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ORGANOLEPTIC QUALITY OF FISH MEAT AS INFLUENCED BY POULTRY DROPPINGS FERTILIZATION OF PONDS

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An experiment was conducted to evaluate the response of five nitrogen levels viz. 0.10, 0.13, 0.16, 0.19 and 0.22g N, from broiler droppings, towards increase in fish weight, organoleptic quality of flesh and meat:bone ratios. A panel of twelve trained judges evaluated the colour (live), texture, softness and flavour of fish meat after two minutes steam cooking. The meat:bone ratios of three fish species under all the six treatments showed inverse relationship with their weight gains. However, 0.16 g nitrogen level gave the best meat:bone ratio of 23.98:1. Among all the three fish species, *Cirrhina mrigala* exhibited the best meat:bone ratio in all the treatments, followed by *Labeo rohita* and *Catla catla.* Taste of fish was not affected by the five fertilization treatments, however, the control fish earned signifieantly less taste scores. Both *Labeo rohita* and *Cirrhina mrigala* came up as the best species in presenting quality meat to the judges, particularly based on their meat:bone ratios.

Key words: broiler droppings, major carps, meat:bone ratio, organoleptic quality, pond fertilization

INTRODUCTION

Fish, whether from sea or from freshwater has been historically regarded as a staple and dependable quality food because of its being a principal source of animal protein for over half of the global population (Ling, 1977). Fish culture is considered today as one of the most promising sources of animal protein. During the recent past the potential and prolific nature of fish culture has been directed towards its large scale adoption and promotion in Pakistan. A reason for the steady increase in aquacultural fish production and its maintenance is the expansion of areas under culture, improvements in fish culture technology and maximum use of experimentally established ecological potential.

The aspect of off-flavour of fresh water fish growing under various water qualities and nutrition treatments, was reported by Meyers (1975) with particular reference to consumer acceptance and a standard allowing the identification of the producer with other than conventional individual characteristics such as flavour, taste and appearance. Moav et al. (1977) reported good flesh colour and intramuscular fat levels for fish grown in intensively manured ponds. There appeared to be a non-significant difference in the taste and texture of fish meat grown in manured ponds and those fed on commercial diets. Allen and Hepher (1979) also reported that the fish reared in ponds receiving well-treated domestic wastes tasted as good or even better than the fish grown in waste-free ponds.

MATERIALS AND METHODS

Factorial experiment, with two replications for each of the treatments, was conducted under ambient condition using earthen ponds. After preliminary preparations (Javed, 1988), all the ponds were initially fertilized, separately, with 40 kg broiler droppings (3333.33 kg/ha) as a starter dose to stimulate primary productivity. Fingerling major carps (6-7 months old, induced bred) of average weight 21.32 ± 1.99 g were randomly stocked, from a selected population, in each of the ponds with stocking density of 25, 60 and 15% for *Catla catla, Labeo rohita* and *Cirrhina mrigala* respectively (64 fish in each of the ponds). Fertilization of ponds with broiler droppings (4.37% nitrogen) was started on the basis of nitrogen contents. Five nitrogen levels viz. 0.10, 0.13, 0.16, 0.19 and 0.22g nitrogen per 100 g of wet fish weight daily were designated as T1, T2, T3, T4, and T5 respectively, while T6 served as control without additives.

At the end of one year experiment, five fish of each species were selected randomly, from each of the ponds. The sampled fish was dressed and cut down into two halves, one was used for the analysis of meat:bone ratio and the other for organoleptic evaluation. Big bones were separated by hand while the small bones by suspending the fish meat in a solution of 0.01 % KOH with gentle heating. Precautionary measures were exercised to prevent the erosion of bones. After successive bathing in distilled water, the moisture was absorbed into

Table 1. Final fish weights (g) after one year pond fertilization trial

Species	Treatments % S.D.					
	T1 10.10 9 Nlevel)	12 10.13 9 Nlevel)	T3 ro.16 9 Nlevel)	T4 ro.19 9 Nlevel}	T5 (O.22 9 Nlevel)	T6 (Control)
Catla catla	786.92±12.25 b	791.59±8.31 b	823.88±10.14 a	798.70±9.58 b	792.06±12.80 b	128.45±6.91 c
Labeo rohita	563A2±12.50 c	590AO±10.63 c	670.35±8.34 ab	686.92±12.12 a	650.02±8.53 b	142.02±3.72 d
Cirrhina mrigala	677.04±10.23 a	668.19±9.55 a	680.26±11.82 a	639.36±8.78 bee	517.24±12.11	157.36±6.15
Mean	675.79	683.39	724.83	708.33	653.11	142.61

Means with similar letters in a row are statistically similar at P< 0.05; S.D. = Standard deviation.

Table 2. Organoleptic quality of fish meat

Species	T1 (0.109 Nlevel)	T2 (0.139 Nlevel)	T3 (0.169 Nlevel)	T4 (0.19g N levell	T5 (0.229 N level)	T6 (Control)	Mean
a) Meat:bone ratio (%s.n.)							
Catla catla	19.87±0.16 d	20.97±0.15 c	22.78±0.25 a	22.14±0.23 b	21.23±0.29 c	18.25±0.08 e	20.87
Labeo rohita	23.20±0.10 b	24.16±0.17 a	24.47±0.19 a	23.79±0.80 ab	22.76±0.24 b	17:70±0.30 c	22.68
Cirrhina mrigala	23.27±0.29 d	23.91±0.30 c	24.70±0.34 a	24.00±0.21 be	23.30±0;10 d	17.94±0.12 e	22.85
Mean	22.11	23.02	23.98	23.31	23.43	17.96	
b) Taste of fish meat							
Catla catla	7.54±0.58 a	7.74±1,23 a	7,45±0.82 a	7.30±0.44 a	7.53±0.21 a	5.70±0.08 b	7.21
Labeo rohita	7.60±0.50 a	7.52±0.66 a	7.47±0.91 a	7.72±0.52 a	7.50±0.45 a	5.94±0.14 b	7.29
Cirrhina mrigala	7.52±0.81 a	7.48±0.69 a	7.65±0.40 a	7.70±0.35 a	7.50±0.63 a	5.62±0.25 b	7.24
Mean	7.55	7.58	7.52	7.57	7.51	5.75	

Taste scores are calculated from the mean scores of colour, texture, softness and flavour for each fish species. Treatment means with the same letters in a row are statistically similar at 5% level of significance.
S.D. = Standard deviation; N = Nitrogen; Key to taste scores: Excellent 9; very good 8; good 7; fair 6; poor 5; very poor 4.

blotting paper and the residue weighed to give the weight of the fine bones.

A panel of twelve trained judges evaluated the colour (live), texture, softness and flavour of fish meat after two minutes steam cooking. From the scores of colour, texture, softness and flavour, the taste scores were computed as mean of these four variables. Data were analysed using analysis of variance and Duncan's multiple range test. Correlation and regression analyses were also performed to find out relationships/trends among various parameters under study.

RESULTS

Table 1 shows the final weights of three fish species under six treatments. The finally harvested fish were analyzed for organoleptic quality and meat : bone ratios.

Organoleptic Quality of Fish Meat: Taste of fish meat was not affected significantly by different nitrogen treatments. However, the comparison of different fertilization treatments with control (without additives) made the analysis statistically significant for treatments, species and interactions (treatments x species). Three fish species viz. *Catla catla, Labeo rohita* and *Cirrhina mrigala* earned non-significantly better scores under T2, T4 and T4 respectively. However, the mean scores earned by three fish species under all the five fertilization treatments were significantly higher than those of the fish reared under control treatment (Table 2).

Meat : Bone Ratios : Table 2 shows statistical differences among treatments and three fish species for their meat: bone ratios. The interaction between treatments and species was highly significant. *Catla catla* had the maximum meat:bone ratio of 22.78 ± 0.25 under T3 followed by the ratio under T4, however, the same was significantly minimum for the fish reared under T6 (18.25 ± 0.08).

In case of *Labeo rohita,* there were non-significant differences among T2, T3 and T4 and T1 vs. T2 for its meat:bone ratio, while this ratio was higher in T3 (24.47 ± 0.19) than rest of the treatments. In *Cirrhina mrigala,* T3 caused significantly higher ratio of 24.70 ±0.34 than rest of the treatments with the minimum ratio of 17.49 ± 0.12 in T6. When overall means for meat:bone ratios of all the three fish species were considered, T3 appeared as the best treatment to cause better meat:bone ratios in fish. *Catla catla* in all the six treatments had the lowest ratios because of its large head which contributed inversely towards meat:bone ratios. However, the varied responses of both *Labeo rohita* and *Cirrhina mrigala* towards meat:bone ratios under different treatments made the interactions between treatments and species highly significant.

DISCUSSION

The significant interaction (treatments x species) for meat:bone ratios in all the three fish species was due to the differential response of treatments towards final fish weights (Tables 1 and 2). Meat:bone ratios in fish showed inverse relationship with final average weights under different treatments. *Cirrhina mrigala* came up as the best species for overall meat:bone ratios under all the treatments except under T2 in which *Labeo rohita* had the meat:bone ratio of 24.16 ± 0.17:1. The significantly lesser meat:bone ratio in *Catla catla* than other species was due to its inherited quality characteristics Le; having large head. *Cirrhina mrigala* had the highest meat:bone ratios under five fertilization treatments, followed by *Labeo rohita* and *Catla catla* which were likely the species specific. Javed (1988) reported *Labeo rohita* as a species with comparatively lesser bones as compared to *Cirrhina mrigala* and differences between *Cirrhina mrigala* and *Catla catla* were significant when reared under different fertilization and feed supplementation treatments.

The taste of fish meat apparently appeared to be the best for *Cirrhina mrigala* under T3 and T4 followed by *Labeo rohita* in T1 and T4, while *Catla catla* in T2 earned maximum taste scores (Table 2). However, the differences among the three fish species under the five fertilization treatments were statistically non-significant. The fish reared under control treatment earned significantly less taste scores than all the fertilization treatments under study (Table 2). The meat quality scores earned by the three fish species were due to their quality presentations to the judges particularly based on meat:bone ratios (Table 2). However, acceptability of fish meat to the judges, on the whole, remained non-significantly different for all the treatments except the control, Jayaram et al. (1980) did not record any differences among *Catla catla, Labeo rohita* and *Cyprinus carpio* meat for its texture, odour and taste when reared in cattle and poultry manure fertilized ponds. However, Javed et al. (1995) recorded significant differences among the taste scores earned by *Catla catla, Labeo rohita* and *Cirrhina mrigala* when reared under inorganic fertilizer (N:P:K, 20:20:03), broiler and layer droppings, cow dung, artificial feed and the control (without additives). Allen and Hepher (1979) also reported that fish reared in ponds receiving well-treated domestic wastes tasted as good or even better than the fish reared in waste free ponds.

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