

International Conference of Sabaragamuwa University of Sri Lanka 2015 (ICSUSL 2015)

Comparative study on organoleptic, microbiological and chemical qualities of dried fish, Goldstripe Sardinella (*Sardinella gibbosa*) with low salt levels and spices

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Abstract

Dried fish is very important component in Sri Lankan fishery products while current domestic production is estimated at around 40,000 tons per year. Generally, dried fish production in Sri Lanka is based on traditional methodology where 30% of salt is used averagely. Use of excess amount of salt can have negative health effects. Therefore production of dried fish with low salt is very important. Accordingly, partial substitution of salt with alternative substances can be done. Current study aimed at evaluating the effect of low levels of salt and combined effect of low salt and spices on quality of dried fish. The study was carried out using eviscerated and cleaned up Goldstripe Sardinella with 0% (T1), 5% (T2), 10% (T3) salt levels and two different combinations of salt and spices (1% salt with 0.2% turmeric, 0.5% chilli, 0.5% pepper (T4) and 2% salt with 0.2% turmeric, 0.2% chilli, 0.2% pepper (T5)). Hot air dehydrator (65-70 °C) was used for fish drying. Chemical (moisture, water activity (a_w), Total volatile nitrogen (TVN), and sodium chloride), physical (texture and rehydration), microbiological (APC, mould and yeast count and coliform count) properties and sensory attributes of experimentally prepared dried fish were investigated. The chemical parameters for all treatments were significantly different ($p < 0.05$) while physical parameters were not ($p > 0.05$). T2 indicated the best chemical quality. The values for moisture, a_w , sodium chloride, TVN, texture and rehydration for T2, were 11.6584 ± 0.03 , 0.591 ± 0.002 , 12.43 ± 0.15 , $59.43 \text{ mg}/100 \text{ g} \pm 12.86$, $1.54 \text{ kg} \pm 0.14$ and 12.70 ± 3.54 respectively. T2 and T3 had least microbial counts while T1 and T5 had highest microbial count. But T5 had highest scores for all sensory attributes indicating consumer preference for low salt and spicy taste regardless of high TVN content and poor microbial quality. Therefore it is essential to improve the methodology to enhance the quality of low salt and spices added dried fish.

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Peer-review under responsibility of International Conference of Sabaragamuwa University of Sri Lanka 2015 (ICSUSL 2015).

Keywords: Dried fish, salt, quality, spices

1. Introduction

Sri Lankan fisheries sector has shown growth in increasing trend during the past decade. Accordingly the total fish production of the country was 486,170 Mt in 2012⁴. Dried fish is very important component in the Sri Lanka fishery production. Traditionally, dried fish represents a low cost source of high quality protein to the population with low income⁶. About 10% of the total marine fish landings are used for production of dried fish³. Drying is often used in combination with salting for additional preservation. Traditionally used proportion of salt is 3kg per 10kg of dressed fish prepared for salting. Any over use of salt in dried fish production creates economic and marketing costs and serious health burden.

According to the Industrial Technology Institute (ITI) findings, salt of dried fish samples from the markets are ranged from 14.05% to 17.41%. According to the Sri Lanka Standard accepted maximum salt content is 12% on dry basis. Consequently existing quality of the dried fish in local market is not appropriate for the human consumption. High levels of sodium consumption contribute to increased blood pressure in the population, and a consequent higher risk of cardiovascular and renal disease. Because of the positive correlation between sodium intake and the incidence of hypertension in old people and those with hypertension and diabetes, there is a tendency to reduce sodium content by substituting part of Sodium Chloride (NaCl) by other substances⁵. For that purpose Potassium lactate, potassium Chloride and spices can be used. Due to modern trends consumers adopt towards the consumption of foodstuffs containing no chemical preservatives, food products with natural additives have become popular. Accordingly spices are good natural alternative to partial substitution of salt in dried fish, as spices able to retard the microbial growth⁷. Accordingly dry fish production with low salt has become a critical requirement for public health security. Therefore objective of this study was to determine the potential of use low levels of salt with spices to produce low salted dried fish.

2. Methodology

Study was conducted at Fish Processing Lab of Food Technology Section in Industrial Technology Institute (ITI). Fresh Goldstriped Sardinella (*Sardinella gibbosa*) was collected from Peliyagoda Central Fish Market. Fish were handled at chilled condition and stored in -18 °C until experiment is conducted.

2.1 Sample preparation

Thawed Goldstripe Sardinella were eviscerated, descaled and washed in running tap water for sample preparation for the experiment. Dried fish were prepared with three different levels of salt (0%(T1), 5%(T2), 10%(T3)) and two different combinations of salt and spices (1% salt with 0.2% turmeric, 0.5% chilli, 0.5% pepper(T4) and 2% salt with 0.2% turmeric, 0.2% chilli, 0.2% pepper(T5)) by following dry salting. 10% salt was used as the maximum salt percentage as it was the lowest salt percentage that provides the preferable quality attributes according to the previous ITI studies. Three spices that most commonly used in fish preservation were selected in two different levels that are compatible with consumer preference.

Samples were kept overnight for curing. Drying of fish was carried out at 65-70 °C in hot air dehydrator (Mitchel Dryer, Pratchill Bros Ltd, UK) for 17 hours until moisture content of dried fish sample reduce to about 12%. Chemical, physical, microbiological and sensory attributes were analyzed to compare the effect of low salt concentrations on quality of dried fish.

2.2 Chemical analysis

Moisture content was determined using oven dry method according to the AOAC 950.46 (2002). Dried fish samples were analysed for Water activity by using water activity meter (Series 3 TE, AquaLab®, USA) at 26 °C. TVN was determined according to the method described by Larson (1991). Dried fish samples were analysed for Chloride content according to the AOAC official method 437.09.

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