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A Live fish carrier system (LFCS) was developed for short distance (about 80 km) transportation of live table carps for food, fingerlings for rearing, ornamental fish for trade, brooders for breeding in hatcheries and other similar species for conservation, research and rancing purposes. The system (battery operated 3-wheeled vehicle) was devised with water filtration, aeration and cooling system, ammonia absorbant, water-splash breaker and excreta separator to maintain good water quality with consistency for live fish transported in it. The carrier is constituted mainly with two components i.e., the Battery Operated Self-contained Aerating Vehicle (BOSCAV) and Stackable Aerating Containers (SAC) or Non-stackable aerating container (NSAC). In traditional method, >50% mortality of the carps (*Labeo rohita*, *Catla catla*, *Cirrihinus mrigala*, *Cyprinus carpio*, *Hypophthalmichthys molitrix*, *Hypophthalmichthys nobilis* with mean weight 500-2000 g) was recorded for a journey period of about 4-5 hours, which was significantly less in new method (<5%). The requirment of handlers also was just 1 person in new method against 4-5 in traditional method. Fish to water ratio was maintained at 1:1 for NSAC (1:2 for SAC) in new method, while this ratio was 1:3 in traditional method. Carps were harvested and kept in *hapa* for 4-6 hours and BOSCAV was charged by electricity. Either SAC or NSAC was mounted in BOSCAV, filled with clean and fresh pond water (or ground water from borewell with 1% NaCl), aeration-filtration-cooling assembly was switched on, live carps loaded in the BOSCAV at recommended density (15-25 carps/SAC or 100-300 carps/NSAC) and then driven to the destination. Apperently the system could

reduced drudgery of fishers along with the handling stresses on fish. Being eco-friendly, this system can also be used as mobile fish retail shop and ornamental fish trade for increasing farmers' income, as live fish fetch 20-50% more price than their dead counterparts.

AV OR 02

Microwave vacuum dried mackerel: Physico chemical qualities and evaluation of essential oils in inhibition of lipid oxidation

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Microwave vacuum drying is an emerging technology for drying food products. In the present study, Indian mackerel (*Rastrelliger kanagurta*) was dried in microwave vacuum drier and compared its physico chemical quality to mackerel dried in hot air oven. Effect of thyme and rosemary essential oils on inhibiting lipid oxidation during drying process was also evaluated. Brine salted mackerel was given dip treatment in 0.75% thyme and clove leaf oil and dried in hot air oven (50-55⁰C) and microwave vacuum drier (600 W and 600 Hg mm). Control samples were also prepared by replacing essential oil solution with potable water. Moisture content of microwave vacuum dried (MVD) and hot air dried samples (HAD) was reduced to 30-32% in 1.2 h and 12 h, respectively. Color and appearance of uncooked MVD sample was superior to that of HAD samples. Rehydration ability and water absorption index of MVD samples were slightly higher to

that of HAD samples. HAD sample had more salt soluble and water soluble protein nitrogen fraction than MVD sample. Higher instrumental hardness values were observed for HAD samples. However, lipid oxidation was slightly higher in MVD samples compared to HAD samples with control having the higher TBARS and PV indices than essential oil treated samples. As per the results of PV and TBARS, thyme oil exhibited better antioxidant effect compared to clove leaf oil. The study demonstrated that fast drying can be achieved by microwave vacuum dryer and it can produce dried fish having better sensory and comparable physicochemical characteristics to that of conventionally dried products.

AV OR 03

Quality attributes of single washed surimi gels of tilapia as affected by different washing media

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This study was conducted to investigate the effect of single washing cycle with different washing media on the quality of tilapia mince in comparison with the quality of conventional washed surimi. Experimental design is as follows (UM; unwashed mince, CW; conventional washed surimi, T1; washing with cold water, T2; alkaline saline solution, T3; calcium chloride and salt solution). Single washing cycle and different washing media interaction factors significantly affected the quality characteristics including gel strength, texture profile analysis, whiteness, SDS-PAGE, fourier transform spectroscopy, differential

scanning calorimeter and scanning electron microscopy images. From the results, it was observed that compared to conventional washed surimi, alkaline saline washed surimi with single washing cycle exhibited significantly ($p < 0.05$) higher gel strength of 619.12 g.cm. A higher whiteness value (72.23) was observed in conventional washed surimi gels in comparison to other treated thermal gels. SDS gel electrophoresis revealed that myosin heavy chain band intensity decreased in heat induced gels, compared to that observed in mince and surimi due to polymerization of proteins on setting indicating formation of a gel matrix. Thermal transition of alkaline saline washed surimi exhibited no endothermic transition, while all other treatments showed a shift in the transition peak from surimi to paste. The single washing cycle with different washing media promoted the heat induced conformational transition from α -helix to β -sheet, β -turn and random coil structures which are positively correlated with gel strength except for surimi washed with cold water. Scanning electron microscopy images showed a fine structure with an absence of voids and larger strands appeared which may be due to the aggregated protein initiated by alkaline saline washing. Therefore, it can be concluded from the present investigation that single washing with alkaline saline treatment yielded good quality tilapia surimi.

AV OR 04

Protein interactions and their effect on expansion and oxidative properties of fish based extrudates modelled by response surface methodology

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