



Various Parameters Affecting To the Dried Salted Snakehead Fish Production

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Abstract

Fish is highly perishable, and is spoiled rapidly if improperly handled. Salted dried, one of the techniques for preserving fish has been practiced for long period and it is an alternative to lowering the water activity of flesh fish. Snakehead fish (*Channa striata*) is a potential freshwater fish species and has become an important commodity in health food industry due to its abundant albumin content. The snakehead fish has commercial value due to its health benefit. It is a good source of medicinal food because it contains high level of amino acids and fatty acids. Therefore we conducted several experiments to identify the effect of salt soaking time, salt soaking concentration, dry temperature and stability of the dried snakehead fish filler by preservation time. Our results showed that the best quality of the dried snakehead fish fillet could be obtained if the dried snakehead fish fillet treated with 1.0% salt in 1.5 hours and drying at 60°C to 20% moisture content. This application could preserve the dried snakehead fish fillet for 12 months in PA bag without any deterioration. Through this investigation, the added value of snakehead fish could be improved in domestic consumption.

Keywords: Snakehead fish, Fillet, Salinity, Drying, Soaking, Preservation

Introduction

Snakehead fish is a very popular food fish in Vietnam and it is one of the most important economic freshwater fish. Snakehead fish is largely used for food, traditional medicines and pharmacological therapeutics including anti-microbial, anti-inflammatory, cell proliferation, induction of platelet accretion and anti-nociceptive activities.

It is a one of the most common fish among the local populace with traditionally identified pharmacological benefits in treating wound and pain and in boosting energy of the sick. Snakehead extract contains high levels of essential amino acids and a good profile of fatty acids that could directly improve tissue growth, wound healing, nutraceutical supplements and

pharmaceutical products [1]. The albumin-rich of snakehead fish (*Channa striata*) extract, has been developed as medicinal-food due to its antioxidant potential. Curing and drying are traditional low cost preservation techniques. Improper handling and processing can result in a poor quality product due to spoilage and insect infestation.

By controlling raw material quality, processing variables and drying conditions the product quality can be improved significantly [2]. Traditionally, snakehead fish has been processed into the salted dried products. Salting as a method of preserving fish has been used for centuries.

The simplicity of the salting process, the low cost of production and the ease with which it combines with other preservation methods, such as drying or smoking, has led to its popularity and extensive use [3]. Solar dryer-dried fish has got good organoleptic score than the traditional sundried fish. The overall quality of fish dried in the solar dryer was better than the traditionally sundried fish [4]. A study was to determine the process of dried salt snakehead fish with the good sensory properties and the safety for both domestic and international trade [5].

A study was conducted to investigate the possibility of enhancing the quality of cultured snakehead fish (*Channa striata*) protein, especially used in the processing of sausage products, by treatment with protease from its viscera [6]. A study was to determine the effects of combined antioxidants (Propyl gallate (PG) and sodium ascorbate) and packing on lipid oxidation in salted dried snakehead fish during storage at refrigerated temperature (4°C) [7].

Microbiological evaluation and storage stability of snakehead fish extract (*Channa striata*) using steaming method was examined [8]. A study aims to evaluate the chemical composition, amino acids and collagen content of the skin and bone of snakehead fish, as a consideration in its use further.

The percentage of water and protein is higher in the skin, and conversely, the fat and ash content is higher in bone. The highest percentage of amino acids in the skin and bone were glycine and proline, respectively, and the presence of hydroxyproline shown that the skin of snakehead fish was the source of collagen [9].

Snakehead is a reputed medicinal fresh water fish and used to treat wounds, alleviate pain, boosts energy and endowed with remarkable anti-inflammatory, anti-nociceptive, platelet aggregation, as well as mild antimicrobial and antifungal properties. On the purpose of commercial utilization of this, we performed an assessment for various technical parameters affecting to the dried salted snakehead fish production. We focused on the effect of salt soaking time and concentration, drying temperature, and shelf-life of the dried snakehead fish fillet under normal preservation.

Material & Method

Material

We raised snakehead fish fishes in BAC Lieu province, Vietnam. They must be cultivated following Global GAP without using antibiotic to ensure food safety. After harvesting, they must be kept in ice chest (< 4°C) and conveyed to laboratory within 4 hours for experiments. Proteolysis and biochemical changes of muscle can be taken place to some degrees during iced storage. We used knife to fillet the muscle out of bone. Besides collecting muscle of snakehead fish, we also used other materials such as NaCl, monosodium glutamate (MSG), pepper, sugar, and garlic. Lab utensils and equipments included knife, weight balance, thermometer, ice chest.

Research Method

Determination of Salt Soaking time to Salinity and Sensory Characteristics of the Dried Snakehead Fish Fillet

Snakehead fish fishes were filleted by knife to remove bone. These fillets should be washed in acetic acid 0.3% in 5 minutes to remove fishy smell. Then they would be deeply soaked in additive solution (salt 1%, MSG 0.2%, sugar 0.5%, pepper 2% and garlic 2.5%) as food ingredients. We examined different soaking time in 0, 0.5, 1.0, 1.5, 2.0 hours to determine the effect of soaking time to salinity and sensory characteristics in the dried snakehead fish fillet.

These soaked fillets would be dried to 20% moisture content. In order to verify the optimal salt soaking time, we analyzed salinity and moisture (%) in the dried snakehead fish fillet; drilled and tasted the dried snakehead fish fillet for sensory evaluation.

Determination of Salt Soaking Concentration to Salinity and Sensory Characteristics of the Dried Snakehead Fish Fillet

Snakehead fish fishes were filleted by knife to remove bone. These fillets should be washed in acetic acid 0.3% in 5 minutes to remove fishy smell. Then they would be deeply soaked in additive solution (MSG 0.2%, sugar 0.5%, pepper 2% and garlic 2.5%) as food ingredients in 1.5 hours. We examined different salt soaking

concentration in 0, 0.5, 1.0, 1.5, 2.0% to determine the effect of salt soaking concentration to salinity and sensory characteristics in the dried snakehead fish fillet.

These soaked fillets would be dried to 20% moisture content. In order to verify the optimal salt soaking concentration, we analyzed salinity and moisture (%) in the dried snakehead fish fillet; drilled and tasted the dried snakehead fish fillet for sensory evaluation.

Determination of Drying Temperature to Sensory Characteristics of the Dried Snakehead Fish Fillet

Snakehead fish fishes were filleted by knife to remove bone. These fillets should be washed in acetic acid 0.3% in 5 minutes to remove fishy smell. Then they would be deeply soaked in additive solution (salt 1.0%, MSG 0.2%, sugar 0.5%, pepper 2% and garlic 2.5%) as food ingredients in 1.5 hours.

We examined different drying temperature in 50, 55, 60, 65°C to determine the effect of drying temperature to sensory characteristics in the dried snakehead fish fillet. These soaked fillets would be dried to 20% moisture content. In order to verify the optimal drying temperature, we drilled and tasted the dried snakehead fish fillet for sensory evaluation.

Determination of Shelf-life of the Dried Snakehead Fish Fillet by Preservation

The dried snakehead fish fillets which were stored in PA bag at normal room temperature would be monitored the sensory characteristics by preservation time (0, 1, 3, 6, 9, 12 months).

Physico-chemical Analysis

We conducted various testing procedures during this research such as moisture content (drying to basic weight), salinity (Mohr), protein (Kjeldahl), lipid (Soxhlet), and sensory evaluation (score, 1-5).

Statistical Analysis

Data were statistically summarized by Statgraphics.

Result & Discussion

Effect of Salt Soaking Time to Salinity of the Dried Snakehead Fish Fillet

By observing the salinity (%) in the dried snakehead fish fillet; sensory characteristics in the drilled dried snakehead fish fillets in different salt soaking time, we noticed the optimal salt soaking time at 1.0 hours (see Table 1).

Table 1: Salinity and sensory score of the dried snakehead fish fillet by salt different soaking time (hours)

Salt soaking time (hours) (counted on the wet basic)	Salinity (%) in the dried snakehead fish fillet (counted on the dry basic)	Sensory score of the drilled dried snakehead fish fillet
0	1.31±0.01 ^e	2.81±0.01 ^c
0.5	9.25±0.03 ^d	3.75±0.02 ^b
1.0	10.41±0.00 ^c	4.50±0.03^a
1.5	11.90±0.01 ^b	3.61±0.04 ^b
2.0	12.71±0.03 ^a	2.95±0.01 ^c

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%)

A study was to determine the process of dried salt snakehead fish with the good sensory properties and the safety for both domestic and international trade. The results showed that the method of dry salting enhanced dried fish more flavor and better structure compared to brine salting.

Moreover, with the use of 5% salt, 5% sugar, 1.5% monosodium glutamate and 2% (w/w) fish sauce produced dried snakehead fish with high sensory properties.

The addition of sticky rice wine and glycerol resulted in reduction of moisture content, water activity and the amount of viable bacteria. Adding garlic juice and packaging dried fish products under vacuum condition also contributed to retain the quality and prolong the shelf-life of dried snakehead fish products [5].

Effect of Salt Soaking Concentration to Salinity and Sensory Characteristics of the Dried Snakehead Fish Fillet

By observing the sanility (%) in the dried snakehead fish fillet; sensory characteristics in the drilled dried snakehead fish fillets in

different salt soaking concentration, we noticed the optimal salt soaking concentration at 1.0% (see Table 2).

Table 2: Salinity and sensory score of the dried snakehead fish fillet by different salt soaking concentration (%)

Salt soaking concentration (%) (counted on the wet basic)	Salinity (%) in the dried snakehead fish fillet (counted on the dry basic)	Sensory score of the drilled dried snakehead fish fillet
0	1.31±0.01 ^e	2.81±0.02 ^c
0.5	7.23±0.02 ^d	3.43±0.01 ^b
1.0	8.10±0.01^c	4.54±0.02^a
1.5	9.40±0.02 ^b	3.40±0.03 ^b
2.0	10.63±0.01 ^a	2.90±0.01 ^c

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%)

Effects of pre-treatments and drying temperatures on the drying rate and the quality of African Catfish *Clarias gariepinus* was examined by drying samples of catfish under four different temperatures (40 0C, 45 0C, 50 0C and 55 0C) and four different pre-treatment methods (Salting, Sugaring, Blanching, and Control) using an experimental dryer.

The drying rate increases with increase in temperature for all the pre-treatment methods and decreases with time. The values are higher for blanched samples and low for the sugar treated samples [10]. Effect of brine and dry salting methods on the physicochemical and microbial quality of

chub was investigated. It was determined that crude protein, lipid, crude ash and salt amounts in the group where dry salting method was applied were higher than the group where brine salting occurred, in addition protein and lipid values decreased as storage period was longer[11].

Effect of Drying Temperature to Sensory Characteristics of the Dried Snakehead Fish Fillet

By observing the sensory characteristics in the drilled dried snakehead fish fillets in different drying temperature, we noticed the optimal drying temperature at 60°C (see Table 3).

Table 3: Sensory score of the dried snakehead fish fillet by different drying temperature (°C)

Drying temperature (°C)	Sensory score of the drilled dried snakehead fish fillet
50	3.71±0.03 ^c
55	4.04±0.01 ^b
60	4.60±0.03^a
65	4.01±0.01 ^b

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Tilapia (*Oreochromis niloticus*) was processed by varying salting time (0-24 h), drying time (6-20 h) and drying temperature (40-60°C) using the central composite rotatable design. The critical salting times for attaining minimum moisture were 20.5, 12 and 8.5 h, respectively, for products dried at 40, 50 and 60°C [13]. For getting better quality-dried fish, it is very essential to use improved methods of fish drying. Moreover, it is also important to maintain required hygiene during the different phases of fish drying [2].

Shelf-life of the Dried Snakehead Fish Fillet by Preservation

The dried snakehead fish fillets which were stored in PA bag at normal room temperature would be monitored the sensory characteristics by preservation time (0, 1, 3, 6, 9, 12 months). We realized our products remain stable until the 9th month. At the 12th months, we saw a minor change of flavor and aroma. So we strongly believed our dried snakehead fish fillet could be safely preserved in PA bag for 12 months without any deterioration.

Table 4: Sensory score of the drilled dried snakehead fish fillet by preservation time (months)

Preservation time (months)	Color score	Flavor score	Aroma	Mold appearance
0	4.60±0.02 ^a	4.56±0.01 ^a	4.45±0.02 ^a	Not detected
3	4.60±0.01 ^a	4.54±0.01 ^a	4.45±0.02 ^a	Not detected
6	4.58±0.03 ^a	4.53±0.01 ^a	4.43±0.01 ^a	Not detected

9	4.57±0.01 ^a	4.53±0.02 ^a	4.42±0.02 ^a	Not detected
12	4.56±0.02 ^a	4.00±0.02 ^b	4.09±0.01 ^b	Not detected
Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant ($\alpha = 5\%$).				

A study was performed to investigate the influence of sun-drying treated with salt (30%) and storage time under refrigeration (4 °C) temperature on the nutritive value (moisture, protein, fat, ash), chemical composition (TVB-N, FFA, pH) and bacteriological analysis (SPC, HBC) of two different size fresh water fish-species (*Channa punctatus* and *Mystus tengra*).

Small sun-dried salted fish like *M. tengra* had longer shelf-life (32 months) than medium-size sun-dried salted fish like *C. punctatus* [13].

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Conclusion

Snakehead fish has been used as biomedical and nutraceutical products for clinical trials, treatment of several chronic diseases as well as improvement of human health and therapeutics to a greater extent. With the purpose of enhancing the added value of snakehead fish, we have successfully investigated some technical parameters affecting to the dried snakehead fish fillet production. This product could be consumed within 9 months on the normal preservation.

To increase consumption, convenient products like this with good sensory attributes should be offered.