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Proximate Composition and Meat Quality Studies of some Edible Fauna

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Meat samples of 15 different edible animal species from fish, birds and mammals were collected for laboratory studies from Multan. It was observed that % water was found to be 75.41 ± 2.75, 72.52 ± 1.5, 74.34 ± 2.37; % fat 2.61± 0.44, 3.01 ± 0.47, 2.76 ± 0.67; % protein 20.93 ± 5.97, 23.54 ± 1.31, 22.03 ± 1.77; % ash 2.41 ± 2.74, 0.93 ± 0.26, 0.89 ± 0.16 in catfish, birds and mammals respectively when expressed on wet weight basis. ANOVA revealed that among fish, birds and mammals the % water, % fat and % protein content were found to be similar ($P>0.05$). Percent ash was significantly higher in catfish than birds and mammals ($P<0.001$). Economically, the significantly cheapest source of protein was found to be catfish parallel to cattle but fish has nutritional superiority.

Key words: Protein content, Cat fish, Birds, Mammals, Meat quality.

Introduction

Pakistan, despite being an agriculture country is facing an acute shortage of protein of high biological value. Animal food has been a major component of the human diet for most of human evolutionary history (Pearson and Dutson 1996).

Flesh of all edible animals including mammals, poultry and fish is termed as meat (Raheena 1989). Poultry consumption has increased over the past few years. Increased consumption of pultry may be related to price in comparison to other meats and recommendations to reduce dietary intake of fat. Increased consumption may also be related to the availability of a reliable supply of fresh and frozen poultry products (Huffman *et al* 1986).

There are scientific principles that weigh very much in favour of aquatic farming of fish for food. It is relatively efficient means of producing animal protein and can compare very favorably with poultry and beef in the economics of pro duction, when appropriate species and techniques are adopted (Pillay 1990).

Fish is an important component of human diet. T here is hardly any nation today whose people do not include this protein in their normal food. Besides, it can convert food into body tissue more efficiently than the best meats of farm animals such as sheep, goat, cow etc (Sinha and Ramachandran 1985). Flesh of fish is generally white and soft and has agreeable taste and flavor. In terms of food value it is of equal rank or mostly superior having less fat and more protein as compared to other fleshes (Sinha and Ramachandran 1985).

The purpose of present study was to investigate the quality of meat in relation to protein content. The additional purpose was to create awareness among consumers to increase the consumption of cheap and high quality fish protein. Fifteen different types of meat samples (Fish, Poultry and Mammalian) have been subjected to chemical analysis to determine their composition. Furthermore their economic feasibility was also calculated.

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Materials and Methods

Five meat samples of fifteen different edible animals were collected for proximate composition of meat of various categories, during winter months.

Muscle samples were taken from the leg (thigh) portion in birds and mammals and edible portion in fish and all the samples were taken from young males (in case of mammal and birds).

To estimate the water content in each sample, the pre-weighed 5-10g sample (Balance H-80 Mettler) was placed in pre-weighed aluminum foil for drying until constant weight in an electric oven (Memmert) at 70-75°C.

For further analysis, each dry sample was crushed in a pestle and mortar and powdered and homogenized in a Moulinax Electric Blender.

The fat contents were estimated using dry samples by dry extraction method in which a mixture of 1:2 chloroform and methanol was used following the method of (Bligh and Dyer 1959; Cui and Wootton 1988; Salam and Davies 1994).

To calculate ash content in each individual sample 1.00 g of sample was taken in a pre-weighed heat resistant China clay crucible and ashed in a muffle furnace (RJM 1.8-10, China) for 6 h at 550°C and re-weighed after cooling.

Table 1
Percent composition (wet weight basis) for various cat fish, avian and mammalian species

Species	% Water	% Ash	% Fat	% Protein
Bargarius bargarius (Foji Khagga)	71.87	0.84	2.25	25.04
Rita rita (Khagga)	76.93	5.57	3.10	14.29
Wallago attu (Mullee)	72.54	0.82	2.47	24.17
Mean ± S.D.	**75.41±2.75**	**2.41±2.74**	**2.61±0.44**	**20.93±5.97**
Gallus gallus (Hen)	72.69	0.54	2.73	24.04
Anas sp. (Duck)	71.05	0.86	2.60	25.49
Streptopelia senegalensis (Dove)	72.72	1.09	2.72	23.47
Coturnix coturnix (Quail)	74.80	1.00	3.35	20.85
Columba livia (Pigeon)	73.52	0.78	3.70	22.00
Ammoperdix griseogularis (See-see Partidge)	74.49	1.30	3.90	24.31
Mean ± S.D.	**72.52±1.5**	**0.93±0.26**	**3.01±0.47**	**23.54±1.39**
Bubalus bubalus (Buffalo)	75.34	0.58	2.35	21.73
Bos indicus (Calf)	74.65	1.01	3.17	21.17
Camelus spp. (Camel)	75.57	0.91	2.19	21.33
Ovis aries (Sheep)	74.87	1.00	2.51	21.62
Capra spp. (Goat)	69.56	0.91	3.95	25.58
Oryctolygus cuniculus (Rabbit)	75.88	0.96	2.41	20.75
Mean± S.D.	**74.34±2.37**	**0.89±0.16**	**2.76±0.67**	**22.03±1.77**

The protein content was estimated by difference from the mass of other main constituents like ash, fat and water following Caulton and Bursell (1977), Salam and Davies (1994).

The economic feasibility was calculated for 1000 g protein:

$$\text{Rate of 1000 gm (Protein)in Rs.} = \frac{\text{Price of 1 kg of a given meat sample}}{\text{Amount of protein/kg of a given meat sample}} \times 1000 \text{ (NACA1989)}$$

MINITAB and EXCEL were used for all data and statistical analysis, which included log transformation and analysis of variance (ANOVA).

Results and Discussion

The present study produced highly comparable results with other studies. The ANOVA revealed that % water, % fat and % protein were not significantly different in fish birds and mammals ($P > 0.05$) and % ash was significantly higher in fish than birds and mammals ($P < 0.001$). The highest % water content was found in *Oryctolagus cuniculus* (rabbit), *Coturnix coturnix* (Quail) and *Rita rita* (Cat fish) and lowest % water was found in *Capra* spp. (Goat), *Anas* sp. (Duck) and *Bagarius bagarius* (Foji Khagga) belonging to mammals, birds and fish respectively (Table 1). Water is quantitatively most important component of the meat, having 75% in weight. It has been thoroughly investigated and established that percentage water content is inversely related to fat content (Vernam and Sutherland 1995). This fact has been well established in fishes reported in various studies (Weatherly and Gill 1987; Salam and Davies 1994). The significantly highest % fat content was found in *Rita rita, Ammoperdix griseogularis* and *Capra* spp. ($P<0.001$) and significantly the lowest % fat was found in *Bagarius bagarius*, *Anas* sp. (Duck) and *Camelus* spp. (Camel) belonging to fish birds and mammals respectively ($p<0.001$) (Table 1).

Table 2
Economic feasibility of meat of various cat fish, avian and mammalian species

Species	Price of 1 kg of sample (Rs)	Proein contents per kg (gm)	Price of 1000 gm Protein (Rs)
Bargarius bargarius (Foji Khagga)	70	250.4	279.55
Rita rita (Khagga)	70	142.9	489.85
Wallago attu (Mullee)	65	214.7	302.74
Gallus gallus (Hen)	90	240.4	374.37
Anas sp. (Duck)	100	254.9	392.31
Streptopelia senegalensis (Dove)	180	234.7	766.94
Coturnix coturnix (Quail)	256	208.5	1227.81
Columba livia (Pigeon)	160	220.0	727.27
Ammoperdix griseogularis (See-see Partridge)	800	243.1	3290.82
Bubalus bubalus (Buffalo)	60	217.3	276.12
Bos indicus (Calf)	60	211.7	283.42
Camelus spp. (Camel)	75	213.3	351.62
Ovis aries (Sheep)	100	216.2	462.53
Capra spp. (Goat)	100	255.8	390.93
Oryctolygus cuniculus (Rabbit)	70	207.5	337.35

The significantly highest % protein content was found in *Bagarius bagarius* (Foji Khagga), *Anas* sp. (Duck) and *Capra* spp. ($P<0.001$) and the significantly lowest % protein content was found in *Rita rita* (khagga), *Coturnix coturnix* (Quail) and *Oryctolygus cuniculus* belonging to fish, birds and mammals respectively ($P<0.001$) (Table 1). Generally farmed animal's meat contains approximately 17% protein, 62% water, 20% fat and 1% mineral substances (Boggart 1988). It has been documented when percentage of fat increases there is a corresponding decrease in percentage of lean meat. It is, therefore, concluded that the carcasses, which are high in fat, have lower percentage of water and protein. These proportions however change with the condition of the animal, being less protein. These proportions however change with the condition of animal, being less protein and higher water in low while more fat and low water content in better condition (Roman and Zeiglar 1977; Boggart 1988).

The significantly highest % ash content was found in *Rita rita, Ammoperdix griseogularis, Bos indicus* (Calf) ($P<0.001$) and the significantly lowest ash was found in *Wallago attu, Gallus gallus* and *Bubalus bubalus* belonging to fish, birds

and mammal respectively (P<0.001) (Table 1).

Among fish, birds and mammals the significantly highest % water was found in Rita rita, significantly highest % protein content was found in *Capra* spp., the significantly highest % ash content was found in *Rita rita*. The significantly lowest % water content was found in *Capra* spp., the significantly lowest % protein content was found in *Rita rita*, the significantly lowest % fat content was found in *Camelus* spp. and the significantly lowest % ash content was found in *Gallus gallus* (P<0.001) (Table 1).

In the present study, meat samples of different animals had very low values of lipids. This may be due to the fact that lean meat was used in this study. Lean meat usually contains less fat and largely composed of protein and water as compared to the whole cut (Gracey and Collins 1992).

Economically *Wallago attu, Bagarius bagarius, Gallus gallus, Bos indicus, Bubalus bubalus,* were found to be the cheapest sources of protein belonging to fish, birds and mammals respectively (Table 2).

The cost of production of land based animals is more than fish culture (Rath 1993). The annual output of 100kg live weight of beef required a capital investment of 2000-2500 roubles while for fish it was only 1500-1700 roubles. The recurring production cost of the same amount of beef had been estimated at 600 roubles, where as for fish it was 200 roubles. Fish thus can be supplied with fewer man-hours and lesser capital investment (Rath 1993).

Overall the significantly (P<0.001) cheapest source of protein was found to be *Wallago attu* and *Bagarius bagarius,* similar to *Bos indicus* and *Bubalus bubalus* (P>0.5). (Table 2). It is, therefore, concluded that fish being superior in quality is relatively cheaper to produce and consume.

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