

maltodextrin. The efficacy of hydrolysate as wall material was evaluated by replacing the sodium caseinate and keeping the proportion of all other polymers constant. Oil encapsulate was also prepared with tuna protein hydrolysate as core material together with sardine oil to evaluate the extent of protection offered against auto-oxidation of fish oil. Oil encapsulates were characterised based on morphological, physical parameters including SEM, DSC, FTIR as well as fatty acid profile, encapsulation efficiency, flow properties, colour, moisture, hygroscopicity and invitro digestibility studies. Storage studies of sardine oil and oil encapsulates under accelerated (60°C), chilled (4°C) and room temperature conditions indicated better oxidative protection to oil encapsulates compared to liquid oil. Tuna protein hydrolysate had more protection efficiency against fish oil oxidation when used as core material than when used as wall material.

AW 12

Development of a smart packaging system for monitoring and managing fish spoilage

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Smart packaging, the combination of active and intelligent packaging, which on the one hand monitors changes in the product (intelligent) and on the other hand acts upon these changes (active), is a promising concept. In the present study, a smart packaging system combining freshness indicators and antimicrobial film was used for monitoring and managing

spoilage of barracuda fish (*Sphyraena jello*) steaks stored at 2°C. Antimicrobial film was prepared from shrimp shell derived chitosan (CH) added with ginger (*Zingiber officinale*) essential oil (GEO). GEO incorporation improved antimicrobial activity, antioxidant capacity, water barrier property and thermal stability of CH films. GEO at lower concentrations didn't significantly ($p>0.05$) affect the mechanical properties of CH film. FTIR (Fourier transform infrared spectroscopy) spectra indicated that functional groups of phenolic compounds were more recognizable with increasing GEO concentration in CH film. As observed from scanning electron microscopy (SEM) of the film, presence of GEO resulted in a heterogenous structure in CH film. Volatile base formation and microbial growth in barracuda steaks packed with CH-GEO film were significantly ($p<0.05$) lower than control. pH sensitive dyes were used as freshness indicators to monitor the quality of chill stored barracuda steaks. Among the various dyes used, bromocresol purple was the most effective visual indicator of barracuda deterioration. The results of the present study indicate that CH-GEO film is an effective packaging material with potential bioactivities for improving the keeping quality of fish steaks and synergistic use of freshness indicator and antimicrobial film can provide the consumers a more safe fish.

AW 13

Life Cycle Assessment (LCA) based identification of environmental hotspots in commercial trawl fisheries and mitigation strategies

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Life Cycle Assessment (LCA) is used to identify environmentally preferred products or processes and can be used as a support tool for decision-making and policy development. In India, till now no study has been undertaken on LCA of trawl fishing wherein impact categories such as Global warming potential (GWP), Abiotic depletion potential (fossil) (ADP), Acidification potential (AP), Eutrophication potential (EP), Marine aquatic ecotoxicity potential (MAETP), Ozone layer depletion potential (ODP) and Photochemical ozone creation potential (POCP) are considered. In this study, LCA and carbon footprint analysis of fish production by trawlers operating in Kerala fisheries sector has been carried out. Direct energy input for fishing operations due to consumption of fuel typically account for 75 to 90% of the total energy inputs when compared with energy inputs associated with vessel construction and maintenance, fishing gear and others. In the LCA analysis of trawl caught fishes, the impact categories such as GWP, ADP, AP, EP and POCP are predominantly related to the consumption of diesel in vessel operation, and, hence, it is highlighted as the main hotspot in respect of environmental burdens which need focussed action in mitigation approaches. The results of this study delineate approaches for reducing carbon footprint of the trawl caught resources in Kerala. The study has identified hotspots requiring urgent attention in mitigation of environmental impacts of trawl sector.

AW 14

Modeling and forecasting shrimp production in Chilika lagoon, India

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Chilika lagoon (a Ramsar site) is a large source of fish production and biodiversity situated in the east coast of India, Odisha. Shrimps landings contribute an average of 4185 mt which is about 35% of total fish production after new lake mouth opening of Chilika lagoon since 2001 to 2015. Catch prediction is necessary for appropriate planning and designing of the national fishery development plan for the lagoon system. In this study, SARIMA (Seasonal Auto Regressive Integrated Moving Average) model has been developed on quarterly time series shrimp catch data of Chilika lagoon for the period 2001 to 2015 and forecasted up to 2018. Akaike Information Criteria (AIC), Bayesian Information Criterion (SBC) were taken for goodness of fit criteria for developing best fit model. Results showed that, maximum average shrimp landings was observed in the first quarter period (summer season) where as maximum variation in catch was observed in second quarter Q2 (monsoon season) and lowest variation in catch was observed in fourth quarter Q4 (winter season) catch during 2001 to 2015. The SARIMA (0,1,1)(0,1,1)₄ model with minimum AIC (509.23), SBC (517.26) and maximum R² (0.70) was the best fitted model for the shrimp landings in Chilika lagoon. The developed SARIMA model was validated with the original quarter wise catch data for the period 2014 and 2015 with 9.14 and 1.02 percent prediction error. This SARIMA model further used to quarter wise landings forecast for the year 2016, 2017 and 2018. The prediction showed an increase in catch per year by 4.5%, 5.9% and 7.36%, respectively with respect to the base year 2015 by maintaining the present lagoon condition. The present study