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Comparative studies of Organoleptic Quality and Total Bacterial Load Assessment in Indian Major Carps

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Abstract

Fish quality is the result of reflection of culture medium and components fed by fish. So, the aim of the current study was to compare the possible differences in organoleptic quality and bacterial load in pond reared and wild stock of major carps viz; Catla catla, Labeo rohita *and* Cirrhinus mrigala. *A total of fifty (50) samples of each species of major carps from river and farmed sources were collected from Head Trimu River Chenab at District Jhang and Fisheries Research Farms of University of Agriculture, Faisalabad. Maximum bacterial load 18,020±1,301 cfu/gm was observed in wild stock as compared to farmed specimens which have 7,457±938 cfu/gm. All riverine verities of three fish species had firmer and darken texture appearance parallel to farmed species at room temperature. Riverine* Catla catla *texture was found more firm than* Cirrhinus mrigala *followed by* labeo rohita *in farmed specimens respectively. The proficient ecosystem of the river was accountable for dark pigmentation and firmer texture in wild stock. The farm reared fish species display docile tendency as compared to riverine fish species which were agile and active.*

Key Words: Organoleptic quality, Texture, River, Pond, Indian major carps and Total plate count

1. Introduction

Due to upgrading developments of living standards, the peoples are becoming more and more aware about health Worldwide One of the utmost significant sources of animal protein is fish meat which has been extensively recognized as an admirable source of better quality proteins, rich in vitamins, minerals and other elements and low in fatty acids, for the repairs of a healthy body (Andrew, 2001). In current times there has been a growing consciousness about health. Fish as food is more acceptable because of its superior nutritious potentials. The natural wild stock is favored to farm reared fish (Verbeke et al., 2007). Significant biochemical differences were recorded when wild stock and farmed reared fish same species were compared (Chuang et al., 2010).

Fish undertakes large no of physiological, sensory and structural changes after its death and these speedy changes are due to aqueous environment of fish and there is large no of variables like environmental factors, feed composition, feeding frequency and proximate composition effect the

organoleptic features of fish (Gopakumar, 2006). The microbial load was higher in fish species collected from lakes (1000±9.6×105 cfu) as compared to fish species that are collected from hatcheries, tanks and ponds (1001±5.0×105 cfu) (Khato et al., 2016). The diets effect on body survival, growth, proximate body composition and organoleptic status of farmed Nile tilapia shows that with proper diet formulation, acceptable composition quality, sensory characteristics and growth rate of farmed tilapia can be achieved without using more expensive commercial feeds. Cheap, easily available fish feed is likely to boost up fish farming, the growing protein sources for rural societies living far away from fisheries resources such as river, lakes and marine resources by (Muchiri et al., 2015).

There is a lack of information on the biochemical differences between cultured and wild Indian major carps. The present communication highlights the differences in sensory qualities and microbial count in three fish species of major carps. Therefore, by consideration the above differences, the current research was carried out to evaluate the dissimilarities in bacteriological load and organoleptic quality of supreme preferred group of the purchaser's liking, three species (major carps) due to the dissimilarities in water quality features of two kinds of water sources i.e. farm and river.

2. Material and Methods

A fifty (50) no of individuals of each species of major carps in the same time and having similar an average weight ranging from 200 to 250 g and an average length ranging from 18 to 30 cm. respectively, from river and farmed sources were collected from Head Trimu River Chenab at District Jhang and Fisheries Research Farms of University of Agriculture, Faisalabad. The collected samples were kept in sample collecting boxes after placing them in tagged polythene bags for transportation to Saline Fisheries Laboratory, Department of Zoology, Wildlife and Fisheries, University of Agriculture, Faisalabad and stored at room temperature of 35°C for a period of 6 hr duration. The collected samples were also stored at -20°C for microbiological analysis within 72 hours as per prescribed time limit by AOAC (2016).

Total bacterial load/Total plate count (TPC) was determined by following AOAC (2016) standard test methods. After taking 50 g of the fish meat sample in the jar of the blender and added Butterfield's phosphate buffer (450 ml) and blend at 12,000 rpm for 2 min. Serial dilutions were made by adding 10 ml of blended solution in reagent bottle of sterile Butterfield's phosphate buffer (90 ml) and vortex mixer was used to mixed the dilutions vigorously and take 1 ml of each dilution with pipette into labeled petri dishes in duplicate. After adding 15-20 ml of PCA, sample dilutions and agar medium immediately mixed thoroughly. And placed the petri dishes in the incubator in inverted position.

The results were calculated by using the following formula

$$N = C / [(1 \times n1) + (0.1 \times n2)] \times (d)$$

Where,

N = Number of colonies
C = Sum of all colonies
n1 = Number of plates in first dilution
n2 = Number of plates in second dilution
d = Dilution from the first counts

Different sensory methods viz; smell, taste, flavor, texture and overall acceptability were used to assess the organoleptic quality of sampled fish species by a panel of 10 judges on 10 points (Gupta et al., 2013).

Sensual approaches were used to evaluate the brightness based on organoleptic

characteristics such as color of the fish body appearance (shiny/dull and light/dark), skin nature (slime present/absent moist/dry), physical appearance evaluating by thumb imprint, eye position and nature (projected/ sunken, glossy/hemorrhage), colour of gills (pale, yellow brown, red, light red, pale) etc. (Kamal, 2000). The quality (organoleptic) of three fish species were arbitrated by a group of technical experts. The categorizing of fish using slash on the features has been followed by multilingual Guide to EC Freshness Grades for Fishery Products (Howgate et al., 1992) with minor alteration to magistrate the fish quality. Opinion was engaged on regular basis during April 2017 to Nov 2017 and each sample was analyzed for each hr. up to 06 hr. of storage period at ambient temperature. There were not any typical practices for detecting these parameters and simply was performed by exposed to storing at room temperature of 35°C for a 6 hr duration.

3. Results and Discussion

The minimum (Farmed 8560, 8870 and 1230+ Wild 12200, 14200 and 12200) and maximum (10120, 11130 and 8210+ 82000, 19800and 15400) values of total plate count (tpc) were observed in Labeo rohita, Cirrhinus mrigala and Catla catla respectively. Analysis of variance on tpc showed that there is highly significant difference among groups, species and interaction between groups and species Statistical analysis on total plate count(tpc) in farmed and wild three fish species revealed significant differences among two groups and between three fish species. The overall mean values of tpc varied from 7,457±938 to 18,020±1,301cfus/gm respectively (Table1, figure 1).

The current data regarding bacterial loads in meat of three fish species of major carps of wild and farmed cultured revealed that there was a significant difference in total plate count among wild and farmed species. Wild species of major showed highest bacterial load as compared to farmed stock. The highest total plate count was recorded in both catfish and tilapia collected from lakes and cages paralleled to fish species from tanks, ponds and hatcheries (Kaba et al., 2016).

The texture of farmed and riverine major carps was observed firm during the first hour and with the passage of time their texture quality became softer after 6 hours. Riverine Catla catla texture was found more firm than Cirrhinus mrigala followed by labeo rohita in farmed reared specimens respectively. All riverine fish species of major carps had stronger consistency than farmed captured fish species at room temperature comparatively. (Table2, 3 and 4). Alike results of texture in wild stock than farm reared ones were also detected in Channel cat fish, Australian snapper, Gilthead bream and Chinook Salmon (Grigorakis et al., 2003) respectively.

All the farmed major carps had lighter color than its wild counterpart which were darker in appearance. The color in farmed major carps start to become dull during the 3rd hour of storage. The skin state of cultured carps remains persevered during 3rd hour while in wild species started drying from 2nd hour. The gills red color represents the sign of better quality (freshness). The color of the gills in riverine carps remained red throughout all the duration (6th hours). Eyes remained protruded in farm reared major carps up to 3rd hour while the eyes in riverine carps were completely sunken from 1st hour. Parallel comments were also described in other fish species (Howaida and Ali, 2007).

All the wild specimens were observed in darker color while pond reared fish species

had lighter colour. The dull color in the riverine fishes appeared in 2rd hr while in the pond reared fishes appeared to be dull from the 3nd hr of storage. The state of skin in farmed reared individuals persisted up to 2nd hr while the skin of wild captured fish species started drying from 2nd hr. (Table2, 3and 4). These remarks are in the conventionality of Meenakshi et al. (2010). The imprint of darker colour in wild species be associated to the greater proportion of dark muscle in them temperately to the farmed fish species which have shiny white presence (Howaida and Ali, 2007).

Red colour of gills in both varieties of theree fishes was observed in the initial 2 hr. However, gills started becoming light red to brown at the starting of 3rd hr and continued with it till last in cultured fish species. The gills colour remained red all through the duration of 6 hr for wild fish species. (Table2, 3and 4) The red colour of gills in three varieties of riverine carps' species is the sign of best quality and freshness (Gopoakumar , 2006). The position of eye in farmed verities was found convex while in river carps shiny and sunken during 1st hour of storage (Gopoakumar, 2006) and convex eye is the best criteria for measuring the freshness. Eye spunkiness in river species is due to stress condition was also observed during current experiment.

The fishes from wild source show trend to have agile and active life patron, while the farmed reared fishes are comparatively docile The results of current study fully were accordance the findings of Venugopal and Shahidi (1996), who reported that the solider texture and shadier muscle of the body help for incessant swimming action in wild stock fish species from river and white muscles of farm reared fish species help in fast energy spurts. Therefore, the fishes from the wild stock have firmer body texture and shadier body muscles as parallel to pond reared fishes which are white in presence.

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Table 1: Analysis of variance for Bacterial load /total plate count in wild and farmed reared major carps

Source of variation	Degrees of freedom	Mean squares
		Total plate count / Bacterial load (TPC)
Source	1	836880083**
Species(S)	2	164555323**
Source x S	2	35181323**
Error	24	5864752
Total	29	

NS = Non-significant (P>0.05); * = Significant (P<0.05); ** = Highly significant (P<0.01)

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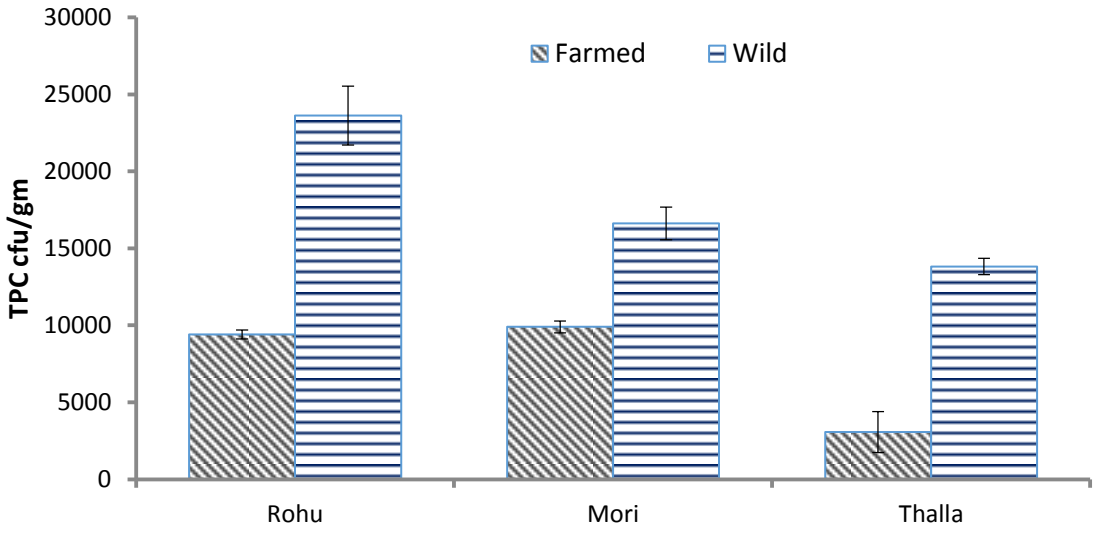

Fig. # 1: Comparison of total plate count (cfus/g) in meat of major carps of wild and farmed sources

Table 2: Organoleptic analysis of river and pond reared *Labeo rohita* at room temperature

Organoleptic properties	Time duration					
	1h	**2h**	**3h**	**4h**	**5h and 6h**	
Texture	Farmed	Firm	Less firm	Less firm	Slight soft	Slight soft
	River	Very firm	Very firm	Firm	Firm	Less firm
Coloration	Farmed	Light, shiny	Slight dull	Dull	Dull	Dull
	River	Dark, shiny	Dull	Dull	Dull	Dull
Skin condition	Farmed	Moist, present	Slime present	Dry	Less Dry	Dry
	River	Moist, slime present	Dryness start	Dry more	Dry	Dry
Gill's Coloration	Farmed	Red	Red	Brown	Brown	More Brown
	River	Red	Red	Red	Red	Red
Eye	Farmed	Protruded shiny	Protruded, shining	Protruded with hemorrhage	Slightly sunken with hemorrhage	Slightly sunken with hemorrhage
	River	Sunken, shiny	Sunken with hemorrhage	Sunken with hemorrhage	Sunken with hemorrhage	Sunken
Overall level of	Farmed	Good	Good	Not so good	Not good	Not good
	River	Excellent	Excellent	Excellent	Good	Good

acceptability

Mean values from month April 2017 to Nov 2017

Table 3: Organoleptic analysis of farmed and riverine *Cirhinus mrigala* at room temperature

Organoleptic properties	Time duration					
		1h	2h	3h	4h	5h and 6h
Texture	Farmed	Firm	Slight firm	Less firm	Slight soft	Soft
	River	Very firm	firm	Firm	Firm	Less firm
Coloration	Farmed	Light, shiny	Slight dull	Dull	Dull	Dull
	River	Dark, shiny	Dull	Dull	Dull	Dull
Skin condition	Farmed	Moist, slime present	Slime present	Dry	Dry	Dry
	River	Moist, slime present	Dryness start	Dry more	Dry	Dry
Gill's Coloration	Farmed	Red	Red	Brown	Brown	Brown
	River	Red	Red	Red	Red	Red
Eye	Farmed	Protruded shiny	Protruded, shining with hemorrhage	Protruded with hemorrhage	Slightly sunken with hemorrhage	Slightly sunken with hemorrhage
	River	Sunken, shiny	Sunken with hemorrhage	Sunken with hemorrhage	Sunken with hemorrhage	Sunken
Overall level of acceptability	Farmed	Good	Good	Not so good	Not good	Not good
	River	Excellent	Excellent	Good	Good	Good

Mean values from month April 2017 to Nov 2017

Table 4: Organoleptic analysis of farmed and riverine *Catla catla* at room temperature

Organoleptic properties	Time duration					
		1h	2h	3h	4h	5h and 6h
Texture	Farmed	Firm	Less firm flexible	Less firm and	Slight soft	Slight soft
	River	Very firm	Very firm	Firm	Firm	Less firm
Coloration	Farmed	Light, shiny	Slight dull	Dull	Dull	Dull
	River	Dark, shiny	Dull	Dull	Dull	Dull
Skin	Farmed	Moist,	Slime	Dry	Dry	Dry

condition		slime present	present			
	River	Moist, slime present	Dryness start	Dry more	Dry	Dry
Gill's	Farmed	Red	Red	Brown	Brown	Brown
Coloration	River	Red	Red	Red	Red	Red
Eye	Farmed	Protruded shiny	Protruded, shining with hemorrhage	Protruded with hemorrhage	Slightly sunken with hemorrhage	Slightly sunken with hemorrhage
	River	Sunken, shiny	Sunken with hemorrhage	Sunken with hemorrhage	Sunken with hemorrhage	Sunken
Overall level of acceptability	Farmed	Good	Good	Not good	Not good	Not good
	River	Excellent	Excellent	Very Good	Good	Good

Mean values from the month of April 2017 to Nov 2017

4. Conclusion

The general assumptions of the study expose that the riverine fish species own higher organoleptic quality due to more suitable water quality parameters limits as compared to the farm reared fish species.

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