

Abstract

Fish spread products known as surimi products are regularly consumed as food products and are made from X Q G H U X W L O L] H G ζ V K V S H F L H V O L N H W L O D S L D D W O D Q W L F P H Q K D G H Q F D V contain functional lipid or micronutrients like oryzanol, squalene and lignans. There is therefore need for proper selection of functional food materials and for developing process steps for making such nutritive spreads. The main objective is to produce nutritionally enriched Bholā bhetki (ζ V K V S U H D G S U R G X F W V E \ D G G L O V R \ D A R X U W K D W F R Q W D L Q V J R R G D P R X Q W R I S U R W H L Q ζ E H U D Q G S K \ W R L V D O V R W R X V H E O H Q G H G Y H J H W D E O H R L O V D V W K H % K R O D E K H W N L ζ V K and soya bean oils are used in a varied proportion so as to obtain more linoleic and linolenic along with lignans like sesamol and sesamolone (in case of sesame oil) and oryzanol (in case of rice bran oil) and alfa linolenic acid (ALnA) from soyabean oil along with various tocopherols and tocotrienols.

1 D G L D % K R O D E K H W N L ζ V K Z D V ζ O O H W H G D Q G G L S S H G L Q V R G L X P W U L S R D Q G P D U L Q D W H G Z L W K Y L Q H J D U V D O W D Q G E O D F N S H S S H U 7 K H ζ V K P L O F H Then the supernatant rich with lipid layer was discarded and the sediment was taken and autoclaved at 121°C and S U H V V X U H O E V T I R U V S H F L ζ F W L P H O L P L W V 7 K H Q F K R O H V W H U R O I U H H P R Q R J O \ F H U L G H D Q G V R O X E O H V W D U F K Z H U H D G G H G D Q G K R P R J H Q L] H G) G R Q H E \ D G G L Q J E O H Q G R I U L F H E U D Q R L O V R \ D E H D Q R L O V H V D P H R L O and Soya Deoiled Cake (soya DOC).

6 H Y H U D O F K H P L F D O D Q D O \ V H V R I W K H ζ V K V S U H D G S U R G X F W V Z H U H L O

Keywords: *N, b, a, ., ., dad.*; Spread; Functional lipids; Micronutrients

Abbreviations: SoyDOC: Soybean deoiled cake; RBO: Rice bran oil; SMO: Sesame oil; SBO: Soybean oil; EPA: Eicosapentaenoic acid; DHA: Docosahexaenoic acid; TPC: Total plate count

Background

Sh paste products or sh based spreads generally resembling surimi. These types of products are regarded as a kind of protein rich food. Generally such products are made from the sh species that are relatively less known or unutilized. Some of the sh species used to make surimi products are, big eye snapper, tilapia, alaskan pollock, cod, atlantic croaker, atlantic menhaden, cat sh, mackerel [1-8].

The technology of production of sh spread products comprises a number of steps in sequence; at first shes are minced and washed with cold water (5°C) and screened and dehydrated and cryoprotectants are added and frozen into blocks [9].

Further development includes the preparation of sh paste products from sh protein isolates [10].

In previous reviews it has been observed that food technologists prepared surimi by washing sh mince with ice-cold water for 25 minutes for four times every time changing the water.

Again washing is also done with 0.2% salt solution for two to three times. Then sh mince was filtered and dehydration was realized in a cheese cloth by using wood press for 30min. By adding 4% sugar, 0.2% sodium polyphosphate, 2.5% salt, the dehydrated surimi was mixed for

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ve minutes by a mixer and homogenized and stored in a freezer at -35°C [11].

Surimi is also prepared by adding ground ice to big eye snapper fish species [12].

Filets were minced and used for surimi preparation as described by Benjakul, et al. Big eye snapper surimi stored at -18°C was thawed to obtain the core temperature of -21°C and used for Som-fug production following the method of Riebroy et al. [13].

Surimi was mixed with minced garlic, ground steamed rice, and salt for 15 min using a mixer (Model EC-20 Crypto Peerless, Birmingham, England). Different Lactic Acid Bacteria (LAB) starters at varying levels involving *L. acidophilus* at 104CFU/g (LP104) and 106CFU/g (LP106), *P. acidilactici* at 104CFU/g (PA104) and 106CFU/g (PA106), and *P. acidilactici* BT520 at 104CFU/g (PP104) and 106CFU/g (PP106) were added into the mixture and mixed thoroughly for 5 min. The mixture containing no LAB starters was used as the control.

The mixture referred to as 'Som-fug raw mix' was then stuffed into a polyethylene casing with a diameter of 2.0 cm. Both ends were sealed tightly with rubber bands and the samples were incubated at 30°C in an incubator (Mammert BE400, Schwabach, Germany). The fermentation was conducted until the pH of Som-fug reached 4.60. Fermentation in surimi preparation is also carried out by varying salt and ginger composition in some cases [14].

Some times surimi products are used as gel like substance which can be prepared from more than two types of fish minced muscles [15].

Objective

Bhola bhetki (*Nibea soldado*) is an edible salt water fish in West Bengal, India. The fish contains about 18% protein, 0.03% total fat, Vitamin A 47.4IU, Niacin is also present but in negligible amount, 11-14mg Calcium and 0.28mg iron and 44mg sodium. The main objective is to produce nutritionally enriched fish based spread products which can be beneficial to school going children and can be affordable to all class of people. This type of product can be fortified by adding soy protein; that contains good amount of protein, fiber, essential fatty acids, antioxidants, and also phytonutrients like isoflavone. The objective of the study is also to use blended oils as the bhola bhetki fish contains negligible amount of fat (in this context fatty acid profile is studied) [16]. Rice bran, sesame and soy bean oils are used in a varied proportion so as to obtain more linoleic and linolenic along with lignans like sesamol and sesamolone (in case of sesame oil) and oryzanol (in case of rice bran oil) and ALnA from soybean oil along with various tocopherols and tocotrienols.

In this paper an approach is made with Bhola bhetki fish which is so far unused to process the production of fish paste like products. Further some fortification of products is also done.

Methods

Materials

Raw material: Nadia Bhola Bhetki fish is brought from local market.

Other ingredients: Cholesterol free Egg lecithin (extracted from raw egg), Refined Soybean oil and Refined Sesame oil were bought from local market, refined rice bran oil (supplied by Sethia Oil mill, Burdwan, W.B, India), fish oil (containing EPA and DHA from Maxepa (E.Mark))

Chemicals: Cornstarch, sorbitol, soluble starch, and Vitamin E

are E-Merck Products Vinegar (4% acetic acid), sodium benzoate and citric acid are provided by Kundu chemicals, Kolkata. Monoglycerides provided by Oil Technology, Co., India. Black pepper are purchased from local market.

Procedures

Production of the fish filets: Nadia bhola bhetki fish is taken. It is descaled and deboned and washed for three or more times in cold water. Then the filleting is done from the dorsal side. The filets are then dipped in sodium tripolyphosphate solution.

Preparation of fish mince: The filets are finely minced and then marinated with vinegar. The marinated filets are then centrifuged at 5000rpm for 20 to 25 minutes. Then the upper supernatant rich with lipid layer is discarded and the sediment is taken for autoclaving for reducing fishy odour and lowering microbial infestation.

Preparation of cholesterol free lecithin from egg yolk: The egg yolk is separated from the whole eggs and then weighed and extracted with the mixture of chloroform and methanol (2:1) for 2 hours. Then the extract is set aside until the sediments settled down and a clear solution is seen on the upper surface. The clear solution is first decanted followed by filtration using Whatmann No.1 filter paper. The filtrate obtained is next distilled to separate the solvents used. The residue obtained after solvent removal is washed 3 times with acetone to remove cholesterol and other lipids [17]. The cholesterol-free lecithin obtained as insoluble mass is used as emulsifier in the fish paste based spread.

Preparation of fish paste based spread: The fish filets autoclaved to reduce odour are taken, mixed with cholesterol free lecithin as isolated from egg lipid, sodium benzoate, citric acid and sorbitol and passed through a blender and finally homogenized in a homogenizer.

Process of preparation of fish spread with Rice bran oil, Soy bean Oil, Sesame oil, EPA-DHA rich fish oil, Vitamin E and Soy Deoiled Cake: Bhola Bhetki fish contains only 0.03% oil. Fortification and enrichment of the spread is done by adding blend of Rice bran oil and sesame oil. From these blended oils we get good amount of linoleic acid along with some antioxidants like tocopherols, tocotrienols, squalene and oryzanol from rice bran oil and lignans like sesamol and sesamolone from sesame oils. The type of fish filets also lack in EPA and DHA in them as most of these acids are present in organs like eye and digestive tract of the fish [16]. Thus EPA and DHA through fish oil are added which are good for brain and eye development. As it is discussed earlier that Vit A and minute quantities of Niacin are only present, vitamin E capsules are added. Then another type of fish spread is made by enriching it with Soybean Deoiled Cake (soy DOC) which is mixed with fish in varying ratio [fish filets: Soy DOC= 60:40, fish filets: SoyDOC=80:20 and fish filets: Soy DOC= 20:80]. The SoyDOC rich fish paste is designed for more protein and fiber content and also for phytonutrients like isoflavone to the spread.

Chemical analysis: Several chemical analyses of the fish spread products developed were investigated that included protein, carbohydrate, lipid, solid content, total soluble solid, fatty acid profile, fiber, oryzanol, isoflavone content and ash. Protein was determined by Lowry's Method. (Lowry et al. (1951)). The carbohydrate content was determined by Anthrone's method. Lipid was extracted by Soxhlet method. Ash for each treatment was determined by placing the residue from moisture determination in a muffle furnace.

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soybean oil, and EPA and DHA and vitamin E Capsules and Soya Deoiled Cake (DOC) [sh llets: Soya DOC= 60:40] made from Fish mince which is autoclaved for 7 min.

Product 6 containing Rice Bran Oil (RBO), Sesame Oil (SMO), soybean oil, and EPA and DHA and vitamin E Capsules and Soya Deoiled Cake (DOC) [sh llets: Soya DOC= 80:20] made from Fish mince which is autoclaved for 7 min.

Proximate composition of products (protein, carbohydrate, total fat, moisture, ash, ber, oryzanol) is in the Table 3 below.

Iso avone detection by UV absorbance and colour reaction

the use of soy DOC is expected to incorporate iso avone in products and the tests performed are shown in the Tables 4 and 5.

Iso avones are detected by reaction with alkali or acid as indicated below in Table 5.

Fatty acid profiles (composition) occurring in various sh-based spreads as determined by GLC analysis of the total fatty acids of the lipids as their methyl esters are shown in Table 6.

SBO- Soy bean oil, RBO-Rice bran oil, SMO-Sesame oil, DHA-Docosahexaenoic acid, EPA-Eicosapentaenoic acid and Soy DOC-Soya Deoiled cake.

From the above Table 6, it is clearly noted that spread containing having only Soya bean Oil contains moderate amount of Palmitic acid, very high amount of linoleic acid (46.2%) and low amount of Linolenic acid and Stearic acid where as spreads containing blend of SMO and RBO, RBO and SBO are highly rich in oleic and linoleic acids. The spreads are also fortified with EPA and DHA along with the blend of

other vegetable oils, and they contain EPA as high as 2.8% and DHA as high as 9.2%.

It is observed from the Table 7 that the spread which is prepared from undeodorized sh llets containing only soybean oil is not at all acceptable whereas product 5 which contains 40% soya DOC is much acceptable while the other 4 products also can be accepted as spreads for consumption.

For TPC dilution factor of 10^{-6} dilution is chosen as the plate count colonies is within 30-300 which the palatable range for food products is.

brain, eyes and liver which are discarded thus fortification is necessary and done by adding them through fish oil so that proportionate amount is retained in the paste products. Bhola bhetki of fish has of low lipid content and thus additions of blended oils highly enhance the nutritional property of the final paste products.

Due to the presence of micronutrients and essential fatty acids these types of spread products can serve as a whole meal for children providing expected developing beneficial effects in their brain and eye. Due to the use of RBO and the blended oils the products can be regarded as beneficial to the elderly people also for providing squalene,

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References

1. % HQMDNXO 6 9LVHVVDQJXDQ : 5LHEUR\ 6 ,VKLJDNL 6 7DQDND O *HO
forming properties of surimi produced from bigeye snapper, *Priacanthus*
WD\HOXV DOG 3 PDFUFDQWKXV VWRUHG LQ LFH - 6FL)RRG \$JU -
2. % LVFDQFKLQ *U\VFKN 6) 2HWWHUH O *DOOR &5 &KDUDFWHULJDWLRO DOG
frozen storage stability of minced Nile tilapia () and red
tilapia (-RXUQDO RI \$TXDWLF)RRG 3URGXFW 7HFKQRORJ\
69.
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UKHRORJLFDO %HKDYLRU 2I \$ODVNDQ 3ROORFN DOG 3DFL 2F :KLWLQJ 6XULPL -)RRG
6FL
- 4.