

The Use of Sub-Products from Sericulture in Fodders' Recipes for Fishes

Liviu MARGHITA¹, MARILENA TALPES², ALEXANDRA MATEI³,
ELPIDA PALTENEA², I. PASCA¹, M.BENTA¹, MAGDALENA TENCIU²

1. University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca
2. National Research and Development Institute for Aquatic Ecology, Fishing and Aquaculture, Galati, icdeapa@icdeapa.ro
3. Commercial Society SERICAROM S.A. – RESEARCH DEPARTMENT

Key words:, fodders' recipes, pupae, mulberry leaf, carp, seyruga

INTRODUCTION

The idea of introduction of the sub-products from sericulture in fodders' recipes for fishes based on a high level of protein (reported to dry substances) and of extractive un-nitrate substances of its (1,2, 4).

As a consequence, based on the chemical composition of chrysalis, the excreta of *Bombyx mori* and the mulberry leaf (4) and following the best capitalization of the bioresources from sericulture, the present work proposes an evaluation of the possibility of its introduction in the food of ciprinidae and acipenseridae species.

MATERIAL AND METHOD

The experiments of fodders recipes from the sub-products and wastes from sericulture in the breeding technologies for fishes were accomplished in the technological flux for the breeding of two fish species, *Cyprinus carpio* (carp) and *Acipenser stellatus* (sevruga).

The nutrition test was developed during 56 days, for the evaluation of chrysalis fodders for sturgeon fingerling feeding and during 94 days for carp fingerling feeding and it was accomplished in The Base of Research – Development Brates, which represents the first phase in biological quality evaluation for these fodders.

The experimental alternatives have the following objectives and were developed in the next conditions:

| Alternative | Alternative I | Alternative II | Alternative III |
|--|--|--|---|
| Objective | Biological evaluation of chrysalis fodder for sturgeon fingerling | Biological evaluation of chrysalis fodder for carp fingerling | Biological evaluation of chrysalis fodder and mulberry leaf for carp fingerling |
| farming specie - | <i>Acipenser stellatus</i> | <i>Cyprinus carpio</i> | <i>Cyprinus carpio</i> |
| age | 11 months | 1 year | 1 year |
| average mass to population | 116,64 g/ex | 80,3 g/ex | 82 g/ex |
| the density to population | 11,664 kg/m ³ | 12,045 kg/m ³ | 12.3 kg/m ³ |
| number of populated exemplars | 100 ex | 150 ex | 150 ex |
| food ratio | 2.5% from the total mass of biologic mate | 2.5% from the total mass of biologic mate | 2.5% from the total mass of biologic mate |
| capacity of breeding enclosure | 1 m ³ | 1 m ³ | 1 m ³ |
| the debit for breeding enclosure supplying alternate between | 10 – 15 l/min. | 10 – 15 l/min. | 10 – 15 l/min. |
| The structural compositions of the fodder | chrysalis 30%; corn flour 11%, wheat 13%, soya groats 25%, cazeinate 20%, vitamins 0.5 %, minerals 0.5%. | chrysalis 40%; corn flour 10%, wheat 9%, soya groats 35%, vitamins 0.5 %, minerals 0.5%, oil 5%. | chrysalis 10%; corn flour 14%, wheat 10 %, soya groats 35%, mulberry leaf 25%, vitamins 0.5 %, minerals 0.5%, oil 5%. |

Alternative I, respectively II and III were compared with a control lot, which worked in similar conditions as density and hydrochemistry. The administrated fodder of control lot has the following chemical composition: protein 53.0 %, fats 20.0%, ash 10%, crude cellulose 0.5%, SEN 16.5%.

The plan of experiments contains:

- Expertise of chemical quality and sanitary – veterinary control of the foddors;
- Biological evaluation of the foddors through determination of bio-productive indicators;

Expertise of chemical quality of the foddors based on the determination of crude chemical composition of the foddors and applying the Weende analyze scheme, respectively determination of the 6th components of a product: humidity, crude protein, fat, crude cellulose, ash and extractive un-nitrate substances (3, 5, 6).

The sanitary – veterinary control of the foddors based on the achievement of some analyze phases, respectively from the macroscopic analyzes and organoleptic tests, which allow the appreciation of hygienic-sanitary quality, to analyzes which follow the evaluation of organo-chlorinated pesticides and organo-phosphoric ones, of heavy metals (plumb and cadmid), of afla-toxins and of the radioactivity.

Biological evaluation of the foddors accomplished through the general methods and through the evaluation of protein quality and nutrition efficiency.

General methods for the biological evaluation based on the assessment of some bio-productive indicators, as following: Breeding rate, Daily breeding rate, Specific breeding rate, Conversion coefficient of the food.

RESULTS AND DISCUSSIONS

Regarding the chemical quality of the foddors, it can be observed, in conformity with data from Table no 1 that he foddors are equilibrated from the point of view of the structural composition and assure the specific physiological necessities of farming species and of their breeding stage (3,5,6).

Table no 1
Chemical quality expertise of the foddors realized in conformity with the recipes based on chrysalis and mulberry leaf

| No. | Fodder type | Specific nutritionally necessities of farming species and of their breeding stage | | Chemical characteristics of the fodder, evaluated through the expertise | |
|-----|---|---|---------|---|-------|
| | | 2 | 3 | | 4 |
| 1 | Fodder with chrysalis for sturgeon fingerling | Protein g% | 42 - 45 | Protein g% | 42.70 |
| | | Fats - g% | 8 – 10 | Fats – g% | 8.95 |
| | | | | Humidity - % | 9.25 |
| | | | | Ash - % | 6.15 |
| | | | | SEN – % - | 32.95 |
| 2 | Fodder with chrysalis for carp fingerling | Protein g% | 30- 40 | Protein g% | 34.95 |
| | | Fats - g% - | 10.40 | Fats – g% | 8.45 |
| | | | | Humidity - % | 10.45 |
| | | | | Ash - % | 5.8 |
| | | | | SEN – % - | 40.35 |
| 3 | Fodder with chrysalis and mulberry leaf for carp fingerling | Protein g% | 25 -36 | Protein g% | 25.55 |
| | | Fats - g% - | 6.06 | Fats – g% | 5.9 |
| | | | | Humidity - % | 10.2 |
| | | | | Ash - % | 7.45 |
| | | | | SEN – % - | 50.90 |

The sanitary – veterinary control of the fodders are in accordance with data from Table no 2. In conformity with data from Table no 2 the pellet food has an adequate granulation, is homogenous, has a nice smell, does not present improper substances (3,5). It can be observed that the chemical wastes register a value below the admissible limit for the organo-chlorinated pesticides, organo-phosphoric ones and for afla-toxins and a small increase in value for the heavy metals.

Table no. 2

The sanitary – veterinary control of the fodders

| Analyze | Fodder type | | | Accepted values |
|--|---|---|---|-----------------|
| | Fodder with chrysalis for sturgeon fingerling | Fodder with chrysalis for carp fingerling | Fodder with chrysalis and mulberry leaf for carp fingerling | |
| | 1 | 2 | 3 | 4 |
| Macroscopic analyze | | | | |
| Sample aspect | granulated, homogenous | granulated, homogenous | granulated, homogenous | |
| Tactile sensation | dry | dry | dry | |
| color | brown | brown | light brown | |
| smell | nice | nice | nice | |
| The presence of some improper substances | absence of the improper substances | absence of the improper substances | absence of the improper substances | |
| Sample state | without alteration signs | without alteration signs | without alteration signs | |
| Residues analyze | | | | |
| Organo-chlorinated pesticides | | | | |
| HCH | 0.003 ppm | 0.002 ppm | 0.002 ppm | 0.005 ppm |
| Lindan | 0.002 ppm | 0.002 ppm | 0.002 ppm | 0.002 ppm |
| HCH | <0.01 ppm | <0.01 ppm | <0.01 ppm | 0.01 ppm |
| Total DDT | <0.04 ppm | <0.04 ppm | 0.013 ppm | 0.04 ppm |
| Organo-phosphoric pesticides | <0.01 ppm | <0.01 ppm | <0.01 ppm | 0.01 ppm |
| Heavy metal | | | | |
| plumb | 0.3 ppm | 0.19 ppm | 0.04 ppm | 0.2 ppm |
| cadmiu | 0.16 | 0.08 ppm | 0.17 ppm | 0.02 ppm |
| Radioactivity | 0.00 | 0.00 | 0.00 | 600 Bq/kg |
| Afla-toxins (B1 +B2 +G1+G2) | <0.05 ppm | <0.05 ppm | <0.05 ppm | 0.001 ppm |

The breeding performances for sevruga fingerling, respectively for the carp fingerling, are systematized in table no. 3

Table no. 3

Efficiency of the nutritious keeping from the fodder with chrysalis meal, and mulberry leaf administrated to *Acipenser stellatus* specie end *Cyprinus carpio* specie

| Breeding indexes | Alternative I | Control lot | Alternative II | Alternative III | Control lot |
|---|---------------|-------------|----------------|-----------------|-------------|
| Specia | | | | | |
| Initial biomass - g - | 11664 | 12170 | 12045 | 12300 | 12390 |
| final biomass – g - | 24270 | 28526 | 28905 | 26085 | 37772 |
| Total breeding rate – g - | 12606 | 16356 | 16860 | 13785 | 25382 |
| Breeding rate g/zi/ex | 2.25 | 2.92 | 1.19 | 1.0 | 1.8 |
| Specific breeding rate SGR W/zi[%] | 1.3 | 1.52 | 0.93 | 0.799 | 1.12 |
| Total quantity of the distributed food– g | 13866.6 | 16028 | 24447 | 30327 | 26651 |
| Conversion coefficient of the food kg/kg | 1.1 | 0.98 | 1.45 | 2.2 | 1.05 |
| Protein efficiency coefficient (PER) | 2.1 | 1.9 | 2.2 | 1.9 | 1.7 |
| Crude protein of the fodder - % | 42.77 | 53 | 30.95 | 23.55 | 53 |
| The initial corporal protein - % | 11.29 | 11.29 | 14.28 | 14.28 | 14.28 |
| The final corporal protein -% | 13.71 | 15.5 | 17.4 | 16.6 | 18.6 |
| The productive value of the protein % | 33.9 | 35.85 | 43.7 | 36 | 37.2 |

Analyzing the results obtained through the biologic evaluation of the fodders, it could be observed that, in Alternative I are not registered significant differences of the bio-productive indicators of the biologic material from *Acipenser stellatus* species and the control lot (7). Thus, it could be concluded that for both alternatives a rate of corporal proteins was obtained, higher than the control lot, than to the breeding alternative with fodder based on chrysalis a lower value was registered, but an approximate one. Correlating the rate for weight breeding and the total quantity of administrated protein, it can be observed that the ratio of the protein efficiency (PER) and the productive value of the protein is higher for the lot fed with fodder based on chrysalis than the control lot.

Regarding the bio-productive indexes registered for *Cyprinus carpio* species in the two experimental alternatives, it can be observed that these are close to those which were registered in the control lot. The lowest total rate of breeding occurred in the biologic material with a diet based on fodder with chrysalis and mulberry leaf, and also this one register the highest conversion rate. But, analyzing the protein efficiency coefficient and the productive value of protein it can be estimated that *Cyprinus carpio* species capitalizes very well the protein from the fodder with chrysalis meal, compared with the fodder used in the third alternative and the control lot.

Correlating the indicators which characterize the efficiency of fish nutrition from these three alternatives that were studied, we can conclude that the fodders which are composed of chrysalis meal and the combination with chrysalis meal and mulberry leaf, have an equilibrated chemical composition, being easily digestible and assimilated by the fingerling of sturgeon and carp specie. Biologic evaluation emphasizes the fact that these types of fodders with sub-products from sericulture could be used with classic fodders for breeding of sturgeon and carp fingerling.

CONCLUSIONS

- Analyzing the results obtained through the evaluation and experimentation of the recipes of fodders from sub-products and wastes from sericulture, with the ones from the execution documentation, it can be concluded that:
 - from the biochemical point of view, all the types of fodders assure the nutritional requirements specific to the farming species, the values of proteins and fats obtained being very approximate with the programmed ones;
 - from the organoleptic point of view, the fodders have an adequate granulation, are homogenous, have a nice smell, do not present improper substances;
 - from the point of view of the presence of chemical residues it was detected that to the organo-chlorinated pesticides, to the organo-phosphoric ones and aflatoxins, the obtained values were much lower that the admissible limit. A small exceed of the heavy metal values in the fodder was detectable, but in fish meat the values of these elements were much lower than the admissible limits;
 - from the point of view of the presence of bio-productive indexes, it was detected that for all the types of fodders a rate of corporal proteins was obtained in conditions of some lower conversion coefficients. A protein efficiency was detected in the fodder for the sturgeon and carp fingerling based on chrysalis, and, implicitly, a very well capitalization of proteins compared with the fodder of a control lot.
- From the evaluation and experimentation of recipes for fodders from sub-products and

wastes from sericulture, it can be concluded that these coincide with the proposed goal for which they were conceived, respectively the obtaining of some fodders in which the protein fodders ingredients with animal origin, especially fish meal, to be replaced with sub-product from sericulture.

- Biologic evaluation emphasizes the fact that these types of fodders which contain sub-product from sericulture, especially chrysalis, could be used with classic fodders for the breeding of sturgeon and carp fingerling.

REFERENCES

1. Cadar, D. (1999). Some actual issues regarding nutrition and farming fishes feeding, Moldavia Pisciculture. chapter 1;
2. Costin, G.M., and G. Lungulescu (1985). Capitalization of the sub-products from the milk industry. Technical Ed. Bucharest.
3. Halver, J.E. (1989). Fish nutrition 2nd ed. Academic Press, Inc. California.
4. Matei, A. and col. (1989). Bedding results from the silkworms farming as a source of fodder. Scientific Symposium "Methods of increase of fecundity, natality, profilactity and productivity at the animals", Zooculture faculty, Bucharest.
5. Oprea, L., and R. Georgescu (2000). Nutrition and fishes feeding. Technical Ed., Bucharest.
6. P Itânea, E. (1999). PhD these "Researches regarding the obtaining of some fodders enzyme hydrolyzate in intensive pisciculture" Low Danube University, Galati.
7. Talpe , M., N. Patriche (1996). Experiments on growth in the summer I had the species of *Acipenser stellatus* in polyculture East Asian species, Aquarom 1997.