

**SF OR 09**

**Development of fish freshness indicator with red cabbage and turmeric extracts**

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Fish freshness indicators were developed using pH sensing red cabbage and turmeric extracts. Chitosan films entrapped with the natural extracts were evaluated for their efficiency in detecting fish freshness during storage. The films act as visual colorimetric sensors inside fish package, changing colour with the rate of spoilage. The colour change indicates the degree of fish freshness. The pH chart developed in pH buffer gradient solutions with the extracts were correlated with the headspace pH. Biochemical (TMA, TVBN), microbial (TPC) and sensory quality of the fish were estimated during storage. The colour change of the film was measured using colorimeter. The red cabbage film turned from purple to green and the turmeric film turned from yellow to orange. The study reveals that the smart films can be effectively used as visual fish freshness detectors.

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**Development of freshness indicator for packed fish and shell-fishes**

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The intelligent packaging systems with emphasis on monitoring real-time freshness of food are gaining increased

importance. Keeping this in view, the present study was undertaken to develop a freshness indicator for packed fish and shellfishes in refrigerated storage condition (2-3°C). Indian mackerel (*Rastrelliger kanagurta*), Indian white shrimp (*Fenneropenaeus indicus*) and squid (*Loligo duaceuli*) was used in the study. Ten different pH-sensitive dyes, with chemical modification were impregnated on to the sterile filter paper and allowed to dry. Cleaned fish and shellfishes were packed in HDPE trays and filter paper impregnated with pH-sensitive dyes was attached separately to the inner-side of the tray top sealing packaging material. The trays were placed in refrigerator and samples were drawn at regular intervals to monitor the visible colour change, CO<sub>2</sub> level in headspace, pH, total volatile base nitrogen, microbial and sensory quality. A progressive increase in the CO<sub>2</sub> level was observed in all the packs. TVB-N values, total aerobic plate counts, total psychrotrophic counts and *Pseudomonas* counts increased with the storage period. Among the 10 different dyes, bromocresol purple correlated well with the biochemical and microbial changes, thus indicating its application as real-time monitoring of freshness for packed fish and shellfishes.

**SF OR 11**

**Comparative *in-vitro* studies on antimicrobial activity of bulk and nano-zinc oxide incorporated chitosan**

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