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मत्स्य प्रौद्योगिकी समाचार
Fish Technology Newsletter

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Contents

Editorial Committee

News from the Research Front

Isolation and characterization of pharmacologically active lead compounds from marine Red algae, *Amphiroa anceps* (Lamark) Decaisne

Traditional medicines have been the starting point for the discovery of many important modern drugs. This has led to the screening of natural products and medicinal plants for pharmacologically active substances all over the world. In Indian ayurvedic medicine, marine algal extracts have been used for the treatment of various human ailments such as liver diseases, heart ailments, cancer, inflammatory disorders, etc. Oflate, isolation and characterization of bioactive compounds from marine sources has become one of the potential emerging fields in pharmacological research for the production of components of human healthcare importance. An attempt has been made in the Biochemistry & Nutrition Division of CIFT, Cochin to study the biochemical

Fig.1. Red algae (A. anceps)

केन्द्रीय मत्स्यकी प्रौद्योगिकी संस्थान
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composition of marine red algae *Amphiroa anceps* (Fig. 1), to isolate the active components and to test cytotoxicity against Dalton's Lymphoma Ascites, a type of cancer. This marine red algae belongs to the Division Rhodophyta, a primitive group of plants with no true roots, stems and leaves.

Red algae *Amphiroa anceps* were collected from the Gulf of Mannar region of Mandapam coast, Rameswaram, Tamil Nadu. The shade dried algae were powdered, sonicated and extracted with methanol:chloroform (2:1) and used for preliminary pharmacological screening, mineral/ trace element profiling and determination of amino acid/ fatty acid composition. The minerals, sodium, potassium and calcium were quantified using Flame Photometer while iron, copper, manganese, and magnesium were determined using Atomic Absorption Spectroscopy (AAS). Amino acids were deter-mined using High Performance Liquid Chromatography (HPLC) on dry weight basis. Tryptophan was estimated colourimetrically following digestion under alkaline condition and estimated with thioglycolic acid reagent. Fatty acid methyl esters were determined by Gas Chromato-graphy-Mass Spectrometry (GC-MS). Preliminary phytochemical screening revealed the presence of carbo-hydrates, alkaloids, glycosides, saponins, tannins, phenolic compounds, terpenoids, amino acids, fats and oils. The mineral profile of the algae showed the presence of essential trace elements and minerals, which are required to maintain the normal cellular homeostasis (Fig. 2).

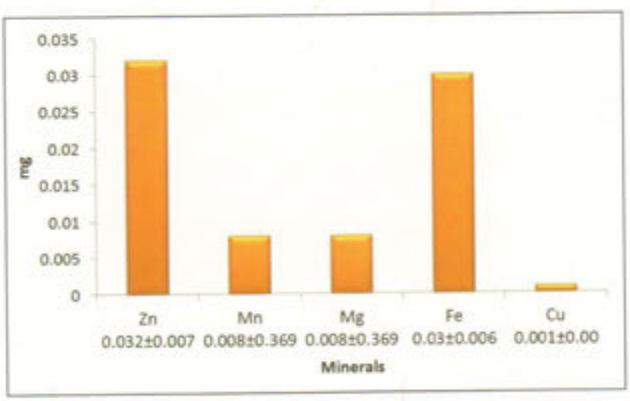

Fig. 2. Minerals (mg) in A. anceps

Amino acid profile of the algae (Fig. 3) revealed the presence of essential and non-essential amino acids in significant proportion. Though both saturated and polyunsaturated fatty acids were present in significant quantities, C22:6 (n-3 PUFA) essentially required for brain and retinal function was found to be present in significant proportion (Fig. 4). The anti-inflammatory n-6 PUFA (C18:2) was also present in considerable amount.

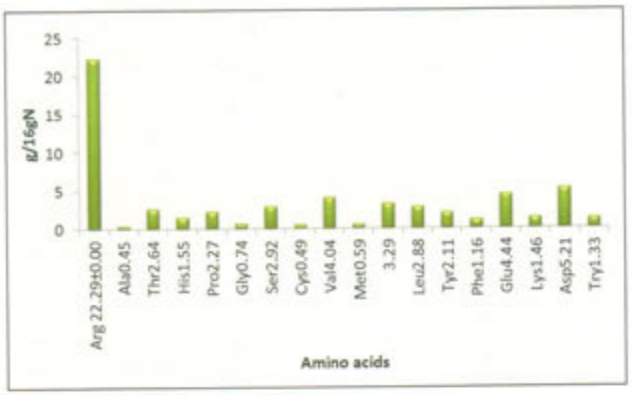

Fig. 3. Amino acid composition of A. anceps

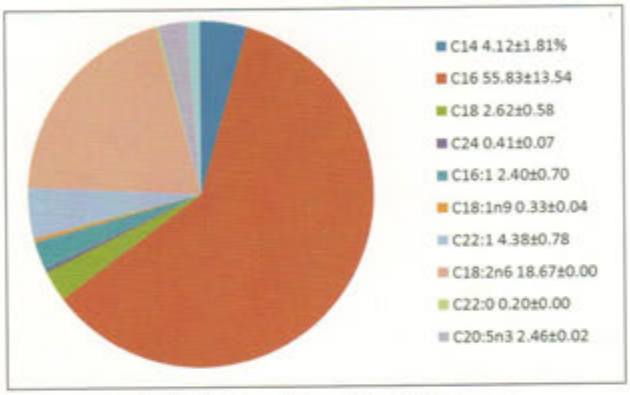

Fig. 4. Fatty acid profile of A. anceps

Analytical HPLC was performed and based on the retention time 3.936 and 4.782, two compounds were isolated using preparative HPLC with methanol as solvent. The two isolated compounds were subjected for UV, GC-MS, I.R, ^{1}H NMR spectral analyses and identified as 1,2-dibutyl benzene-1,2-dicarboxylate (a) and 2,2,4,4,5,5-hexamethyl-1,3-dioxolane hexa-hydrateicosamethane (b). *In vitro* antioxidant assay of the methanol: chloroform extract showed moderate activity with IC_{50} values of 287±1.10 µg/ml for DPPH radical scavenging assay, 340±9.98 µg/ml for nitric oxide radical scavenging assay, 250±3.11 µg/ml for hydrogen peroxide scavenging assay and 227±2.63 µg/ml for reducing power assay. Total antioxidant activity of 10µg chloroform:methanol extract was found to be equivalent to 20µg of gallic acid. The isolated compounds (1,2-dibutyl benzene-1,2-dicarboxylate (a) and 2,2,4,4,5,5-hexamethyl-1,3-dioxolane hexa-hydrateicosamethane (b) exerted significant anti-tumor property against Dalton's Lymphoma Ascites with IC_{50} values of 402±28.11 and 252±5.06, respectively. Since this marine algae is a good source of minerals, trace elements, vitamins, amino acids and polyunsaturated fatty acids having high nutritional value in human health, they can be considered as comparable to that of nutritionally valuable

fresh or dried vegetables and/or as ingredients in the formulations of health foods. In conclusion, the results of the present study have shown that the red algae *A. anceps* is not only rich in nutrients, but also can be effectively utilized as a natural antioxidant and anticancer agent.

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In vitro antioxidant and antibacterial activities of ethanolic extracts of mint (*Mentha arvensis*) leaves and bitter orange (*Citrus aurantium*) peel

Use of synthetic preservative chemicals have significant drawbacks such as higher cost, handling hazards, concerns about residues in food and threat to human environment. The stringent laws from legislative bodies coupled with the continuous demand from the consumers for natural preservatives have compelled the processors and manufacturers to restrict the use of synthetic preservatives and to use their natural counterparts. Constituents from plant sources are generally recognized as safe (GRAS), either because of their traditional use without any documented side effects on health or because of dedicated toxicological studies. Phenolics have been considered as powerful antioxidants *in vitro* and proved to be more potent antioxidants than Vitamin C and E and carotenoids. Moreover, the extracts obtained from different plant sources *viz.* herbs, spices, fruit peels etc. exhibit marked antibacterial activities against food-born pathogens and food spoilage bacteria.

Extracts were prepared from mint (*Mentha arvensis* - corn mint) leaves and bitter orange (*Citrus aurantium*) peel using ethanol as solvent. The dried extracts were evaluated for its antioxidant and antibacterial activities. The antioxidant activities of the extracts were evaluated *in vitro* by DPPH radical scavenging assay, reducing power assay, FRAP assay and metal chelating power assay. The results revealed that both the extracts, especially mint extract have potential *in vitro* antioxidant activities. The total phenolic content and antioxidant activities were significantly higher ($p<0.05\%$) in mint leaf extract compared to orange peel extract.

Antibacterial activities of the extracts against 15 ATCC bacterial strains including food-born spoilage and pathogenic bacteria were evaluated by disc diffusion assay. The result indicated that mint leaf and orange peel extracts have significant antibacterial activities against the tested organisms. Among the bacteria, *Yersinia enterocolitica,*

Mint leaf extract

Orange peel extract

Antioxidant activities of the extracts

Antioxidant sources/assays	Mint leaf extract	Orange peel extract
Total phenolic content (µg gallic acid eq wt/mg dry wt.)	96.2±8.2	40.8±4.3
DPPH assay (IC_{50}, mg/ml)	16.86±2.73	42.62±5.89
FRAP assay (µ mol Fe (II)/g)	862.85±34.11	177.14±20.31
Metal reducing power (Abs), (0.1 mg/ml)	0.302±0.024	0.074±0.026
Metal chelating activity (%), 5 mg/ml	33.56±6.9	12.68±3.2

Antibacterial activities of the extracts

Bacteria	Inhibition zone (mm)	
	Mint leaf extract	Orange peel extract
Escherichia coli	18	14
Pseudomonas aeruginosa	18	19
Aeromonas hydrophila	21	20
Staphylococcus aureus	19	18
Yersinia enterocolitica	21	20
Morgenella morganii	16	17
Streptococci spp.	20	23
Shigella flexneri	16	20
Salmonella typhimurium	14	16
S. enteritidis	18	14
Listeria monocytogenes	17	20
S. paratyphi	15	19
Klebsiella pneumonia	16	19
Enterococcus faecalis	15	20

Streptococci spp. and *Aeromonas hydrophila* was most sensitive whereas *Salmonella typhimurium, S. enetritidis* and *Morganella morganii* were resistant to the extracts analyzed. It was difficult to rank the extracts with regard to its antibacterial activity, as there were variations with respect to the sensitivity between the organisms.

The *in vitro* activities of the extracts suggest that both the extracts are promising natural preservatives with marked bioactivities. In the present scenario, intentional contaminants such as formaldehyde, ammonia etc. have emerged as major hazards rather than accidental contaminants such as heavy metals. Use of these detrimental chemicals to prolong the shelf life of fish has become a common practice in the domestic market. Hence, the development of novel preservatives from natural resources as an alternative could be one of the best options for developing ecofriendly management of these practices.

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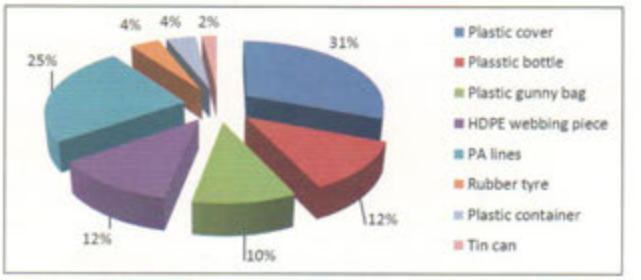
Plastic debris in the sea – A serious concern

In the past few decades, the use of synthetic materials, mainly plastics has increased tremendously. The quantity of plastic debris entering the marine environment also has increased substantially. It is a well known fact that degradation of these products takes several years and are very harmful to the environment as well as the life in the sea. Most of the buoyant materials remain floating at the sea surface for a long time while other synthetic materials sink and remain on the bottom. Plastic is a threat to all living creatures in the sea. The ingested plastics may block digestive tracts and cause harm to the organisms. Researchers have cautioned that the mechanical effects of these materials would affect many marine species in many ocean areas, and that these plastic debris will be a major form of ocean pollution. Sea has become a dumping ground and it is a common practice for fishermen to throw all types of waste into the sea. Plastic waste thrown by fishermen into the sea is just one source. The major source of plastic waste is from the land which reaches the sea through the rivers and other water bodies.

In addition to different kinds of plastic bags and other plastic items, old synthetic netting, fishing lines, vehicle tyres, gear materials etc. are also thrown into the sea. All these synthetic non-biodegradable materials will be drifting in the

Views of debris landed in trawl nets

'Ghost fishing' - Turtle stranded in discarded webbing



Types of debris landed in trawl nets - February 2013 to March 2014 (%)

water column, before it settles down to the sea bottom leading to habitat degradation. Synthetic materials are extensively used in fisheries, as they have very good strength and other desirable properties, and contribute to the high efficiency and catchability of the fishing gear. Though the material is highly durable, it has been considered to be among the most non-biodegradable materials in existence. Abandoned, lost or otherwise discarded fishing gear (ALDFG), popularly known as derelict fishing gear, causes ecological concerns such as ghost fishing. The deleterious effects of plastic debris on the marine environment are well known and a large number of marine species including marine mammals are known to be harmed or killed by plastic debris.

There are strict rules and regulations for cargo/oil tankers for disposal of degradable and non-degradable waste into the sea. There are a number of international agreements containing specific prohibitions against dumping plastics into the marine environment. The 1972 London Dumping Convention, Annex V to the MARPOL Convention, and the 1978 MARPOL Protocol cite plastic pollution as unlawful in international waters. It is high time that the fishermen are also made aware of the consequences of plastic pollution and action to be taken to prevent further disposal of any harmful or toxic waste into the sea.

The photographs shown give us the glimpse of plastic debris landed in fishing boats off Cochin.

Data on plastic waste landed along with the trawl nets on-board the research vessels were collected for a period of one year from February 2013 to March 2014. Trawling operations were conducted off Cochin in the depth range of 10-30 m. Various trawls like the shrimp trawls and semi-pelagic trawls were operated. The average duration of operation was one hour. After every haul, the fish were sorted and the plastic landed along with the catch was segregated and the type of debris and numbers were recorded. The Figure depicts the type of debris in numbers/ percentage segregated during the period of study. A detailed study quantifying the different types of debris that come in the trawl net and mitigation measures to minimize plastic debris and measures aimed at the prevention of mitigation of ALDFG and its impacts are envisaged.

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Quality index scheme for Indian fishes

The term 'quality' in general refers to the acceptance with reference to the particular commodity by the consumer. In food products it reflects the totality of characteristics by which it is accepted by the consumer. In a commodity like fish the overall sensory characteristics are grouped under the term quality which may include the common characteristics such as appearance, flavour, odour and texture.

Fish or in general seafood is highly perishable in nature primarily because of its high water content. This necessitates the requirement of maintaining cold chain approach in order to prevent them from spoiling and fluctuations in storage temperature often results in spoilage with loss of freshness and quality deterioration. The quality of fish and fish products depends on the length of storage, most often besides the temperature of storage. The fish for human consumption comes from wild catch i.e. from marine environment or from aquaculture sector, in either case there are specific hazards which needs to be addressed before given for human consumption. The important points where temperature abuse or mishandling is possible include on-board vessels, landing centres, transportation, processing, storage, fish markets, consumer handling etc. Duration of processing, length of transportation and non-availability of good quality ice are some of the factors which contribute to spoilage during spoilage and quality deterioration.

Fish or seafood undergoes deterioration from the moment it is dead. The changes in biochemical processes within the body as a result of anaerobic environment, incidence of rigor mortis, resolution of rigor, increase in pH, hydrolysis of macromolecules such as protein and lipids contribute to the decomposition of intact fresh fish into nutritionally inferior product, negatively affecting the sensory quality of the product (Martinsdottir *et al.*, 2001). The hydrolysis of high energy phosphate compounds such as adenosine triphosphate leads to accumulation of nucleotide degradation products such as inosine and hypoxanthine, thereby affecting the quality of the fish. Accumulation of volatile compounds such as trimethyl amine, volatile sulphur compounds, aldehydes, ketones, esters, hypoxanthine etc. and other low molecular weight compounds contribute to changes in the sensory characteristics, thereby affecting the quality and acceptability (Huss, 1995).

Fish like any other food commodity contains bacteria associated with it. Following the death of fish, the microorganism multiply at a faster rate depending on the storage temperature and invade the flesh (Huss, 1995). The bacteria continues to multiply during storage in ice and reaches 10^8–10^9 cfu/g and the flora is mainly composed of *Pseudomonas* and *Shewanella*.

Sensory evaluation is defined as "A scientific discipline used to evoke, measure, analyze, and interpret those responses to products that are perceived by the senses of sight, smell, touch, taste, and hearing" (Stone and Sidel, 1993). The criteria of sensory evaluation can be applied to products under controlled conditions and can be statistically evaluated to get an appreciable criteria for fish and fish products and is a method practiced at all stages of marketing by trained professionals by assessing appearance, texture and odour.

There are regulations by individual countries which clearly spell out methods for evaluating the freshness of seafood. They are basically based on grading system in accordance to general appearance, odour, texture, eyes and gills. There exists regulations in every country which need to be complied before it is introduced in the market and regulations are more stringent if they are meant for

Fresh fish used for the study

international market. There are country guidelines as well as Codex guidelines existing which need to be complied with strictly so as to achieve international competitiveness.

There are regulations stipulated by countries, which describe the methods to use in order to determine the freshness of seafood products. Mexican regulations contain a norm which generally describes the procedure. Some products, like tuna, shrimp, lobster, oyster and saltwater fish have their own norms which include the general characteristics that should be checked when receiving raw materials at the processing plants. The descriptions given in these regulations are not often clearly expressed. As a result, inexperienced people cannot conduct effective evaluations.

Sensory evaluation has been used as a tool by both buyers and seafood processing establishments for empirically assessing the freshness and quality of fish. Buyers use it to meet their expectations, whereas regulatory agencies use it for compliance verification as per set standards. Fish can be evaluated in the unprocessed or processed form such as filleted, cooked or frozen by differential grading system with a pre-assigned scoring pattern. The first scheme for sensory analysis of raw fish was developed by Torry Research Station (Shewan *et al.*, 1953) which gives single numerical value to a broad range of characteristics.

The European Union has Regulation No. 2406/96 which establishes the freshness rating for fishery products. It has a grading scheme with three categories of freshness: Extra, A and B (below B, the product is discarded for human consumption), that are given according to the sensory evaluation. Such schemes are available for different groups of fish namely whitefish, bluefish, cephalopods and crustaceans (EC 1996).

Quality Index Method (QIM)

The Quality Index Method, developed by the Tasmanian Food Research Unit (Bremner, 1985), is a grading system for freshness and quality evaluation of fishery products. This scheme for individual species of fish are precise, objective, and independent. It is based on characteristics of fresh or raw fish and needs to be developed for each fish species (Ólafsdóttir *et al.*, 1997, Sveinsdottir *et al.*, 2003). Many QIM schemes have been developed in Europe and species such as Brill, Cod, Deep water shrimp, Fjord shrimp, Haddock, Herring, peeled shrimp, Plaice, Pollock, Redfish, Salmon, Sole, Turbot and also the seafood product Maatjesherring can be evaluated.

Significant, well-defined characteristic changes of appearance occur in fresh fish with reference to eyes, skin, gills and changes that occur in odour and texture as a function of storage temperature and time. The characteristics are given score, called demerit score between 0 and 3 for each quality parameter according to the specific parameter descriptions. The sum of scores is referred to as overall score and is called as the Quality Index (QI). The advantage is that the quality index generated could be used to estimate the period of storage of the fish in ice and also the remaining period of shelf life or predicted shelf life of the fish in ice. The microbiological and chemical analysis data can be generated to provide supporting information on the spoilage of fish (Chytiri *et al.*, 2004).

The Quality Assurance and Management Division of CIFT, Cochin has initiated a project, "Development of Quality Index Scheme for commercially important fishes of India". The quality index scheme for Indian mackerel (*Rastrelliger kanagurta*) has been finalized with 14 descriptors and with a total demerit score of 33. The data were analyzed statistically to get a relation between the different data on different parameters. The quality indices of biological, chemical and combined showed an increasing trend with storage days and they are in conformity with increasing trend of demerit score. Quality indices is being developed for marine species of Oil sardine (*Sardinella longiceps*) and brackish water fish Pearlspot (*Etroplus suratensis*).

Further reading

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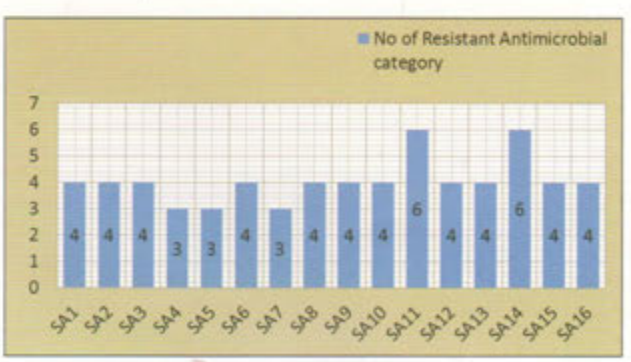
Multidrug resistance pattern in Methicillin-Resistant Staphylococci

The extensive use of antibiotics for human therapy, as well as for farm animals and even for fish in aquaculture has resulted in the selection of pathogenic bacteria resistant to multiple dugs. Development of multi-drug resistant organisms (MDROs) limits the action of drugs previously considered to be highly active. The spread of antimicrobial resistance through the food chain is regarded as a major public health issue. *Staphylococcus aureus* is an etiological infection agent responsible for significant levels of morbidity and mortality. Methicillin-resistant *S. aureus* (MRSA) is one of the main MDROs related to antimicrobial resistance. Methicillin-resistant Staphylococci which includes Methicillin-resistant Coagulase negative Staphylococci (MR-CoNS) and Methicillin-resistant *Staphylococcus aureus* (MRSA) are considered to be zoonotic multidrug resistant, nosocomial pathogens of clinical importance. Frequently, often they pose a challenge to the physician to choose the drug for treating the patient especially in surgical conditions. It's occurrence in hospital associated patients and community associated peoples; domestic, companion and pet animals were already reported and it's occurrence keeps on increasing every year tremendously.



Antimicrobial resistance pattern among Methicillin-resistant Staphylococci

In order to interpret the epidemiological surveillance data on antimicrobial resistance pattern by the public health working group, European Center for Disease Control and prevention (ECDC) and Center for Disease Control and prevention in Atlanta, USA as a joint initiative made a classification of antimicrobial resistance pattern found among healthcare associated antimicrobial resistant bacteria such as *Staphylcoccus aureus*, *Enterococcus* spp., Enterobacteriaceae other than *Salmonella* and *Shigella*; *Pseudomonas aeruginosa* and *Acinetobacter* spp. into MDR (Multidrug-resistant), XDR (Extensively drug-resistant) and PDR (Pandrug-resistant) based on the documents and breakpoints of CLSI, EUCAST and USFDA (Magiorakos *et al.*, 2011).

With the view of classifying these Staphylococci prevalent in seafood, antimicrobial susceptibility or sensitivity testing was performed with an array of 20 antibiotics for 16 Methicillin-resistant Staphylococci isolated from fish and shellfish. AST was performed by Standard Disk Diffusion Method of Kirby-Bauer by following guidelines of CLSI, 2007 and 2012.

The study revealed that all the isolates belonged to MDR (Multidrug Resistant) with resistance pattern ranging from three categories of antimicrobials to a maximum of six categories of antimicrobials. The isolates were neither XDR nor PDR. The resistance pattern observed were β-lactams including Cephamycins, Erythromycin, Chloramphenicols, and with or without either one of the antibiotics such as Clindamycin, Gentamicin, Trimethoprim-Sulphamethaxa-zole, Teicoplanin, Linezolid or Vancomycin. Mechanisms of Vancomycin/Linezolid resistance are not studied completely.

The results of this study indicates the prevalence of Methicillin-resistant Staphylococci and its multidrug

resistance in the fishery environment of Kerala. This result will be useful to the public health department in choosing the antimicrobial of choice for treating patient with Methicillin-resistant Staphylococci infection.

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Microbial quality of sun dried and solar dried *Parapenaeopsis stylifera*

Drying is the most economical traditional method of preserving food products. As there are problems associated with traditional sun drying, solar drying is gaining importance to dry food commodity hygienically. *Parapenaeopsis stylifera*, which is locally known as *Kiddi shrimp* in Gujarat, is landed abundantly, which is processed and marketed in fresh and frozen forms. It is one of the potential shrimp species for drying which fetches very good price in both domestic and international market. The present study deals with evaluating the microbial quality of solar dried *Parapenaeopsis stylifera* in comparison with the traditional sun dried product.

The fresh Kiddi shrimp were collected from Bhidia landing site, Veraval, Gujarat. The collected shrimp was cleaned, washed, deveined and mixed with salt (not exceeding 7% by weight). It was then sun dried hygienically by keeping on drying racks under direct sun light for four days and in solar dryer at 60 °C for 10-12 hrs for achieving the final moisture content of 18-20%. The sun and solar dried prawns were packed in polythene bags and stored at room temperature (RT) for two months. The microbial quality of the fresh and dried prawn was assessed with the standard protocol of BAM. Enumeration of bacterial load was done using Plate Count Agar (PCA), Total Enetrobacteriaceae on Violet Red Bile Glucose Agar and fecal Streptococci on Kennel Faecal Streptococcal Agar by pour plating (1.0 ml). Enumeration of *E. coli* (0.5 ml) and Staphylococci (0.4, 0.3 and 0.3 ml) were done on Tergitol-7 and Baird Parker Agar by spread plating method. Total Fungal Count (TFC) was done on Rose Bengal

Fresh and cleaned Kiddi shrimp, Parapenaeopsis stylifera

Microbial quality of sun and solar dried prawn pulp

Type of drying	TVC (cfu. g^{-1})	Total Entero bacteriacae (cfu. g^{-1})	Staphylo coccal count (cfu. g^{-1})	*E. coli* (cfu. g^{-1})	Fecal Streptococcal (cfu. g^{-1})	Total fungal count (cfu. g^{-1})
Fresh	2.4×10^5	Absent	Absent	Absent	Absent	Absent
Sun Dried	1.0×10^2	Absent	Absent	Absent	Absent	Absent
Solar Dried	1.0×10^2	Absent	Absent	Absent	Absent	Absent
1st Month of storage						
Sun Dried	2.6×10^2	Absent	Absent	Absent	Absent	1.65×10^1
Solar Dried	1.29×10^2	Absent	Absent	Absent	Absent	1.4×10^1
2nd Month of storage						
Sun Dried	2.0×10^3	Absent	Absent	Absent	Absent	1.0×10^2
Solar Dried	1.25×10^3	Absent	Absent	Absent	Absent	2.1×10^2

Solar and sun dried Kiddi shrimp, Parapenaeopsis stylifera

Chloramphenicol Agar and sensitivity of the fungal isolates to NaCl was done by inoculating fungal colonies on Potato Dextrose Agar (0, 10, 14 and 18%).

Solar dried shrimps were sensorily more appealing as compared to traditional sun dried samples. There was a substantial reduction in the microbial load of dried shrimp samples as compared to the fresh samples. The total viable count (TVC) in fresh, sun dried and solar dried prawn was 2.4×10^5, 1.0×10^2 and 1.0×10^2, respectively. The TVC counts for sun and solar dried prawn samples were 2.6×10^2 and 1.29×10^2 and 2.0×10^3 and 1.25×10^3 after 1st and 2nd month of storage, respectively. The TFC was 1.65×10^1 and 1.4×10^1 and 1.0×10^2 and 2.1×10^2 for the 1st and 2nd month of storage, respectively. A slight increase in the levels of TVC and TFC was observed over a period of two months storage at room temperature but the counts were well within the permitted level. The solar dried prawn had better microbial quality as compared to the sun dried samples and could be attributed to faster drying rate when compared to traditional sun drying. The open exposure to environment in sun dried sample as well as atmospheric relative humidity also contributes to higher load in sun dried samples.

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Solar drying: An alternate drying method for quality improvement of squid rings

Squid is an important marine resource belonging to the group of cephalopods. They form one of the most important commercial fishery commodities in Gujarat coast, due to its abundant availability and for its nutritional and ecological significance. Indian squid, *Loligo duvauceli* contributes a major share to the cephalopod landings in India. An estimated squid landing in India during 2013 was 100,014 tonne (CMFRI, 2013). Fresh squid is highly perishable and the time to spoilage depends mainly on species, handling, processing and storage temperature. In India, squids are normally processed in frozen form. Although there exists improved freezing and cold storage facilities for providing fresh squid either in chilled or frozen form, a variety of dried and seasoned squid products are very popular in Japan and other south-east Asian countries. Sizeable quantity of squid is processed into these dried products annually in these countries. Traditionally, these are processed manually and sun dried.

Drying is a traditional method which has been used since long for fish preservation in many parts of the world. Drying helps in reducing the moisture content of the food to a level at which microbial spoilage and deterioration reactions are minimized, which allows safe storage over an extended period of time. Traditionally, drying is carried out in open air under direct sunlight, using the energy of the sun to evaporate the water and air currents to carry away the vapour. The major problems associated with open sun drying method are insect infestations, poor handling and improper processing which lead to contamination and spoilage. As a result, not only does the final product lack quality, but has to be sold at the lowest price in the market. To improve the quality of the dried products, various types of drying techniques have been developed. CIFT has designed different types of solar dryers varying from very

Solar and sun dried squid rings

simple direct dryers to more complex hybrid ones for hygienic drying of fish. One of the hybrid solar dryer developed has electricity as alternate back up heating source for continuous hygienic drying of fish even under unfavourable weather conditions. Solar energy is effectively harnessed using specially designed solar air heating panels and proper circulation of the hot air across the stainless steel trays loaded with fish with the help of blowers makes the drying process faster. The present study is aimed to develop a hygienic squid drying method which can be adopted by the entrepreneurs to tap the dry squid export market in Japan and other south-east Asian countries.

Fresh Indian squid (*Loligo duvauceli*), procured from Veraval fishing harbour was brought to the laboratory in thermocol boxes in iced condition. The samples were washed and the head, viscera and fins were removed. The skin was also removed from the mantle and the squid is cut into rings. One batch of rings was dried in a raised platform under direct sunlight for 9 h for four days and another batch was dried in solar dryer continuously till the moisture content reached 24%. Various biochemical and microbiological quality attributes were compared between solar and traditional sun dried squid.

Proximate composition of the sun dried and solar dried squid rings

Attributes	Fresh squid	Sun dried	Solar dried
Moisture (%)	82	24	24
Crude Protein (%)	15.68	65.00	66.40
Ash (%)	1.1	5.6	4.4
Crude Fat (%)	0.86	4.8	5.1

Biochemical and microbiological quality of squid rings

Parameters	Fresh Squid	Sun dried	Solar dried
TVBN (mg %)	10.69	29.00	24.00
TBA (mg malonaldehyde per kg)	0.312	1.8	1.2
pH	6.5	5.9	6.1
Mesophilic Count (log cfu/g)	2.67	4.54	3.12
Rehydration (%)	-	55	61

Fresh squid had a moisture content of 82%, crude protein content of 15.68%, lipid content of 0.86% and ash content of 1.1%. The moisture content was reduced to 24% in 36 h in sun dried samples and in 12 h in solar dried samples. Compared to open sun drying, moisture reduction was three times faster in solar drying. Initial bacterial count of the fresh sample was 2.67 log cfu g^{-1}. The total bacterial count in both sun and solar dried samples increased but was within the acceptable limit. The increase was higher in sun dried samples (4.54 log cfu g^{-1}) compared to solar dried samples (3.12 log cfu g^{-1}). This difference in the bacterial count of solar dried squid rings could be attributed to the continuous drying with the help of alternate electricity back-up heating system which enables the continuous drying even under unfavourable weather conditions. Apart from this, the contamination from pest, sand etc. was also avoided in solar drying process unlike open sun drying method. pH value of fresh squid was 6.5 which dropped to 5.9 and 6.1 in sun and solar dried squid rings. TVBN values of the sun dried samples were more than solar dried samples. TBA value of both sun and solar dried squid rings were within the acceptable limit of 2 mg malonaldehyde per kg of sample. Sensory score of the solar dried squid was higher than the sun dried squid samples especially for texture, colour and appearance. Values of other quality indicators such as shrinkage, colour, rehydration ratio etc. were also better for the solar dried squid samples. In the present study, rehydration capacity of solar dried sample was 6% more than sun dried squid rings which shows that squid rings dried using solar dryer were able to hold more water and rehydrated more rapidly compared to sun dried samples. So, drying in solar dryer not only reduced the time taken for drying the squid ring samples, but also improved the quality of the sample considerably.

S. Remya, Dr. C.O. Mohan*, Dr. G.K. Sivaraman, Dr. R. Badonia, Dr. C.N. Ravishankar*, and Dr. T.K. Srinivasa Gopal*

Veraval Research Centre of CIFT

Fish Processing Division, CIFT, Cochin

Publications

Research Papers

1. Ankur Nagori, Joshi, P.N. and Ravishankar, C.N. (2014) – Development of solar dryer with electrical energy backup for hygienic drying of fish and fish products, *Fish. Technol.*, **51(2):** 112-116.
2. Hema, G.S., Shyni, K., Suseela Mathew, George Ninan and Joshy, C.G. (2014) – Comparison of collagen extracted from skin of double spotted queenfish and Malabar grouper, *Fish. Technol.*, **51(2):** 93-97.
3. Nimit Kumar, Madhu, V.R. and Meenakumari, B. (2014) – Co-occurrence of species in catches from multi-day trawlers along north-east Arabian sea – Implications for resource predictions, *Fish. Technol.*, **51(2):** 82-86.
4. Obulesu, T., Suseela Mathew, Lakshmanan, P.T., Krishna, G., Lakra, W.S. and Anandan, R. (2014) – Salubrious effects of dietary supplementation of squalene and n-3 polyunsaturated fatty acid concentrate on mitochondrial function in young and aged rats, *Fish. Technol.*, **51(2):** 98-101.
5. Tanuja, S., Viji, P., Zynudheen, A.A., George Ninan and Joshy, C.G. (2014) – Composition, textural quality and gel strength of surumi prepared from stripped Catfish (*Pangasianodon hypophthalmus* Souvage, 1878), *Fish. Technol.*, **51(2):** 106-111.
6. Viji, P., Tanuja, S., George Ninan, Zynudheen, A.A. and Lalitha, K.V. (2014) - Quality characteristics and shelf life of Sutchi Catfish (*Pangasianodon hypophthalmus*) steaks during refrigerated storage, *Intl. J. Agril. & Food Sci. Technol.* **5(2):** 105-116.
7. Vipin, P.M., Renju Ravi, Pravin, P., Saly N. Thomas and Leela Edwin (2014) – Long line fishing for high value species off southern India with special reference to structural and operational changes, *Fish. Technol.*, **51(2):** 87-92.

Training Programmes

Cochin

1. Production of chitin and chitosan (3-4 April)
2. Trace metal analysis with regard to ISO 17025 (17-18 April)
3. Laboratory techniques in microbial biotechnology (21 April - 3 May & 21 April – 6 May)
4. Food processing technology (28 April – 2 May)
5. Modern food processing technology (13-24 May)
6. Mono filament ling lining (26-28 May)
7. Chemical and microbiological analysis of water (26 May – 9 June)
8. Analysis of crude fibre (28-30 May)
9. Bioactivity of Actinobacteria isolated from aquatic environment (10 March – 9 June)
10. Isolation and characterization of Methicillin-resistant Staphylococci from seafood (10 March – 9 June)
11. Isolation and characterization of *Vibrio parahaemolyticus* from aquatic environment (10 March – 9 June)
12. Modern analytical techniques in Biochemistry by GC, GCMS, HPLC, LCMS-MS, AAS, ICP-OES and FTIR (29 May – 9 June)
13. Modern analytical techniques in Biochemistry by GC,

Modern analytical techniques in Biochemistry (Cochin) – Participants with faculty

Training on Modern analytical techniques in Biochemistry in progress (Cochin)

Modern food processing technology (Cochin)

GCMS, HPLC, LCMS-MS, AAS and Electrophoresis-Gel doc (18-28 June)

14. Modern analytical techniques in nutrient profiling and residue monitoring of fish (18-28 June)
15. Modern food processing technology (23-27 June)
16. HACCP concepts (23-27 June)
17. Purification of chitinase enzyme from *Paenibacillus elgii* (1 April – 30 June)
18. Identification and characterization of plastic degrading bacteria (1 April – 30 June)

Visakhapatnam

1. Bacteriological analyses of product intended for aquaculture feed (5 May - 23 June)

Participation in Exhibitions

During the quarter the Institute participated in the following exhibitions:

1. Exhibition held at Thodupuzha in connection with 'Green Fest 2014' during 21-26 April, 2014.
2. Exhibition organized during CIFT Foundation Day Celebrations on 29 April, 2014.

Outreach Programmes

During the quarter the following outreach programmes were conducted by the Institute:

1. Fish products development and value addition techniques for Nicobari tribals at Little Andamans during 26-28 May, 2014.
2. Fabrication and field trial of square mesh codend at Ratnagiri, Maharashtra during 20-22 May, 2014.
3. Responsible fishing and Hygienic handling of fish and preparation of value added fish products at Thanga village, Loktak Lake, Bishnupur district and Phumlen, Tokpaching and Sharik Konjin fishing villages, Thoubal district, Manipur during 27 May to 1 June, 2014.
4. Bycatch reduction devices for shrimp trawling at Malvan fishing harbor, Sindhudurg district, Maharashtra on 21 June, 2014.
5. Bycatch reduction devices for shrimp trawling at Devgad fishing harbor, Sindhudurg district, Maharashtra on 23 June, 2014.

CIFT, Cochin Receives ISO Certification

CIFT, Cochin was awarded ISO 9001:2008 Certificate (Certificate No. 63371/A/0001/NB/En) for "Provision of Research and Development Services to Promote Sustainable and Responsible Harvest and Post Harvest Technologies in Fisheries Sector, including Consulting, Training, Testing, Business Incubation and Transfer of Technologies. The certificate was awarded by the URS Certification Ltd. (Member of Registrar of Standards (Holdings) Limited, UK.


Certificate of Registration

Central Institute of Fisheries Technology

ISO 9001:2008

Provision of Research and Development Services to Promote Sustainable and Responsible Harvest and Post Harvest Technologies in Fisheries Sector, including Consulting, Training, Testing, Business Incubation and Transfer of Technologies

Dr. B. Meenakumari, Deputy Director General (Fisheries), ICAR, New Delhi officially handed over the ISO Certificate document to Dr. T.K. Srinivasa Gopal, Director, CIFT, Cochin in a simple function held on

Dr. Meenakumari handing over the ISO Certificate document to Dr. Srinivasa Gopal. Also seen are Dr. Suseela Mathew, HOD Incharge, B&N, Dr. Leela Edwin, HOD, FT and Shri P.J. Davis, SAO

11 April, 2014 at CIFT, Cochin.

The Institute has NABL accreditation (ISO 17025) and has been recognized as a Referral Lab in fish and fishery products for both export and import items.

Inauguration of Pilot Level Wood Preservation Facility

The pilot level wood preservation facility of Fishing Technology Division of CIFT was inaugurated by Dr. B. Meenakumari, DDG (Fy.), ICAR on 11 April, 2014 in presence of Dr. T. K. Srinivasa Gopal, Director, CIFT. Heads of various Divisions of institute, Scientists and other staff were present in the inaugural function. Dr. Leela Edwin, Head, Fishing Technology Division, CIFT briefed the functioning of the unit. The unit provides facility for mixing of preservatives, storage and impregnation treatment of wood. There are two treatment cylinders; small one (capacity 400 l) for treating wooden test panels and bigger one (capacity 2700 l) for treating wooden planks for boat building up to 3m length. This facility will help to upgrade the duration of low valued timbers and thereby reuses the pressure on high value timbers. The fishers can utilize this facility to construct canoes from low value and easily available timbers.

Dr. B. Meenakumari inagurating the facility

Dr. Leela Edwin explaining the facility

Digital Repository Launched

CIFT Digital Repository developed using Dspace open source software is an important step taken under the ICAR project to provide worldwide access to Institute's research output. Currently the digital library holds 1551 publications including journal articles, conference papers, reports, course materials, book chapters, newsletters etc. The repository was officially launched by Dr. B. Meenakumari, Deputy Director General (Fisheries), ICAR, New Delhi on 11 April, 2014.

Launching of CIFT Digital Repository

National Trainers Training Programme on Monofilament Long Lining

CIFT, Cochin and CIFNET, Cochin, jointly organized the 2nd National Trainers Training Programme on Monofilament Long Lining for eight stakeholders sponsored by the Department of Fisheries, Govt. of Tamil Nadu during 26-28 May, 2014.

The training programme started on 26 May, 2014 with a three day voyage fishing trip onboard CIFNET Training Vessel M.V. Prashikshani and fishing operations were carried out at a depth of 1300 m. The participants were familiarized with handling, shooting and hauling of the monofilament long lines. A total of 160 hooks were operated. Dr. V.R. Madhu, Senior Scientist and Shri P.T. David, Skipper were the resource personnel from CIFT. Dr. S. Balu, Instructor (FT) represented CIFNET. A theory class on handling sashimi grade tuna was conducted at CIFT on 28 May. Dr. K. Ashok Kumar, Principal Scientist, CIFT was the resource person.

Participants onboard Vessel M.V. Prashikshani

Dr. Ashok Kumar handling the session on sashimi grade tuna

Valedictory session in progress

The valedictory function was held on 28 May, 2014. Dr. M.P. Remesan, Principal Scientist, CIFT welcomed the gathering. Dr. A. Shibhu, Senior Instructor (FT), CIFNET gave a talk on The importance of long lining and need for collaborative programmes for the benefit of fishermen. Shri C.D. Joshy, Senior Instructor (Electronics) and Dr. S. Sabu, CIFNET also attended the function. Trainee representative gave the feedback of the training programme and requested for arranging marketing links for export of sashimi grade tuna and hands-on training on tuna handling. Dr. V.R. Madhu proposed vote of thanks.

Punjab Chief Minister Visits CIFT, Cochin

Shri Parkash Singh Badal, Hon'ble Chief Minister of Punjab visited CIFT, Cochin on 13 May, 2014. He held discussions with the Director-in-charge and Heads of Divisions and also visited the laboratory of the Fish Processing Division.

Shri Parkash Singh Badal having discussion with Heads of Divisions

Shri Parkash Singh Badal visiting the Fish Processing Division

NEH Training Programmes at Manipur

In collaboration with the National Association of Fishermen (NAF), Manipur State Unit, CIFT, Cochin conducted two training programmes from 29 May to 1 June, 2014. The first programme was conducted at Thanga fishing village, Bishnupur district during 29–30 May, 2014 in the subjects Responsible fishing and Production of value added products. Shri H. Kangjamba Singh, President, NAF, Manipur State unit welcomed the gathering. Dr. S. Balasubramaniam, HOD, EIS Division, CIFT, Cochin explained about the technology transfer programmes of CIFT and specifically about the importance of responsible fishing techniques for protection of fishery resources in the Loktak lake, so as to ensure sustainable fishing. The unemployed fisherwomen members of the Self Help Groups (SHGs)/ NGO were motivated to start a fish processing unit for the production of value added fishery products such as fish pickles, fish cutlets, fish balls and salted dry fish products. Shri Umananda Singh, Fishery Officer (Extension), Directorate of Fisheries, Imphal was the Chief Guest. About 40 fisherfolk participated in the training

programme. The responsible fishing techniques and the fabrication of improved gillnets were explained by Dr. M.S. Kumar, Chief Technical Officer, Visakhapatnam Research Centre of CIFT. The second training programme on Production of value added fishery products was conducted by Kum. Jesmi Debbarma, Scientist and Shri B.K. Panda, Technical Officer at Tokpaching and Sharik Konjin fishing village, Thoubal district during 31 May - 1 June, 2014. Shri H. Kangjamba Singh, President, NAF, Manipur State Unit, Dr. S. Balasubramaniam, HOD, EIS Division, CIFT, Cochin and Shri Umananda Singh, Fishery Officer (Extension), Directorate of Fisheries, Imphal addressed the audience. About 40 fisherfolk participated in the training programme. Input materials were also distributed on the occasion.

Beneficiaries of the training programme at Thanga village

Beneficiaries of the training programme at Phumlen, Tokpaching and Sharik Konjin village

TSP Training Programme for Nicobari Tribes

A training programme on "Fish product development and value addition techniques" for Nicobari tribes was jointly organized by the Central Island Agricultural Research Institute (CIARI), Port Blair and Department of Fisheries, A&N Administration in collaboration with CIFT, Cochin, at Harminder Bay, Little Andamans during 26-28 May, 2014 under the Tribal Sub-Plan. Dr. J. Bindu, Senior Scientist, CIFT was the resource person who handled the theory and practical sessions on Post harvest handling, processing methods and product development. Smt. K.B. Beena, Asst. Chief Technical Officer and Shri V.T. Sadanandan, Technical Assistant assisted and demonstrated the various processing methods and preparation of value added products. Shri Irfan and Shri Narsilu, SRFs of CIARI were also associated with the Project. Thirty two tribal fishermen and women beneficiaries of Harminder Bay were trained.

The training imparted was on hygienic handling of fish, different types of dressing like filleting, preparation of steaks, chunks, mince etc. Salt curing and drying of mackerel was practically demonstrated to them. Value added products prepared included battered and breaded products like fish balls, fish fingers and fish cutlets using mince of mackerel, fish pickle and fish chutney powder. Packaging of fish pickle and chutney powder in stand alone pouches was also done by them. The importance of packaging materials, mainly films and trays for storage of different value added fish products were taught to the trainees. The participants highly appreciated the training since it was the first time they got an exposure to the different types of products that could be prepared using fish resources.

Trainees with resource persons

Training in progress

A Nicobari tribal women displaying traditionally smoked fish

Training on Fabrication and Field Trial of Square Mesh Codend

Veraval Research Centre of CIFT offered three day training cum field demonstration of square mesh codend to fishermen at Ratnagiri, Maharashtra during 20-22 May, 2014. The programme was organized by NETFISH, MPEDA in association with 'Manav Vikas Sevabhavi Sanstha' (an NGO), Thane, Maharashtra. The programme was attended by 18 active fishermen and net makers of the village Karla, Ratnagiri. Shri Nizar Borkar, Chairman of Karla Fisheries Cooperative Society welcomed the gathering Dr. K.K. Prajith, Scientist of the Centre explained the activities of CIFT in the direction of responsible and resource conservation fishing techniques. Further he narrated the advantage of square mesh codend over conventional diamond mesh codend. Shri Santhosh Kadam, State Coordinator, NETFISH proposed vote of thanks. Later on Shri H.V. Pungera and Shri Aravind Kalangutkar, Technical Officers, CIFT demonstrated designing and fabrication of square mesh codend for commercial trawl nets. Two day commercial fishing trials were also conducted with the modified codend.

Participants and faculty of the training programme

Dr. Prajith speaking about the benefits of square mesh codend

Fabrication and field trials of square mesh codend

Training on BRD in Shrimp Trawling

Two training programmes on "BRDs in shrimp trawling" was conducted at Malvan and Devgad Taluks of Sindhudurg district of Maharashtra on 21 and 23 June, 2014, respectively. The programme was arranged as part of the GOI-UNDP-GEF funded project "Demonstration of bycatch reduction and juvenile excluder devices along Sindhudurg district of Maharashtra". Power point presentation on the ecological effects of bycatch and different BRDs used for shrimp trawling to reduce impact was made. Eighty five fishermen attended the training programmes. Dr. V.R. Madhu, Senior Scientist, CIFT, Cochin was the resource person for the training programmes.

Women Entrepreneur Graduates from CIFT Incubation Centre

The technology developed by CIFT for development of extruded snacks from fish and shellfish was taken up by a women entrepreneur Smt. Omana Muraleedharan, M/s Charis Food Products, Aroor, Kerala. Smt. Omana was running a small scale metal industry named Amrutha Metal Works. She approached CIFT with the idea to develop prawn flavored extruded snack food and registered as an incubate at ZTM-BPD Unit of CIFT. A brand named 'Prawnoes' was created and registered for trademark protection by ZTM-BPD Unit. CIFT developed and standardized three varieties of Fish Kure for the Incubatee, 'Spicy Shrimp', 'Shrimp n Onion' and 'Prawn Seasoning'.

Prawnoes, is the first prawn flavored Ready-to-eat Snack Food. Usually, extruded products are prepared using flour, which have less protein content and are limited in some essential amino acid. By incorporating protein rich prawn flavor, the product becomes an enriched snack food. This nutritious and delicious snack provides alternative to the high-fat and low-protein convenience store snacks. The

Shri K. Babu delivering the Chief Guest's address

Release of the product by Adv. A.M. Arif, MLA

rapid economic and population growth is set to fuel expansion of the snack food industry in India and the extruded food like Prawnoes are likely to target premium and economy market segments.

Prawnoes has received excellent product reviews during its test marketing period and Smt. Omana is planning to add more snack foods to her product range. CIFT gave her technical guidance in developing the product, standardization of process parameters, testing, packaging solutions, ideas for branding, assistance in trademark filing and setting up the production unit at Aroor. The promoter is a young educated entrepreneur. Having a dream and vision to bring a positive change she has started M/s Charis Food Products – A manufacturing unit at Industrial Development Area, Aroor Panchayath in Alappuzha district. Ready-to-eat snack food industry is a potential market with consumers not being brand loyal, there is always a scope for new entrants with new innovative products. Consumers generally like to try new products emerging in the markets.

The product was officially launched on 28 June, 2014 by Shri K. Babu, Hon'ble Minister of Fisheries, Excise and Ports, Govt. of Kerala. The function was presided over by Shri Ramesh, Vice President, KSSIA. Adv. A.M. Arif, MLA, Aroor, Dr. C.N. Ravishankar, HOD, FP & PI, ZTM-BPDU, CIFT, Shri Adinarayanan, Manager, Canara Bank, Ernakulam were the Guests of Honour on the occasion.

QRT visits Visakhapatnam Centre

The Quinquennial Review Team (QRT) meeting was held on 30 June, 2014 at Visakhapatnam Research Centre of CIFT. The Team was Chaired by Dr. S.D. Tripathi and the expert members were Dr. V.C. George, Prof. Sham Sunder and Dr. Krishna Srinath. Dr. P. Pravin, Member Secretary accompanied the Team. Dr. T.K. Srinivasa Gopal, Director, CIFT visited the Centre and stayed all through the proceedings guiding the CIFT scientists in presentation of progress. Initially the team made extensive visit to all the laboratories and was briefed on the research developments. The QRT visited Fishing Technology Section and got first-hand information on the latest developments and field studies made by the scientists of the Research Centre. It was followed by an assessment of innovative developments in fish processing technology wherein scientists showcased the product developments.

QRT vising the laboratories

Presentation before the QRT

Observations made by the Team during the laboratory visits and points made were noted. The review of the Team started with welcome address by Dr. M.M. Prasad, SIC of the Centre. Progress made in different of Divisions of the Centre was reviewed by the Team. Presentations were made by the scientists and extensive discussions were made in different aspects of research. Representing aquaculturists Shri Eashwar Dev Anand, Managing Editor, Fishing Chimes participated in the proceedings as guest observer. In the post lunch session the QRT made field visits to EU approved seafood processing plants where analytical service guidance was provided by CIFT in conducting the training programmes, national workshops, training the personnel at regular intervals, attending to APE as part of expert team in solving the serious problems related to seafood industry in the form of alerts, rejections due to health hazard bacteria, chemical contaminants and analyzing the product in different stages for various, physical, chemical and biological hazards. The visit came to an end with vote of thanks to all the team members.

World Environment Day Celebrations at CIFT

As part of the World Environment Day 2014 celebrations at CIFT, Cochin, saplings were planted by the Heads of different Divisions, scientists and staff in the premises of CIFT during the 'Green Hour' on 5 June, 2014. In the afternoon Dr. Leela Edwin, Director incharge addressed the gathering and conveyed the theme (*Raise Your Voice, Not the Sea Level*) of the World Environment Day 2014 after which a 40 minute documentary film of National Geographic Channel named "*Earth Under Water*" directed by Tilman Remme was screened at the Conference Hall of CIFT. The documentary was based on research by NASA astro-biologist and paleontologist Professor Peter Ward and a group of American climatologists and this eye-opening documentary uses scientific evidence past and present, archive film, location photography and computer-generated imagery (CGI) to explore the dire consequences should the atmosphere's CO_2 levels treble over the next 100-300 years, as predicted.

Dr. M.P. Remesan, Principal Scientist planting a sapling

Dr. Leele Edwin, HOD, FT & Director incharge addressing the gathering

Consultancy Agreements Signed

During the period under report CIFT, Cochin signed the following consultancy agreements:

i. With M/s Fisheries Institute of Technology and Training (FITT), Chennai for providing technical advice and assistance for the purchase of 40 feet long Fibreglass Reinforced Plastic (FRP) boats.

ii. With M/s Accelerated Freeze Drying Company Ltd., Ezhupunna, Alappuzha for conducting nutritional analysis and toxicological studies of their new seafood based product, "Seafood mix powder".

iii. With Ernakulam Regional Co-operative Milk Producers Union Ltd. (MILMA), Edappally, Cochin for providing technical guidance for designing and setting up of laboratory and facilitating NABL accreditation.

Testing of Slotted Otter Boards

Slotted otter boards of M/s Garware Wall Ropes Ltd., Pune were tested onboard Departmental fishing vessel MFV Matsyakumari–II, as per their request, during 5-10 May, 2014. The weight of each otter board was 140kg. These boards were

Slotted otter boards

NOTUS sensors

Otter board rigging

rigged to 27 m shrimp trawls. Comparative studies was carried out using V-form steel boards. NOTUS trawl sensors were deployed to evaluate the performance. The average spread of the slotted otter boards was 27m. Preliminary results reveated that the slotted otter boards showed higher horizontal spread as compared to V-form otter boards.

Demonstration of CIFT Semi Pelagic Trawl System

Under the Institute project 'Responsible fishing systems for marine sector' the CIFT semi pelagic trawl system was demonstrated onboard a private fishing trawler 'NEHAL' on 21 June, 2014 at Mangalore. The 22 m semi pelagic trawl is a modified version of the 18 m SPTS and has a mesh size of 1000 mm in the wing region. One pair of horizontally curved 'Suberkrub' otter boards each weighing 85 kgs was used for the fishing operation. Three hauls were done using 40 m sweep lines off Mangalore in depth range from 10 to 30 m with an average trawling speed of 2.8 knots. The catch consisted of pomfrets, squids, prawns and other miscellaneous fishes. The CPUE was 10 kg per hour. Fishermen were very keen seeing the quality fish in the catch and have retained the CIFT SPTS for more operations during the ensuing fishing season.

Operation of CIFT SPTS onboard private boat at Mangalore. Inset: Sample catch from CIFT SPTS

Institute Research Council Meeting

The Institute Research Council (IRC) under the Chairmanship of Dr. T.K. Srinivasa Gopal, Director met during 10-12 June, 2014 to discuss the progress in the ongoing research programmes as well as to finalize the research projects for the year 2014-15. The house discussed in detail the 14 ongoing research projects, four new projects, four concluded projects and the various ad hoc externally funded research projects. Presentations were also made on the visits of Scientists abroad to attend training programmes, symposia etc. The following are the new in-house projects

IRC meeting in progress

Participants of IRC meeting

approved for initiation during the year 2014-15:

1. Innovative product development for value addition, nutrient fortification and shelf-life extension of farmed and wild freshwater and marine fish

2. Development of standard processes and protocols for innovative products from aquatic resources, shelf life modeling and assessment of energy use

3. Development of high value by-products from fish and shellfish processing discards

4. Formulation of a fortified fish soup powder and its use in a nutritional intervention study against malnutrition

IMC Meeting

The 64th Meeting of the Institute Management Committee was held at Head Quarters on 30 May, 2014.

Hindi Workshop

A two day Official Language Workshop was conducted at CIFT, Cochin during 20-21 June, 2014 for the benefit of the Administrative Staff of the Institute. Dr. Santhosh Alex, Sr. Tech. Officer was the resource person of the Workshop.

Dr. Santhosh Alex conducting the Workshop

Celebrations

Foundation Day

The Institute celebrated its 57th Foundation Day on 29 April, 2014. The day was also celebrated as Agricultural Education Day. To commemorate the day, the Institute organized an "Open House" in the forenoon. The Institute remained open for the public to get acquainted with the activities and achievements of the Institute. The expert scientists and technicians of the organization facilitated the visit of students and the general public.

The formal Foundation Day Celebrations was held in the afternoon. Dr. K. Gopakumar, Former Deputy Director General (Fisheries), ICAR, New Delhi was the Chief Guest of the function which was presided over by Dr. T.K. Srinivasa Gopal, Director, CIFT. Dr. Leela Edwin, HOD, FT welcomed the gathering. Selected retired staff of the Institute namely Dr. V.C. George, Scientist, Shri C.C. Gandhi, Technical Officer and Shri V.N. Rajasekharan Nair, AAO were honored on the occasion. Shri P.K. Pushpangadhan, retired technical staff who made an invention to combat bird menace in rice fields was also felicitated on the occasion. Shri R. Anil Kumar, Administrative Officer proposed the vote of thanks. The function was followed by a musical fusion concert by Tansen Band, Cochin.

Anti Terrorism Day

The Institute observed Anti Terrorism Day on 21 May, 2014. The Director and Staff of the Institute at the Head Quarters assembled together and took 'Anti Terrorism Day Pledge'.

Students being explained in Open House

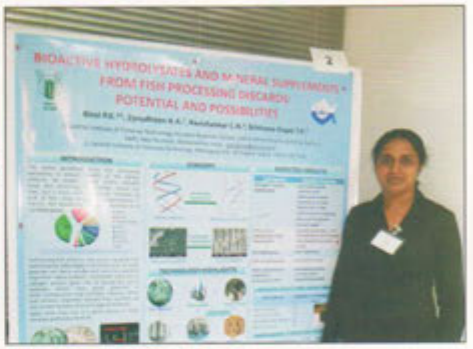
Dr. T.K. Srinivasa Gopal delivering the presidential address

Deputation Abroad

Dr. Nikita Gopal, Principal Scientist, CIFT, Cochin attended and led the Project Planning Workshop for the NACA-MARKET project 'Thematic Studies and Outreach on Gender in Aquaculture in Cambodia, Lao PDR, Thailand and Vietnam' at Bangkok, Thailand during 5-7 June, 2014.

Dr. P.K. Binsi, Scientist, Mumbai Research Centre of CIFT was deputed to Germany to attend the 6th Indo-German Conference on Frontiers of Engineering held at Postdam, Germany during 22-25 May, 2014. Dr. Binsi also presented a poster on "Bioactive hydrolysates and mineral supplements from fish processing discards" in the Conference.

Dr. Nikita Gopal (Sixth from left) with other participants



Dr. Binsi with the exhibited poster

Personnel News

Participation in Seminars/Symposia/ Workshops etc.

- **Dr. T.K. Srinivasa Gopal,** Director – IUFOST National Committee Meeting, INSA, New Delhi (20 April)
- **Dr. T.K. Srinivasa Gopal,** Director – Interactive conference of the Vice Chancellors of Universities and Directors of ICAR Institutes, New Delhi (26-28 April)
- **Dr. T.K. Srinivasa Gopal,** Director – Foundation Day Lecture of NAAS, New Delhi (5 May)
- **Dr. T.K. Srinivasa Gopal,** Director and **Dr. P. Muhamed Ashraf,** Senior Scientist - Workshop on Impact of capacity building programmes under NAIP, New Delhi (6-7 May)
- **Dr. T.K. Srinivasa Gopal,** Director and **Dr. A.R.S. Menon,** Chief Tech. Officer – 24th Meeting of ICAR Regional Committee No. VIII, CTCRI, Thiruvananthapuram (2-3 May)
- **Dr. Leela Edwin,** HOD, FT – 2nd Meeting of the Technical Committee to review the duration of the trawl ban period and to suggest measures to strengthen the conservation and management aspects, CMFRI, Cochin (30 May)
- **Dr. K.V. Lalitha,** HOD, MFB – NAIP Component 2 Workshop, ICAR, New Delhi (28-29 June)
- **Dr. T.V. Sankar,** HOD, QAM, **Dr. C.N. Ravishankar,** HOD, FP and **Dr. S.K. Panda,** Senior Scientist – Scientific panel meeting of FSSAI, New Delhi (30 April). Dr. Panda as a Special Invitee presented a report on The harmonization of standards for fish and fishery products, dairy products and analogues, beverages, meat and meat products in the Meeting.
- **Dr. S. Balasubramaniam,** HOD, EIS – Workshop for the PME Cell Incharges of ICAR Institutes, New Delhi (27 May)
- **Dr. T.V. Sankar,** HOD, QAM and **Dr. S. Sanjeev,** Principal Scientist – Group meeting of FSSAI Scientific Panel for Fish and fishery products, CIFT, Cochin (27 June)
- **Dr. C.N. Ravishankar,** HOD, FP – National brainstorming workshop on Strategies for enhancing livestock and fishery production in the state of Chattisgarh, Kamadhenu Viswa Vidyalaya, Anjora, Durg (12-13 May). Dr. Ravishankar gave an invited talk on "Advances in freshwater fish processing and business options for small scale entrepreneurs" in the Workshop.

composition of marine red algae *Amphiroa anceps* (Fig. 1), to isolate the active components and to test cytotoxicity against Dalton's Lymphoma Ascites, a type of cancer. This marine red algae belongs to the Division Rhodophyta, a primitive group of plants with no true roots, stems and leaves.

Red algae *Amphiroa anceps* were collected from the Gulf of Mannar region of Mandapam coast, Rameswaram, Tamil Nadu. The shade dried algae were powdered, sonicated and extracted with methanol:chloroform (2:1) and used for preliminary pharmacological screening, mineral/ trace element profiling and determination of amino acid/ fatty acid composition. The minerals, sodium, potassium and calcium were quantified using Flame Photometer while iron, copper, manganese, and magnesium were determined using Atomic Absorption Spectroscopy (AAS). Amino acids were deter-mined using High Performance Liquid Chromatography (HPLC) on dry weight basis. Tryptophan was estimated colourimetrically following digestion under alkaline condition and estimated with thioglycolic acid reagent. Fatty acid methyl esters were determined by Gas Chromato-graphy-Mass Spectrometry (GC-MS). Preliminary phytochemical screening revealed the presence of carbo-hydrates, alkaloids, glycosides, saponins, tannins, phenolic compounds, terpenoids, amino acids, fats and oils. The mineral profile of the algae showed the presence of essential trace elements and minerals, which are required to maintain the normal cellular homeostasis (Fig. 2).

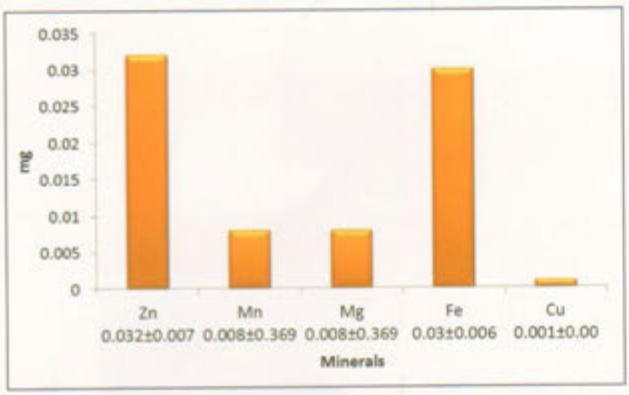


Fig. 2. Minerals (mg) in A. anceps

Amino acid profile of the algae (Fig. 3) revealed the presence of essential and non-essential amino acids in significant proportion. Though both saturated and polyunsaturated fatty acids were present in significant quantities, C22:6 (n-3 PUFA) essentially required for brain and retinal function was found to be present in significant proportion (Fig. 4). The anti-inflammatory n-6 PUFA (C18:2) was also present in considerable amount.

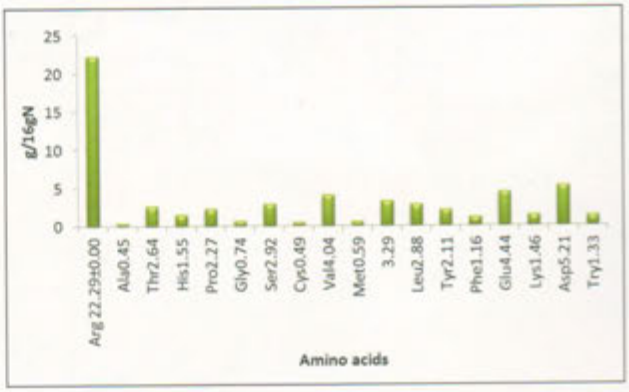


Fig. 3. Amino acid composition of A. anceps

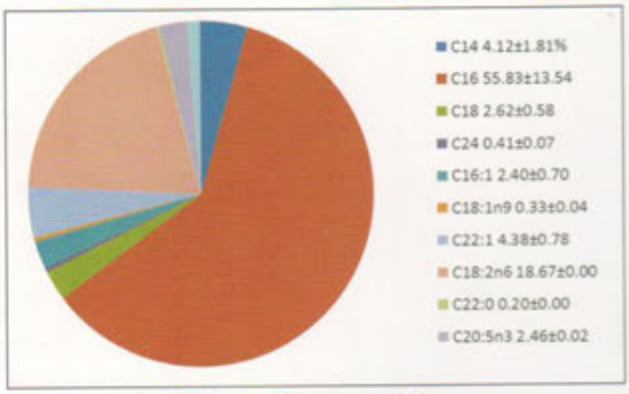


Fig. 4. Fatty acid profile of A. anceps

Analytical HPLC was performed and based on the retention time 3.936 and 4.782, two compounds were isolated using preparative HPLC with methanol as solvent. The two isolated compounds were subjected for UV, GC-MS, I.R, ^{1}H NMR spectral analyses and identified as 1,2-dibutyl benzene-1,2-dicarboxylate (a) and 2,2,4,4,5,5-hexamethyl-1,3-dioxolane hexa-hydrateicosamethane (b). *In vitro* antioxidant assay of the methanol: chloroform extract showed moderate activity with IC_{50} values of 287±1.10 µg/ml for DPPH radical scavenging assay, 340±9.98 µg/ml for nitric oxide radical scavenging assay, 250±3.11 µg/ml for hydrogen peroxide scavenging assay and 227±2.63 µg/ml for reducing power assay. Total antioxidant activity of 10µg chloroform:methanol extract was found to be equivalent to 20µg of gallic acid. The isolated compounds (1,2-dibutyl benzene-1,2-dicarboxylate (a) and 2,2,4,4,5,5-hexamethyl-1,3-dioxolane hexa-hydrateicosamethane (b) exerted significant anti-tumor property against Dalton's Lymphoma Ascites with IC_{50} values of 402±28.11 and 252±5.06, respectively. Since this marine algae is a good source of minerals, trace elements, vitamins, amino acids and polyunsaturated fatty acids having high nutritional value in human health, they can be considered as comparable to that of nutritionally valuable

ethnic and organic foods, CF&DT, TANUVAS, Chennai (26-27 May). Smt. Renuka also presented a paper entitled, "Preservative effect of chitosan on edible coating of Ribbonfish steaks" by V. Renuka, C.O. Mohan, A.K. Jha, S. Remya, G.K. Sivaraman, C.N. Ravishankar and T.K. Srinivasa Gopal in the Conference. The poster received the First Prize for best poster presentation in the Technical Session on "Chemical and microbiological safety and certification of ethnic and organic foods".

Personalia

Appointments

1. Dr. Pankaj Kishore, Scientist, Fish Processing Technology, CIFT, Cochin
2. Shri Kusunur Basha Ahamed, Scientist, Fish Health, CIFT, Cochin
3. Shri Karankumar K. Ramteke, Scientist, Fisheries Resource Management, CIFT, Cochin
4. Shri Ranjith Kumar Nadella, Scientist, Fish Health, CIFT, Cochin
5. Shri G.M. Siddaiah, Scientist, Fish Nutrition, CIFT, Cochin
6. Shri S. Sreejith, Scientist, Fish Processing Technology, CIFT, Cochin
7. Kum. T.K. Anupama, Scientist, Fish Processing Technology, CIFT, Cochin
8. Kum. Hanjabam Mandakini Devi, Scientist, Fish Processing Technology, CIFT, Cochin

Promotions

1. Dr. R. Raghu Prakash, Senior Scientist, Visakhapatnam as Principal Scientist
2. Shri K.B. Sabukuttan, Asst., Cochin as AAO

Transfers

1. Dr. L.N. Murthy, Senior Scientist, Visakhapatnam as SIC, Mumbai
2. Smt. P. Viji, Scientist, Mumbai to Visakhapatnam
3. Dr. Santhosh Alex, Sr. Tech. Officer, Visakhapatnam to Cochin
4. Dr. P. Shankar, Tech. Officer, Veraval to Cochin
5. Shri D.P. Parmar, Asst., Visakhapatnam to Veraval
6. Shri L.N. Badi, Asst., Burla to Visakhapatnam
7. Shri Ramesh Mirdha, LD Clerk, Veraval to Visakhapatnam

Retirements

1. Shri K.U. Dholia, Asst. Chief Tech. Officer, Veraval
2. Shri T.R. Sreekumaran, Tech. Officer, Cochin
3. Shri G.C. Adhikari, AAO, Visakhapatnam
4. Shri D.B. Chudasama, SSS, Veraval

OBITURY

We deeply mourn the sad and untimely demise of Shri N. Krishnan, Technical Assistant, CIFT, Cochin. May the departed soul rest in peace.

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