

Effects of Sea-Buckthorn (*Hippophae rhamnoides* L.) upon the Growth and Development of Common Carp (*Cyprinus carpio*)

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Abstract. In this paper, we approached a research theme regarding the effects of Sea-buckthorn (*Hippophae rhamnoides* L.) upon the growth and development of the common carp (*Cyprinus carpio*) in aquarium conditions. In this sense, there were organized 3 lots, each lot containing 25 individuals, weighting between 7.27 and 16.01 g. Feeding occurred with granulated feed, having a protein level of 26 %, the only difference between the lots was represented by the percentage of the added Sea-buckthorn, which was in the first case 1% and in the second one 2%, compared to the control lot, without Sea-buckthorn. During the 120 days of this experiment, we monitored the dynamic of the body weight, accumulation of body mass, average daily gain and the survival rate. The fish breeding was carried out in aquariums, each with a total capacity of 500 l, and controlled medial conditions the only difference between the lots was the addition of Sea-buckthorn regarding the feed system.

The results obtained during this experiment, prove the opportunity and the actuality of this research theme, and the positive impact of the Sea-buckthorn upon the growth of the common carp. We need to mention the fact, that the best results were achieved in case of the supplementation of the feed with 1% Sea-buckthorn powder compared to the other two lots.

Keywords: Sea-buckthorn, carp, feed, supplementation, growth

INTRODUCTION

Since ancient times, the therapeutical effect of some plants from the spontaneous flora were well known, and often these were used in order to treat or prevent some health problems.

The Sea-buckthorn (*Hippophae rhamnoides* L.) makes part from this plant category, but unfortunately, its miraculous effects upon the health of different organisms was not researched and explained scientifically for a long time. The development of the science and the need to return to nature in order to find natural medicines, made this thorny bush the subject of many researches all over the world (Brad, 2002).

Between the many domains in which there were tested the effects of sea-buckthorn, we can mention the animal breeding too. In this case, many experiments refers to the effect of sea-buckthorn upon the growth performances of different farmed animal (Brad, 2002).

From this field of study, makes part the carp breeding too, which has a well-known tradition in our country.

The carp is omnivorous fish specie, which uses very well, both natural and supplementary foods. The natural food of the carp can be divided in four groups: main food, represented by the benthic biomass of the pond: secondary food-zooplankton; accidental food and the forced food, this is the food eaten by the fish in case of food crisis (Bud, 2004).

In order to achieve a high production in the carp breeding facilities, the natural food provided by the ponds, must be supplemented with additional feed, because in many cases the

natural food of the pond, is not sufficient to ensure a good development of the fish. The mentioned food supplementation can be made using different kinds of carp feeds, feed which may contain growth and healthy promoters (Oprea, 2000).

The researches made so far, upon the supplementation of some animal feeds with sea-buckthorn have shown that this determined a higher growth rate and higher production level.

MATERIALS AND METHODS

The references studied so far, and the results achieved in case of adding sea-buckthorn in the feed of some farmed animals, made us approach this research theme, through which we would like to highlight the effects of the sea-buckthorn upon the growth and development of the common carp in aquarium, laboratory conditions.

Our researches were carried out, in the aquaculture laboratory of the University of Agricultural Sciences and Veterinary Medicine, from Cluj-Napoca. In order to make the experiment possible, we used three aquariums with a capacity of 500 liters each. These aquariums represented the three studied lots, each of them containing 25 individuals of common carp, weighting between 7 and 16 g.

Feeding was made with granulated feed, having a protein level of 26%. The only difference between the feeds given to the experimental lots was represented by the supplementation of the feed with dried and ground sea-buckthorn, in proportion of 1% and 2%.

The experiment was carried out on 120 days, and at 30 days interspace, took place the individual weighting and measurement of the fish. The date collected, served to monitorise the effect of the two sea-buckthorn concentration, upon the growth of the biological material.

RESULTS AND DISCUSSION

After 30 days of study, we obtained the first results, which showed significant differences between the experimental lots. The highest value was achieved by the Lot II, fed with feed containing 1% sea-buckthorn, having an average weight of 24.06 g, followed by an average of 12.69 g of the Lot III, fed with feed containing 2% sea-buckthorn, and last in order was the control lot (Lot I) which achieved just 11.64 g average weight (Tab. 1).

Tab. 1

Dynamics of the body weight depending on the administrated feed

| Date of weighting | Lot I-Control | | Lot II- 1% sea-buckthorn | | Lot III-2%sea-buckthorn | |
|------------------------|----------------------------|-------|----------------------------|-------|----------------------------|-------|
| | X \pm s _x (g) | V% | X \pm s _x (g) | V% | X \pm s _x (g) | V% |
| Stocking 28.10.2009 | 8.58 \pm 0.34 | 19.58 | 16.1 \pm 0.73 | 22.86 | 7.27 \pm 0.25 | 17.26 |
| 28.11.2009 | 11.64 \pm 0.42 | 18.13 | 24.06 \pm 1.02 | 21.18 | 12.69 \pm 0.46 | 18.28 |
| 28.12.2009 | 16.33 \pm 0.60 | 18.30 | 35.12 \pm 1.62 | 23.09 | 20.48 \pm 1.22 | 29.72 |
| 28.01.2010 | 28.59 \pm 1.17 | 20.43 | 56.13 \pm 2.67 | 23.76 | 32.78 \pm 1.50 | 22.92 |
| 28.02.2010 | 50.17 \pm 2.25 | 22.4 | 91.19 \pm 5.62 | 30.83 | 57.21 \pm 3.01 | 26.28 |

At the second weighting, made at 60 days the evolution of the body weight was on the same linear ascending trend, the order between the lots being the same: Lot II, being superior to Lot I (control lot) and Lot III.

After 90 days of experiments, the differences between the lots increased significantly but the growth order was the same with the order from the first two measurements.

At the end of the experiment, we concluded that Lot I which had part of 1% sea-buckthorn in its` diet, reached the highest growth performance, having an average weight of 91.19 g, compared with 57.21g in the case of Lot III, and 50.17 g in the case of Lot I.

Following the date shown in Tab. 1, we can highlight the fact that the supplementation of the carp diet with 2% sea-buckthorn, determines a slower growth, having a mean value of 57.21 g, being closer to the value of the control lot (Lot I) with 50.17 g than to the value of the Lot II.

The results shown above, demonstrates the efficiency of the sea-buckthorn added in the diet of the common carp, but between certain proportions, proportion which will be tested in the future.

If we refer to the development of the accumulation of body weight, depending on the administrated feed, we can say, that the first place has been taken in this case too by the Lot II (Tab. 2).

Tab. 2

Evolution of the accumulation of body weight, depending on the administrated feed

| Days interspace | Lot I Control (g) | Lot II 1% Sea-buckthorn (g) | Lot III 2% Sea-buckthorn (g) |
|-----------------|----------------------|--------------------------------|---------------------------------|
| 0-30 days | 3.06 ± 0.08 | 7.96 ± 0.29 | 5.42±0.21 |
| 30-60 days | 4.69 ± 0.18 | 11.06 ± 0.6 | 7.79±0.76 |
| 60-90 days | 12.26 ± 0.57 | 21.01 ± 1.05 | 12.3±0.28 |
| 90-120 days | 21.58 ± 1.08 | 35.06 ± 2.95 | 24.43±1.51 |
| 0-120 days | 41,59 ± 1,91 | 75,09 ± 4,89 | 49.94±2.78 |

Analyzing the date shown in the table from above, we notice that in all three cases the accumulation of the body weight head an ascending trend, the highest values were achieved between 90 and 120 days with 21.58 g in case of Lot I, 35.06 g for Lot II, and 24.43 g for Lot III.

Regarding the accumulation of the body weight, through the whole experimental period, it can be noticed that the hierarchical order remains the same, in favor of the Lot II whit 75.09, g, followed by Lot III whit 49.94 g, and in the end is the control lot (Lot I) whit a value of 41.59 g.

Making a brief mathematical calculation, based on the total accumulation of the body weight, we can underline the fact that between Lot II and Lot I it was achieved a difference of 33.50 g, and between Lot II and Lot III a difference of 25.15 g. These differences show the positive effect of certain proportions the sea-buckthorn added in the fish diet.

Tab. 3

Evolution of the average daily gain, based on the administrated feed

| Days interspace | Lot I Control (g) | Lot II 1% Sea-buckthorn (g) | Lot III 2% Sea-buckthorn (g) |
|-----------------|----------------------|--------------------------------|---------------------------------|
| 0-30 days | 0.10 | 0.26 | 0.18 |
| 30-60 days | 0.15 | 0.36 | 0.26 |
| 60-90 days | 0.40 | 0.70 | 0.41 |
| 90-120 days | 0.71 | 1.16 | 0.81 |
| Total period | 0.34 | 0.62 | 0.41 |

Turning our attention on the evolution of the average daily gain (Tab.3), we can conclude, that this is highly influenced by the added sea-buckthorn in the diet. At the end of the experiment the evolution of the average daily gain was the following: 0.62 g for Lot II, 0.41 g for Lot III, and 0.34 g for the control lot (Lot I).

Making a synthesis of the date obtained during our experiment (Tab. 4), we can underline the fact that the sea-buckthorn added in the feed of the common carp, has a positive impact upon the growth and development of this fish specie.

Tab. 4

Growth dynamics based on the administrated feed

| Specification | Initial Weight (g) | Final Weight (g) | Total mass accumulation (g) | Average daily gain (g) | Differences from control group (g) | Survival rate (%) |
|------------------------------|--------------------|------------------|-----------------------------|------------------------|------------------------------------|-------------------|
| Lot I Control | 8.58 ± 0.34 | 50.17 ± 2.25 | 41,59 ± 1,91 | 0,34 | - | 100 |
| Lot II 1% Sea-buckthorn | 16.1 ± 0.73 | 91.19 ± 5.62 | 75,09 ± 4,89 | 0,62 | + 33,5 ± 2.98 | 100 |
| Lot III- 2% Sea-buckthorn | 7.27 ± 0.25 | 57.21 ± 3.01 | 49.94±2.78 | 0,41 | + 8.83 ± 2.11 | 100 |

CONCLUSIONS

Through our experiment we managed to prove for the first time in our country, the efficiency of the sea-buckthorn added in the fish diet, in this case the diet of the common carp.

The supplementation of the fish diet with sea-buckthorn, has a positive impact on the growth and development of the fish, but only if the added sea-buckthorn doesn't exceeds certain threshold limit.

From the two tested variants, the one with 1% sea-buckthorn, proved itself to the best tested version, compared to the one having 2% sea-buckthorn. We need to mention the fact that the version whit 2% sea-buckthor, was also superior to the version without sea-buckthorn adding, but the values encountered were very close to the values of this one.

In the end we want to highlight the fact that this results are exclusively determined by the administrated feed, all other breeding condition being the same in all three cases.

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