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Enhance the Utilization of Trash Fish through Value Addition and Its Storage Study

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Abstract:
Trash fishes are widely used in coastal areas either directly or indirectly for human consumption and un-hygienically dried and used as poultry feed. Trash fishes that are freshly prepared and carefully managed can be a very good and inexpensive, source of food for culturing aquatic animals. Sadly, this is not in practical due to its unknown nutritional components. The nutritional values of the discarded fishes are very important to initiate proper use of these trash fishes in a desirable way. Hence, understanding the nutritional value of trash fish is very important. Although several studies have dealt with the proximate biochemical components of many commercially important fishes work on similar lines was very limited in trash fishes and the present study has been conducted to collect the nutritional data sheet of selected trash fish and compared with commercial available fish. Furthermore, value added fish products has been prepared from the meat of trash fish.
Utilization of low valued by catches from catches for human consumption is mainly done in the form of mince based products like fish sausage, cakes, cutlets, patties, balls, pastes, wafers, fingers, surimi, texturized products etc., or fish protein concentrate with or without bone was already studied. All these are net cod end should not exceed 35-40 mm mesh size. made from commercially high value market sized fishes. However, in the above products fish bones are discarded for the convenience of eating, there by wasting important minerals like calcium, potassium, sodium and zinc. Value addition and diversification to satisfy the ever changing demand from the importing countries as well as urban consumers at home are some of the major challenges faced by the Indian fish processing industry. Value addition means "any additional activity that unused. The fish that are not utilized for human changes the nature and presentation of the product thus adding value to it for sale". Present market trends are indicative of extensive growth in the demand for ready-to cook or ready-to - serve convenience products processed out of a variety of fin and shell fishes.

1. Materials and Methods

1.1. Sample Collection
In this study fresh two species of Lizard fishes with different size ranging from 20-35 cm will be collected from the landing areas of Kerala fishing harbour. The collected samples will be kept in ice and transported to the laboratory in polystyrene boxes to sustain freshness. In the laboratory, the fish samples will be thoroughly washed and rinsed with de-ionized water to remove the adhering contaminants and then drained. Some whole fish will be used in fresh and other preserved by freezing and others are preserving by drying and smoking for identification and comparison of proximate composition.

SL No.	Sample collected area	No. of samples	*Saurida tumbil*	*Saurida undosquamis*
1	Kerala coast	2	1	1
2	Fish landing centre	49	31	25
3	Fish market	49	18	24
4	Total	100	50	50

Table 1

By utilizing of trash fishes especially lizard fishes were different value added products in Kerala region. For example, Fish cutlet, fish pickle, fish wafer, fish chutney powder, fish curry and fish ball etc.

1.2. Preparation of Fish Pickle

Low value fish like Lizard fish meat is using for the preparation of fish pickles.

1.2.1. Ingredients (for 1 kg Fish meat)

Salt	-	40g
Vegetable oil	-	200g
Garlic	-	100g
Green chilli	-	100g
Ginger	-	100g
Curry leaves	-	10g
Broken mustard	-	20g
Chilli powder	-	50g
Turmeric powder	-	20g
Pepper powder	-	5g
Fenugreek	-	10g
Vinegar	-	20 ml

1.2.2. Procedure:

Dressed fish cut into small pieces and mix with turmeric powder and salt and keep for 1-2 hours. It is then fried in vegetable oil. In the remaining oil the ground spices (by grinding of green chilli, ginger, curry leaves and garlic) are fried. If it is in semi fried condition adds the chilli powder and broken mustard. Once it is fried it is mixed with vinegar and heated. When it boils adds the fried fish and boil for 10 minutes. Cool to room temperature or allow curing for 1-2 day. Finally pack in pouches or glass bottles for storage at room temperature.

1.3. Product – 1.8-2.0 Kg Fish Pickle

1.3.1. Fish Cutlet

Ingredients (for 1 kg cooked & mashed fish meat)

Salt	-	30g
Potato	-	1-1.5kg
Onion	-	500g
Green chilli	-	50g
Ginger	-	50g
Curry leaves	-	20g
Coriander leaves	-	20g
Chilli powder	-	20g
Turmeric powder	-	20g
Pepper powder	-	5g
Masala	-	10g
Vegetable oil	-	150g
Egg	-	2 nos.
Wheat flour	-	100g
Bread powder	-	200g

1.3.2. Procedure

Dress the fish and cook in water for 5-10 minutes. Cool to room temperature and separate the meat manually. In the case of prawn peel and cook the meat and mash it. Potato is cooked, peeled and mashed. Green chilli, ginger, onion, curry leaves etc. are chopped and fried in oil. When this frying is almost over, adds chilli powder, turmeric, masala and chopped coriander leaves. Blend cooked meat with mashed potato, fried spice and mould this blended mixture in the wooden/metallic mould of required size.

Egg is mixed with water and Maida to form batter in which the moulded cutlet is dipped and bread powder is sprinkled. This battered and breaded cutlet are quick frozen, packed in polythene bags and stored at -20 ^{o}C.

1.4. Product – 40g Fish Cutlet – 50 To 60 Nos.

1.4.1. Fish Finger

Ingredients (for 1 kg fish)

Egg	-	6 nos.
Salt	-	10g
Garlic	-	10g
Ginger	-	20g
Small onion	-	25g
Chilli powder	-	25g
Pepper powder	-	10g
Lemon	-	3 nos.
Wheat flour	-	50-75g
Bread powder	-	200g

1.4.2. Procedure

Dress the fish and remove the skin, separated meat cut in to small sizes. Marinate the fish pieces with salt and lime juice and keep for 1 hour.

1.4.3. Batter preparation

Cleaned garlic, ginger and small onion are grind first to get a paste and to this paste add chilli powder, pepper powder, wheat flour and salt and mix well to get a batter. After 1 hour, dip the fish pieces in this batter and s bread powder is sprinkled. The battered and breaded fish finger is quick frozen at -40^{o}C and packs in polythene bags and store at -18 ^{o}C.

2. Analysis

The samples were analyzed at regular intervals of every 15th days for various parameters.

i. Proximate composition: Moisture, fat, protein and ash were determined according to A.O.A.C, 2006.
ii. Microbial test: The Microbiological characteristic of fresh fish and fish burgers was carried out according to standard method recommended by AOAC (2006).
iii. Freshness analysis
iv. Determination of Total Volatile Base Nitrogen (TVB-N): Determination of total volatile base in the sample was determined as total volatile base nitrogen (TVB-N) by the micro diffusion method described by Beatty and Gibbons (1937).
v. Determination of Trim ethylamine Nitrogen (TMA-N): TMA was determined as trim ethylamine nitrogen (TMA-N) by the micro diffusion method described by Beatty and Gibbons (1937).
vi. Determination of Peroxide Value (PV): The peroxide value (PV) of lipid was determined from the lipid extract according to Jacobs (1958) iodomatrically.
vii. Determination of Free Fatty Acid (FFA): The free fatty acid (FFA) content in the lipid extract was determined with improved titrimetric method as described by Takagi *et al.,* (1984).
viii. Sensory Analysis: Sensory characteristics were evaluated for fresh fish, minced meat and fish burgers using 9-point Hedonic scale (Joseph and Iyer, 2006).
ix. Statistical Analysis: Data analyzed statistically were carried out as per factorial complete randomized design. Analysis of variance was worked out using standard statistical procedures as described by Snedecor and Cochran (1967).

3. Results & Discussion

From the obtained data of raw material characteristics lizardfish is suitable for minced based products development. In present study, Enhance the utilization of trash fish through value addition and its storage study Lizardfish selected for the preparation of minced meat and value added products because since it was not preferred as a table fish in fresh condition due to it unfamiliar appearance. Lizardfish (*Saurida tumbil*) is a lean fish with high flesh content, available throughout the year and low price. Present study had shown that the results of sensory, chemical and bacteriological parameter within limit of acceptability. So, value added products from this fish have better organoleptic quality and nutritional characteristics.

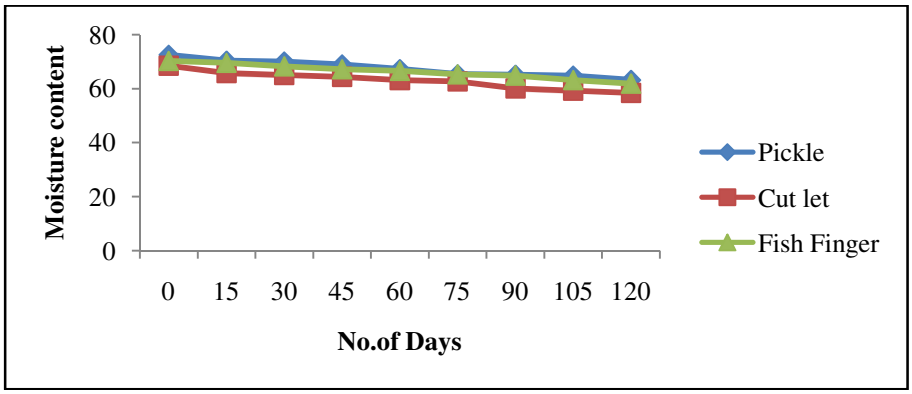

Figure 1: Proximate composition of Value added products

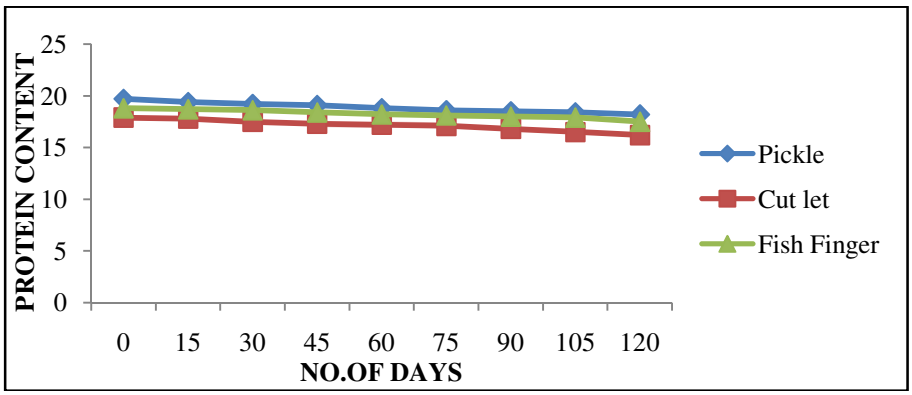

Figure 2

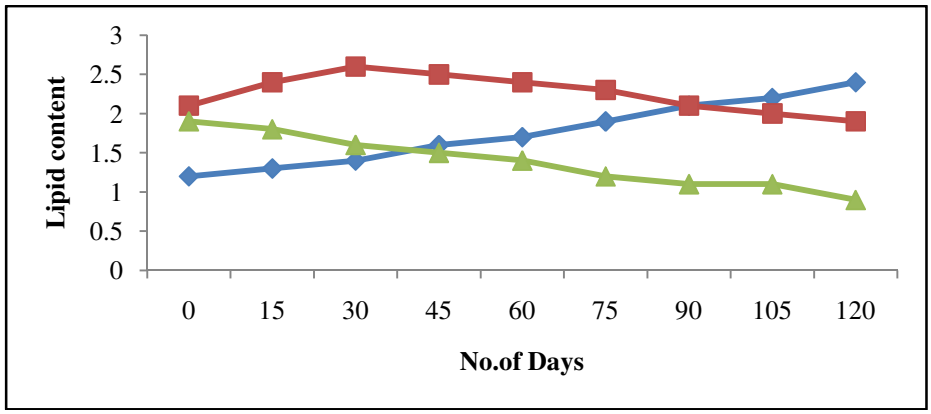

Figure 3

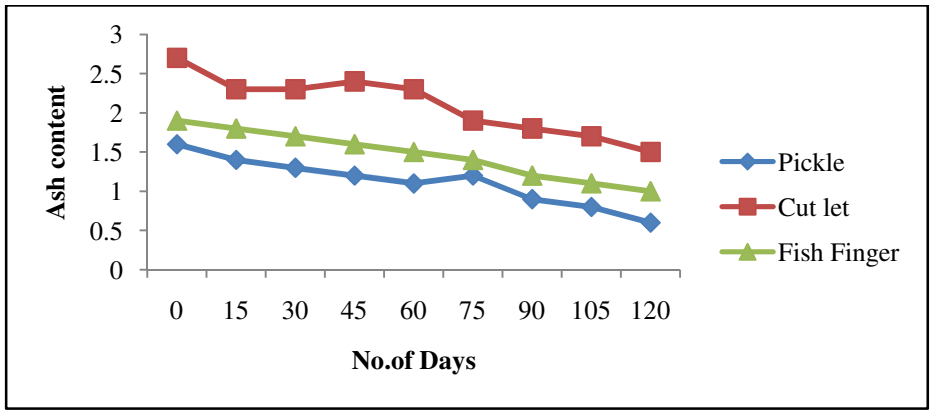

Figure 4

3.1. Proximate Composition

According to statistical findings, there were significant (P<0.05) differences in the moisture, crude protein and total ash in the fish pickle, fish cutlet, and fish finger samples but no significant (P>0.05) differences was found in the total lipid. (Figures 1-4)

During frozen storage the moisture content of fish pickle, fish cutlet, and fish finger slightly decreased. It is usual to find reduction in moisture content of fish and fishery products during frozen storage because of dehydration (Joseph and Perigreen, 1988). A significant decrease in protein content of value added products. During 30 days on wards fish pickle lipid content was drastically increased position compared fish cutlet, fish finger. Ash content of the value added products was increasing by period of storage days.

3.1.1. TMA-N

TMA-N value increased in all the samples but remained within the acceptable limit of 10-15 mg % as suggested by many workers (Sengupta *et al.,* 1972; Connel, 1980; Lakshmanan, 2000). However, the initial value was lowest in fish pickle. Even after 120 days of storage the TMA-N value did not crossed the limit of acceptability in all samples.

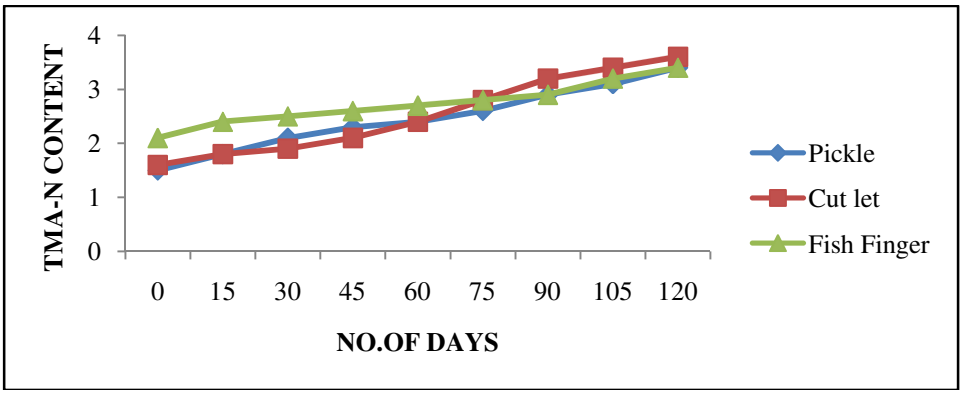

Figure 5

This suggests the stability of the all three samples during frozen storage of 120 days at -18 ºC (Figure-5)

3.1.2. TVB-N

A value of 35-40 mg% of TVB-N in fish muscle is usually regarded as the limit of acceptability, beyond which the fish is regarded as spoiled (Mathew, 2003). Recorded value of 11.13 mg % of TVB-N in study was found well within the acceptable limit of 35 mg%. This further supports the freshness of the products.

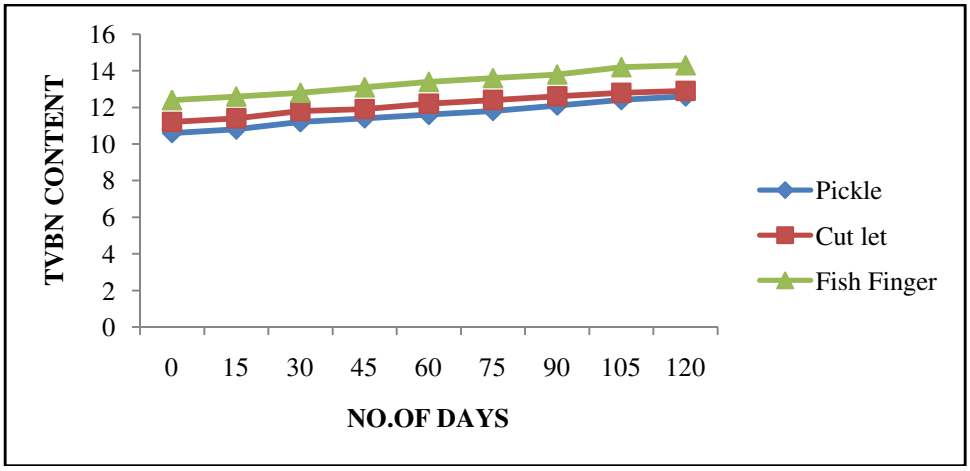

Figure 6

The estimation of total volatile base nitrogen (TVB-N) content is one of the most common indices of quality for deciding the state of freshness of sea food. The TVB-N of all the samples increased (Figure-6) significantly during frozen storage which indicated the production of ammonia and several volatile amines for the end of 120 days.

3.1.3. Free Fatty Acid (FFA)

The FFA content in freshly prepared products were 0.56, 0.11, and 0.12 % of oleic acid for fish pickle, fish cutlet and fish finger respectively (Fig-7) and it increased significantly (P<0.05), with increasing storage period, indicating a mild lipid hydrolysis during frozen storage.

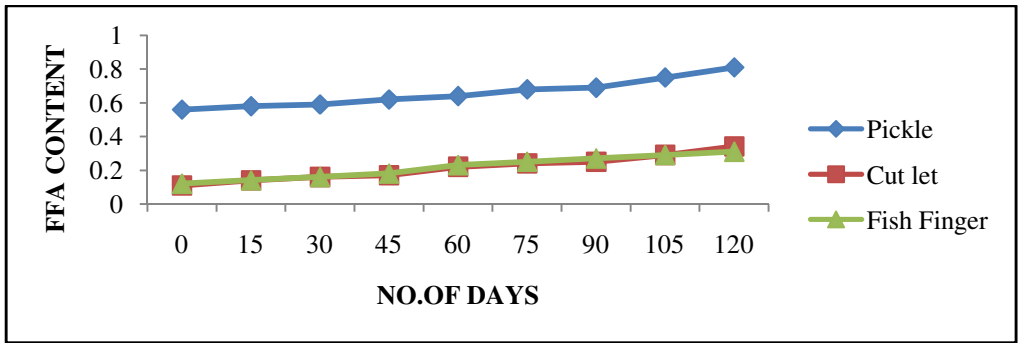

Figure 7

A slight increase in FFA during storage is due to the enzymic degradation of triglycerides and phospholipids (Bilinski *et al.,* 1981). s

3.1.4. Peroxide Value (PV)

Peroxide value (PV) is used to express the oxidative state of lipid-containing foods. It measures the first stage of oxidative rancidity (Balachandran, 2001). Pearson (1970) suggested that the acceptable level of PV is 20 to 40 millimoles O2 per kg of fat. Peroxide value in all samples showed increasing trend during frozen storage but did not crossed the critical limit of rancidity (Figure 8).

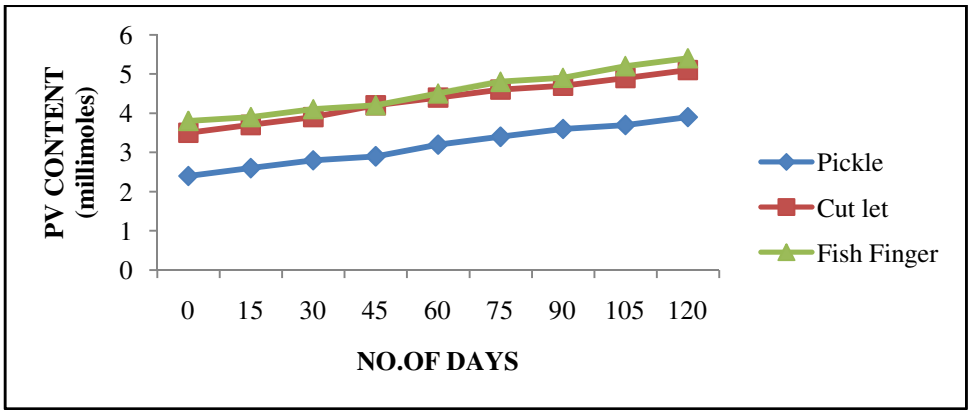

Figure 8

In all the samples increase in PV was significant ($P<0.05$) but did not reach the detectable level of rancidity. This may be due to packaging and very low temperature of storage.

3.2. Microbiological Analysis

In present study total plate count was significantly ($P< 0.05$) decreases throughout the storage periods. TPC of very low value was found to decrease in all the four samples with the progress of storage period. Results suggest that products were prepared and stored in hygienic condition and the temperature of storage was inhibitory and lethal to the small number of bacteria on the samples. Effect of antimicrobial activities of spices may also be a contributing factor in supporting and killing effect on the microbes. Such view has been expressed by Sallam (2004), while studying antioxidant and antimicrobial effects of garlic in fish pickle.

3.3. Sensory Characteristics

From the data of raw material characteristics and the quality of value added products made it was found that lizardfish (*saurida tumbil*) meat can be used to make a value added product like fish pickle, fish finger and cutlets. It is a lean while fish with high flesh content and available throughout the year. Lizardfish have been long considered a high-grade raw material for surimi and kamaboko, with high meat yield, white colour, good flavour, and high gel-forming ability noted by Itoh *et al.,* (1995).

Sensory characteristics were evaluated for products (fish pickle, fish cutlet and fish finger) using 9-point hedonic scale described by Peryam and Pilgrims (1957). Fried burger was found superior over all. The sensory scores for appearance, taste, odour, and overall acceptability decreased progressively with time in products (fish pickle, fish cutlet and fish finger). The decrease in the values of sensory analyses was faster than chemical changes during frozen storage as noted by Orak and Kayisoglu (2008). This decreasing score indicated the loss of freshness in three samples. According to the statistical analysis results, there were significant differences ($p<0.05$) between, appearance, taste, odour, and general acceptability properties of products (fish pickle, fish cutlet and fish finger) during the storage. General acceptability and odour score of the fish culet were significantly higher than those of fish pickle. Fish finger sample showed low sensory scores, however, it was indicated by the panellists as of moderate quality.

4. Conclusion

Lizardfish, an underutilized low priced fish, is not considered as table fish. It is usually diverted for drying and curing. This resulting in loss of valuable protein rich resource. Moreover, fishermen are also not getting enough returns to their catch due to less demand by consumers in its original form and appearance.

The present study indicated that lizard fish can be utilized effectively for production of value added products like fish pickle, cutlets and fish fingers, a popular ready-to-eat type of product for today's consumer. These products can be stored for a period of 4 months in acceptable condition. The fish products (fish pickle, fish cutlet and fish finger) prepared from lizard fish had a shelf life of 4 months. By developing this value added products, using low value fish like lizardfish, catch can be utilized properly which will help fishermen in getting better returns to their catch. Consumer will also get better quality and convenient fish products, to suit to their fast food life style.

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