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Development of Ready to Eat (RTE) Snack Crackers Incorporated with Amaranth Flour

Praveena.P', Liyana.K Amina, Nahida Kuruniyan, Nishma. P.K,

UG Student, Department of Department of Food Technology, Dhaanish Ahmed Institute of Technology,
Coimbatore, India

Assistant Professor, Department of Food Technology, Dhaanish Ahmed Institute of Technology, Coimbatore, India.

ABSTRACT: The development of Ready-to-Eat (RTE) Snack Crackers incorporated with Amaranth Flour, a millet-based flour, was undertaken to create a nutritious and convenient snack option. Amaranth, recognized for its high nutritional value and significance as a millet, was integrated into the formulation to enhance the health profile of the snack. Amaranth belonging to the millet family, stands out for its exceptional nutritional properties. It is a rich source of proteins, fibers, and essential micronutrients such as iron and calcium. These millet-based attributes contribute not only to the nutritional benefits of the RTE Snack Crackers but also enhance their overall health appeal. The research focused on optimizing the formulation to achieve the desired balance of taste, texture, and nutritional content. Amaranth Flour, as a key ingredient, not only imparted nutritional benefits but also contributed to the unique sensory attributes of the crackers. Physiochemical analyses were conducted to assess quality parameters, including texture, crispiness, and nutritional composition. The utilization of Amaranth Flour aimed to capitalize on its rich content of proteins, fibers, and essential micronutrients, making the RTE Snack Crackers a wholesome and appealing choice for consumers. The study results highlight the successful development of RTE Snack Crackers, providing a nutritious alternative for consumers seeking convenient and health-conscious snack options with the added millet-based benefits of Amaranth Flour.

KEYWORDS: Amaranth Flour, Snack crackers, Nutrition, Health benefits, Ready-to-Eat (RTE)

I. INTRODUCTION

Amaranth is one of the most promising crops that has attracted attention recently, because it bears the water lack and is suitable for all types of soil and its rapid growth Amaya-Farfén, I.J. (ef al.,2012). Amaranth contains high protein compared to most other grains such as wheat, rice and corn which are low in lysine content. In recent it has been used in developing countries as a way to overcome protein malnutrition and also it is become popular among patients with celiac disease because it does not cause allergic reactions in the intestinal mucosa, so it is used in preparation of gluten-free products Giménez, M.S. (2006). Grain amaranth contains from 13.1% to 21.00% protein, 5.6 to 10.9% crude fat, 3.1% to 5% fiber dietary and 2.5 to 4.4 ash, also rich sources minerals especially calcium, magnesium, copper, zinc, iron, potassium, and phosphorus and contains many bioactive compounds, especially phytosterols, polyphenols, saponins, and squalene Rahman, S. (2016) Recently, fast snacks, especially crackers, have become one of the most widely consumed food products which is suitable for all age groups, because of its favorable texture and taste. Also it is considered as crisp and thin and low in moisture content. It's usually prepared from wheat flour, water, fat, salt and sometimes low sugar. It can be used as an alternative to healthy snacks. In addition, it's divided into three main types' soda crackers, snack crackers, and savory crackers Tzia, C. (2014) Crackers are popular snack foods in human diet (Sedej ef al., 2011). They are dry, thin and crisp bakery products and the low level of moisture, decreased even further with baking, left no medium for mold growth (Han et al., 2010). The basic ingredients in cracker production are soft white wheat flour, fat (or shortening), salt, leavening today, gluten free flours (potato, rice or corn flours) and starches are used in bakery foods for celiac patients instead of wheat flour. But, many gluten-free cereal foods indicate an unbalanced intake of carbohydrates, protein, and fat, as well as limited intake of certain essential nutrients in celiac subjects compared to gluten containing ones. In addition, many gluten-free cereal foods do not contain the same levels of calcium, iron, and fiber as their gluten-containing counterparts (Alvarez-Jubete et al., 2010b). The advancement in crafting Ready-to-Eat (RTE) Snack Crackers featuring Amaranth Flour responds to the growing demand for



nutritionally robust and convenient snack options on a global scale. Amidst an increasingly health-conscious consumer base, the incorporation of Amaranth Flour becomes a strategic move to align with evolving dietary preferences. Yilmaz, M. (2019) Amaranth, a member of the millet family, is strategically chosen for its remarkable nutritional profile, characterized by high protein and fiber content, alongside essential micronutrients like iron and calcium. Amaranth-based snack crackers provide a sustained release of energy, preventing the rapid spikes and crashes often associated with refined carbohydrates. One of the primary advantages of Amaranth is its low glycemic index (GI), which means it is absorbed slowly by the body and do not cause sudden spikes in blood sugar levels. This is beneficial for individuals with diabetes. High in fiber, which can aid in digestion and decrease the risk of constipation. Amaranth contains a bioactive peptide, lunasin, which is important in reducing the growth of cancerous cells. Folate is also found in amaranth which assists in reducing risks of pancreatic and breast cancer. Delorme, M. M., Cruz, A. G. (2021) Snacks made from Amaranth are also gluten-free, making them suitable for individuals with gluten sensitivities. Overall, Amaranth-based snack crackers are a nutritious and healthy choice for snacks and other foods. They are particularly suitable for people looking to manage their weight, regular levels, or improve their gut health. Amaranth Flour stands out as a unique resource, not only enhancing the nutritional aspects of RTE Snack Crackers but also contributing to their overall health appeal. This development strategically capitalizes on Amaranth Flour's rich protein, fiber, and micronutrient composition, positioning RTE Snack Crackers as an enticing option for individuals seeking both convenience and health-conscious snacking.

II. MATERIALS AND METHODS

Raw Materials 1.Amaranth Flour - 100gm 2.Dried oregano - 5 gm 3.Garlic powder - 2 gm 4.Baking Powder - 2 gm 5.Olive oil - 10 ml 6.Water - 60 ml 7.Salt-2 gm.

METHODS

1. The oven was preheated to 180°C and a baking sheet was lined with parchment paper.
- 2.100g Amaranth Grain is ground to make a fine gluten-free flour.
3. In a bowl, amaranth flour, salt, garlic powder, dried oregano, and baking powder of exact measurements were combined.
- 4.Olive oil was added to the dry ingredients, and the mixture was mixed well.
5. Gradually, water was added, and the mixture was kneaded into a smooth dough.
6. The combined ingredients were thoroughly mixed to create a well-distributed blend.
7. The mixture was pressed into a baking pan, creating an even layer and cut into desired shapes.
8. The oven was used to bake the crackers at 180°C for 15-20 minutes, until they turned golden brown and crisp.
9. The crackers were allowed to cool completely at room temperature before being stored in an airtight container
10. Now the ready to Eat healthy cracker is ready for consumption.

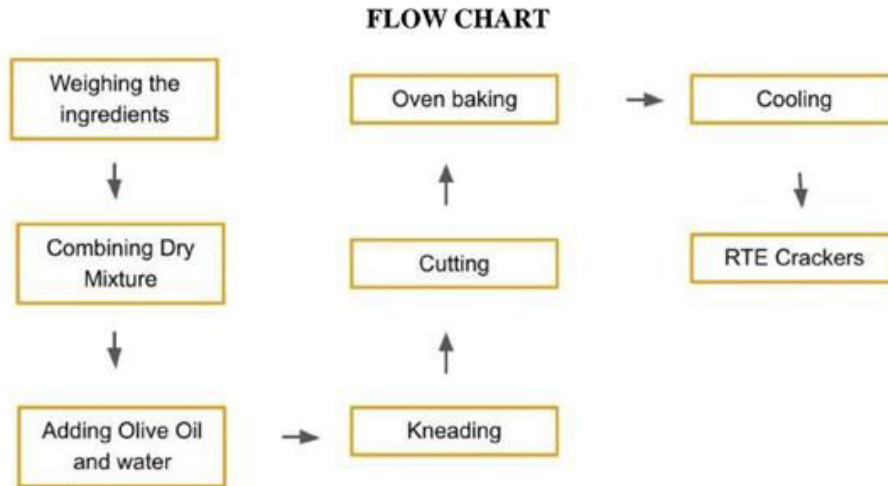


Fig.1. Graphical Flow chart for preparation method

Pictorial Representation



Fig 2. Graphical Pictorial Representation

III. RESULTS AND DISCUSSION

NUTRITIONAL ANALYSIS - ESTIMATION METHODS

The fat was determined using Soxhlet extraction method of AOAC920.39 (1984).The protein content of the Crackers samples was determined using the Micro kjeldahl method of AOAC 981.10 (1984).Fibre was determined in the Crackers sample using the standard methods of analysis of the AOAC 962.09 (1984).



The total carbohydrate content was determined by analysis of the AOAC985.29 (1984). Sodium was determined by atomic absorption spectrophotometric method AOAC 985.01. Total sugar in sample was determined by the phenolsulfuric acid method AOAC 982.14

SENSORY TEST

Amaranth Crackers were analyzed by five panel members using 9 Point Hedonic Scale for its sensory characteristics such as Colour, Appearance, Taste, Texture which is tabulated below. 1. Dislike extremely, 2. Dislike very much, 3. Dislike moderately, 4. Dislike slightly, 5. Neither like nor dislike, 6. Like slightly, 7. Like moderately, 8. Like very much, 9. Like extremely,

SHELF LIFE STUDY BY MICROBIOLOGICAL ANALYSIS

The 1-month shelflife study of RTE snack crackers incorporated with amaranth flour was evaluated by observing microbiological analysis.

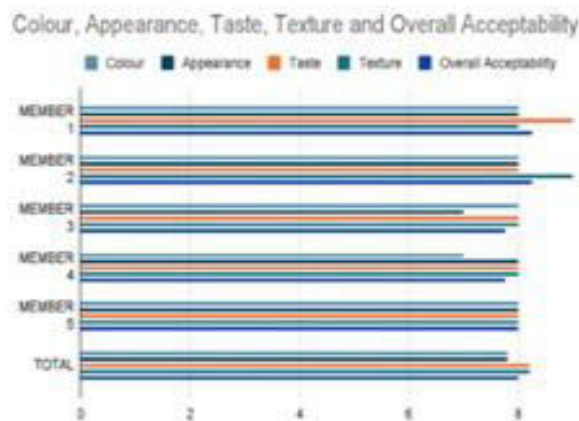
*Total Viable Count (TVC)

* Yeast and Mold Count

* Coliform Count

SENSORY TEST OBSERVATIONS Colour –

The colour of the Amaranth Crackers was golden brown and received 7.8 out of 9. Appearance - The Crackers were square shaped, appearing delicious and received 7.8 out of 9. Taste - It has nutty taste, the garlic powder and oregano enhanced the taste of the crackers received 8.2 out of 9. Texture - The texture of the Amaranth Crackers was hard, Crispy and Crunchy achieving a score of 8.2 out of 9. Overall Acceptability - The Ready to Eat Amaranth Crackers received an overall score of 8 out of 9 which indicates good acceptability rate.



NUTRITIONAL ANALYSIS

The Amaranth crackers provided a balanced nutritional profile, with each serving containing 139 kcal of energy. They were a moderate source of energy, suitable for snacking between meals or as part of a balanced diet. With 3 grams of protein per serving, these crackers contributed to meeting daily protein needs and helped keep individuals satisfied between meals. Containing 6 grams of fat per serving, the crackers offered essential fatty acids necessary for various bodily functions. The fat content contributed to the texture and flavor of the crackers, while also providing satiety. A serving of these crackers contained 19 grams of carbohydrates, offering a moderate amount of energy to fuel daily



activities and support metabolic functions. The high fiber content of 6.8 grams per serving promoted digestive health, regulated bowel movements, and controlled cholesterol levels. This made the crackers a satisfying option and aided in weight management. With only 2 grams of total sugar per serving, the crackers were a healthier alternative to snacks high in added sugars, supporting controlled blood sugar levels and reducing the risk of insulin spikes. Containing 69 mg of sodium per serving, the crackers were suitable for individuals watching their sodium intake. This helped in maintaining healthy blood pressure levels and reducing the risk of cardiovascular diseases. In summary, the Amaranth crackers provided a balanced combination of macronutrients and contributed to meeting daily nutrient needs. Incorporating them into a balanced diet promoted overall health and vitality.

SHELFLIFE STUDY BY MICROBIOLOGICAL ANALYSIS

Total Viable Count (TVC): Initial Count: 2.1×10^3 CFU/g Final Count (after 1 month): 2.8×10^3 CFU/g Yeast and Mold Count: Initial Count: 1.8×10^2 CFU/g Final Count (after 1 month): 2.2×10^2 CFU/g. Coliform Count: Initial Count: < 10 CFU/g Final Count (after 1 month): < 10 CFU/g.

The increase in TVC suggests some microbial growth over the 1-month period, although levels remain within acceptable limits for microbiological safety. Yeast and mold counts show a slight increase, indicating minimal potential for spoilage, but remain within acceptable limits. Coliform counts remain consistently low throughout the study, indicating good hygiene practices and microbiological safety. The 1-month shelf life study of RTE snack crackers incorporated with amaranth flour indicates acceptable microbiological safety and minimal changes in physical attributes. While microbial counts showed slight increases, they remained within acceptable limits for safety. Minor changes in texture suggest potential for further optimization to maintain product quality over longer storage periods. Overall, the RTE snack crackers demonstrate good stability within the 1-month timeframe, providing valuable insights for product development and quality assurance.

IV. CONCLUSION AND FUTURE WORK

RTE Amaranth crackers represent a nutritious and balanced snack option that contributes to fulfilling daily nutrient requirements and promoting overall health and vitality. With an impressive overall acceptability rate of 8 out of 9, these crackers demonstrate strong consumer appeal, indicating their potential success in the market. The findings from the 1-month shelf life study highlight the acceptable microbiological safety and minimal changes of the RTE Amaranth crackers. Despite slight increases in microbial counts, they remained within safety limits, while minor texture changes suggest room for further optimization to maintain product quality over longer storage periods. Overall, the RTE Amaranth crackers show promising stability within 1-month timeframe, providing valuable insights for product development and quality assurance. Going forward, continued refinement and quality control measures will ensure that these crackers remain a wholesome and satisfying snack choice for consumers seeking nutritious and convenient options.

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