

GENETIC EVALUATION IN A POPULATION OF FRASINET CYPRINIDS USED FOR SELECTION TO MAXIMIZE MEAT PRODUCTION

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Abstract

Genetic improvement of animals is defined as a process of directed change in the productive potential of the hereditary characteristics and the genetic resources of livestock populations in the desired direction by man. Achieving genetic improvement of the population is made by selecting the current generation, animals with the highest value of improvement that real genetic value for bio and ecoeconomic important characters. Breeding value cannot be measured directly in animals, but it can be deduced from phenotypic values of animals. Depending on breeding value, assessed individual is retained or dismissed from reproduction.

This study was conducted on a sample of 215 individuals Frasinet carp that came from 9 mother families. Frasinet carp, is part, of the morphological point of view, in a constitutional and productive category of carp breeds, with high degree of improved. This breed is characterized by high body profile, curved back and small caudal peduncle, head and fins. Individuals were reared in intensive system, in the same environmental conditions, from the juvenile stage by 2.5 ages. Each descendant was measured for three morphological characters: body weight (W), maximum body height (H) and body length (l) at the end of the first three summers of growth. Of the total of 215 candidates were retained for breeding 50% at end of each summer of growth. For the phenotypic characterization of the population have been used classical statistic methods and breeding value for each character was calculated based on individual animal model (B.L.U.P.-Animal Model). After selection of candidates, at the end of summer growth, annual genetic progress for body weight was 3.51%; 1.69%; 1.27%; for maximum body height was 1.35%; 0.85%, 0.43% and for body length was 1.10%; 0.80%, 0.44%. Expressed in the unit of character, annual genetic progress for body weight at the end of the third summer selection is higher than that of the first two years of selection. This is due to increase muscle mass and gonad development, both are processes specific to installation of sexual maturity.

Key words: breeding value, carp, morphological characters.

INTRODUCTION

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 (Grosu, Oltenacu et. al., 2005). 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 (Nicolae, 2012a). 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 (Nicolae, 2004).

MATERIALS AND METHODS

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.

This study was conducted on a sample of 215 individuals Frasinet carp breed that came from 9 mother families. Frasinet carp is a breed with high level of amelioration and is characterized by a high meet production. This breed is characterized by high body profile, curved back and small caudal peduncle, head and fins. Individuals were reared in intensive system, in the same environmental conditions, from the juvenile stage by 2.5 ages. Each descendant was measured for three morphological 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.

Of the total of 215 candidates were retained for breeding 50% at end of each summer of growth. For the phenotypic characterization of the population have been used classical statistic methods and breeding value for each character was calculated by B.L.U.P. methodology (Best Linear Unbiased Prediction) based on individual animal model (B.L.U.P.-Animal Model) (Grosu, Oltenacu et. al., 2005).

RESULTS AND DISCUSSIONS

After estimating the breeding value of the 215 individuals of first summer, it was selected the first 108 individuals (50%) to be evaluated next summer, based on morphological characters studied (Nicolae, 2012b).

The value of global breeding value in Frasinet candidates carp breeding population, after first summer of growth, ranged from 2.095 to -0.812, while the retained candidates to selection varied between 2.095 and -0.565.

To estimate genetic progress were calculated by phenotypic parameters of the 108 individuals selected (Nicolae, 2012b). Based by phenotypic parameters of the candidates of selection and the retained candidates was estimated effect of selection (Table 1).

Table 1. The effect of selection in Frasinet carp breeds, after the first summer of growth

Specification	Characters		
	Body weight (W), g	Maximum body height (H), mm	Body length (l), mm
Selection differential	27.25	8.10	16.17
Heritability (h^2)	0.25	0.24	0.24
Genetic progress per generation	6.84	1.98	3.88
Generation interval (years)	3	3	3
Annual genetic progress	2.28 g	0.66 mm	1.29 mm
Annual genetic progress (%)	3.51	1.35	1.10

According to the results, in the next generation will most likely be an increase in body weight with 6.84 g, in maximum body height with 1.98 mm and in body length with 3.88 mm. After selection in first summer of growth, in terms of annual genetic progress, the average population changes by 2.28 g or 3.51% by body weight, 0.66 mm or 1.35% at the maximum body height and 1, 29 mm or 1.10% of the body length.

At the age of two summers, individual performance measures fall within the specific growth data of Frasinet breed. Body size index (l/H) is 2.37, lower than the first summer,

which leads to increased meat production due to curvature of the line of back.

After estimating the breeding value of the 108 individuals of the second summer of growth, were selected first 54 individuals (50%) to be evaluated in the third summer, based on morphological characters studied (Nicolae, 2012b).

The value of global breeding value in Frasinet candidates carp breeding population, after the second summer of growth and selection, ranged from 1.865 to 0.899, while the retained candidates to selection varied between 1.865 and 1.278. It notes that the global breeding

value of retained candidates is positive. To estimate genetic progress were calculated phenotypic parameters of the 54 individuals selected (Nicolae, 2012b). Based by phenotypic

parameters of the candidates of selection and the retained candidates was estimated effect of selection (Table 2).

Table 2. The effect of selection in Frasinet carp breeds, after the second summer of growth

Specification	Characters		
	Body weight (W), g	Maximum body height (H), mm	Body length (l), mm
Selection differential	100.79	7.02	17.83
Heritability (h^2)	0.34	0.43	0.38
Genetic progress per generation	33.82	2.99	6.73
Generation interval (years)	3	3	3
Annual genetic progress	11.28 g	1,00 mm	2.24 mm
Annual genetic progress (%)	1.69	0.85	0.80

According to the results, in the next generation will most likely be an increase in body weight of 33.82 g, maximum body height of 2.99 mm and a body length of 6.73 mm. As regards annual genetic progress after selection in the second summer of growth, the average population changes by 11.28 g or 1.69% by body weight, 1.00 mm or 0.85% at the maximum body height and 2,24 mm or 0.80% of the body length (Nicolae, 2012b).

At the age of three summers, individual performance measures fall within the specific growth data Frasinet breed. Body size index (l/H) is 2.25, lower than the second summer of growth.

After estimating the breeding value of 54 individuals, after the third summer of growth, were selected the first 27 individuals (50%) to participate in breeding the following year.

The value of global breeding value in Frasinet candidates carp breeding population, after the third summer of growth and selection, ranged from 2.120 to 0.280, while the retained

candidates to selection varied between 2.120 and 1.219. It notes that the global breeding value becomes positive compared to previous ages. Also, due to selection, global breeding values are the highest values at the age of three summers.

To estimate genetic progress were calculated phenotypic parameters of the 27 individuals selected (Nicolae, 2012b). Based by phenotypic parameters of the candidates of selection and the retained candidates was estimated effect of selection (Table 3).

According to the results, in the next generation will most likely be an increase in body weight of 76.45 g, maximum body height of 2.17 mm and a body length of 4.96 mm.

As regards annual genetic progress after selection in the third summer of growth, the average population will increase by 1.27% or 25.48 g in body weight, 2.17 mm and 0.43% for maximum body height and 4, 96 mm or 0.44% of the body length (Nicolae, 2012b).

Table 3. The effect of selection in Frasinet carp breeds, after the third summer of growth

Specification	Characters		
	Body weight (W), g	Maximum body height (H), mm	Body length (l), mm
Selection differential	181.20	5.56	10.52
Heritability (h^2)	0.42	0.39	0.47
Genetic progress per generation	76.45	2.17	4.96
Generation interval (years)	3	3	3
Annual genetic progress	25.48 g	2.17 mm	4.96 mm
Annual genetic progress (%)	1.27	0.43	0.44

CONCLUSIONS

As a consequence of the study in the population of Frasinet carp breed, in what regards the

genetic evaluation used for selection to maximize meat production, the following has been observed:

1. Selection to maximize meat production in Frasinet carp breed population can be made based on body weight character.
2. In a Frasinet carp population studied, annual genetic progress for body weight at the end of the third summer selection, is higher than that of the first two years of selection. This is due to increase muscle mass and gonad development, both are processes specific to installation of sexual maturity.
3. The 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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