

RESEARCH ARTICLE

BEHAVIOR OF *CLARIAS GARIEPINUS* JUVENILES FED A LOCAL DIED (XXX) IN RELATION TO SEASONAL VARIATIONS. A CASE STUDY AT THE SAPE FARM IN LEFINI, REPUBLIC OF THE CONGO

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Congo

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ABSTRACT

In the Congo, *Clarias gariepinus* (catfish) is traditionally fished in the numerous aquatic ecosystems. Fish farming-which could play a significant role in the national economy, particularly by improving protein self-sufficiency, is still in its infancy. However, fish feed represents a major constraint on the development of this sector. This study aims to evaluate the effect of a local feed (XXX) on zootechnical performance and to assess the impact of seasonal variations on *Clarias gariepinus* (Burchell, 1822). To do this, an experiment with three repetitions (dry season, rainy season, and the intermediate season) was conducted over 56 days at the SAPE company's premises in the village of Léfini (Republic of Congo). For this, for each season, a total of 150 juveniles with an average weight of 10.79 ± 0.48 g; 10.98 ± 0.5 g and 10.48 ± 0.26 g were placed in above-ground cylindrical tanks. In *Clarias gariepinus* individuals fed during the rainy season, the final average weight was 195.36 ± 5.53 g, the daily weight gain (DWG) was 3.3 ± 0.09 g/day, and the average specific growth rate (SGR) was 4.96 ± 0.08 %/day. For *Clarias gariepinus* individuals fed during the dry season, the final average weight was 168.16 ± 5.35 g, the DWG was 2.82 ± 0.09 g/day, and the average SGR was 5.17 ± 0.09 %/day. For *Clarias gariepinus* individuals fed during the intermediate season (dry and rainy seasons), the final average weight was 184.43 ± 5.55 g, the DWG was 3.1 ± 0.1 g/day, and the average SGR was 5.04 ± 0.09 %/day. The food and temperature variation affect the expression of better zootechnical performance in *Clarias gariepinus*.

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INTRODUCTION

Several authors have worked on feed formulas based on local by-products (El-Naggar *et al.*, 2006; Ndour *et al.*, 2011 ; Ajani *et al.*, 2011 ; Ekanem *et al.*, 2012 ; Limbu, 2015; Limbu, 2019) for rural aquaculture of the species *Clarias gariepinus* (Burchell, 1822). They showed that, in addition to the composition of the feed formulas, the ways the feed is distributed (feed ration, frequency and timing of feeding, presentation of the feed) need to be considered, as they can significantly affect feed efficiency and growth. The quality of the inputs used, the poor quality of local feed, the high cost of imported feed, and the sector development policy are the main constraints holding back fish production in Africa (Rurangwa *et al.*, 2014; Elegbé *et al.*, 2015; Lederoun *et al.*, 2021). Buying feed is the biggest expense in fish production costs (Gourène *et al.*, 2002; Rana *et al.*, 2009). In the Republic of Congo, the efforts of various stakeholders in the aquaculture

and fish farming sector (government, donors, NGOs, researchers, producers, etc.) are recognized. Despite this, the problem of fish feed remains the main blockage for this industry at the national level. This study aims, on the one hand, to assess the effect of feed on achieving better zootechnical performance and, on the other hand, to evaluate the seasonal variation in *Clarias gariepinus*.

MATERIALS AND METHODS

Study setting: The study was carried out between April and June 2023 on the premises of the company "SAPE." SAPE (Figure 1) is located in the village of Mbouambé – Léfini, in the Pool department, about 200 km north of Brazzaville department. Its geographical coordinates are S020°55.284' and E015°37.026', with an average altitude of 344m.

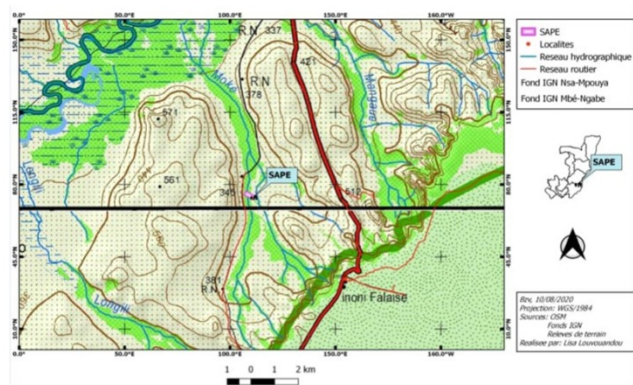


Figure 1. Location of the experimental site

Biological material: For the feeding test, with three repetitions (dry season, rainy season, and the intermediate season), it was conducted over 56 days at the SAPE company's facility in the village of Léfini (Republic of Congo). For this, in each season, a total of 150 juveniles with an average weight of 10.79 ± 0.48 g ; 10.98 ± 0.5 g ; and 10.48 ± 0.26 g were placed in the above-ground cylindrical tanks.

Studied settings

Physico-chemical parameters: In this study, the physico-chemical parameters that were collected were none other than: temperature, the amount of dissolved oxygen, and the pH of the water in the above-ground tanks during the two (2) months of our study per season. In a month, we collected the aforementioned variables eight (8) times per tank, twice a week each morning and evening on sampling days (between 6 and 7 a.m. and between 3 and 4 p.m. in the evening).

The local feed XXX is produced locally in the Congo, with the inclusion rates of the various raw materials presented in table 1.

Table 1. Inclusion rate of pre-grow-out feed for *Clarias*

Raw materials	Values (%)
Prémix	1
Salt	0,5
Palm oil	1
Fish meal	15
Soybean meal	20,5
Cottonseed meal	12
Wheat bran	25
Rice bran	10
Peanut oil cake	15
Total	100

Zootechnical settings

Final Average Weight (FAW)

$$FAW (g) = Bf / Nf$$

Bf: Final biomass of *C. gariepinus* ; Nf: Final number of *C. gariepinus* juveniles

Daily growth rate (DGR) or Daily Weight Gain (DWG)

$$DGR (g/day) = (Final\ avg\ weight - Initial\ avg\ weight) / \Delta t$$

Final avg weight: Pmf
Initial avg weight: Pmi

Δt : duration of the experiment in number of days.

Daily growth rate (DGR) or Daily Weight Gain (DWG):

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Final avg weight: Pmf

Initial avg weight: Pmi

Δt : duration of the experiment in number of days.

Statistical data analysis: The comparison of the physicochemical parameters of the water and the assessment of the effect of diets on the species *C. gariepinus* according to seasonal variations was tested using one-way analysis of variance (ANOVA 1). This was done to check for significant differences at the 5% level in the local XXX feed treatment across different seasons. The SPSS version 22.0 software allowed us to perform the statistical data analysis.

RESULTS

Physico-chemical parameters: The average values of the water's physico-chemical parameters according to seasonal variation are shown in Table 2.

Table 2. Physico-chemical parameters of water

Settings	Rainy season	Mid-season	Dry season
T °C	$26.81 \pm 0.48a$	$26.32 \pm 0.84b$	$25.71 \pm 0.66c$
Ph	$6.75 \pm 0.59a$	$6.64 \pm 0.61a$	$6.46 \pm 0.61a$
O ₂	$5.6 \pm 0.12a$	$5.37 \pm 0.13a$	$5.18 \pm 0.11b$

The results of the bromatological analysis of the local feed XXX, conducted at the animal nutrition and feed laboratories of the Inter-State School of Veterinary Sciences and Medicine of Dakar are presented table 3.

Table 3. Nutrient content of pre-grow-out feed for *Clarias*

Components	Quantity (%)
Crude protein	45
Crude fat	10,4
Fibers	1,3
Ashes	7,3
Calcium	0,7
Phosphorus	1,3
Size in mm	1,5

Zootechnical settings

Final average weights: The final average weight values of the species *C. gariepinus* fed the local food XXX according to the seasons are shown in Figure 2.

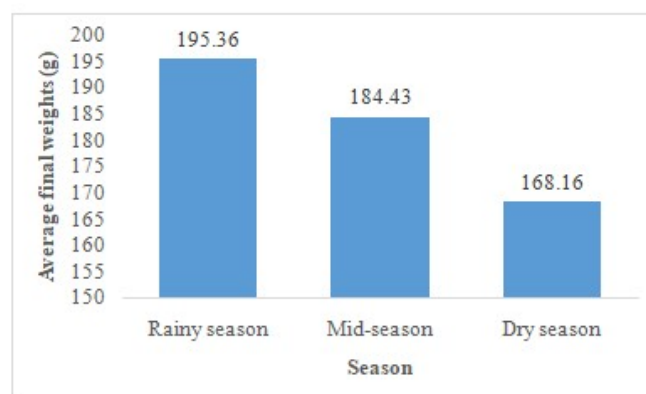


Figure 2. Average final weights of juveniles according to the seasons

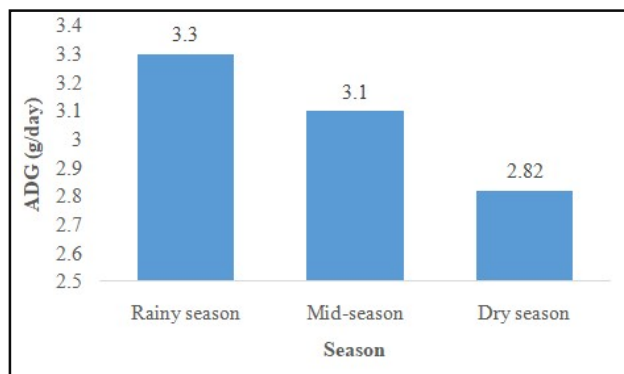


Figure 3. Juveniles' GMQ according to the seasons

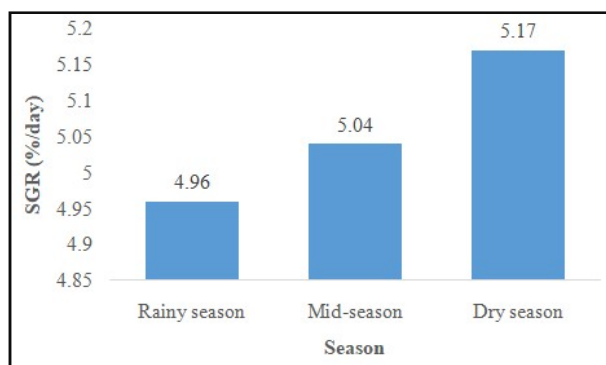


Figure 4. Juvenile TCS according to the seasons

The results of the mean comparison test using analysis of variance (ANOVA) show that there is a significant difference between the final average weights of *Clarias gariepinus* juveniles fed this food during the different seasons ($0.000 < 0.05$).

Average Daily Gain (ADG): The ADG values of the species *C. gariepinus* fed the local feed XXX according to the seasons are shown in Figure 3. The results from the comparison of means using analysis of variance (ANOVA) show that there is no significant difference between the final average weights of *Clarias gariepinus* juveniles fed this feed during the different seasons ($0.07 < 0.05$).

Specific Growth Rate (SGR): The SGR values of the *C. gariepinus* species fed the local feed XXX according to the seasons are shown in figure 4. The results from the comparison of means using analysis of variance (ANOVA) show that there is no significant difference between the specific growth rates of *Clarias gariepinus* juveniles fed this feed during the different seasons ($0.000 < 0.05$).

DISCUSSION

Physico-chemical parameters: Throughout our study, the temperature ranged between 25°C and 27°C, is favorable for the good growth of *C. gariepinus*. Our results are similar to those of Teugels (1986), who showed that *Clarias gariepinus* can survive large temperature fluctuations (between 8 and 30°C). The catfish, with a normal growth temperature around 28°C (Baras and Jobling, 2002), can still feed and grow at around 20°C. Food consumption, energy conversion efficiency, and growth are all influenced by temperature. At temperatures between 26 and 28°C, the fish can grow from 1

to 800 g in seven months (Dasuki, Auta, and Oniye, 2013). The pH ranges from 5.7 to 7.8 in this study. In ponds, according to Viveen *et al.* (1990), the water pH varies between 6.5 and 7. Teugels' (1996) research on *Clarias gariepinus* showed that this species can grow and develop under extreme environmental conditions. It can live in a pH range from 6.5 to 8, with an optimum of 7–8, according to Micha (2007).

However, *C. gariepinus* can live in a pH range between 5 and 9 (www.planetcatfish.com). The amount of dissolved oxygen varied between 5.1 and 5.8 mg/l in this study. The work of Hecht *et al.*, 1988 and Viveen *et al.*, 1985 showed that the amount of dissolved oxygen is ≥ 3 mg/l. Research results from Cheung *et al.*, 2012 showed that protein synthesis and fish growth depend heavily on oxygen.

Zootechnical parameters: Depending on seasonal variation, the average weight of *C. gariepinus* is ≥ 160 g in this study. This can be explained by the fact that the feed given to the fish has a protein content within the recommended range for their diet at this stage of their development. This weight is higher than what was found (120 g) for the same species in 56 days by Ducarme and Micha (2003) in an intensive system, and higher than what was obtained by Lederoun *et al.*, 2021, where the final average weights were 94.90 ± 5.10 g, 82.89 ± 6.63 g, and 76.72 ± 7.50 g for the Gouessant, Blue Crown, and BioMar® diets, respectively. In this study, the ADG showed a value ≥ 2.8 g/day. Depending on the feeding method, rearing duration, stocking density, setup, and farming system, different values of average daily gain (ADG) and weight have been reported for non-hybrid *C. gariepinus*, at 3.2 g/day (Dasuki, Auta, and Oniye, 2013); 3.3 g/day in cage polyculture (Otubusin, 1997); 4.2 g/day in cages (Otubusin and Olaitan, 2001); 7.3 g/day (Otubusin, Olaofo, and Agbebi, 2009). An ADG of 2.6 g/day was nonetheless reported for *C. gariepinus* hybrids raised in monoculture in concrete tanks (Salami, Fagbenro, and Sydenham, 1993). In this study, the SGR showed a value $\geq 4.95\%$ /day. Our results are similar to those obtained in the work by Lederoun *et al.*, 2021 for the same species, where the specific growth rate for the three feeds ranged from 4.74 ± 0.17 to $5.12 \pm 0.10\%$ per day.

CONCLUSION

This study informs fish farmers about the influence of food and temperature on the zootechnical performance of *Clarias gariepinus*.

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