Evaluation of Organoleptic Qualities of Fish Grown in Ponds Treated with Different Organic Manures*

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Catla, rohu, silver carp and common carp raised employing different organic manures were subjected to organoleptic evaluation, both in raw and cooked form. The combination treatment of poultry manure and silkworm faecal matter had positive effect on colour and glossiness of skin and colour of flesh in the case of common carp. Though no significant difference was observed in the overall quality, odour of flesh and texture of meat of rohu were found to be better in sewage treated and poultry manure treated ponds respectively. From the results, it can be discerned that treated sewage has no adverse effect on the acceptable qualities of the carps studied.

One of the means of enhancing growth rate of fish in static environment is to fertilize the ponds periodically with organic and/or inorganic fertilizers. Unlike feeds, which are directly consumed by fish, manures indirectly affect the fish growth, through the production of fish food organisms. Flavour producing organisms and decomposing organic matter are known to influence organoleptic qualities of fish flesh (Spinelli, 1978). Any flavour that appears in the ecosystem is quickly absorbed by fish (Lovell & Sackey, 1973). If fishes develop undesirable flavour, it may pose severe problems in marketing.

Although there are reports with regard to the effects of feeds on the organoleptic qualities of fish (Mann, 1969; Ghittino, 1972; Venugopal, 1980; Jayaram *et al.*, 1980; Anil, 1981), there is paucity of information on the influence of organic manures *vis-a-vis* flesh quality. In view of this, the present study was undertaken wherein the influence of poultry manure, silkworm faecal matter and sewage on the organoleptic qualities of carps was investigated.

Materials and Methods

The experiment was carried out at the fish farm of the College of Fisheries, Mangalore. Poultry manure treatment, sewage treatment, silkworm faecal matter treatment and combination treatment of poultry manure and silkworm faecal matter (1:1) were tried, each in triplicates. Except sewage, the other organic manures were applied at the rate of 2000 kg/ha on dry weight basis as an initial dose before stocking the fish and the second dose was applied 77 days after the initial fertilization at the rate of 1000/kg/ha on dry weight basis. Raw sewage was used after stabilizing it for eight days. The first dose of sewage was applied in the ratio of 1:3 (sewage: water), while in the second dose given after 77 days of initial fertilization the dilution ratio was 1:6 (sewage: water). Catla, rohu, silver carp and common carp were stocked at a density of 8000 fingerlings/ha in the ratio of 1:1:1:1, a week after the initial manuring and grown for 126 days.

On termination of the experiment, uniform sized fish of the different species were collected and dressed separately, a portion of the dressed fish was given in raw condition to a batch of ten experienced panelists to judge the quality. In order to find out whether there was any difference in the quality of cooked fish, each species was cooked separately in 1.5% salt solution for 3 min and the same panelists were entrusted with

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the task of grading this product. A standard proforma was designed for this purpose, incorporating various attributes for raw flesh and cooked meat. The different attributes included for raw flesh were colour and glossiness of skin and colour, odour and texture of flesh, while colour, odour, texture and flavour of meat were considered for cooked meat.

The grades obtained were converted into suitable hedonic scales. In the first set, scores obtained for each character were clubbed together to find out the difference in the overall organoleptic quality of the fish, if any. For this purpose the method of Kramer & Twigg (1970) as modified by Udupa & Jayaram (1979) was used. In the second set, each attribute was tested separately using the method developed by Kramer & Twigg (1970).

Results and Discussion

The results of statistical analysis on the organoleptic qualities of the different species of fish are presented in Table 1. There was no significant difference in the overall quality among the fish grown in different organic manure treated ponds, except for raw flesh of common carp. Common carp grown in combination treatment of poultry manure and silkworm faecal matter were found to be superior (mean panel score 2.6) to those raised in sewage treatment, silkworm faecal matter treatment or poultry manure treatment (mean panel scores 2.1, 2.33 and 2.35 respectively). However, statistical difference could be noticed only between the combination treatment and sewage treatment. Further analysis was carried out to find out the attributes that were responsible for this variation and significant difference was observed with respect to colour and glossiness of skin and colour of flesh. It was the combination treatment which had the positive effect on the above attributes; sewage treatment had the least influence on them. The superiority of common carp raised in combination treatment could probably be due to its heavy feeding on zooplankton. Incorporation of zooplankton in the diet is known to improve the colour of meat (Spinelli, 1978). Raw fish of rohu grown in sewage treated ponds differed significantly with regard to odour of flesh (mean 'panel score 2.3). though significant difference was not observed in the overall quality (Table 1).

The results of analysis of variance of the mean panel scores obtained for the cooked fish showed that only in the case of rohu the texture of meat was different; rohu cultured in poultry manure treated ponds had better texture (mean panel score 2.3) than those raised in ponds with other treatments (Table 1). But, the treatment or attribute did not bring about any change in the overall quality of cooked flesh of rohu. No significant difference could be observed between the texture of rohu of sewage treatment and poultry manure treatment ponds. One of the possible reasons for the better texture of rohu grown in poultry manure treatment ponds could be the availability of the desired quality feed in abundance. Rohu being a phytophagous fish seems to prefer food which have some fibre. Anil (1981) and Nandeesha *et al.* (1983) recorded better growth of rohu fed on feeds containing higher amount of crude fibre. If crude fibre content is too high in meat, its texture becomes hard. On the other hand, if crude fibre content is too less, meat becomes too soft. Hence, the type of food ingested appears to alter the texture of meat.

Off-taste and odour in the fish from sewage discharge areas according to Allen & Hepher (1976) are mainly due to odour arising from industrial hydrocarbons. According to them fish grown in ponds treated with sewage normally have equal or even superior organoleptic qualities than those cultured in non-waste waters. Sewage employed in the present investigation was from community source and no off-flavour was noticed in the fish raised in sewage treated ponds. It was the general opinion of all the panelists that silver carp had earthy-musty odour irrespective of the treatment. Lovell & Sackey (1973) recognized earthy-musty flavour in channel catfish as caused by blue-green algae. Silver carp being a voracious algal feeder and blue-green algae being the preferred food, the earthy-musty flavour recorded may be due to blue-green algae. The results of the present study indicated that carps grown using different organic manures were not distinct from

Table 1. *F. ratios of analysis of variance on the mean panel scores of individual characteristics and overall quality of carps raised with different manures*

$$F = \frac{\text{Mean sum of squares due to manures}}{\text{Mean sum of squares due to error}}$$

	Catla	Rohu	Common carp	Silver carp	Isd_t**
Colour and glossiness of skin	0.49÷0.41=1.19	0.97÷0.35=2.77	1.50÷0.32=4.69*	0.03÷0.86=0.03	0.50
Raw colour of flesh	0.20÷0.36=0.55	0.40÷0.40=1.00	1.09÷0.24=4.54*	0.03÷0.27=0.11	0.44
Odour of flesh	0.69÷1.05=0.66	0.70÷0.24=2.92*	0.36÷0.28=1.29	0.17÷0.35=0.49	0.44
Texture of flesh	0.49÷0.54=0.91	0.29÷0.78=0.37	0.43÷0.43=1.00	0.16÷0.29=0.55	—
Overall quality	0.18÷0.16=1.13	0.13÷0.19=0.68	0.43÷0.14=3.07*	0.01÷0.15=0.07	0.27
Colour of meat	0.47÷0.39=1.18	0.60÷0.33=1.82	0.80÷0.59=1.36	0.43÷1.01=0.43	—
Odour of meat	0.17÷0.26=0.65	0.13÷0.21=0.62	0.20÷0.32=0.63	0.27÷0.32=0.84	—
Cooked texture of meat	0.17÷0.48=0.35	0.83÷0.15=5.53*	0.23÷0.59=0.39	0.37÷0.61=0.61	0.36
Flavour of meat	0.95÷0.42=2.26	0.36÷0.38=0.95	0.30÷0.34=0.88	0.29÷0.29=1.00	—
Overall quality	0.03÷0.16=0.19	0.16÷0.10=1.6	0.05÷0.24=0.21	0.19÷0.18=1.05	—

* Significant at 5% level based on critical value of F for (3,36) degrees of freedom=2.86

** Isd_t =least significant difference based on t test

each other with respect to overall organoleptic qualities, except for raw flesh of common carp. Further, it is clear that if fish are grown in treated sewage, there will not be any problem of acceptability.

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