), crude fibers (0.99%), protein(12.68%). Sensory assessment Using a 9-point hedonic scale, a semi-trained panel of academic staff members assessed the prepared product's sensory attributes, Organoleptic analysis was carried out including sensory attributes like colour, flavour, taste, texture and appearance to check the overall Acceptability of the products.

Stated in the objectives, the Sample 2 formulation is standardized based on sensory and nutritional analysis. As Spinach , Pearl millet Flouris in higher proportion, its grainy taste is accepted by most of the panel members. Generally Pearl millet are not consumed because of their taste, and final product's hard and Uneven texture which is not acceptable by many consumers, keeping this in mind product is formulated in an appealing way, where product does not give any off flavour yet providing palatable flavour and nutritious. Traditional taste and nutritional profile are achieved making the product healthier

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