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RESEARCH ON THE EVOLUTION OF THE MEAT PRODUCTION CHARACTERS AND THE CORRELATIONS AMONG THEM IN INEU CRAP BREED

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Abstract

The knowledge of fish characters for meat production and the correlations among them presents a major importance. Ineu carp breed can have a significant contribution by providing a high quality protein to Romanian and other consumers also. The increased human population requires a larger production of food and aquaculture production must meet this need. The study was based on the analysis of morphologic characters of descendants of five Ineu carp females. The studied characters were weight, body depth and standard length; each descendent being measured and weighed over a period of three years. The Fisher test was used to check variance homogeneity, and Pearson correlation coefficient was used to verify the interdependence of the three characters. Regarding the homogeneity of the variance, no significant differences were found ($P \geq 0.05$). According to the results, the correlation between the weight and the body depth was the highest, namely 0.99; 0.95 between weight and standard length and 0.96 between standard length and body depth. In conclusion, the three production characters are strongly correlated and have a major influence on meat production.

Key words*: carp, correlation, fish, productions, traits.*

INTRODUCTION

The body growth is the third major change that defines the complicated process of development, along with gene replication and cell differentiation. During development, the body undergoes an increasing of body mass and dimensions, a process that is even the phenomenon of growth.

Any fish population subjected to the genetic improvement process must be known in terms of performance for the studied characters (Oroian, 2007). The quantitative characters represent the phenotypic expression of genotype occurrence under certain environmental conditions, phenotypic expression so called performance.

Due to its qualities (high growth rate, good utilization of feed, precocity and good prolificacy), Ineu carp is registered from morphological, constitutional and productive point of view in the category of breeds with advanced degree of amelioration. Ineu carp is part of the category of high carp breeds, small headed, with short and tall caudal peduncle. The scales are low, and specimens without scales have been identified. All these features recommend it to both breeders and consumers.

The study of the evolution of characters for meat production has a great theoretical and practical importance (Ivancia, 2007).

Thus, knowing the age distribution of a fish population, as well as the growth rate of this population, it can easily tell if there is overcapacity in a fish pond or, on the contrary, an insufficient exploitation of the fishery resource. Considering these, a favourable moment for fishing and the choice of the earliest specimens and breeds can be identified which leads to the increase of the economic profitability of the fish farm.

When the goal is to increase meat production, it is recommended to consider the measurement of those characters that have the greatest influence on the amount of meat. Recording the information on weight, body depth, standard length and other characters translates as phenotypic information in statistics. If the analyze of data obtained by direct measurement on the live animal, shows that there are highly positive correlations between the characters that are to be traced, then we can say that the

intended aim was achieved: improving the meat production in a sufficient quantity and with an adequate quality to satisfy the increasing needs of consumers.

MATERIALS AND METHODS

For an accurate analysis of the three studied production characters, five Ineu carp families were evaluated. Thus, the descendants of five carp females were measured for 3 years and the three characters were registered each year.

The five females had 10 males of the Ineu breed carp as partners, each female had two partners. 5 descendants from each pair were kept, a total of 50 offspring obtained after the mating and they were observed and recorded for 3 summers. Every end of summer we measured: weight, body depth and standard length; for each of the measurements, the appropriate tools were used to prevent the measurement error from occurring. In the first step, a primary statistical analysis was performed and for each trait was calculated average, standard deviation and the coefficient of variability (Table 1). The calculation was based on the specific formulas (Grosu et al., 2005):

Average:

$$\bar{X}=\frac{\sum X}{n} \quad (1)$$

Standard Deviation:

$$S_X = \sqrt{S_X^2} \quad (2)$$

Average Error:

$$S_{\bar{X}}=\frac{S_X}{\sqrt{n}} \quad (3)$$

Coefficient of variability:

$$C.V.\%=\frac{S_X}{\bar{X}}\cdot 100 \quad (4)$$

Regarding the correlation between the analyzed characters, the Pearson Correlation was used in order to verify whether the three characters are dependent or not and whether they can influence the meat production.

Correlations among mother families and the actual total were also verified.

The correlation formula was proposed by Karl Pearson and named by him (Karl Pearson cited by Bolboacă and Jantschi, 2006):

$$r=\frac{\sum (X-\bar{X})\cdot(Y-\bar{Y})}{\sqrt{\sum (X-\bar{X})^2\cdot \sum (Y-\bar{Y})^2}} \quad (5)$$

The analyzed data were collected from the Fish Culture Research and Development Station of Nucet.

RESULTS AND DISCUSSIONS

Using the classical formulas for the primary statistics, the average with its error, the standard deviation and the coefficient of variability were calculated for the analyzed population.

Analyzing the results we can observe that the studied population is within the specific species limits.

The averages for each of the characters had different evolutions: for body weight the increase was significant from one year to the next, as it can be seen in Table 1.

Table 1. Phenotypic characterisation of the analyzed population

Parameter	Weight (W)			Body Depth (BD)			Standard Length (SL)		
	0+	1+	2+	0+	1+	2+	0+	1+	2+
n	50	50	50	50	50	50	50	50	50
Average	36.46 ± 0.67	594.48 ± 17.25	1462.8 ± 50.54	53.6 ± 1.4	114.56 ± 1.35	152.18 ± 1.84	130.78 ± 3.26	249.62 ± 2.82	330.84 ± 3.70
Standard Deviation	4.7	121.9	357.4	9.9	9.5	13.0	23.0	19.9	26.2
CV	12.9	20.5	24.4	18.5	8.3	8.6	17.6	8.0	7.9

The weight increased from 36 g to 1462 g, being 40 times higher in the third year of measurement compared to the first one. For the other two characters the evolution was less representative: the standard length increased from 130 cm to 330 cm, an increase of only 2.5

times higher. These evolutions show that the most fluctuating character is body weight. Considering the analysis of the variability coefficient, it can be observed that for all three analyzed characters and years of measurement we have a homogeneous population, the value of the coefficient is between 8 and 24%, no figure exceeded 30%.

The analysis of correlations shows that the three analyzed characters are positively correlated: when one increases, the other two automatically increase also. As it can be seen in Table 2, for the first year of measurement, the highest correlation was between body depth and standard length (0.989, respectively).

Table 2. Pearson Correlation for all population in first year of measurement

0+	Weight	Body Depth	Standard Length
Weight	1		
Body Depth	0.982	1	
Standard Length	0.976	0.989	1

In the second year of measurement, the correlation values dropped slightly compared to the previous year, but the same positive trend is maintained and all correlations are higher than 0.850 (Table 3). In this case, the highest correlation was obtained between weight and body depth (0.939).

Table 3. Pearson Correlation for all population in second year of measurement

1+	Weight	Body Depth	Standard Length
Weight	1		
Body Depth	0.939	1	
Standard Length	0.901	0.865	1

As expected, in the third year of measurement the correlations were positive and with very high values, the highest correlation was recorded between standard length and weight (0.960) (Table 4).

Tabel 4. Pearson Correlation for all population in third year of measurement

2+	Weight	Body Depth	Standard Length
Weight	1		
Body Depth	0.924	1	
Standard Length	0.960	0.921	1

The dynamic of productions parameters of Ineu carp breed is shoved in Figure 1.

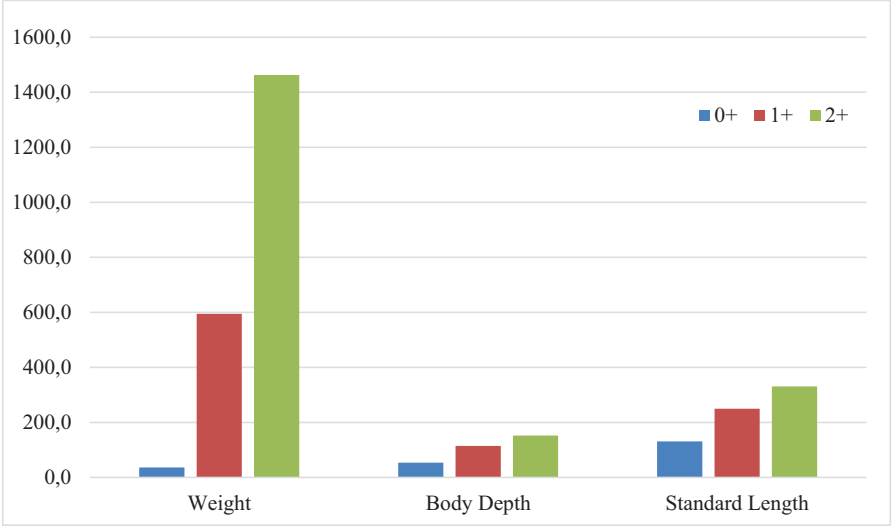

Figure 1. Evolution in time for the three characters

In Romania, the carp was, is and will remain the main fish species in aquaculture and human preferences (Nicolae et al., 2012). The improvement objectives of Ineu carp breed are reflected in the transformation of production characters (Simeanu, 2016).
The knowledge of fish production contributes to development of distribution chain of fish and fishery products which include the links between the production point and final consumer.

CONCLUSIONS

In conclusion, it can say that the three characters are highly positively correlated, and together they have a major influence on meat production.
The increasing competitiveness on the biological material market requires, in addition to fish farming, the obtaining and improvement of some fish breeds.
The values of the analysed meat production characters refer only to sample of the population and specific environmental conditions in which it has evolved.

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