PRODUCTION PERFORMANCE OF CACHARA AND HYBRID CACHAPINTA*

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ABSTRACT

This study aimed to compare the growth performance of surubins (cachara *Pseudoplatystoma reticulatum* and hybrid cachapinta *P. reticulatum* × *Pseudoplatystoma corruscans*) produced in cages. The experiment had a randomized design with two treatments and three replicates, with one cage comprising an experimental unit, i.e., six cages in total. Fingerlings of the two genetic groups (cachara and hybrid cachapinta) were fed twice a day with extruded feed for carnivorous fishes. After 216 days of production, the growth parameters were evaluated, including total length, final weight, final biomass, biomass gain, survival, and apparent feed conversion values. No differences were found between cachara and cachapinta in the variables analyzed. In conclusion, cachara and cachapinta produced in cages exhibit the same growth performances.

Keywords: cages; growth; *Pseudoplatystoma*; surubim

DESEMPENHO PRODUTIVO DO CACHARA E HÍBRIDO CACHAPINTA

RESUMO

Objetivou-se comparar o desempenho zootécnico do cachara, *Pseudoplatystoma reticulatum*, e do híbrido cachapinta, *P. reticulatum* × *Pseudoplatystoma corruscans*, produzidos em tanques-rede. Utilizou-se o delineamento inteiramente casualizado com dois tratamentos e três repetições, sendo que cada tanque-rede foi considerado uma unidade experimental, totalizando seis tanques-rede. Alevinos dos dois grupos genéticos (cachara e cachapinta) foram alimentados duas vezes ao dia com ração extrusada para peixes carnívoros. Após 216 dias de produção, os parâmetros zootécnicos avaliados foram: comprimento total, peso final, biomassa final, ganho de biomassa, sobrevivência e conversão alimentar aparente. Não foram encontradas diferenças significativas para as variáveis analisadas entre cachara e cachapinta. Pode-se concluir que o cachara e cachapinta produzidos em tanque-rede apresentam o mesmo desempenho zootécnico.

Palavras-chave: tanque-rede; crescimento; *Pseudoplatystoma*; surubim

INTRODUCTION

Surubins (pintado, cachara, and their hybrids) that are adapted to production in cages exhibit reasonable performance and survival within these systems. Although some performance characteristics might be elevated in excavated nursery ponds, the biomass is usually higher in intensive cages systems.

Fish production in cages provides an alternative to conventional fish farming practices for the practical use of water bodies that face difficulties using these conventional methods (CAMPOS *et al.*, 2007). Cages positioned at sites having large quantities of high-quality water allow for the use of high storage densities compared to fish production in ponds.

Cachapinta hybrids *Pseudoplatystoma reticulatum × Pseudoplatystoma corruscans* have been produced in Brazil with an aim to increase productivity from heterosis, as there is an absence of genetic improvement programs for these species. Information comparing the performances of these hybrid fishes with purebred fish during all production stages is lacking. The hypothesis that there are real gains from heterosis in the performance characteristics of hybrids has caused an increase in the use of these hybrids in Brazilian fish farming; however, in many situations, this hypothesis might not be true. Thus, the present study aims to compare the growth performances of cachara with those of hybrid cachapinta produced in cages.

MATERIAL AND METHODS

The experiment was conducted using floating cages placed in a 24-ha hill side pond in a commercial fish farm located in Nova Alvorada do Sul, state of Mato Grosso do Sul, Brazil (21°27'51"S and 54°23'3"W). Two groups of fish were used: the pure species cachara (*P. reticulatum*) and the hybrid cachapinta obtained by cross breeding the female cachara (*P. reticulatum*) with male pintado (*P. corruscans*). Fingerlings of both groups of fish (mean weight of 60 g ± 0,005 were bought from a local commercial hatchery and were originated from the spawning of wild caught broodfish.

A randomized experimental design was established with two treatments (cachara and cachapinta) and three replicates, using six 13.5-m³ cages. Three cages were stocked with cachara at 144 fish per cage and three cages with hybrid cachapinta at 127 fish per cage. Fingerlings were acclimated in the cages for 14 days previous to the start of the experimental period. Mean weigh of fish at the start of the experiment were 75 ± 0,004 g and 85 ± 0,001 g for cachara and cachapinta, respectively. The unequal number of fish for each group was set in order to start the experiment with equal fish biomass in all cages. The experimental period lasted for 216 days.

Water samples were collected monthly from the dam at three points close to the cages, from which alkalinity, hardness, and total ammonia were evaluated, according to standard methods (APHA, 2012). Temperature, dissolved oxygen, and pH (monthly) analyses of the water were conducted using an YSI ProPlus multiparameter meter.

The fishes were fed twice a day, in the morning and afternoon, with extruded feed for carnivorous fishes. The ration amount offered to the fish was based on the total biomass of each cages, adjusted after the biometrics, where the amount of feed was calculated based on the decreasing biomass percentage, starting with 8% and finishing with 3%. Feed with 40% crude protein was used during the 30 to 800 g growth stage and 38% crude protein was used during the final stage, with more than 800 g (Table 1).

Seven biometrics were performed every 30 days in 20% of the fishes from each experimental unit. Before the biometric analyses, fishes were anesthetized with eugenol (Biodinâmica Química e Farmacêutica LTDA) at a concentration of 50 mg L^{-1} until the surgical anesthesia stage was reached, as recommended by ROSS and ROSS (1999). The biometric measurements were preceded by a 24-h fasting. The procedures adopted in the present study were approved by the Ethics Committee on Animal Use – CEUA/UFMS (Protocol N° 642/2014).

The growth characteristics evaluated included total length – TL (measurement from the anterior end of the mouth to the end of the caudal fin);

final weight – FW; final biomass – FB; biomass gain – BG = (final biomass – initial biomass); survival – SUR% = [(final number of fishes x 100)/Initial number of fishes]; and apparent feed conversion – AFC = (feed intake/biomass gain) values.

Table 1. Pellet grain size and percentage composition of the feed used during production of cachara (*Pseudoplatystoma reticulatum*) and cachapinta (*P. reticulatum* × *P. corruscans*).

Variables	Weight class (g)			
	30 – 100	**100 – 300**	**300 – 800**	**> 800**
Pellet grain size (mm)	2 – 3	4 – 5	7 – 9	13 – 15
Crude protein (%)	40.0	40.0	40.0	38.0
Ether extract (%)	11.0	11.0	9.0	9.0
Fibrous material (%)	2.5	2.5	2.8	3.2
Mineral material (%)	14.0	14.0	10.0	12.5
Calcium (%)	3.5	3.5	3.5	3.8
Phosphorus (%)	2.0	2.0	1.8	2.0
DM (%)	12.0	12.0	12.0	12.0

The results of the experiment were adjusted for a density of 135 fishes per cages. Since the mean weight of the groups differed, the numbers of fish were adjusted at the onset of the experiment so that the density in kg per m³ remained the same for each cage, irrespective of the group present. Student's *t*-test was used to compare between groups for the dependent variables, assuming equivalent variances ($P>0.05$).

RESULTS AND DISCUSSION

The mean temperature, dissolved oxygen, pH, and total ammonia values of the water during the months of production were 25.80 ± 1.62 °C, 7.87 ± 0.18 mg L^{-1}, 7.39 ± 0.24, and 0.11 ± 0.01 mg L^{-1}, respectively. These water characteristics are within the recommended values for fish farming, as advocated by ARANA (1997). The values for alkalinity and total hardness of the water were slightly below the ideal values recommended by this author, being 15.02 ± 1.48 and 14.06 ± 2.27 mg L^{-1}, respectively. There was no significant difference between the two treatments ($P>0.05$).

Hybrid individuals exhibit high degree of heterosis. However, higher heterosis does not necessarily imply in better production performance. Improvement in production for pure *Pseudoplatystoma* species can be also achieved through the development of a breeding program, as occurs with other fishes and animals. According to PONZONI *et al.* (2005), breeding programs with several fish species have shown that the resultant genetic changes can lead to a 15% growth rate per generation in well conducted programs.

The growth characteristics of the groups, cachara and cachapinta, produced in cages for 216 days were not statistically different ($P>0.05$) (Table 2). Fish farmers have reported that cachapinta perform better than the purebred fishes, as they are more docile, receive inert feed more easily, and exhibit higher growth rates (CREPALDI *et al.*, 2006; LOPERA-BARRERO *et al.*, 2011). OLIVEIRA *et al.* (2014) observed that the cachapinta group exhibited better growth performances after 150 days of production in earth ponds, which examined the same groups as those used in the present study. The cachapinta group did not display different growth performances to those of the cachara group in the present study.

These results of total length in the present study are similar to those obtained by SCORVO FILHO *et al.* (2008) and LIRANÇO *et al.* (2011), who observed values between 57.31 ± 6.42 cm and 45.10 ± 4.8 cm, respectively, for surubins within the same weight range (1.556 ± 0.09 g for hybrid and 1.639 ± 0.24 g for cachara).

SCORVO FILHO *et al.* (2008) obtained a survival rate of 69.55 to 70.56% while working with pintados in cages. In a previous study examining surubim (*Pseudoplatystoma* spp.),

TURRA *et al.* (2009) observed higher biomass with increasing density, although the weight gain rate decreased and feed conversion and survival rate remained constant.

Table 2. Mean values (± standard deviation) of the performance parameters in cachara (*Pseudoplatystoma reticulatum*) and cachapinta (*P. reticulatum* × *P. corruscans*) genetic groups produced in net-tanks for 216 days.

Variables	Genetic group	
	Cachapinta	Cachara
Final length (cm)	54.53 ± 0.77	58.27 ± 2.32
Final weight (kg)	1.556 ± 0.09	1.639 ± 0.24
Final biomass (kg)	185.35 ± 18.66	199.43 ± 51.43
Biomass gain (kg)	173.81 ± 19.38	189.28 ± 51.75
Survival (%)	92.97 ± 5.63	84.74 ± 9.89
Apparent feed conversion	03.15 ± 0.47	03.34 ± 1.04

Means followed by the same letter in the rows do not differ by Student t-test (P>0.05), assuming equivalent variances.

The genotype-environment interaction might influence cachapinta production, where in certain situations the hybrid may exhibit enhanced growth characteristics compared to the purebred species (BENTSEN *et al.,* 2012), although this might not occur in other situations (KHAW *et al.,* 2012). According to GJEDREM and BARANSKI (2009), it is very difficult to predict systematically the results that will be obtained from the hybrids.

The feed efficiency in fishes is affected by the species, stock density, production system, feed used, water quality, feed protein level, and production stage (ARBELÁEZ-ROJAS *et al.,* 2002). In the evaluated genetic groups, the AFC values were similar, indicating that hybridization did not lead to an improved AFC value. Similar results were obtained by ZANARDI *et al.* (2008) who observed AFC values for pintado between 2.37 and 3.94. This result is contrary to the hypothesis that this hybrid is better than pure cachara.

Currently, different surubim hybrids are produced, since these can be obtained from eight *Pseudoplatystoma* species (BUITRAGO-SÚAREZ and BURR 2007) and their hybrids, which are prolific (PORTO-FORESTI *et al.,* 2008). This reveals the potential for great differences in the produced genetic groups, which might be reflected in the differences observed in growth performance. Additionally, it is difficult to distinguish the different hybrids of surubins from

each other, since the spotted pattern and other characteristics do not allow confidence in the determination of the species involved in the cross breeding. To overcome this problem, VAINI *et al.* (2014) recommends molecular analysis (RFLP-RCR molecular marker) to determine the specific species of these genera and hybrids. The comparison between different genetic groups must be carefully analyzed, since it depends on the analyzed characteristics with the possible genetic effects of parental fishes and the genotype–environment interaction.

CONCLUSION

Cachara and cachapinta produced in cages exhibited similar growth performances.

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