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Development of Calcium Enriched Wheat Flour from Valorization of Salmon Fish Bones (*Eleutheronema Tetradactylum*)

J Priyanga¹, Sisira KP², Athira Sneha³, Sasna Saleem⁴, Sumi TS⁵

Assistant Professor, Department of Food Technology, Dhaanish Ahmed Institute of Technology, Coimbatore, Tamilnadu, India¹

U.G Student, Department of Food Technology, Dhaanish Ahmed Institute of Technology, Coimbatore, Tamilnadu, India^{2,3,4,5}

ABSTRACT: The project aimed to evaluate the potential of Salmon bones for use in food products through various chapati combinations. The 100:10 combination showed a significant increase in calcium levels and was found to be highly nutritious. Nutritional and microbial analyses were conducted, demonstrating the safety and viability of this approach. The study highlights the importance of utilizing underutilized food sources, such as Salmon bones, for developing innovative and sustainable food products that can contribute to reducing calcium deficiency diseases. The findings of this study could have significant implications for the food industry and human health, paving the way for the utilization of underutilized food sources for nutritional purposes. This study highlights the potential of Salmon bones to serve as an excellent source of calcium and its significance in reducing calcium deficiency diseases such as osteoporosis. Further research in this area could lead to the development of more innovative new products promoting sustainable food ecosystems.

KEYWORDS: Salmon bones, food products, nutritional analysis, microbial analysis, underutilized food sources, sustainability.

I. INTRODUCTION

Calcium is one of the essential minerals required for the human body. Bones and teeth contribute 99% of total body calcium and rest is found in the blood. Calcium plays a vital role in various physiological activities such as nerve conduction, muscle contraction, and blood clotting. When the blood calcium level drops in the body, it will be replaced from the bones so as to maintain the level. Deficiency of calcium will lead to deformity of bone called osteoporosis. Calcium is generally obtained from the diet and it is severely deficient in most regular diets. Therefore, it is essential to enrich calcium along with the foods. Several calcium-fortified products and tablets are blooming in the market and demands for these products are growing at a faster price. Among all non-dairy products Fish bone is a potential source of calcium[1].

Salmon bones are a waste or by-product of processing fish filets, frozen fish filets, smoked salmon, fish sausages and crispy skin snacks. Bones from salmon processing are normally just discarded and can cause environmental pollution. However, salmon bones can be made into salmon bone powder (SBP) for use in food products. Generally Fish bones are a valuable natural source of minerals, especially calcium which is a necessary mineral for building up healthy bones and teeth. Fish bones are non edible parts separated after removal of muscle from the skeletal body. But in the case of salmon, the bones are also edible. Salmon are considered as superfoods and safest fish for consumption on earth as it does not contain mercury and heavy metals such as lead and arsenic. Fish bone consists of 60%-70% of inorganic substances and it is mainly composed of calcium, phosphorus and hydroxyapatite. Indian marine fisheries produces one third of the total production of fishes in productive years (Bal DV et al.,1984).Among these, oil Salmons are coastal, pelagic, tropical fish which shows data, that it produces 12.4% of 3.16million tons of total marines fishes[2].

Greater utilization of fish bone powder could give improved nutritional content of food products, give consumers options in the organoleptic properties for several food products and decrease environmental pollution by reducing industrial waste. Development of healthy food products could be achieved by reducing wheat flour through substitution with salmon bone powder, which is a natural source of minerals especially calcium. This research paper investigates the effects on cooking quality, chemical composition, physical analysis, sensory acceptability and shelf life evaluation of partially substitute wheat flour with salmon bone powder at different concentrations[3].

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II. RELATED WORK

- Step 1: Raw salmon fish
- Step 2: Cleaning the fish with fresh water
- Step 3: Removing the Head and gut
- Step 4: Steam boiling (30 mins)
- Step 5: Removing muscles from skeletal body
- Step 6: Clean the fish bone
- Step 7: Sun drying of fish bone
- Step 8: pulverized into powder
- Step 9: Addition of fish bone Powder in wheat flour
- Step 10: Calcium Enriched Wheat flour

III. METHODOLOGY

The Raw Salmon fish of 2 kg has been washed in order to remove the dirt particles and are degutted and tissues were removed[4]. The head and gut were separated and steam boiled in demineralised water for 40 mins. After boiling the fish the muscles were separated from the skeletal body and sundried for 3-4 hours. The dried fish bone is grinded into ultra fine powders using pulverizers. Nearly 32g of powder is obtained from dried fish bones. The pulverized powder is mixed with wheat flour and by adding water and salt the dough is formed. By heating the dough, the desired chapati is prepared. It is prepared in various combinations and sensory evaluated[5].

IV. EXPERIMENTAL RESULTS

As per the nutritional analysis, the chapati made using 20% of salmon bone powder have the highest calcium content of 350mg. However, they also have the highest fat content of 2.5g and the highest calorie content of 305 kcal, On the other hand, the chapati made using 0g of salmon bone powder have the lowest calcium content of 14mg, but they also have the lowest fat content of 1.2g and the lowest calorie content of 250 kcal Therefore, the best ratio would depend on an individual's nutritional requirements and health goals[6]. Consumers looking to increase their calcium intake, then chapati made using higher proportions of salmon bone powder would be a good option, But if consumers watching their calorie or fat intake, then chapatis made with lower proportions of salmon bone powder or without it would be a better choice Overall, all four ratios provide a good amount of protein and carbohydrates[7].

The result obtained on the basis of sensory attributes of highest scores were found in 53 (100g wheat flour and 10g salmon fish bone powder). Nearly similar scores were obtained by \$2 and \$4. The appearance and aroma characteristics of all the samples are similar while other parameters such as texture is harder and flavor is stronger with increase in proportion of Salmon Fish Bone powder. Based on the observation, sample 3 has high acceptability in taste and overall value when compared to other samples[8-11]. Based on the microbial test results, it can be justified that the Salmon incorporated chapathi is free from harmful bacteria and is safe for consumption. According to RDA allowance of calcium intake level it is necessary for adult men or women to consume 1000g (h_{le}-4) to maintain the calcium level in body. This Salmon chappathi of 100g commibutes 48.29% of daily calcium make level. This Salmon chappathi of 20g's (20gm) will be sufficient for adult men and women to attain 96.4% of daily intake level[12-13].

V. CONCLUSION

Hence it is proved that oil Salmon bones are rich in calcium and it should be recommended for human consumption either directly or indirectly by making use of it as a raw material for the production of calcium fortifiers or incorporating it in food diet. Since oil Salmons are landed in large quantities throughout the year and are available at cheaper price, sustainable and judicious utilization of its skeletal remains for the production of calcium fortifiers are warranted. The above analysis proved that Salmon chappathi 100:10 was found to be much more significant when compared to other samples. From the present findings, it is safe to conclude that Salmon bones serve as an excellent calcium storehouse and it will be utilized for the production of calcium enriched chapatis which maintains the adequate calcium level in the human body. In upcoming years this may lead to reduce the calcium deficiency disease such as osteoporosis.

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