THE INFLUENCE OF PHYTOBIOTICS (THYME AND SEABUCKTHORN) ON A. STELLATUS (PALLAS, 1771) MEAT BIOCHEMISTRY, GROWTH IN A INDUSTRIAL AQUACULTURE RECIRCULATING SYSTEM

Oana Georgiana Dorojan (Varlan)[1*], V. Cristea[1], Săndiţa Plăcintă[1], M. Fotea[2]

[1]"Dunărea de Jos" University of Galati, Romania
[2]Fishing Department, AM POP, Romania

Abstract

The main objective of the present research is to evaluate the biochemical composition of A. stellatus meat, after the administration of the phytobiotics in feed. One year and four months old A. stellatus fish were used, with an initial average weight of 121.21 ± 68 g / fish. The experimental trial lasted days and was hold at the pilot aquaculture recirculating system. The phytobiotics used were incorporated in feed with gelatin in a concentration of 2% / kg feed and were represented by thyme (Thymus vulgaris) that the seabuckthorn (Hippophaerhamnoides). Two experimental variants were made: V1 – sea buckthorn and V2 - thyme. The fish were fed with Alterna Storione feed, with 48% crude protein and 16% fat. During the experiment, the water physico-chemical parameters were in the normal range for an optimal growth of stellate sturgeon. At the end of the experiment significant differences ($p<0.05$) were observed between the two experimental variations in terms of dry matter, protein, fat and moisture content. Not significant differences ($p>0.05$) were recorded concerning the percentage of ash. The highest value of moisture (83.44%) was recorded in V2 (thyme), the lowest fat content (0.29%) was recorded in V1 (seabuckthorn). In conclusion, the two types of phytobiotics (thyme, seabuckthorn), administered in a concentration of 2% / kg feed, significantly influenced the biochemical composition of A. stellatus meat.

Key words: A. stellatus, biochemical composition, phytobiotics, aquaculture recirculating system

INTRODUCTION

The fish is a source of food with high nutritional value, used in the human diet.

Sahu and his collaborators (2000) reported that among the commercial characteristics of quality the fish meat is the most important aquaculture industries. [1]

The nutritional value of fish meat is the moisture content, dry matter, protein, fat, vitamins and minerals and also the heating value of the fish. [2,3]

The biochemical composition of fish is largely influenced by the composition of the feed consumed.

An increase in feed and in the size of the fish leads to increase of the lipids and the water content decreases in the body of the fish. [4]

Besides the composition of the feed consumed by, the fish meat composition is influenced by age of the fish and its growing conditions.

The stor sturgeon is an important species in aquaculture due to its accessibility, with a low waist, it can be detained and transported easily to the capture places.

The phytobiotics are a variety of bioactive compounds which can be extracted from various plant sources. In recent years, there were new and exciting applications of phytobiotics in animal production. [5]

Phytobiotics used in this experiment were thyme and sea buckthorn.

The thyme is an aromatic plant known and used since ancient kitchen in cosmetic and medicinal purposes. It contains thymol (44-60%), an essential oil with powerful antiseptic properties; it is rich in antioxidants, potassium, magnesium and vitamins A, C and E. [6]

*Corresponding author: varlanoana79@yahoo.com
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The therapeutic properties of thyme in aquaculture are antiseptic, antioxidant, stimulating digestion. [7]

The sea buckthorn is originally from Central Asia.

The sea buckthorn berries contain vitamin C at a rate twice higher than rosehip and ten times higher than citrus.

The Vitamins A, B1, B2, B6, B9, E, K, L and M are also present in significant concentrations in sea buckthorn berries.

Many researches have been done in recent years on phytobiotics effects on the immune response, disease resistance and growth performance.

The purpose of this experiment was to observe the influence on the biochemistry of the above mentioned phytobiotics meat species A. stellatus, increased in a controlled aquaculture system.

MATERIAL AND METHOD

The present experiment lasted 63 days and was held in a recirculating system designed and built in the Department of Aquaculture and Fisheries of Galați.

The design of a recirculating system including two units of increase in a volume of 600 l each and an air conditioning system for water quality. [8]

We used specimens of A. stellatus, aged one year and four months, which were evenly distributed in the two growth units.

The phytobiotics gelatin used were incorporated in the feed in a concentration of 2%/kg feed, as follows: thyme (Thymus vulgaris) that sea buckthorn (Hippophae rhamnoides).

The experimental variants were two in number: V1 – sea buckthorn and V2 - thyme.

The fish were fed with feed Alterna Storionii 2P, with 48% crude protein and 16% fat (table 1).

The fish were fed four times a day with a daily ration of 1.5% of fish body weight.

Determination of biochemical composition of meat from A. stellatus was performed at the end of the experiment, fresh meat.

The determination was carried out on biochemical samples of muscle tissue, which were weighed and chopped to ensure uniform samples for analysis.

Table 1 Biochemical composition of the feed Alterna Storionii 2P

Composition	2P
Crude protein%	48,0
Raw fat %	16,0
Raw cellulose%	1,9
Raw ash %	8,5
Phosphorus %	1,3
Digestible energy (MJ/kg)	16,6

The proximate composition of diets was carried out using the Association of Analytical Chemists methods.[9]

The biochemical analysis consisted of a multitude of tests that followed the establishment of this species in the protein content of meat, fat, dry matter and ash.

The fat was determined by Soxhlet extraction method with solvents (petroleum ether) using standard extraction apparatus Raypa, for protein we used the method of Kjeldahl equipment type Gerhardt, dry matter was determined by the method of heating at 105 ± 2ºC using oven-type sterilizer ESAC and ash was evaluated by calcination at 550 ± 20ºC oven type Nabertherm.

The main water parameters (temperature, dissolved oxygen, pH) were determined with oximeter - Oxi315i and pH-meter type pH 315i. [10]

The Data were statistically analyzed with Microsoft Excel.

RESULTS AND DISCUSSIONS

The biochemical composition of the meat varies, depending on many factors, such as age, size, sex of fish and not least for environmental conditions.

During the experiment the physico-chemical process water were located in the normal range for optimal growth (table 2).

Table 2 Values of main water quality parameters

Water quality parameters	V1	V2
N-NO2 mg/l	0.119±0.0035	0.124±0.0013
N-NO3 mg/l	23.59±0.12	23.92±0.24
N-NH4 mg/l	0.555±0.18	0.292±0.15
pH – upH	7.823±0.094	7.916±0.065

The experiment was started at optimal temperatures 18 to 20ºC sturgeon [11, 12] they maintained throughout the experiment. At the end of the experiment we obtained differences in the end the average weight (g / eg.): V1 - 219.66; V2 - 228.68 individually and increase growth (g): V1 - 98.45; V2 - 105.90.

The Biochemical composition of meat of fish is influenced by feed composition administered [4].

For biochemical analyzes sacrificed a copy of each experimental variant: V1 = V2 = 166g and 140g.

The main biochemical parameters (moisture, protein content, fat and ash) of meat species A. stellatus, obtained after feeding with different fitobiotice in a recirculating aquaculture industry, are presented in Figure 1.

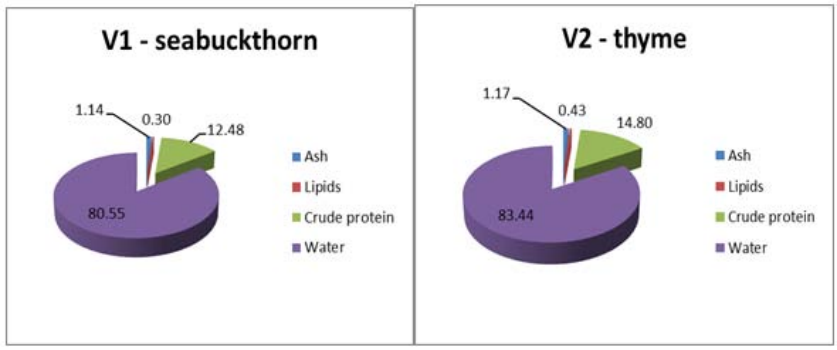

Figure 1 Comparative graphical representation (V1/V2) of stellate sturgeon meat biochemistry

The protein content of the fish meat may be in the range of 12.3-28% by weight of the sample. [13]

After (Sikorski et al., 1994) [14], the fish can be classified into four categories, depending on the protein content as follows: less than 10%, 10-15%, 15-20% and over 20% protein.

If we consider the results of I. Vasilean and his collaborators [15] we note that sturgeon reared in recirculating aquaculture systems are in the range 15-20% protein sturgeon reared in the wild that would fall in the range 10-15% protein.

The nutritional value of fish meat and maintaining the biological material can be characterized by the ratio between the water and protein content.

Thus, a lower value of this ratio indicates better maintenance of biological material and high nutritional value.

In the current experiment, the ratio of water and protein content is lower in variant V2 to V1.

Also Desimir and his collaborators in an experiment [16] obtained the differences between the versions on the relationship between water and protein content, but it was statistically significant ($p \geq 0.05$).

The percentage of fat in the fish flesh varies widely from 0.1% to 28%. In the literature, [13, 18, 17] and have been reported values on sturgeon less than 4% fat, [16] include those in which the group of low-fat fish.

Ackman and his collaborators, in 1989, affirm that fish can be grouped into four categories, according to their fat content: lean fish (<2%), low fat (2 to 4%), medium fat (4 to 8%), and high fat (>8%) [19].

In the present experiment was obtained values of the fat, the smaller the V1, with a mean of 0.29 ± 0.057%, compared to the version V2, with an average of 0.43 ± 0.017%.

Lionel and his collaborators, 2012, states that an ash content between 1.17 and 1.79% in the flesh of fish is a good source of minerals like calcium, potassium, zinc, iron and magnesium. [20]

The highest value of ash content was recorded in variant V2 (1.16%) than V1 (1.14%).

CONCLUSIONS

The phytobiotics contribute to the improvement of the defense mechanisms of fish thus providing resistance to infection, and thus affect the performance of the growth.

However one should not ignore the fact that exposure of fish on a very high immunostimulant may result in loss of immune function, innate immune system losing sensitivity.

Supplementing the diet with phytobiotics influenced biochemical meat composition A. stellatus follows:

- a highest value of moisture was recorded in variant V2 (thyme) - 83.44% compared to V1 (sea buckthorn) - 80.55%.
- the use of the thyme increased the protein content (14.80%) compared with sea buckthorn, where he obtained a rate of only 12.48% of protein content.
- according to the literature and the data obtained in this experiment, in terms of fat content, are part of sturgeon fish meat lean (<2%), thus having a low fat content.

In conclusion, the administration of the two types of phytobiotics (thyme and sea buckthorn) at a concentration of 2% / kg feed, the biochemical composition of the meat are influenced by the species A. stellatus different.

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