

STUDY CONCERNING THE HERITABILITY ESTIMATION FOR SOME BIOECONOMIC AND ECOECONOMIC CHARACTERS IN ROPSA CARP BREED

Carmen Georgeta NICOLAE¹, Horia GROSU¹, Mioara COSTACHE², Georgeta DINIȚĂ¹,
Monica MARIN¹, Victor NIȚA

¹ University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăști Blvd.,
Sector 1, 011464, Bucharest, Romania; Phone number: +40213182564; Fax: +402131828 88;
e-mails: carmennicolae19@yahoo.com; hgrosu@hotmail.com; monica_marin_zoo@yahoo.com;
ndefta@yahoo.com; victor_nicolae@yahoo.com

² Station for Fisheries Research Nucet, 137335, com. Nucet, jud. Dâmbovița, Romania;
Phone number: +40245267003; Fax: +40245267009; e-mail: scp_nucet@yahoo.com

Corresponding author email: carmennicolae19@yahoo.com

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, issue that can be quantified by heritability.

The biological material studied consisted of 50 descendants of Ropsa 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. Thus, it was found after the first three summers of growth, morphological characters measured have a medium genetic determinism, to the lower limit (0.20). The exception was the maximum body height that had a genetic determinism 0.2757 after the first summer of growth and 0.1910, after the second summer.

The results in the investigated effective showed that the determinism of the considered characters is low to intermediate. This thing shows that the main performance is not a sufficiently precise indicator for additive genotype; for this reason is necessary to supplement this source with information provided by family candidate selection. As a result we can expect increased accuracy of selection and consequently the selection effect.

Key words: carp, genetic variance, morphological characters

INTRODUCTION

The intensive animal growth in order to obtain high productions of meat, has determined the research orientation towards the study of the genetic capacity for growth. It is considered to be one of the main factors which interfere in obtaining high bioeconomic and ecoeconomic productions.

Highlighting the animal production is the result of simultaneous or separate action of the genetic potential of the individual, the number of individuals and the operating conditions.

During a short term, the increase of animal production can be achieved by increasing the workforce. On the other hand, on a long term, the solution is not useful, because the animal

production grows as a geometric progression, which leads to the overcome of the support capacity [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 genetic improvement of fish can be defined as a process of change, by specific methods and ways, of the genetic structure of the populations, in the wanted direction given by human, keeping in mind the characteristics of the species and of the environment [5]. Therefore, the aim of the genetic improvement is to identify and quantify the elements which get involved in the creation of useful bioeconomic and ecoeconomic characters,

moreover, to determine whether a data value is transmitted to the offspring.

In the growth of carp, species which is considered valuable in our country, the followed goals are similar to the ones of the fishes of bioeconomic and ecoeconomic interest [4].

They are represented by: high growth rate; a certain external morphological aspect, according to biological and economic considerations; increased precocity and prolificity; resistance to diseases and unfavourable environment factors.

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

Any negligence or mistake in the management of the genofund may have most serious consequences, until the disappearance of some races or local populations [2].

MATERIAL AND METHOD

In Romania, 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 Ropsa 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. Ropsa 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 Ropsa 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 Ropsa breed

Breed/age	Characters	Error variation	Additive genetic variation	Phenotypic variation	Heritability
Ropsa 0+	W (g)	41.4315	11.8120	53.2435	0.2218
	H (mm)	32.0216	12.1912	44.2128	0.2757
	l (mm)	333.5126	85.1395	418.6521	0.2034

After the first summer of the Ropsa 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 results may be the consequence of an increased resistance of carp individuals of the Ropsa breed towards the environment conditions.

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

Breed/age	Characters	Error variation	Additive genetic variation	Phenotypic variation	Heritability
Ropsa 1+	W (g)	8225.2	2330.1	10555.3	0.2207
	H (mm)	29.7920	7.0351	36.8271	0.1910
	l (mm)	229.6105	63.6016	293.2121	0.2169

At the end of the second summer of growth, gn 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.

Table 3. Genetic determinism of the weight, maximum body height and body length, on a third summer carp of Ropsa breed11

Breed/age	Characters	Error variation	Additive genetic variation	Phenotypic variation	Heritability
Ropsa 2+	W (g)	40397	10241	50638	0.2022
	H (mm)	185.6248	47.5118	233.1366	0.2038
	l (mm)	1602.0406	424.1594	2026.2000	0.2093

At the end of experimental period, respectively the third summer of growth, the morphological analysis tended to maintain intermediate heritability, at the lower limit (Table 3).

For all the three characters, the average effect of genes from the genotype assures more than 20% of their phenotypic expression.

The heritability is influenced by the environmental conditions in which the analyzed individuals of the population develop. Any change in the environmental factors influences their share in the total phenotypic variance, changing by default the share of other components of variance, including the ones of the additive variance [1].

The Ropsa carp breed is recognized as a breed resistant to the environmental conditions and it is possible that they may not interfere too much in modifying the phenotypic expression of the analyzed characters.

CONCLUSIONS

As a consequence of the study on the population of Ropsa 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 an average genetic determinism, at the lower limit (0.20).
2. The maximum body height had a slightly modified genetically determinism from the other characters, being the largest after the first summer of growth (0.2757) and the lowest after the second summer (0.1910).
3. In the conducted study, it is possible that the own performance is not a sufficiently precise indicator for the additive genotype, reason why the supplement of this source with the provided information is imposed by the family of the

candidate at selection. As a result we can expect an increased accuracy of selection and thus of the effect of the selection.

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

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