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Survey on the Quality of Jaadi Available Sri Lankan Market

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Abstract

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A quality of survey was conducted at the fish curing yards in a Northwest Cost an the South Cost in Sri Lanka. A total of 40 samples different varieties of fishes were collected from the market and jaadi curing yards and all were evaluated for the quality, fungal and insect infestation. Samples were analyzed for proximate composition chemical, microbiological and sensory quality.

Thirty percent of the total analyzed samples of fish were found to be unfit for consumption. Samples collected from Negombo were found to the infected with maggots. Only 42% samples had dry matter above 50%. All the samples showed a protein content above 20%. The highest protein content was 27.92% in hurulla. Over 90% of the samples had TVN at acceptable quality limits (>40). The TBC OF 33% of the samples were in the range 104 - 105 /g range, while 48% were in the range of 107-108 /g due to contamination of maggots and fungi.

The Survey showed jaadi had a high level of protein in its composition. But defects of curing process such on imperfect cleaning inadequate salting resulted in low (Chemical and microbiological) quality of the product.

Introduction

The Asian people are found to consume relatively low protein diets compared to their western counterparts. The marine and fresh water fish species constitute an important source of protein in their diets. Due to the lack of adequate facilities for cold storage in many developing countries, curing and fermentation are considered suitable options to meet the preservation of fish, especially collected during the peak fish season. The cured fish is not only

low in price but also provide the taste and nutrients to the consumers to satisfy their needs

Jaadi is low cost preservation method ideally suitable for local conditions. It is a high salt containing traditional Sri-Lankan fishery product consisting of partially hydrolyzed fish flesh and organs, immersed in a liquid exuded from fish. The low pH is maintained by the addition of fruit of goraka (*Garcinia camboges*). The pod contains several organic acids of which tartaric and citric are most important ones.

The fish is gutted and cleaned in sea water and then packed in suitable containers with alternative layers of fish and salt/ goraka mixture, at a ratio of 1part of the above mixture to three parts of fish and then content are sealed.

Jaadi is low cost fish preservation method ideally suitable for local conditions. Commercial scale production of this items has many problems of safety due to the fungal and microbial contamination and due to high level of fats and oil in the raw materials used. Rancidity is also another serious problem. Unhygienic traditional method of processing also seriously limits the shelf life of the products.

This experiment was carried out to study the curing methods adopted at various centers and evaluate the quality of jaadi at different centers.

Materials & Methods

The five sampling sites were identified in North West coast up to chillaw and in Southern coast up to Matara. Experiment lasted for three months. Five visits were made during three months period. Samples were collected and taken to the laboratory packing in polythene bags. The data in relation to preparation technique and marketing informations were collected. Jaadi samples from fourty fish stalls, located in Negombo, Beruwala, Wadduwa and Dodanduwa. The samples were evaluated for quality parameters. The species like skipjack tuna (Katsuwonus pelamis), Sardinella (Sardinella longiceps). Spanish mackerel (Scomberomorus commerson), Striped tuna (Euthynnus pelamis), Herring (Amblygaster Sirm), Trevally (Caranx, stellatus), Ribbon fish (Trichiurus savala), Indian mackerel (Rastrelliger Kanagurta) were collected from coastal areas. Only small fish species were used in Chillaw and Negombo. The ten fish species were analyzsed for the following quality parameters.

The set of five fish from each species was taken for analysis following quality parameters. The samples were analyzed Total Volatile nitrogen and Trimethylamine by Conway byners method (1931). Fat analysis was carried

out using Bligh and Dyer method. The salt content, ash, dry matter, protein were evaluated using AOAC (1980) standed metod were used to estimate.FFA (Anonymous, 1992) and Total plate Count (Busta. 1984)

Results

Table-1 presents the proximate composition of raw fish and jaadi. All the varieties were found to be rich in minerals, protein and oil. However crude protein content was highest in jaadi made out of Herring *(Amblygaster sirm)* while it was lowest in Spanish mackerel. (*Scomberomorus commersom*) The highest ash content was observed in jaadi made out of Sardine (*Sardinella longiceps*), Skipjack tuna (*Katsuwonus pelamis*) and Indian mackerel (*Rastrelliger kanagurta*) respectively. The ash content in raw fish sample did not exceed 4.3% in Skip jack tuna (*Katsuwonus pelamis)* The lowest ash content was 17.6% in jaadi made out of Ribbon fish. (*Trichiurus savala*). Herring *(Amblygaster sirm)* had 4% oil content in raw fish and 5.85% in jaadi while the highest oil content 11.5% was observed in jaadi made out of Spanish mackerel (*Scomberomorus commersom).* The lowest oil content 0.9% was recorded in jaadi made out of Skipjack tuna (*Katsuwonus pelamis*).

Table-.2. Presents the quality parameters of some jaadi prepared using different fish varieties. Among ten fish varieties, Sardine (*Sardinella longiceps*) indicated the highest level of TVN. It was in the range of 10^7-10^8 /g and FFA value 25.84%. The Spanish mackerel. (*Scomberomorus commersom*) sample shows the second highest TVN value and 14.26 mg/100g of TMA value. The TBC/g ranged from 10^7-10^8 /g and FFA value was 14.3. The lowest TVN value 41.23 mg/100g was indicated in Herring (*Amblygaster sirm*) which had TBC in the range of 10^4-10^5 /g sample.

The ranges of Total Bacterial Counts of jaadi in different producing areas in table-3. Total Bacterial Counts of a majority of samples fell in the range of 10^4-10^5. /g. According to the samples from the five stalls only Beruwala and Dodanduwa fell the minimum range of 10^2-10^3 /g. The highest range of viable counts that is 10^7-10^8 /g recorded in thirteen stalls, out of which eight stalls were in Negombo. It was 32.5% of the total samples. The high total bacterial counts may be an indicator of improper hygienic conditions of jaadi. The producers should be educated to use only specific quantity of salts with good quality (Anon, 1962). Only by using good salt, the attack of halophiles, can be controlled. Salting time has to be enhanced in order to prepare hygienic products. Spoilage of dried fish may be due to bacterial, fungal or yeast action rancidity and other reactions, all, of which depend on temperature and water activity.

Evaluation of the proximate composition of selected samples of fermented fish jaadi

Table 1: Proximate (%) composition of different varieties of jaadi and the raw fish

	Dry matter		Ash		Oil		Salt		Protein	
Variety	Raw	Jaadi	Raw	Jaadi	Raw	Jaadi	Raw	Jaadi	Raw	jaadi
Skipjack tuna.(*Katsuwonus pelamis)*	35	39.17	4.3	24	1.1	0.94	4.3	19.68	15.6	18.32
Ribbon fish (*Trichiurus Savala)*	40.5	43	19	17.6	1.8	3.4	13.2	17.8	18.2	18.05
Spanish mackerel (*Scomberomorus commersom)*	41.5	43.4	2.6	18.3	1.2	11.5	14.5	14.8	21.5	13.83
Striped tuna(*Euthnnus pelamis)*	40.5	41	2.7	19.24	2.2	1.31	5.3	24.56	23.3	20.57
Herring(*Amblygaster sirm)*	41.3	45.3	2.3	18.08	4.5	5.85	6.4	18.3	19.2	27.92
Trevalley (*Caranx stellatus)*	43	46.3	2.3	18.26	6.6	1.32	2.8	22.4	21.4	24.35
Pulunna(*Histrophorus gladius)*	45.6	50.99	2.4	18.4	0.9	6.92	6.7	17.8	22	24.35
Sardine (*Sardinella longiceps)*	51.3	54.13	22	21.27	2.1	6.3	7.3	20.23	17.3	19.09
Indian mackerel(*Rastrelliger kanagurta)*	46	50.82	2.7	23.31	2.7	1.4	7.3	20.23	17.2	19.09
Sardine (*Sardinella Albella*	45	54.13	2.7	24.64	0.8	6.3	7.5	20.23	17.3	17.86

Table 2: Quality parameters of some jaadi prepared different at of fish varieties.

Variety	TVNmg/100g	TMA mg/100g	TBC $10^4 10^6$/g, $10^7 10^8$/g	FFA(%)
Skipjack tuna.(*Katsuwonus pelamis)*	45.7	9.51	+	56.57
Ribbon fish (*Trichiurus Savala)*	159.41	5.7	+	14.3
Spanish mackerel (*Scomberomorus commersom)*	237.61	14.26	+	5.02
Striped tuna(*Euthnnus pelamis)*	75.073	14.08	+	18.23
Herring(*Amblygaster sirm)*	41.23	9.39	+	18.23
Trevalley (*Caranx stellatus)*	75.03	11.74	+	14.23
Pulunna (*Histrophorus gladius)*	58.65	16.43	+	15.99
Sardine (*Sardinella longiceps)*	green	18.86	+	25.84
Indian mackerel(*Rastrelliger kanagurta)*	42.23	2.35	+	32.15
Sardine (*Sardinella albela)*	92.77	20.44	+	25.84

Table 3: Ranges of Total Bacterial Counts at (300 C) of jaadi samples obtain from the Southern coasts and the North Western coastal area

Producing area	10^2-10^3/g	10^3-10^4/g	10^4-10^5/g	10^5-10^6/g	10^7-10^8/g
Negombo	0	0	2	0	8
Beruwala	3	0	6	1	0
Wadduwa	0	0	5	5	0
Dodanduwa	2	0	3	0	5

Table 4: Ranges of TMA (Try Methyl Amine content in jaadi samples from different producing areas of Sri Lanka

Producing areas	0-5 mg/100g	5-10 mg/100g	10-20 mg/100g	20>mg/100g
Negombo	0	0	5	5
Beruwala	5	5	0	0
Wadduwa	5	0	5	0
Dodanduwa	0	0	5	5

Table 5: Ranges of TVN (Total Volatile Nitrogen) of jaadi samples From different producing areas of Sri Lanka.

Producing area	0-10	10-40	>40
Negombo	-	-	10
Beruwala	-	-	10
Wadduwa	-	-	10
Dodanduwa	-	-	10

he ranges of TMA level of jaadi purchased from producing areas are given ı table-4. The ten samples from Negombo and Dodanduwa were observed to ave the highest range of TMA levels above >20mg/100g and it was 25% of ıe total. The samples from Beruwala and Wadduwa recorded a minimum MA content of 0-5mg/100g. Majority of samples fell in the range of 10-5mg/100g

able-5. Shows ranges of TVN (Total Volatile Nitrogen) of jaadi samples rom different producing areas of Sri Lanka.None of the jaadi samples had 40mg/100g while all the samples had >40mg/100g in all producing areas.

Discussion

he proximate composition of jaadi varied depending on the handling ractices, species of raw material used, fermentation stage and processing ıethod of the jaadi. The proximate composition shows that jaadi of various sh species is an important animal protein and mineral supplement while it is lso and important cottage industry.

ıadi indicates high protein content, oil content and ash content. It contains ıore than 50% dry matter. However a reduction in proximate composition of

product is shown, which can be attributed mainly to dilution effect of added salt and goraka. (Taeluk, 1992). The variation could depend on the fish species used, the concentration levels of salt, goraka and fermentation period.

The present study indicates that the dry matter content is above 50% in 7 samples, and the moisture content is within the limits of ISI standard ISI (Anon, 1964: Anon, 1969: Anon, 1976). Dry matter increases with the salt content. The greater the proportion of salt employed, the quicker its absorption and shedding of moisture by the muscle. Some studies have shown that the final level of Sodium chloride and moisture attained too are dependent on the salt ratio (Narayanswamy 1980). But this study did not show similar increase of dry matter with salt Content. This may be due to the variation of pH value which was changed by the proportion of goraka added. In this study, the salt content ranged from 13.44% to 24.5%. Most of the samples do not conform to the ISI level of salt (Anon, 1962). Previous studies have shown that of the inadequate salting of the samples make them easily unacceptable (Poulter, 1980). George *et.al.* (1983) in his study has reported that 77.12% of samples he studied had a moisture level above 35%, 97.18% showed salt level below 25% and also 42.32% gave standard plate counts above 10,00 the major defects he observed were imperfect cleaning , inadequate salting and unhygienic conditions of processing. Similar observations were made in the present study.

The samples with higher TVN and TMA values also indicated higher plate count. The TBC decreased with the increase in salt and pH. while increased with dry matter. This is influenced by growth of microorganisms. It is highly essential to use good quality salt (Anon, 1962). The maggots affected sample was in the range of 10^7-10^9/g in TBC value.

The fish varieties in the highest TBC/g range of 10^7-10^8 /g were Skip jack tuna (*Katsuwonus pelamis*), Ribbon fish (*Trichiurus savala*), Striped tuna (*Ethnnus pelamis*) and Sardine (*Sardinella longiceps*) The main reason for spoilage in fish with higher plate counts were fungi and maggots. The red halophiles were not observed. These results indicate that the highest spoilage shown by Sardine (*Sardinella longiceps).* Simillar observations have been made by Sirinivasan *et al.* (1966) where they attributed the TVN values observed to inadequate salty and acidification.The fish sauce of low pH do not always show high acidity, but they contain little volatile basic nitrogen and trimethylamine (Hiroshilotoh *et.al.* 1992). High ranges of TVN values for cured fish have been observed previous studies by George *et al.* (1983). The TVN value range from 36.26 to 140.9 mg/100g. The average is 79.62 mg/100g. George *et. al.* (1983) commercially cured fishery products from Malabar and Kanara coast were the TVN value of sardine 77.58mg/100g and

white bait 117.31 mg /100g mackerel 77.73 mg/100g. This shows that the curing processes practiced are not in upto standards.

The present study indicates the TVN value ranging from 24.32 to 237.61 mg/100g in many samples and also some varieties are above non-detected level. The highest TVN value was observed in Skipjack tuna (*Katsuwonus pelamis*) at Wadduwa and in Sardine (*Sardinella longiceps*) at Negombo. The lowest TVN value was 40.66mg/100g in Indian mackerel. (*Rastrelliger kanagurta*) from Wadduwa When TVN and TMA value increased, The TBC, TVN, TMA values indicate that the products from Southern coast are of exceptional high quality compared to those from other centres.

That there were differences in the quality of cured product depending on the variety and these differences can be connected to the differences in the specis used practice of curing, such as condition of raw fish, concentration of salt and goraka added maturation period, storage technique, handling practices Naranyaswamy, (1980) also pointed out that short maturation period results poor penetration of salt and acid.

Strict sanitary conditions in all stages of processing and using proper combinations of ingredients should be enforced for the preparation of hygienic products. The method of processing wasn't similar in all the centers. Proper washing of the dressed fish was not found to be practiced in most of the places. The ratio of salt to fish and goraka and the period of maturation should be observed correctly and properly under hygienic conditions. The gathered informations in the present study showed the method of processing jaadi wasn't similar in all centers. The ratio of fish: salt was not in proper combination.

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