in polyester-polyethylene laminated pouches. The packs were divided into 7 lots. One lot was used as control air pack and for other 6 lots, different combinations of CO_2 and O_2 (100:0; 80:20; 60:40; 40:60; 20:80; 0:100) were flushed before sealing the pouches. All the packs were stored on ice (0-2^{0}C) and the survival of *Y enterocolitica*, total aerobic plate counts and biochemical quality was monitored at regular intervals. Total volatile base nitrogen content increased with the storage period, which correlated well with the total aerobic plate counts. The gas combination of 80:20 (CO_2:O_2) exhibited better inhibitory effect for *Y. enterocolitica* compared to other gas compositions. The use of MAP with combination of 80:20 (CO_2:O_2) can be used for extending the shelf life of perishable food commodities like fishes significantly which helps in expanding the marketing of fishes to distant locations with maximum control with respect to major food borne pathogens.

SF OR 20

Development of DIG labeled probes for detection of *Salmonella*

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The genus *Salmonella* has zero tolerance in food and the presence of this pathogen is a serious concern world over. A DIG-labeled probe was developed to enumerate the pathogenic, food borne *Salmonella* by targeting *hns* and *invA* genes. The presence of hns and *invA* genes in all the isolates included in the study were confirmed by performing polymerase chain reaction (PCR) followed by agarose gel electrophoresis to confirm *Salmonella* by observing the specific band. From the same isolates, DNA were isolated, amplification and purification were performed which were then subjected to quantification of labeling efficiency, DNA spotting, hybridization and immunological detection. Dot blot hybridization revealed that all the PCR products obtained with *hns* and *invA* primers hybridized with the probe confirming the specificity of this primer to detect *Salmonella* by evident positive color reaction. DIG labeled *hns* and *invA* probes that were developed in this study showed similar efficacy in detecting Salmonellaas thePCR. The present investigation revealed that both *hns* and *invA* probes developed were simple, reliable and specific for enumerating *Salmonella* with the minimum probe volume that in turn assures its efficient application in detecting/enumerating *Salmonella*. This method subverts the necessity to perform agarose gel electrophoresis followed by gel documentation and can be performed on the PCR product directly. It can also lend itself to using the probes to perform colony hybridization on agar plates with suspected *Salmonella*.

SF OR 21

Effect of liquid smoke and chitosan treatment on inhibition of *Listeria monocytogenes* in fishmodel system

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Fish and fishery products which are considered as an excellent source of nutrition can also act as vehicles for the transmission of food borne pathogens. In the present study, the inhibition effects of liquid smoke alone and a combination of liquid smoke and chitosan to inhibit *Listeria monocytogenes* was investigated. The total phenolic content of liquid smoke was determined according to the Folin-Ciocalteu method and the value observed was 20.7 mg/ml. To study the effect of liquid smoke alone, cold smoking of *Pangasianodon hypophthalmus* was done with 5% liquid smoke and inoculated with *L. monocytogenes*. Further, the combined effect of liquid smoke and chitosan was studied by dipping cold smoked *P. hypophthalmus* pieces in different concentrations (1%, 1.5% and 2%) of chitosan solution for 10 minutes and inoculated with *L. monocytogenes*. After 14 days of survival study, liquid smoke-treated fish showed reduced bacterial count from 8 log units to 2 log units. However, fish treated with liquid smoke and 1.5% chitosan showed a significant reduction in the bacterial count from 8 log units to 1 log unit. Hence, from the present study, it can be concluded that the combined treatment of liquid smoke and 1.5% chitosan can inhibit *L. monocytogenes* considerably than liquid smoke alone.

SF PO 01

Endogenous formaldehyde content in some commercially important Indian food fishes

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Formaldehyde is currently classified as a known human carcinogen by the International Agency for Research on Cancer (IARC, 2012) and the National Toxicology Program (NTP, 2011). The oral reference dose (RfD) suggested by the US Environmental Protection Agency (EPA) is 0.2 mg/kg of body weight. Similarly, some other countries have proposed standard maximum limits for fish like a maximum limit of 60 mg/kg for fish (for Gadidae family) and 10 mg/kg for crustaceans (Italian Ministry of Health). In recent times, illegal applications of formaldehyde to increase the shelf-life of fish, which is a highly perishable food commodity although of high value and high export-demand, have been reported. However, formaldehyde also occurs in fish and certain other food items as a degradation product of trimethyl amine oxide (TMOA). Therefore, it is necessary to have information on the endogenous formaldehyde content in different fish food/food products to differentiate it from the exogenous formaldehyde illegally added. In this context, we have determined the endogenous formaldehyde content in some commercially important food fishes including rohu (*Labeo rohita*), catla (*Catla catla*), mrigal (*Cirrhinus mrigala*), hilsa (*Tenualosa ilisha*), tilapia (*Oreochromis niloticus*) and Bombay duck (*Harpadon nehereus*) by HPLC. The endogenous formaldehyde contents were found to be < 5 mg/kg wet weight in all the fishes studied except Bombay duck in which it was found to be 26.9 mg/kg. However, these values are much lower than the permitted value for fish (60 mg/kg as proposed by the Italian Ministry of Health). This study provides baseline information that can be used for quarantine purposes and to set the permissible limit of formaldehyde in Indian food fishes by the Food Safety and Standards Authority of India (FSSAI).