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Boulti (*Tilapia nilotica* Linn.) fish paste 1. Preparation and chemical composition

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With 4 tables

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The main problem associated with the increasing utilization of fish for human consumption is the high perishability of fish, and extreme precautions must be taken to preserve fish in an economical manner. Much work has been done on packaging of fish paste. *Yasuda* (1970) covered fish paste with a film of heat-resistant resin and then steam-cooked. The British patent (Anon., 1970) prepared fish paste for packing into tubes. *Zaitev* et al. (1969) used aluminium tubes for fish paste and pâté. The tube has a cylindrical body with a conical end and a small projection to which a plastic cap is screwed. The other end of the tube is sealed by rolling it over two to four times. They also indicated that the tubes may also be made of polyvinylchloride (PVC), polystyrene and cellulose acetate. The purpose of the present work is to study the possibility of converting the edible parts of the large sizes of Boulti fish (*Tilapia nilotica* Linn.), from Naser's lake in Aswan to a ready marketable product in aluminium tubes and polyethylene bags. The quality of the product was ascertained by chemical methods.

Materials and methods

Boulti fish (*Tilapia nilotica* Linn.) was caught from Naser's lake (Aswan) and transported to Cairo under refrigeration by the Egyptian General Organization for Food Stuffs. It was decapitated, eviscerated, washed with tap water, and then it was cooked in water (2 parts water : 1 part fish by weight) which contained. 3 % Na_2CO_3 $10H_2O$ and 2 % acetic acid at 80 °C for one hour. The flesh was separated, and 800 g of the fish were then mixed with the following ingredients (measured in g): salt, 40; onion (powder), 56; coriander, 4; starch, 80; glucose, 16; vitamine C, 2; pepper, 4; and cottonseed oil, 520. The paste was poured in 30-ml aluminium tubes and polyethylene bags and kept under refrigeration (2–4 °C) for 5 weeks. Samples were analysed every week for 5 weeks for the freshness indices.

Moisture content, total lipids, ash and total carbohydrates were determined using the standard methods reported in the A.O.A.C. (1970). Total nitrogen was determined according to *Lillevik* (1970), and the factor 6.25 was used to calculate protein content. Volatile nitrogenous constituents were carried out according to the *Okaloff* magnesium oxide distillation volumetric method as described by *Winton* and *Winton* (1958). α-amino nitrogen was determined according to *Pope* and *Stevens* (1939).

Results and discussion

Table 1 shows the chemical composition of fish flesh used and the produced paste. It could be seen that the paste is rich in lipids, protein, and carbohydrates. Table 2 shows the moisture content of fish paste through 5 weeks storage at 2–4 °C in both aluminium tubes and polyethylene bags. From these results it could be noticed that there was no change in the moisture content of fish paste during the storage period. These results indicate that fish paste could be packaged in both polyethylene bags and aluminium tubes.

Table 1. Proximate composition of Boulti fish (*Tilapia nilotica* linn.) and fish paste (g/100 g).

	Fish Flesh	Fish Paste
Moisture	77.32	46.79
Protein (N × 6.25)	19.75	11.52
Lipids	2.17	27.28
Ash	0.21	1.37
Carbohydrates	–	15.43

Table 2. Moisture content of Boulti fish paste during storage at 2–4 °C.

Time (weeks)	Aluminium tubes	Polyethylene bags
0	46.79	46.79
1	46.83	46.91
2	44.42	43.34
3	44.84	46.63
4	46.39	45.31
5	46.23	46.68

Table 3 shows the volatile nitrogenous constituents of the fish paste during the storage period. Total volatile nitrogen is a mixture of many volatile nitrogenous compounds, such as ammonia and other lower simple monoamines. It is usually used as an index of freshness of proteinatious materials (*Sen*, 1966). Samples of fish paste were found to contain 55.6 mg T.V.N./100 g of fish paste at the beginning of the storage period. A slight decrease was noticed in T.V.N. during the first two weeks. Trimethylamine nitrogen has been used also as an index of the quality of fish. The product contained 4.9 mg T.M.A. nitrogen per 100 g. T.M.A. nitrogen content increased after a storage period of two weeks. T.M.A. could be synthesized from amino compounds such as betain, choline, acetyl choline, and trimethylamine oxide. The later compound has been reported to be the main source and gave about 94 % of T.M.A. (*Beatty*, 1938). The produced paste contained 14.0 mg ammonia nitrogen/100 g immediately after its manufacturing. Ammonia nitrogen increased to 30.8–32.9 mg/g after 3 weeks, followed by a decrease to 20.5–22.6 mg/100 g at the end of the storage period.

Table 3. Volatile nitrogenous constituents of Boulti fish paste during storage at 2–4 °C (mg/100 g).

Time in weeks	Total volatile nitrogen		Trimethylamine nitrogen		Ammonia nitrogen	
	a.t.[1])	p.b.[2])	a.t.[1])	p.b.[2])	a.t.[1])	p.b.[2])
0	55.6	55.6	4.9	4.9	14.0	14.0
1	31.5	37.8	4.9	6.8	17.5	17.5
2	36.1	40.3	12.6	11.5	21.0	20.3
3	50.4	48.9	12.6	11.9	30.8	32.9
4	52.8	47.3	9.1	10.7	61.1	25.6
5	55.6	46.4	11.2	11.4	22.6	20.5

[1]) aluminium tubes
[2]) polyethylene bags

α-amino nitrogen was used to follow the protein degradation by bacterial and/or autolytic enzymes present in the tissues. From table 4 no changes can be seen in α-amino nitrogen of the fish paste during the storage period.

It can be further concluded that fish paste has a good flavour and can be kept for 5 weeks without undesirable changes at refrigeration temperature. Therefore we recommended its production in Egypt especially from Aswan lake fishes. The fish paste in this experiment is a precooked product. The ease of its handling and usage makes it a potential fish product in Egypt. Further studies should be done on the storage of fish paste at room temperature, since this is one of the main problems in handling fish and fish products.

Table 4. α-amino nitrogen of Boulti fish paste during storage at 2–4 °C (mg/100 g).

Time in weeks	Aluminium tubes	Polyethylene bags
0	56.0	56.0
1	56.0	56.0
2	56.0	56.0
3	54.7	55.6
4	55.1	57.2
5	54.5	56.4

Summary

Boulti fish (*Tilapia nilotica* Linn.) from Naser's lake in Aswan was converted to a ready marketable product (paste) in aluminium tubes. The quality of the product was ascertained by chemical indices. The product has a good flavour and can be kept for 5 weeks without undesirable changes. It is concluded that the production of fish paste in aluminium tubes is one of the possibilities of converting fish to precooked product.

References

1. *Anonymous:* British Patent 1,171,982. Fish protein product. Food Technology **24** (5), 62 (1970). – 2. A.O.A.C.: "Official Methods of Analysis", 12th ed. Association of Official Agricultural Chemists (Washington, D.C. 1970). – 3. *Beatty, S. A.:* Studies of fish spoilage. II. The origin of trimethylamine produced during the spoilage of cod muscle press juice. J. Fisheries Research Board Can. **4,** 63 (1938). – 4. *Lillevik, H. A.:* The determination of total organic nitrogen. In: "Methods in Food Analysis", *Joslyn, M. A.,* 2nd ed. 601 (New York 1970). – 5. *Pope, E. G., M. F. Stevens:* The determination of amino nitrogen using a copper method. Biochem. J. **33,** 1070 (1939). – 6. *Sen, D. P.:* Fish odors and problems of their removal. J. Food Sci. Technol. **3,** 1 (1966). – 7. *Winton, A. L., R. B. Winton:* The Analysis of Food (New York 1958). – 8. *Yasuda, S. K. K.:* Fish paste. Japanese patent. Food Technol. **24,** (5) 62 (1970). – 9. *Zaitsev, V., I. Kizevetter, L. Lagunov, T. Makarova, L. Minder, V. Podsevalov:* Fish curing and processing, Mir Publishers (Moscow 1969).

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