Development of principal component based quality index and shelf life prediction of *Pangasius hypophthalmus* stored in iced condition

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Preservation of fish is important in the context of providing quality product to the consumer. Chilling effectively delays bacterial growth and prolong the shelf life of fish. Various types of chilling systems have been used for seafood products including the conventional flake ice, refrigerated seawater, slurry ice and dry ice. Quality changes of ice stored *Pangasius hypophthalmus* were evaluated by assessing chemical, physical and sensory quality parameters. The primary objective was to develop a quality index in terms of all chemical, physical and sensory quality parameters using principal component analysis.

P. hypophthalmus, a commercially important freshwater fish was collected from a fish farm near Cherthala, Kerala. The average total length of the collected fish was 32-35 cm and average weight was 0.6-0.7 kg. Fish were kept in iced condition throughout the study and daily sampling was done for a period of 25 days. During storage study, chemical parameters *viz:*, TVB-N, TBA, PV, FFA and physical parameters *viz:* pH and water activity (WA) was also measured as per standard analytical procedures. Colour parameters of the samples *viz:* L*(lightness), a*(red/blue) and b*(yellow/green) were also measured. The freshness of whole fish was assessed by expert panel for different quality descriptors and the cumulative demerit score was recorded for every day for a period of 25 days.

The initial TVB-N value of fish sample was 2.8 mgL 100 g; which gradually showed an increasing trend during the period of storage and reached 23.8 mgL100 g sample on the 25th day of rejection. The initial PV value was 8.46 milli equivalents per kg and showed a decreasing value in most of the days and final PV value was 1.49 milliequivalents per kg on rejection day. TBA value showed an increasing trend initially up to 9th day of storage, followed by a static trend up to 22nd day of storage and again an increasing trend till the day of rejection of the product. The initial TBA value was 0.0078 mg malonaldehyde/kg and increased significantly to 0.28 mg malonaldehyde /kg on 25th day indicating the progress of lipid oxidation. FFA values showed a fluctuating trend initially up to 10th day of storage and thereafter increasing till rejection of the sample. The initial FFA content was 3.04 mg% oleic acid which reached 4.64 mg% oleic acid on the day of rejection.

The initial pH of ice stored fish was 6.78 which decreased to 6.43 on 7th day of sampling and gradually increased to 7.01 on rejection day. Initial water activity of ice stored fish was in the range of 0.98 to 0.998. This remained static throughout the study. The initial L* of the ice stored fish was 56.52 which showed an increasing trend throughout the storage period and reached 61.93 for ice stored fish. a* value showed a decreasing trend during the storage period from an initial value of 20.3 to 10.3. The initial b* value of ice stored fish was 34.10 and decreased to 23.88 on second day of sampling. On the day of rejection, b* value reached 27.33.

The organoleptic analysis was carried out by using demerit score sheet (Fig.1). The initial demerit score for ice stored fish was 1 which increased significantly to 23 on the day of rejection. This increase in demerit score is due to the characteristic changes in the appearance, texture of muscle, eyes, gills, belly etc.

Principal component analysis was performed for the chemical, physical and sensory quality parameters of ice stored fish for a period of 25 days. Variables *viz.* pH, water activity, TVB-N, TBA, PV, FFA, sensory score, L*, a* and b* were considered for the analysis. All the parameters
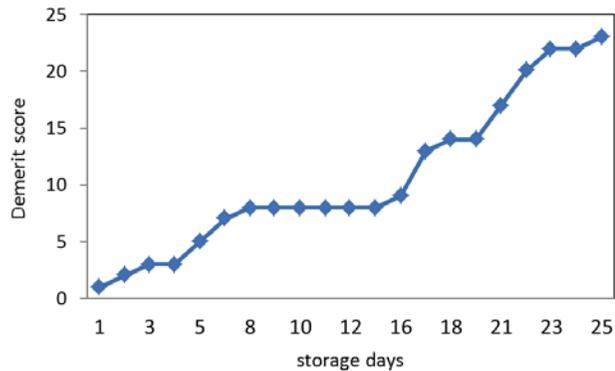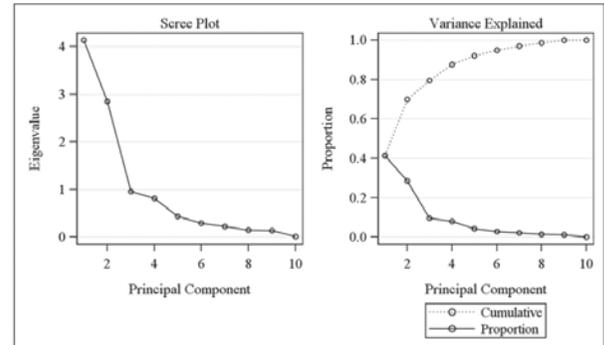
Fig.1. Organoleptic changes during ice storage

Fig.2. Variance explained by the principal components

except a* and b* produced a positive correlation with the storage days. All the correlation

physical and sensory parameters and can be used to predict the shelf life of a fish species stored in

Table1. Principal component score of different quality variables

PC	pH	WA	TVBN	TBA	PV	FFA	SS	L*	a*	b*
					Variables					
PC1	0.340	0.375	0.422	0.372	0.078	0.223	0.454	0.193	-0.342	-0.097
PC2	-0.017	0.173	0.027	0.092	0.489	0.461	-0.024	-0.454	0.301	0.457

coefficients were significant at 5% level of significance except for PV, FFA and b*. First two principal components (PC1 and PC2) explained 70% of the total variability comprising PC1 and PC2 with 42 and 28% variability, respectively (Fig.2).

Principal component score of PC1 and PC2 for different quality parameters is given in Table.1. Storage day was considered as a function of these principal component score to predict the shelf life of ice stored Pangasius, i.e. / Shelf Life = f (PC1, PC2)+ e, where e is error term.

This type of combined index can be formulated in terms of changes in chemical,

chilled condition.

References

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