Cereal Feeding in Fishes Nutrition for Fishery in Fresh Water from Banat Region

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Abstract
Fisheries have traditionally been managed by direct restrictions, including seasonal and area closures, minimum mesh size, and access limitations. In recent years, licensing and an individual quota system were introduced as effort-control measures, in order to bring fishing effort more in line with the available resources. The overall responsibility for fisheries policy in Romania falls under auspices of the Ministry of Agriculture, Forests and Rural Development through its Directorate of Fisheries.
The major objectives of Romanian fisheries are to bring the national fisheries legislation closer to the European Union (EU) Common Fisheries Policy (CFP) and to set up the administrative capacity and institutional building needed to cope with EU accession in 2007. In June 2001, Romania completed negotiations with EU in the area of fisheries, accepting the entire *acquis communautaire* without requesting any derogation or transition periods.
The European Fisheries Fund will support Romania as a new EU Member State to develop a competitive, modern and dynamic fisheries sector, based on sustainable fishing and aquaculture activities, while also taking account of other important aspects such as environmental protection, the demands of the consumers and the food industry. The program is also expected to increase the competitiveness of the fisheries sector, encourage job creation and promote the growth of the aquaculture industry.
The paper shows some aspects about Romanian fishery policy, an important opportunity for development research in fishery in fresh water from Banat region. Also, it is presents some research results about using the cereal feeding as fish's nutrition, in special for common carp.

Keywords: aquaculture, cereal feeding, common carp, fishery, fresh water, nutrition

1. Introduction

Romania's economy began in 1990 with the transition from a centrally planned economy to a market economy and went through several phases of recession and recovery and has grown steadily since 2000: between 2000 and 2005, the average annual gross domestic product (GDP) growth rate exceeded 5% against a background of macroeconomic stability.

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The old ("undivided") Banat comprises areas of present-day western Romania, north-eastern Serbia, and southern Hungary, with a total area of 11,013 square miles. The whole territory of Banat is good for Fisheries because here there are many rivers, lakes and a lot of possibilities for development of artificial lakes for fisheries in fresh water. (fig. 1.)
In Romania the numbers of threatened freshwater fishes from total of 87 species it uses 11 threatened species (13%). (fig.2).
The Romanian Banat is mountainous in the south and southeast, while in the north, west and south-west it is flat and in some places marshy. The climate, except in the marshy parts, is generally healthy. Cereals (wheat, barley, oats, rye, maize –

can be dried by lyophilization [1], are grown in large quantities, and the products of the vineyards are of a good quality. Game is plentiful and the rivers swarm with fish.

That situation for Banat region represents a good opportunity for to combine the agriculture sources with development of the fisheries for human nutrition.

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2. Materials and methods

After Przybyl A (2004), in the case of application of nutritionally balanced feeds in carp rearing, the type of used cereal may have no essential effect on the obtained production results because the deficiency of nutritive substances in one component is supplemented by their higher amount in others.[3]

Fish meal and fish oil have been primary ingredients of fish feeds, but the finite supply of these crucial ingredients will begin to limit industry expansion within the next 10 years. These capture fisheries products are also costly, variable in quality and availability, and considered by some to be unsustainable. To allow for the continued expansion of aquaculture, production efficiencies must be increased. Developing feeds with fishmeal and fish oil replaced with plant derived ingredients can reduce both fish feed cost and cost variability. The use of plant ingredients in fish feeds does present problems in the palatability and digestibility of the feed. Development of new cultivars of oats and barley will be critical to development of plant based fish feeds. In addition, recent research has indicated that selection of fish from fresh water can improve utilization of plant-based feeds. For aquaculture to continue its growth, genetically enhanced domesticated stocks of fish that can utilize the plant-based feeds, and improved sources of grains, are needed. That is conducted a coordinated, multi-disciplinary, project to improve production efficiency of fish from freshwater fed grain-based diets using genetic, physiological and nutritional approaches.

For using cereal feeding in fish nutrition it was made some study together with the Department of Fisheries and Wild Management, Faculty of Agriculture, University of South Bohemia in Ceske Budejovice, Czech Republic.

In fresh water from Banat one of the familiar and productive fish is common carp (Cyprinus carpio). For this it was identifies the profile of poly-unsaturated fatty acids in different parts. All the fish used for experiment were of the same genetic origin and age. They were stocked into the ponds on April 15, 2007. Their live weight at the beginning of experiment was 0.55±0.10 kg. Maize was chosen as the cereal for supplemental feeding because of its demonstrable effect on production and composition of fat. The fish were harvested on October 10, 2007 resulting in an experiment lasting 200 days. From the commercial criteria, fish weight and the final weight gain were evaluated. The control group of fish consisted of specimens of the same origin and age as in the experimental group reared at the same locality under comparable conditions. These fish took only the natural food available (plankton, benthos) without any supplementary feeding of cereals and they were harvested and evaluated in an identical manner to the previous group. Seven specimens from each group were used for analyses. The fish were slaughtered, gutted, all scales were removed and the fish were filleted. The fillet was divided into three parts (fig. 3) according to the proportion of dorsal (D), ventral (V), and caudal (C) muscles. Fish muscle was analyzed for fatty acid composition – polyunsaturated fatty acid, eicosapentaenoic acid, docosahexaenoic acid, n-6, n-3, n-3/n-6 in the fat of the fish flesh. (Vacha F., 2007).

Fish flesh samples were lyophilized and weighed. The extraction of lipids was performed in petrol ether. The filtered extract was vaporized at 60^0C under nitrogen until a constant weight was achieved. Lipids were extracted by means of petrol ether from lyophilized flesh samples at 4^0C for 24 hours. The extract was vaporized under nitrogen at 60^0C and the isolated lipids were used for determination of fatty acids. [3]

The fatty acid composition was determined by gas liquid chromatography (GLC) using a Varian 3300 gas chromatograph. Fatty acids for

chromatography determination were transferred to methylester by re-esterification of fat petrol ether solution using potassium hydroxid/methanol. Fatty acid representation was specified by counting peak area proportion to total peak area of all determined acids.
Differences in fatty acids content between/among types of food, body parts and fish individuals were analyzed by hierarchical ANOVA ($p<0.05$) check. The analyzed were done using the STATISTICA 8.0 application check, means and standard deviations for summary tables were also computed in the program.

3. Results and discussion

The experimental group of fish gained the mean live weight of 2.22±0.38 kg by October 2007 and the weight gain was 7.66 g. kg^{-1}. day. The food conversion coefficient was 1.99. The control group of fish, reared in ponds on natural food alone, gained the mean live weight of 2.15±kg and their weight gain was 7.61g.kg^{-1}.day-^{1}.
Depending on the diet provided, the fatty acids profile was found to be substantially changed.[4] Fish fed with a supplementary diet of maize unequivocally showed changes in PUFA content in their flesh, when compared to fish fed with natural food alone. Supplementary in their flesh, when compared to fish fed with natural food alone. Supplementary feeding with maize affected the increase of oleic acid content. In all parts of fillet of fish fed with a supplementary diet of maize; there was a significantly higher proportion of n-6 PUFA. The n-3 PUFA group from neutral lipids was mostly represented in fat from the ventral part of fillet, either from fish fed with natural food only (22.26±0.35%), or from fish fed with a supplementary diet of maize (7.95±0.98%).
The study showed the proportion of fatty acids and polyunsaturated fatty acids in neural lipids of common carp fillet, i.e. in its dorsal, ventral and caudal parts. Also, it can observe an evident slight fluctuation in proportions of individual fatty acids in three parts of the fish body. For example, the ventral part (fig 4) of the control fish demonstrably showed higher proportions of these substances than the dorsal and caudal parts. Ventral parts if fish fed with a supplementary diet of maize contain less nutritionally important n-3 fatty acids that affect the total quality of the fish flesh. [5]
The modernization of the processing industry will be continued and support will be granted for a better and more efficient organization of this sector. The expected results are the following:

- Modernization and adaptation of the processing facilities
- Creation of representative organizations of producers through the restructuring or merging of the existing organizations

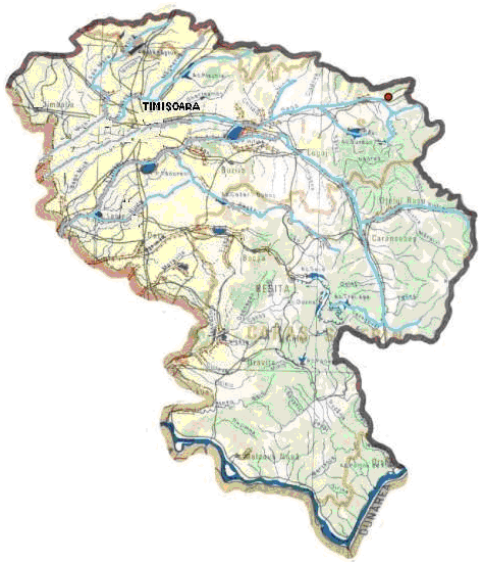

Figure1. Map of Banat region with fresh water

In România, there are several important communities depending on fishing. These areas have a development potential based on the implementation of an integrated local development strategy seeking the valorization of local features. This creates a good opportunity for implementing the area-based (territorial) approach which is being promoted by the EFF Regulation.

Figure 2. Some species of fish from fresh water

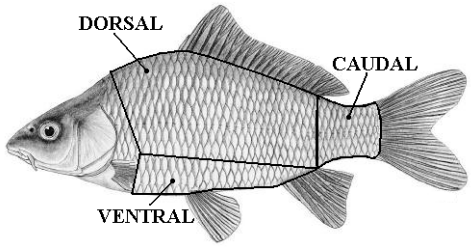

Figure 3. Sample of common carp (Cyprinus carpio), use for experiments

The exact location of these areas will be determined at a later stage, when the groups present integrated strategic plans.

The lack of former experience (partnership development, strategic planning) with local development procedures should be taken into account when preparing the implementation of the measure.

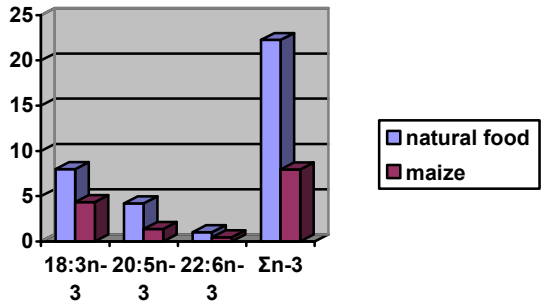

Figure 4. Values of selected polyunsaturated fatty acids in the ventral part of common carp fillets. (% of total PUFA)

4. Conclusions

In Banat region the freshwater fish production is based on common carp culture, it is possible to consider preparation of specialized products based on knowledge of the distribution of fatty acids and higher proportion of biologically valuable substances (PUFA, n-3, …) in the ventral part of body of those fish which were fed with natural food only. The other perspective of fish production shows that if supplementary feeding with cereals is applied, the growth capacity of common carp is substantially boosted and higher weight gain is realized. The price to be paid for that is in lower biological value of the flesh, considering the significantly reduced proportion of essential fatty acids. For rear fish in extensive fresh water aquaculture systems, there might be greater potential to increase the nutritional value of these fish. In addition, labeling as "organically produsedfood" will raise the price even more. This also permits the production of fish with a higher nutritional value by changing the feeding and rearing systems. [5]

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