

## STUDY CONCERNING THE EVALUATION OF THE GENETIC DETERMINISM OF SOME BIOECONOMIC AND ECOECONOMIC CHARACTERS IN INEU CARP BREED

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### Abstract

*Increased competitiveness in the biological fish material market required the improving the quantitative characters of exploited species. One of the essential problems of heredity study quantitative characters is knowing the degree of hereditary transmission of characters from parents to offspring. Assessment of genetic determinism was based on heritability. This procedure requires knowledge of causal components of variance.*

*The biological material studied consisted of 50 descendants of Ineu carp breed, who came from five mothers and ten fathers. Each descendant was measured for three characters: body weight, maximum body height and body length at the end of the first three summers of growth. For variance components analysis was used BLUP (Best Linear Unbiased Prediction) methodology, applied to an individual animal model. The results showed that the characteristics considered their genetic determinism is low to medium and medium to high. Thus, it was found that, after the first summer of growth, morphological characters measured have a low genetic determinism (0.1615; 0.1894; 0.1708). After the second summer of growth, body weight and maximum body height have medium genetic determinism and body length high genetic determinism (0.4426). After the third summer, weight and body length have high genetic determinism and maximum body height has medium genetic determinism (0.3270).*

*In conclusion, genetic determinism of considered characters is low to medium, an aspect which leads to the conclusion that to maximize the effect of selection is necessary to consider family selection.*

**Key words:** carp, genetic variance, morphological characters

### INTRODUCTION

The methods of intensive animal growth to obtain high productions of meat, has located in the forefront the research and study of the genetic capacity for growth as the main factor that interferes with the development of high bioeconomic and ecoeconomic productions. Making the animal production is the result of simultaneous or separate action of the three factors: the genetic potential of the individual, the number of individuals and the operating conditions. Short-term increase of animal production can be achieved by increasing the workforce, but on long term, this approach is unfeasible, because the vegetal production

grows as an arithmetic progression, while the animal one, as a geometric progression, leading to an excess of the capacity support [1].

In the context of sustainable animal production, the way which should be followed is to increase the animal production based on improving the genetic potential, together with the improvement of the operating conditions [1]. The followed goals in the growth of valuable species of fish, carp in our case, consist of transforming some bioeconomic and ecoeconomic features, in order to be useful for humans [4].

The aim is to obtain species with:

- high growth rate;

- a certain external morphological aspect, according to biological and economic considerations;
- increased precocity and prolificity;
- resistance to diseases and unfavorable environment factors.

In practice, these objectives are reflected in the transformation of some characters of individuals belonging to the population with which the work is done.

Also, at fish, they can be considered domestic animals, whose genetic evolution is under long human intervention, and that any negligence or mistake in the management of the genetic fund, may have most serious consequences, until the disappearance of some races or local populations [2].

## MATERIAL AND METHOD

In our country, the carp, which as a wild species was, decades ago, the basic fishery production in the lower Danube basin, was, is and it will remain, at least as goal, the main fish species in Romania, regardless the economic circumstances.

The studied biological material consisted of 50 offspring of Ineu carp (Photo 1), which belonged from five mothers and ten fathers.

Each descendant has been measured for three characters: body weight (W), maximum body height (H) and body length (l), at the end of the first three summers of growth.

The body weight (W) has been determined by weighing with a scale for small weights.

The maximum body height (H) has been measured in the highest region of the body, at the level of the first radiating from the dorsal fin, with the help of a graduated ruler.

The body length (l) has been measured on the midline of the body, from the top scaly snout to the end cover to the caudal fin, with the help of a graduated ruler.



Photo 1. Ineu carp breed (Source: S.C.P. Nucet)

For the analysis of the variance components the BLUP (Best Linear Unbiased Prediction) methodology has been used, being applied to an individual animal model.

## RESULTS AND DISCUSSIONS

Knowing the level of quantitative hereditary transmission of characters from parents to offspring is one of the important problems of their heredity study [3].

To highlight the genetic determinism of quantitative characters, subject to genetic improvement programs to breed the Ineu carp using heritability.

Heritability expresses the proportion of phenotypic manifestation of a character that can be attributed to environmental effects of genes involved in that genotype [1].

Table 1. Genetic determinism of the weight, maximum body height and body length, on a first summer carp of Ineu breed

Breed/age	Characters	Error variation	Additive genetic variation	Phenotypic variation	Heritability
Ineu 0+	W (g)	19.0851	3.6757	22.7609	0.1615
	H (mm)	81.3038	18.9949	100.2987	0.1894
	l (mm)	450.3851	92.7415	543.1267	0.1708

After the first summer of the Ineu carp individuals growth, there is weak genetic determinism of the measured morphological characters (Table 1). This means that the

average effect of genes from the genotype is responsible for more than 20% of the phenotypic manifestation of the analyzed characters.

The value of heritability is also influenced by the environmental conditions in which the analyzed individuals of the population evolve. Any change in the action of the environmental factors influences their share in the total

phenotypic variance, changing by default, and the share of the other components of the variance, including the additive variance [1].

Table 2. Genetic determinism of the weight, maximum body height and body length, on a second summer carp of Ineu breed

Breed/age	Characteristics	Error variation	Additive genetic variation	Phenotypic variation	Heritability
Ineu 1+	W (g)	11026.1	4360.9	15387.0	0.2834
	H (mm)	68.2523	25.9540	94.2063	0.2755
	l (mm)	232.5263	184.6654	417.1917	0.4426

At the end of the second summer of growth, an intense genetic determinism is found in the length of the body characteristic. The other two characters, the body weight and maximum body height are intermediate heritability (Table 2). After the second summer of growth, in the phenotypic expression of genes character average effect from the genotype provides over

40% of the phenotypic expression of the body length and between 20-40% for the weight and for the maximum body height.

The results can be the result of uniformity of the environmental conditions and lower sensitivity of the breed towards them.

Table 3. Genetic determinism of the weight, maximum body height and body length, on a third summer carp of Ineu breed

Breed/age	Characters	Error variation	Additive genetic variation	Phenotypic variation	Heritability
Ineu 2+	W (g)	78896	55637	134533	0.4136
	H (mm)	119.4897	57.9617	177.4513	0.3270
	l (mm)	427.0243	296.9444	723.9687	0.4102

At the end of the experimental period, respectively the third summer of growth, the weight and body length characters have hard heritability determinism, having similar values. The maximum body height is, as in the end of the second summer of growth, an average heritability characteristic (Table 3).

Except for the body length, the other analysed morphological characters, the body weight and the maximum body height, there is an increasing tendency of heritability. In the same tendency is the body length characteristic, making an exception after the second summer of growth.

## CONCLUSIONS

As a consequence of the study on the population of Ineu carp, in what regards the evaluation of the genetic determinism of some

useful bioeconomic and ecoeconomic characters, the following has been observed:

1. After the first summer of growth, the measured morphologic characters have a low genetic determinism (0.1615; 0.1894; 0.1708).
2. At the end of the second summer of growth, the body weight and the maximum body height have an average genetic determinism (0.2834, 0.2755) and body length has a high determinism (0.4426).
3. At the end of the third summer of growth, the weight and the body length have a high determinism (0.4136; 0.4102), and the maximum body height has an average determinism (0.3270).
4. The genetic determinism of the characters is considered low to intermediate, which means that to maximize the effect of the selection, the family selection is required.

5. The heritability values of the analyzed characters refer only to the study of the analyzed population and to the environmental conditions in which it has developed.

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