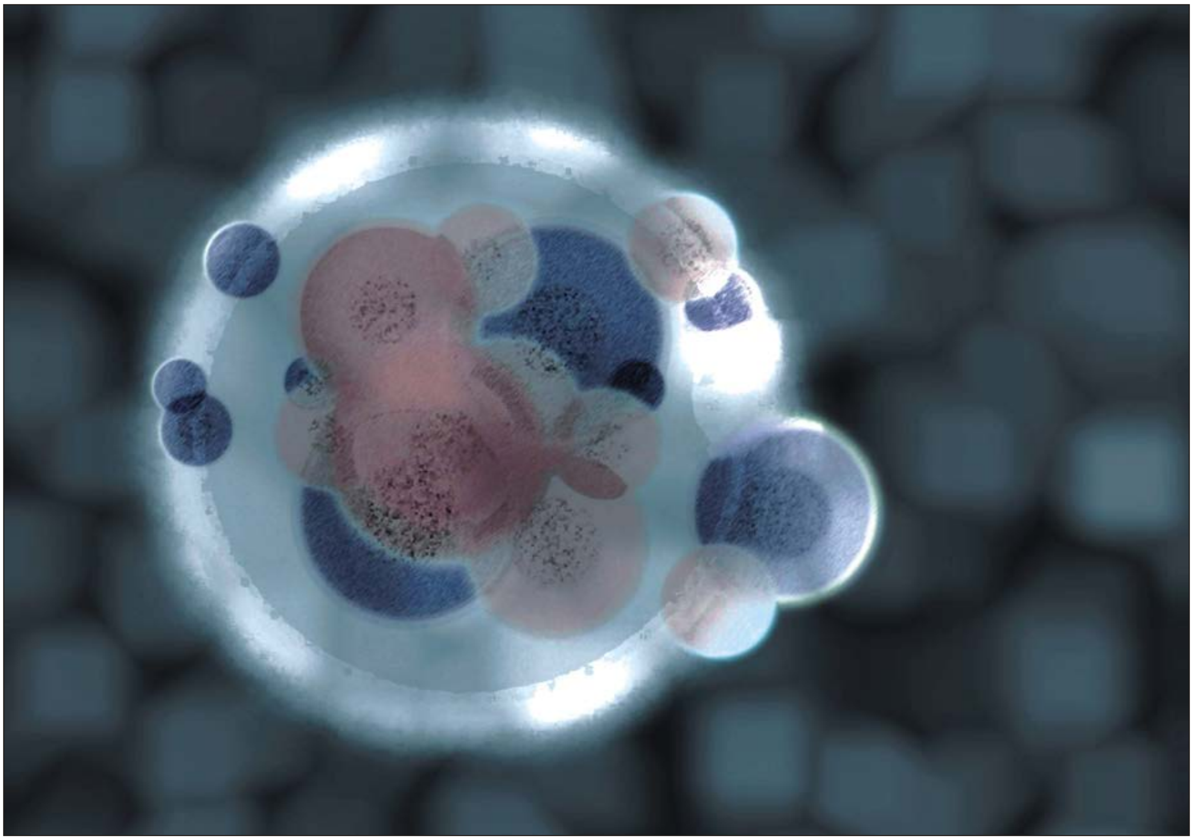

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Studies on Fillet Composition of Fresh Water Farmed *Labeo rohita* in Relation to Body Size, Collected from Government Fish Seed Hatchery Mian Channu Pakistan

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Abstract: The present study was carried out to investigate the fillet composition of fresh water farmed *Labeo rohita* in relation to body size. For this purpose forty-five specimens ranged in total length from 15.6 to 31.5 cm and in weight from 36.82 to 350.17 g were collected from Government Fish Seed Hatchery Mian Channu during November 2001. After the removal of head, scales, fins and viscera, the remaining trunk (processing yield) was cut into fore, mid and hind fillets. Each fillet was dried and powdered for the analysis of dry mass, water mass, ash content, organic content (all on percentage basis). There was a good correlation between water content (%) and other constituents (% ash, % organic mass) of the processing yield. Body mass and total length significantly affect the processing yield and nutrient constituents. Equations were developed to describe the relationships between body constituents and body mass and length. ANOVA was applied to assess the difference among the body composition parameters. Significant differences were found in these fillets, which indicates the quantitative and qualitative nature of fillets for nutritive purposes.

Key words: Body composition, processing yield, fillet, *Labeo rohita*

INTRODUCTION

Fish is an important component of human diet because it is a rich source of animal protein, which is more qualitative than plant protein (Sinha and Ramchandran, 1985). Flesh of fish is generally called as white meat and has agreeable taste and flavor. For these reasons, people of almost all nations include fish in their normal diet. As far as food value is concerned, fish is more superior, having less amount of fat and more or equal protein as compared to other animal flesh consumed by human beings (Salam and Janjua, 1991 and Unbreen, 1998). Recent research has pointed out that the fish meat has anti cancerous effects, minimized risk of heart diseases and as a result enhances life expectancy. Fish meat and oil contains vitamins and are helpful in controlling the eye and cardiovascular diseases (Kulikov, 1978). In this regard, the fishes are of utmost national importance in increasing the country's food resources (Rath, 1993). Fish are highest on the comparative list in terms of protein gain per unit of feed intake (Hastings and Dickie, 1972 and Pillay, 1990). Edible tissue of fish is appreciably greater than that in mutton, beef or poultry. The lean meat percentage in fish (80.9%) is greater than chicken broiler (64.7%) and beef (Choice grade, 51%) (Rath, 1993). The fish flesh produced in Russia contains 67% protein, which of course, is more than all other meat (Kulikov, 1978). Pakistan is facing acute alarming deficiency of high biological value protein. Intensive fish culture in polyculture is the only proposition to remove the shortage of animal protein in the form of fish meat (Chatta and Salam, 1993). Population explosion accompanied by the limitation of terrestrial resources of pertinacious food is going to play havoc with human lives, a fact not difficult to visualize in the near future. Hence it is imperative to exploit our aquatic resources to fullest extent, through aquaculture practice, as many types of proteins, which are not directly consumed by man, can be upgraded through this practice into highly acceptable and well-relished products (Pillay, 1994). Fish culture is a major component of aquaculture and many aquaculture practices are based on biological studies of fish. The primary advantage of fish over land animal is low energy cost of protein gain and superior feed conversion efficiency (Rath, 1993). Fish culture is relatively efficient means of producing animal protein and it incurs less production cost than poultry and beef, if appropriate technique and management is applied (Pillay, 1990). A great increase in fish farming is envisaged as a result of intensification of production from existing fish farms and expansion of area under cultivation (Tang, 1976). Studies on biochemical composition are one of the most important subjects of research. As the public has become more nutrition conscious, there has been demand for more information on nutritional value of fish. The information obtained on fats, proteins and minerals and their percentages in relation to size are important for the fish used as food for the consumers. It makes it easy to select the most suitable species having the highest protein content and optimum size for human consumption. While there is a sizeable amount of information available on nutritional value of marine seafood, there is much less on fresh water aquaculture species (Clement and Lovell, 1994). The present study on *Labeo rohita* is unique in the sense that it deals with the composition of only the edible portion and in the comparison of relative proportion of processing yield and major constituents of processing yield in different fillets in relation to body mass and total length. Body composition parameters are the good indicators of the physiological condition of a fish but it is relatively time consuming to measure. Indices of the condition that can easily and conveniently be measured prove to be good predictors of the body composition and growth, are essentially needed for routine analysis of fisheries (Cui and Wootten, 1988; Salam and Davies, 1994). The major composition of material of fish body is the same as those of other animals: water (which predominates), fats, proteins and much smaller amounts of carbohydrates plus minerals (the latter frequently termed ash) (Weatherly and Gill, 1987). The live weight of the majority of fish usually consists of 70-80% water; 20-30% protein; 2-12% fat (love, 1970). However, these values very considerably within and between species and also with size, sexual condition, feeding, time of year, temperature, salinity and activity (Weatherley and Gill, 1987; Shearer, 1994). The distribution of these substances among the various organs and tissues of the body may also show considerable differences. Protein content, which is so vital a constituent of the living cell, tends to very relatively little in healthy fish (Weatherley and Gill, 1987). Proximate analysis is the analysis of water, fat, protein and ash contents of fish (Love, 1970). Carbohydrates and non-protein nitrogen compounds are also important constituents but are present in negligible amounts and are usually ignored for routine analysis (Cui and Wootton, 1988; Salam and Davies, 1994). The body composition of fish, like other groups of animals is also subject to changes under the influence of several factors which are classified as physical, morphological, abiotic and biotic variables (Salam and Davies, 1994).

MATERIALS AND METHODS

Forty five specimens of farmed *Labeo rohita*, used in the present study were collected from the fish seed hatchery Main Channu, using cast net during the month of November 2001.The fish ranged in to length from 15.6 to 31.5 cm and in weight from 36.82 to 350.17 g. Live fishes were transported in plastic container to the Applied Fisheries Research Laboratory, Institute of Pure and Applied Biology (Zoology division) Bahauddin Zakariya University, Multan. They were removed from plastic containers and were killed, blotted dry with a paper towel and weighed to the nearest 0.01 g on an electronic digital balance (Chyo-MP-3000). Total length of fish was measured to the nearest 0.1 cm from tip of maxilla to the tip of longest caudal fin ray using measuring tape. Scales, fins, head and viscera of all the specimens were removed carefully and remaining trunk was given the name as processing yield (Clement and Lovell, 1994). Processing yield or dressed fish (total fish mass minus mass of head, scales, fins and viscera) were cut into three parts such as fore (the most anterior to the beginning of dorsal fin), mid (beginning of the dorsal fin to the anus) and hind fillet (anus to the most posterior). These three processing yield parts were weighed separately, placed in a reweighed aluminum foil and dried to constant mass by slow heating in an oven at 70°C.To analysis the quantity of water, protein, lipid and ash contents in each part in relation to growth of fish, each dried part was crushed and powdered in a pestle and mortar, homogenized in a Moulinex electric blender and preserved in plastic bottles with proper labeling. To estimate water contents, each pre- weighed fresh part was placed as a whole in pre weighed aluminum foil for drying till constant mass in an electric oven at 70°C. Condition factor was calculated using formula $W/L^3 \times 100$ (Hile, 1936). Dry mass was then subjected to further analysis i.e. estimation of fats and protein and presented elsewhere. The data thus obtained was subjected to statistical analysis using computer package Minitab and excel for ANOVA following Zar, 1996.

RESULTS

Mean values (±S.D) and ranges of % dressed fish, % water, % ash and % organic contents (as wet and dry mass) for *Labeo rohita* are given in Table 1. The variation in the data and their inter-relationships were analyzed. Correlation coefficients R for % ash and % organic (wet mass) were found to be inversely related to %water (Table 2). Each of these relationships were found to be statistically significant and well described by the simple linear model:

$$Y = a - bx \text{ ------------(i)}$$

Where a, b are constants and x is % water content which is independent and Y (%ash, % organic) is dependent variable. The statistical parameters for each of these relationships are given in the Table 2. The equations describing the relationships can be used to predict fillet composition from water content only. As variations

Table 1: Mean values (±S.D) and ranges of various processing yield constituents in *Labeo rohita*

Body constituents	Mean±S.D	Range
% Dressed fish (wet mass)	67.1±3.492	57.56-72.03
% Dressed fish (dry mass)	14.74±4.4044	12.19-16.69
% Water content	77.84±1.231	74.0-80.7
% Ash content (wet mass)	2.74±0.6447	1.26-4.52
% Ash content (dry mass)	12.40±2.829	5.86-19.85
% Organic content (wet mass)	19.36±1.36	16.27-22.56
% Organic content (dry mass)	87.56±3.23	80.14-94.14

in body constituents were found to be related to body mass or length, regression analysis was applied to assess the size dependence of total contents as well as % wet masses and % dry masses of all the body constituents. Percent water showed a significant inverse relationship with total length, while ash and organic (% wet masses) had a significant positive correlation with increasing total length. Dressed fish (% wet mass) remained constant with increasing total length. Dressed fish (% dry mass) and % dry contents were positively correlated, while all other constituents (on % dry mass basis) remained constant with increasing total length (Table 3). Similar trend was observed when these parameters were plotted against increasing wet body mass (Table 4). Total values of each constituents (dressed fish, water, ash, organic content) when log transformed and plotted against log of total length or wet body mass, a linear relationship of the form

$$\log Y = a + b \log x \text{ -----------(ii)}$$

was obtained with a high degree of correlation (Table 5 and 6). The values of exponent (b) for log length versus log mass and log mass versus log mass should be b = 3.0 for former and b= 1.0 in later case, respectively, for ideal symmetrical growth. Log total length versus log dressed (wet mass), log dressed (dry mass), log water, log ash and log organic contents generate slope of b=3.21, b=3.35, b=3.16, b=3.42 and b= 3.34 respectively. These values are significantly higher than b=3, thus all these parameters increase at an accelerated rate showing positive allometry. The slope "b" for log wet body mass versus log dressed fish (wet mass), log dressed (dry mass), log ash and log organic contents is more than b = 1 i.e., b = 1.02, b = 1.06, b = 1.09 and b = 1.05 respectively. These values show that these parameters increase with increasing wet body mass indicating positive allometry. While slope "b" for log wet mass versus log water content is 1.00. This value is equal to b = 1 showing isometric relationship with increasing wet body mass. The index of fish condition used in this study is "K". Value of K for rohu ranges between 0.869-1.708. The relationships between condition factor and %dressed, between condition factor and %ash (as wet and dry mass) are all statistically non-significant (Table 7). However, condition factor has highly significant positive correlation with %water (Table 7) and highly significant inverse correlation with % dry contents and % organic

Table 2: % water content versus % processing yield constituents in *Labeo rohita*. Statistical parameters of various relationships involving water content (%), correlation coefficient (r), intercept (a), regression coefficient (b) and probabilities (p), n = 45 in each case

Variables	r	a	b
% Water content (x) % Ash (wet mass), (y)	-0.22**	12.491	-0.125
% Water content (x) % Ash (dry mass), (y)	0.02$^{n.s}$	11.68	0.0093
% Water content (x) % Organic (wet mass, (y)	-0.788***	82.74	-0.8147
% Water content (x) % Organic (dry mass), (y)	0.04$^{n.s}$	79.188	0.1062

***P < 0.001, **P < 0.01, *P < 0.05 otherwise P > 0.05

Table 3: Total lengths versus % processing yield constituents in *Labeo rohita*. Statistical parameters of various relationships involving total length, correlation coefficient (r), intercept (a), regression coefficient (b) and probabilities (p), n = 45 in each case

Variables	r	a	b
Total length (x), cm % Dressed fish (wet mass), (y)	0.16$^{n.n}$	64.436	0.1022
Total length (x), cm %Dressed fish (dry mass), (y)	0.49***	12.122	0.1169
Total length (x), cm % Water content (y)	0.55***	80.938	-0.1382
Total length (x), cm % Dry content (y)	0.56***	18.935	0.13
Total length (x), cm %Ash (wet mass), (y)	0.198*	2.1148	0.028
Total length (x), cm %Ash (dry mass), (y)	0.065$^{n.s}$	11.502	0.0403
Total length (x), cm % Organic (wet mass),	0.42***	16.888	0.1088
(y) Total length (x), cm % Organic (dry mass), (y)	0.08$^{n.s}$	88.641	-0.0529

***P < 0.001, **P < 0.01, *P < 0.05 otherwise P > 0.05

Table 4: Wet body mass versus % processing yield constituents in *Labeo rohita*. Statistical parameters of various relationships involving wet body mass, correlation coefficient (r), intercept (a), regression coefficient (b) and probabilities (p), n = 45 in each case

Variables	r	a	b
Wet body mass (x), g % Dressed fish (wet mass), (y)	0.15$^{n.s}$	66.008	0.0051
Wet body mass (x), g % Dressed fish (dry mass), (y)	0.46***	13.943	0.0057
Wet body mass (x), g % Water content (y)	0.508***	78.774	-0.0067
Wet body mass (x), g % Dry content (y)	0.518***	21.117	0.0068
Wet body mass (x), g % Ash (wet mass), (y)	0.207**	2.5265	0.0015
Wet body mass (x), g % Ash (dry mass), (y)	0.085$^{n.s}$	12.024	0.0027
Wet body mass (x), g % Organic (wet mass), (y)	0.37***	18.619	0.0051
Wet body mass (x), g % Organic (dry mass), (y)	0.101$^{n.s}$	87.946	-0.0035

***P < 0.001, **P < 0.01, *P < 0.05 otherwise P > 0.05

Table 5: Long length versus log processing yield constituents in *Labeo rohita*. Statistical parameters of various relationships involving log total length ,correlation coefficient (r), intercept (a), regression coefficient (b) and probabilities (p), n = 45 in each case

Variables	r	a	b
Log total length (x), cm Log dressed fish (wet mass)(y), g	0.94***	-2.9325	3.2099
Log total length (x), cm Log dressed fish (dry mass)(y) g	0.95***	-3.7834	3.3553
Log total length (x), cm Log water content (y), g	0.94***	- 2.9755	3.1607
Log total length (x), cm Log ash content (y), g	0.88***	-4.7955	3.4228
Log total length (x), cm Log organic content (y), g	0.95***	-3.824	3.3419

***P < 0.001, **P < 0.01, *P < 0.05 otherwise P > 0.05

Table 6: Log wet body mass versus log processing yield constituents in *Labeo rohita*. Statistical parameters of various relationships involving log wet body mass, correlation coefficient (r), intercept (a), regression coefficient (b) and probabilities (p), n = 45 in each case

Variables	r	a	b
Log wet body mass (x), g Log dressed fish (wet mass)(y) g	0.95***	-0.7051	1.0195
Log wet body mass (x), g Log dressed fish (dry mass)(y), g	0.95***	-1.4532	1.0647
Log wet body mass (x), g Log water content (y), g	0.95***	-0.7829	1.0041
Log wet body mass (x), g Log ash content (y), g	0.89***	-2.4329	1.0933
Log wet body mass (x), g Log organic content (y), g	0.95***	-1.5011	1.0594

***P < 0.001, **P < 0.01, *P < 0.05 otherwise P > 0.05

Table 7: Condition factor versus % processing yield constituents in *Labeo rohita*. Statistical parameters of various relationships involving condition factor, correlation coefficient (r), intercept (a), regression coefficient (b) and probabilities (p), n = 45 in each case

Variables	r	a	b
Condition factor (x) % Dressed fish (wet mass) (y)	0.13$^{n.s}$	61.669	4.8794
Condition factor (x) % Dressed fish (dry mass), (y)	0.15$^{n.s}$	16.9	-2.0868
Condition factor (x) % Water content (y)	0.32***	72.929	4.7446
Condition factor (x) % Dry content (y)	0.32***	26.936	-4.7011
Condition factor (x) % Organic (wet mass) (y)	0.29***	23.912	-4.4279

***P < 0.001, **P < 0.01, *P < 0.05 otherwise P > 0.05

(wet mass) while condition factor has no correlation with %organic (dry mass) (Table 7). There was highly significant difference of percent wet dressed fish between the three fillets (fore, mid, hind) of the processing yield (df = 2,132, n = 134, f = 73.45, p <0.001***). There was a trend of decrease in percent wet dressed fish from fore to hind fillet of processing yield. There was highly significant difference of percent dry dressed fish between the three fillets (fore, mid, hind) of the processing yield (df = 2,132, n = 134, f = 65.94, p <0.001***). There was a trend of decrease in percent dry dressed fish from fore to hind fillet of processing yield. There was highly significant difference of percent wet dressed fish between the three fillets (fore, mid, hind) of the processing yield (df = 2,132,n =134, f = 4.02, p<0.05*). It was observed that percent water was significantly higher in the mid fillet of the processing yield (Table 8).

There was significant difference of percent dry dressed fish between the three fillets (fore, mid, hind) of the processing yield (df = 2,132, n = 134, f = 4.97, P < 0.01***). It was observed that percent dry content were significantly lower in the mid fillet of the processing yield. There was highly significant difference of percent wet ash content between the three fillets (fore, mid, hind) of the processing yield (df = 2,132, n = 134, f = 23.72, P < 0.001***). There was no trend in percent ash contents from fore to hind fillet of processing yield. There was highly significant difference of percent dry ash content between the three fillets (fore, mid, hind) of the processing yield (df = 2,132, n = 134, f = 21.91, P < 0.001***). There was no trend in percent dry ash contents from fore to hind fillet of processing yield. There was significant difference of percent wet organic content between the three fillets (fore, mid, hind) of the processing yield (df = 2,132, n = 134, f = 5.14, P < 0.01**). There was a trend in percent wet organic contents from fore to hind fillet of processing yield. There was highly significant difference of percent dry organic content between the three fillets (fore, mid, hind) of the processing yield (df = 2,132, n = 134, f = 20.49, P < 0.001***). There was no trend in percent dry contents from fore to hind fillet of processing yield (Table 8).

DISCUSSION

Expressed as over all means, the parameters of fillet composition (water, ash and organic) analyzed in forty-five specimens of *Labeo rohita*, have values very similar to those reported for whole body composition for various species, whether farmed or wild. Significant inverse correlation was observed between % water content and % ash content, while highly significant inverse correlation was observed between % water content and % organic content (all on wet mass basis) in processing yield of *Labeo rohita*. These results are in general agreement with those reported by other investigators for a number of fish species, for example *Phoxinus phoxinus L.* by Cui and Wootton (1988), *Catla catla* by Mahmood (1992), *Carassius auratus* by Salam and Davies (1997), *Labeo rohita* by Salam and Janjua (1991), *Oreochromis niloticus* by Javaid *et al*. (1992), fish species (25) of Indus river by Sajjad (1994), *Esox lucius* by Salam and Davies (1994) and 1997). *Ctenopharyngodon idella* and *Hypophthalmicthys molitrix* by Ammanullah *et al.* (1999). Medford and Mackey (1978) reported that fat and water in the muscle of fish fluctuate significantly during the year. This observation supports our main conclusion that major changes in the body composition of fishes are particularly due to variations in the relative proportions of fat and water brought about by changes in the nutritional status of fish (Reintiz, 1983; Weatherly and Gill, 1983 and Salam and Davies, 1994 and 1997) changes in the nutritional condition of fish results in the changes of muscle fat: water ratio of non-fatty fish (Love, 1970), Shearer (1994) found that whole body moisture is inversely related to whole body lipid in cultured Salmonids. Many researchers have developed predictive equations and it was concluded that the body composition of fish could be analyzed with high degree of accuracy from water contents using regression equation. In present study

Table 8: Processing yield composition of *Labeo rohita*. Results of ANOVA

Fillet composition parameters	Fore Fillet Mean±S.D.	Mid Fillet Mean±S.D.	Hind Fillet Mean±S.D.	DF	n	F	P
Dressed fish							
% dressed wet mass	26.47±3.58	22.89±4.45	17.34±2.51	2,132	134	73.45	<0.001***
% dressed wet mass	5.91±0.83	4.95±1.04	3.87±0.59	2,132	134	65.94	<0.001***
% water contents	77.61±1.38	78.29±1.10	77.64±1.35	2,132	134	4.02	<0.05*
% Dry contents Ash content	22.29±1.43	21.57±1.04	22.32±1.33	2,132	134	4.97	<0.01**
% Ash (wet mass)	3.28±0.65	2.41±0.49	2.53±0.76	2,132	134	23.72	<0.001***
% Ash (dry mass)	14.68±2.81	11.18±2.22	11.34±3.34	2,132	134	21.91	<0.001***
Organic contents							
% Organic (wet mass)	85.07±3.32	19.15±1.08	19.83±1.45	2,132	134	5.14	<0.01**
% Organic (dry mass)	85.07±3.32	88.68±2.47	88.62±3.29	2,132	134	20.49	<0.001***

percent ash and percent organic (both on wet mass basis) increased, percent water decreased and percent dressed (wet mass). All body constituents when expressed on log wet mass basis and plotted against log total length or wet body mass to analyzed the effect of size, it was found that all the parameters increased with body size (length and mass) showing positive allometry. The increased pattern of body constituents in relation to body size is similar to those reported for other species (Groves, 1970; Staples and Normura, 1976 and Elliott, 1976). In the present study only young and immature fast growing fish were selected. They were expected to add new tissues, which is largely protein and skeleton (ash) with no increase in fat content. Therefore, with increasing body size, increase in percent protein and percent ash is obviously expected in the young Rohu. Berg and Bremest (1998) reported that body of smallest salmon fry consisted largest of proteins and bones (ash), with a corresponding high level of water. The lower fat and energy values are normally associated with an increase in water content (Marais and Erasmus, 1977; Rottiers and Tucker, 1982 and Ahmed and Niazi 1998). The maximum % level of water content in any fish has been reported up to 86%. In the present study, the highest % level was observed to be 80.7%. When an allometric approach, developed initially by Huxley (1932) proposed and review by Weatherly and Gill (1987), was applied here, it showed that the slope"b" of the log-log regression relationship between total body constituents and wet body mass or total length,when compared with b=1 or b=3(an isometric slope) is a good predictor for isomatric and allomatric increase of those constituents with increasing weight or length. A condition factor is considered to be one of the factors influencing body composition of fish (Love, 1970; Elliott, 1976 and Caulton and Bursell, 1977). In fish with good conditions, water content decreases and fat content increases; while the water content of non-fatty muscle rises during fasting or non-feeding phase due to utilization of protein for metabolic activities (Love, 1970). The present study on Rohu showed no significant correlation between condition factor and other body constituents (Table 8) except %water, which showed positive correlation and % organic (wet mass), which showed significant inverse correlation with increasing condition. These results are different from those, reported by Amanullah *et al.*, 1999 for the processing yields of grass carp and silver carp. These results show that the correlation between condition factor and % body constituents may be significant or non-significant for different species. The present study was based on young and farmed reared Rohu living in controlled conditions. Furthermore the sampling was restricted to one particular month of the year. Therefore a limited range of condition factor was available. It is for this reason the influence of condition on body composition could not be expected. Apparent variation in condition may be due to the fact that when fish starve they absorb water and show higher condition. This starvation normally occurs in winter when fish is not feeding at all (Khan and Jhingran, 1975). In the present case, the samples were collected in November; therefore no consistent trend was obtained. Similar inconsistencies occur in various studies in various species. Salam and Janjua (1991) showed that condition factor had no significant effect on body composition of *Tilapia nilitica*, while Salam and Janjua (1992), reported significant negative correlation with fat, positive with water content, ash and protein remain fairly constant in *Labeo rohita*. These interesting results cannot further be interpreted and no definite conclusion can be drawn because of limited number of studies on processing yield and inconsistencies in the results. When different processing yield parts (fore, mid, hind) were compared, significant differences were found in %dressed, %water, % ash and % organic contents. % Dressed (wet and dry mass) was higher in the fore part of processing yield and it gradually decreased, being lowest in the hind part of processing yield. %Ash (wet and dry mass) was highest and %organic (wet and dry mass) was lowest in the fore part of processing yield. The situation was reversed in the hind part of processing yield. These results provide confirmation to those reported by Amanullah *et al.* (1999) for the processing yield of grass carp and silver carp. The hind part of the fillet contains more organic content especially protein. This, we can classify the fillets (fore, mid and hind) on the basis of nutrients e.g. less nutritious, more nutritious and highly nutritious. Using ANOVA, comparison should be made on percentages reported on a wet basis. When dry mass values are used, a change in one component affects the relative amounts of the others. Differences in lipid are often observed; resulting in apparent differences in the other components while, allometric analysis is useful when the range of fish size is as large as possible. Though significant differences exist between the three fillets of the processing yield, but if we compare our results with those reported by Salam and Janjua (1992) for whole body composition of *Labeo rohita*, no apparent variation exists except % ash content (as wet and dry mass) which is obviously low in the processing yield as head scales and fins were removed before analysis. The present study recommends that proximate composition should be analyzed only for the edible portion as it constitutes a large part (30-80%) of the bulk of live fish and is of much value to human nutrition. Proximate composition of fish should be reported on a wet mass basis. Comparison of proximate compositions between groups of fish using ANOVA is only valid for fish of the same size with in the same life cycle stage. Comparison of fish of differing size is best accomplished through the use of allometric analysis to account for the effect of size on composition. For commonly cultivated fish such as *Labeo rohita*, accurate weight – composition tables could save considerable time and expense over direct measurement of proximate composition and thus could serve to modify the carcass composition and thus could serve to modify the carcass composition to meet a consumer preference for a specific characteristic.

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