

# Slurry ice for improving quality of fish and shellfish onboard

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Total fish production in India during 2013-14 was 9.4 Mt of which 4.60, 2.62 and 0.11 Mt was contributed by East, West coasts and Union Territories, respectively. The ice requirement is same as that of landed fish, as recommended fish to ice ratio is 1:1. Accordingly, total requirement of ice across the coastal states is approximately 10 Mmt. The cost of freshwater ice is around ₹ 2000/ t. In the North West coast of India including Mumbai region, use of slurry ice manufactured using sea water is gaining popularity. The use of slurry ice system for onboard chilling of fish is one of the recent developments. Compared to conventional solid ice, slurry ice offers several advantages like uniform cooling and even heat transfer. Slurry ice engulfs the fish completely without leaving any air pockets and ensures rapid and even heat transfer. Slurry ice also reduces physical damage caused to seafood products due to spherical

microscopic ice particles when compared to aciculate crystals of flake ice. When technical advantages are considered, it is possible to pump the slurry ice mixture thus making fish handling more hygienic. Varying capacities of slurry ice machines from 4 to 10 tons per day are available for installation onboard the fishing vessels. The slurry ice temperature ranges between -2 to -6 °C depending on the salt content of seawater. Slurry ice unit can be operated either by diesel engine or through electrical power mode which costs around ₹ 7.5 to 12.5 lakh depending on several factors like capacity. In Mumbai region, four trawlers have installed the unit onboard the fishing vessel and more initiatives have been taken for installation of slurry ice units in Gujarat, Goa, Andhra Pradesh and Tamil Nadu.

Onboard handling is one of the parameters that determine the quality of fish and hence their economic value. The present study was

undertaken to evaluate the effect of slurry ice on the biochemical, textural and microbiological quality of pink perch (*Nemipterus japonicus*) and tiger shrimp (*Penaeus monodon*), stored onboard for seven days. Slurry ice was prepared from filtered seawater (salinity: 3.5%) onboard fishing vessel using ICEFLOW (Chirag Ice Factory Pvt. Ltd., Navi Mumbai) machine working with BOCK F4 compressor using chlorodifluoro methane (R-22) as refrigerant. The temperature of the slurry ice mixture was -2 °C. Pink perch and tiger shrimp with average length of 13.40 cm and 9.36 cm and average weight of 16.77 and 11.09 g respectively were caught and stored onboard fishing vessel under slurry ice conditions.

The L\*, a\* and b\* values were 63.84, 5.61, 17.42 for pink perch and 51.04, 9.35 and 15.99 for tiger shrimp picked meat respectively. The proximate composition of pink perch and tiger shrimp stored under slurry ice is given in Table 1.

Biochemical quality parameters were evaluated for pink perch and shrimp stored under slurry ice and the values are presented in Table 2. The values for pH of pink perch and shrimp meat were found to be in the neutral range. Tri methyl amine nitrogen (TMA-N) and Total volatile base nitrogen (TVB-N) content for

**Table 1. Proximate composition of pink perch and tiger shrimp stored onboard under slurry ice**

Parameters	Pink Perch	Tiger Shrimp
Moisture (%)	78.23	78.57
Crude protein (%)	18.20	18.43
Crude fat (%)	0.62	0.21
Ash (%)	1.90	1.82

pink perch were within the acceptable limit. Alpha amino nitrogen (AAN) contents were 0.35 and 0.05 mg/kg respectively for pink perch and tiger shrimp samples. The NPN values were found to be higher for shrimp samples when compared to pink perch. Salt content of pink perch and tiger shrimp under slurry ice were 0.81, 0.99%, respectively. Salt soluble nitrogen (SSN) was slightly higher in pink perch samples when compared to shrimp samples.

Textural evaluation of shrimp samples revealed higher hardness values compared to pink perch samples. Cohesiveness, springiness, chewiness and gumminess of samples did not show much difference between the fish and shrimp samples. Microbiological evaluation showed that APC were within the permissible limits for both the samples.

**Table 2. Biochemical quality indices of pink perch and tiger shrimp stored onboard under slurry ice**

Parameters	Pink Perch	Tiger Shrimp
pH	7.35	7.68
Tri methyl amine nitrogen (TMA-N) (mg%)	1.05	0.35
Total volatile base nitrogen (TVB-N) (mg%)	6.30	17.15
Alpha amino nitrogen (AAN) (mg/kg)	0.35	0.05
Free fatty acid (% of oleic acid)	9.01	15.67
Thiobarbituric Acid Value (mg malonaldehyde /kg of fat)	-	0.05
Non-protein nitrogen (NPN) (mgN/100 g meat)	256.20	504.00
Salt content (%)	0.81	0.99
Salt soluble nitrogen (SSN) (g%)	13.50	10.70

Overall, the fish and shellfish sample stored under slurry ice for seven days exhibited

acceptable level of biochemical and microbiological quality parameters.