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Fruit Powder of *Tetrapleura tetraptera* in Local Feed on Some Zootechnical Performances of Juveniles of *Clarias gariepinus* in Concrete Tank

Ngouana Tadjong Ruben[1*], Abdoulaye Abdoulaye[1], Kana Jean Raphaël[2], Téguia Alexis[2]

[1]Laboratory of Aquaculture and Demography of Fisheries Resources, Aquaculture Department, Institute of Fisheries and Aquatic Science of Yabassi, University of Douala, Douala, Cameroon
[2]Laboratory of Animal Nutrition, Department of Animal Science, Faculty of Agronomy and Agricultural Sciences, University of Dschang, Dschang, Cameroon
Email: *ngouanarubens@yahoo.fr

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Abstract

This study focused on the supplementation of four-sided spice fruit powder (*Tetrapleura tetraptera*) on some zootechnical performances of juveniles of *Clarias gariepinus* and was carried out from February 14 to July 20 at the Massoma Fish Farm of Bojongo Mbeidi located in the Littoral Region, Department of Wouri, Douala IV district. The farm benefits from a climate favorable to aquaculture activity. For this purpose, five (5) treatments were tested including T_{0+} (imported feed), T_{0-}, $T_{0.3}$, $T_{0.4}$, and $T_{0.5}$ respectively for the treatments with 0% supplemented food; 0.3%; 0.4% and 0.5% of *Tetrapleura tetraptera* powder. A total of 450 *Clarias gariepinus* fry with an initial average weight of 7 ± 1.5 g, were distributed in happas of 0.49 m^2 each placed in Triplicate in a completely randomized device. Four isoprotein foods with 38% crude protein were formulated to feed these fry at 7% of their biomass per day for 15 days then to their fullness until the end of the experiment. Intermediate fishing was carried out every fortnight. 75 days later, the results recorded show that the highest average survival rate (96.44% ± 3.5%) was recorded with the subjects fed feed supplemented with 0.4% *T. tetraptera* powder. The average weight (120.93 ± 67.20), weight gain (113.93 ± 67.20), specific growth rate (3.64 ± 0.79% g/d) and total lengths and standard (26.43 ± 1.9 and 23.66 ± 1.76) the highest were recorded with the T_{0+} treatment (imported feed). The highest conditioning factor K (2.14 ± 0.15) was recorded with the treatment supplemented with 0.4% *T. tetraptera*. The lowest conversion ratio (1.28) was recorded with the treatment fed with imported blue crown food (T_{0+}). Furthermore, the lowest production cost was recorded with the treatment supplemented with 0.4% *T. tetraptera*. It appears from this study that

the juveniles of *C. gariepinus* better value the feed substituted with 0.4% of the powder of four sides (*Tetrapleura tetraptera*).

Keywords

Tetrapleura tetraptera, Local Feed, Zootechnical Performance, Juvenile of *Clarias gariepinus*

1. Introduction

According to the FAO [1], world fish production (fish, mollusks and crustaceans) reached a volume of 170 million tones, so 94 million tonnes for fishing and nearly 76 million tonnes for aquaculture, 70% of which was in fresh water and 30% in sea and brackish water. Aquaculture throughout the African continent represents 995 thousand tonnes, or 10.5% of the continent's total fish production in 2008 [2]. In Cameroon, national fish production is only 335,000 tones with less than 15,000 tones/year coming from aquaculture. This remains low for an annual demand estimated at 500,000 tones [2]. However, Cameroon has numerous fish farming potential, including 4 billion bodies of inland water [3] for a potential estimated at 20,000 tonnes per year. The construction of aquaculture centers in certain localities has enabled Cameroon to boost its fish production. This country located in central Africa saw its production increase from 205,000 tons of fish in 2008 to 285,000 tonnes of fish in 2018 [4]. In addition, Cameroon today imports nearly 180,000 tonnes of fish each year, which affects the trade balance by around 200 billion FCFA each year. In order to reduce this significant loss of foreign currency, the new technique therefore consists of boosting production and limiting imports. Among the many problems hindering its development, limited access to quality and cheap exogenous food is highlighted by breeders [2]. This study is part of the strategy issued by the International Fund for the Development of Aquaculture (IFAD) to ensure the sustainable development of aquaculture via the government through the policy of supporting producers while promoting fish production. At a lower cost thanks to a quality and inexpensive feed. The use of phytobiotics will make it possible to eliminate the use of synthetic feed additives and will earn the State significant currency on the economic level, ensuring better health for the population by reducing famine on the social and political levels.

The evolution of extensive breeding towards increasingly intensive systems requires the orientation of selection and breeding conditions towards the maximization of feed efficiency, growth speed, and reduction of adiposity, carcasses for the benefit of muscle deposits [5]. This intensification of animal production also calls for the use of auxiliary substances called feed additives. Antibiotics are the first group of additives that have been used in animal feed as growth promoters [5]. Its use has undoubtedly been very beneficial for improving production performance and preventing diseases. However, threats to biosecurity, and hu-

man and animal health resulting from the increase in resistance of pathogens to antibiotics and the accumulation of antibiotic residues in animal products and in the environment have led to the ban on their uses at subtherapeutic doses in animal diets in several regions of the world [6]. This ban has led to the development of strategies aimed at promoting the use of non-therapeutic substitute products such as prebiotics, probiotics, enzymes, hormones, synbiotics, and organic acids [7]. Unfortunately, these substitute products are not within the reach of breeders in sub-Saharan African countries because of their unavailability on the local market and their excessively high costs [8]. It is therefore necessary to consider the search for other natural, effective, available, and inexpensive substances that do not present a danger to both the health of animals and that of consumers. This challenge underlies the increasing efforts made on the valorization of parts of plants, plant extracts and essential oils which are grouped under the term phytobiotic in animal feed. Phytobiotics or plant extracts are compounds of plant origin which are incorporated into animal feed with the aim of improving livestock productivity through good digestive use of nutrients and the elimination of pathogens from the digestive system of animals [9]. The term phytobiotics includes herbs, spices as well as essential oils and plant extracts [10]. Natural phytobiotics are composed of numerous molecules [11] and [12] with different activities, including antibacterial properties [13], antioxidant activities [14], anti-inflammatory activities [15] [16] and immunomodulators [12] [16]. Some phytobiotics improve enzyme activity and nutrient absorption [17]. The work of [18] demonstrated that the use of garlic (*Allium sativum*) as a feed additive improves feed digestibility, growth, and carcass characteristics of poultry. Furthermore, [19] showed that the fruits of *Tetrapleura tetraptera* known in Cameroon as "4 sides" possess chemical compounds such as saponin, flavonoids, phenols, alkaloids, tannins and other compounds which confer This plant has antibacterial activity, particularly against *Escherichia coli*, *Staphyloccoccus aureus*, *Pseudomonas aeruginosa* and *Salmonella typhi*. Furthermore, [20] reported that this same plant has antioxidant and hepatoprotective properties. Despite its antibacterial, antioxidant, hepatoprotective properties and its availability at the local level, very few studies aimed at its valorization in animal feed and particularly in aquaculture feed have been listed. However, the various virtues of this plant could ensure the balance of the bacterial flora with the consequence of improving the growth performance of livestock. Hence the objective of this study which focused on the supplementation of powder from the fruits of the four-sided spice (*Tetrapleura tetraptera*) in local food on some zootechnical performances of *Clarais gariepinus* fry in concrete tanks, which should contribute to the improvement of the production of market fish by the use of phytobiotics in freshwater fish feed.

2. Materials and Method

2.1. Study Zone and Duration

The study took place from April 21 to July 5, 2023 in the Massoma fish farm

(FPM) is located in the Mbedi district in the village Bojongo, Douala 4th district between 04˚05'41" - 04˚06'14" of North Latitude and 09˚35'22" - 09˚37'17" Longitude East, in the Wouri Department, Littoral Region.

2.2. Biological Material and Duration of the Study

The study lasted 75 days, with the aim of evaluating the monitoring rate, growth parameters as well as the cost of production of the feed. 450 *Clarias gariepinus* fry with an average weight of 7 ± 1.5 g were taken from the fry production of the Mas-soma farm.

2.3. Origin of *Tetrapleura tetraptera* Fruit

The fruits of *Tetrapleura tetraptera* were purchased from the local market, crushed, sifted, then the powder was incorporated into the food at different rates.

2.4. Experimental Design

Fifteen happas with a mesh diameter of 0.2 mm and a dimension of 0.7 m * 0.7 m * 1 m were previously sewn and installed in a 24 m^2 concrete tank. 450 fry were distributed in triplicates in 5 treatments of 75 individuals with an average weight of 7 ± 1.5 g following a completely randomized design (3 repetitions × 5 treatments). Each replicate contained 25 fry and each treatment 75 fry. Five rations were formulated and distributed randomly.

Every two weeks (15 days), control fishing was carried out and the weight and height of each individual was taken. The physicochemical parameters of the water including pH and temperature were recorded every day throughout the study period.

2.5. Experimental Rations and Feed Formulation

For this study, the ingredients for the production of our food were purchased in a local feed mill. A food with 38% protein was formulated. Once the purchasing operation was completed, the ingredients were weighed according to the previously established formula, then ground to obtain a fine powder, after grinding they were mixed and extruded. Then the feed from the excavator was dried in the sun in order to eliminate impurities and increase the feed conditioning time. Once dry, it was packaged in a hermetically sealed bag and stored in the store. Five rations were formulated. The control rations (T_{0+}) were the imported Blue crown brand feed and (T_{0-}) those not containing the fruit powder of *T. tetraptera* and the three other rations $T_{0.3}$, $T_{0.4}$ and $T_{0.5}$ where the *T. tetraptera* fruit powder was supplemented at 0.3% respectively; 0.4% and 0.5% in the control ration T_{0-} (Table 1).

T_{0-}: without supplement (negative control);

T_{0+}: Blue crown imported feed (positive control);

$T_{0.3}$: feed supplemented with 0.3% *Tetrapleura tetraptera* fruit powder;

Table 1. Centesimal composition of the experimental feed.

Ingredients	Percentages (%)
Fishmeal	40
Soya flour	20
Peanut cakes	11
Mheat bran	6
Corn flour	10
Cassava flour	1.85
Premix 5%*	5
Fish oil	1
Peanut oil	1
Shellfish meal	1
Lysine	2
Methionine	1
Vitamine	0.15
Total	100
Calculated chemical composition (% Dry matter/kg)	
Proteins	38.10
Carbohydrates	22.76
Lipids	8.93
Dry matter	81.12

*Premix 5%; Metabolizable energy = 2078 Kcal/Kg; Crude protein = 40%; Lysine = 3.3%; Methionine = 2.40; Calcium = 8%; Phosphorus = 2.05%.

$T_{0.4}$: feed supplemented with 0.4% *Tetrapleura tetraptera* fruit powder;
$T_{0.5}$: feed supplemented with 0.5% *Tetrapleura tetraptera* fruit powder.

2.6. Conduct of the Test

The study took place over a period of 75 days. Each treatment thus contained a total of 75 fry, therefore 3 happas of 25 fry each. The fish were fed three times a day at fixed times of 8 a.m., 1 p.m. and 6 p.m. at a rate of 7% of their ichthyo-biomass during the first fifteen days then at their nap until the end of the experiment. A control fishing was carried out every two weeks (after 15 days) and at the end of the fishing, the growth characteristics such as weight were measured using a balance sensitive to 0.001 g when loaded. Then with an SF-400 balance with a sensitivity of 1 g, the size (total length) of the fry was measured using graph paper. Before distribution of the different diets, the quantities proportional to the densities of the fry for each happa were calculated and weighed. These quantities of feed distributed to the fry were adjusted according to their

development. A TDS/EC/PH/SALT/SG/ORP brand multi-parameter was used for taking the temperature and the JBL brand analysis kit for taking the physicochemical parameters.

2.7. Zootechnical Parameters and Characteristics Studied

- **Survival rate** (SR)

SR (%) = 100 × NF/Ni.

NF = number of fish at the end of the experiment and Ni = number of fish at the start of the experiment.

Growth characteristics:

- **Live weight**

At the start of the test and every 14 days thereafter, fish from each experimental unit were weighed. The weekly weight gain was obtained by taking the difference between 2 consecutive average weekly live weights.

- **Average weight gain (AWG in g)** = final average fish weight (FAFW in g) - initial average fish weight (IAWG in g);
- **Average daily gain (ADG in g/day)** = (FAWG-IAWG)/t With IAW = initial average weight (g), FAW = final average weight (g), t = duration of the experiment (in days);
- **Specific growth rate (SGR in % day)** = [(lnPmf − lnPmi)/rearing time (day)] × 100; Pmi = initial average weight (g), Pmf = final average weight (g);
- **Feed conversion ratio (FCR)** = Quantity of feed distributed/Body mass gain;
- **Condition factor (K)** = W × 100/LT3 with W: weight (g), LT: Total length (cm).

2.8. Statistical Analysis

Data on zootechnical parameters (survival rate, average weight gain, average weight, average daily gain, specific growth rate, feed efficiency and standard length, total length and conditioning factor K) were submitted to the Analysis of variance One-way ANOVA, when there were differences, the Duncan test was applied to separate the means at the 5% significance level using SPSS 20.0 software.

3. Results and Discussion

3.1. Resuts: Zootechnical Performances

Survival

The evolution of the survival rates of juveniles of *Clarias gariepinus* fed with feed supplemented with four sides (*T. tetraptera*) is illustrated in **Figure 1**. It appears that no significant difference ($p > 0.05$) was observed. However, the highest survival rate (97.33% ± 3.35%) was observed with fish fed feed supplemented with 0.4% *T. tetraptera* ($T_{0.4}$) followed by (90.20% ± 1.1%) of subjects fed feed without supplement (T_{0-}) and the lowest survival rate (84.00% ± 1.39%) was observed in fish fed feed supplemented with 0. 5% *T. tetraptera* ($T_{0.5}$).

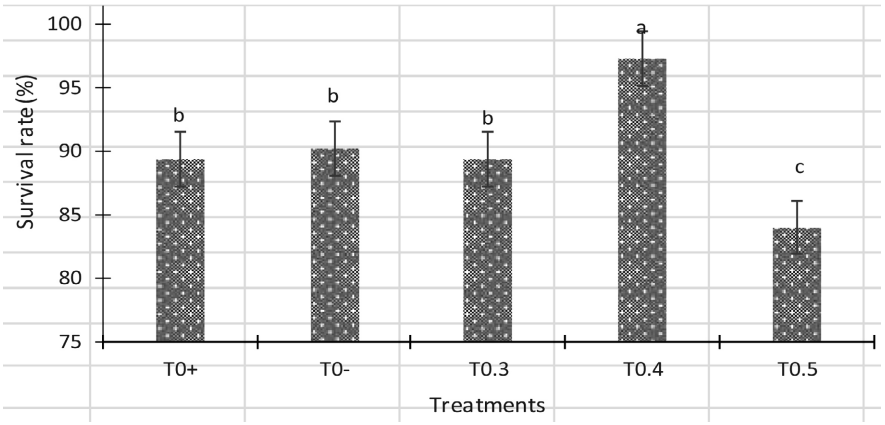

Figure 1. Variation of the survival rate of *Clarias gariepinus* juveniles depending on treatments over the entire study period. a, b, c ($p < 0.05$), histograms with the same letter are not significantly different. T_{0+} = imported feed; T_{0-} = feed supplemented with 0% *T. tetraptera* fruit powder; $T_{0.3}$ = feed supplemented with 0.3% of *T. tetraptera* fruit powder; $T_{0.4}$ = feed supplemented with 4% *T. tetraptera* fruit powder; $T_{0.5}$ = feed supplemented with 0.5% fruit powder of *T. tetraptera*.

3.2. Growth Performances

Table 2 illustrates the zootechnical characteristics of *Clarias gariepinus* juveniles fed feed supplemented with *T. tetraptera* fruit powder over the entire study period. It follows from this table that apart from the survival rate and the consumption index, all other parameters were not significantly ($p > 0.05$) affected by the supplementation of the feed with fruit powder of *T. tetraptera.*

The highest lengths (total length and standard length) (26.43 ± 1.91 cm and 23.66 ± 1.76 cm respectively) were obtained on subjects fed imported feed (T_{0+}) and the least high (26.08 ± 1.93 cm and 23.33 ± 1.51 cm respectively) were observed with subjects fed feed supplemented with 0.5% *T. tetraptera* ($T_{0.5}$).

3.3. Live Weight

The evolution of the live weight of juveniles of *Clarias gariepinus* fed with feed supplemented with *T. tetraptera* fruit powder during the trial period is illustrated in Figure 2. We observe an increasing evolution of the different treatments over all the period of the study. The curve of the subjects fed the imported feed T_{0+} was above those of all the other curves with a mean value (120.93 ± 67.20 g) the highest ($p = 0.946$) at 75 days compared to the other treatments and that of subjects fed with feed supplemented at 0.3% ($T_{0.3}$) remained below all other curves until the end of the study.

3.4. Daily Weight Gain

The evolution of the daily weight gain of juveniles of *Clarias gariepinus* fed with feed supplemented with *T.* teraptera fruit powder during the duration of the experiment is illustrated in Figure 3. The curves evolve in a sawtooth pattern with a peak observed on the 60th day regardless of the treatment considered. The highest average weight gain value (2.73 ± 0.20 g) was recorded with the subjects

fed the feed supplemented at 0.4%. *T. tetraptera* followed the subjects fed the imported feed (2.43 ± 0.10 g) and the lowest Daily weight gain (1.94 ± 0.10 g) was recorded in the subjects fed the feed without T_0 supplement at the same period.

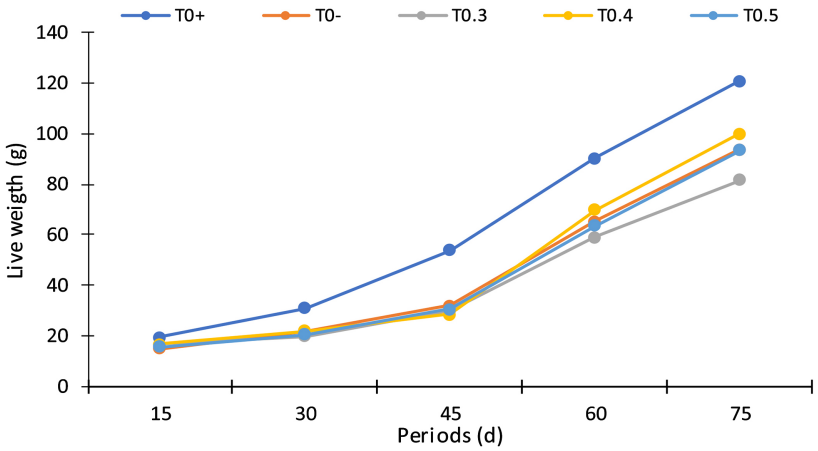

Figure 2. Evolution of the average weight of *Clarias gariepinus* juveniles depending on the period. T_{0+} = imported feed; T_{0-} = feed supplemented with 0% *T. tetraptera* fruit powder; $T_{0.3}$ = feed supplemented with 0.3% of *T. tetraptera* fruit powder; $T_{0.4}$ = feed supplemented with 4% *T. tetraptera* fruit powder; $T_{0.5}$ = feed supplemented with 0.5% *T. tetraptera* fruit powder of *T. tetraptera*; d = days.

Table 2. Zootechnical parameters and characteristics studied.

Traitements	T_{0+}	T_{0-}	$T_{0.3}$	$T_{0.4}$	$T_{0.5}$	p
IN	75	75	75	75	75	/
FN	67	69	67	73	63	/
IW (g)	7 ± 1.5	7 ± 1.5	7 ± 1.5	7 ± 1.5	7 ± 1.5	/
FI (g)	818.00 ± 484.20	753.00 ± 428.14	672.67 ± 368.62	836.67 ± 512.64	757.47 ± 475.05	0.992
SR (%)	89.33 ± 2.38 ^{b}	90.20 ± 1.81^{b}	88.89 ± 1.92^{b}	97.33 ± 3.35^{a}	84.00 ± 1.39^{c}	0.037
LW (g)	120.93 ± 67.20	93.86 ± 59.42	81.73 ± 50.42	100.13 ± 60.91	93.33 ± 60.05	0.946
AWG (g)	113.93 ± 67.20	86.86 ± 59.42	74.73 ± 50.42	93.13 ± 60.91	86.33 ± 60.05	0.948
ADWG (g)	1.51 ± 0.89	1.15 ± 0.79	0.99 ± 0.67	1.24 ± 0.81	1.15 ± 0.80	0.946
SGR (%)	3.64 ± 0.79	3.27 ± 0.87	3.10 ± 0.81	3.37 ± 0.85	3.25 ± 0.90	0.950
FCR	1.28 ± 0.01^{c}	1.76 ± 0.20^{b}	1.86 ± 0.10^{a}	1.69 ± 0.02^{b}	1.74 ± 0.12^{b}	0.001
K	1.89 ± 0.15	1.75 ± 0.39	1.98 ± 0.55	2.14 ± 0.15	1.83 ± 0.40	0.744
TL (cm)	26.43 ± 1.9 1	25.56 ± 1.78	25.77 ± 2.11	25.83 ± 2.00	26.08 ± 1.93	0.985
SL (cm)	23.66 ± 1.76^{a}	23.03 ± 1.51	23.12 ± 2.13	23.16 ± 1.70	23.33 ± 1.51	0.992

a, b: ($p < 0.05$) the values bearing different letters on the same line are significantly different. T_{0+} = imported feed; T_{0-} = feed supplemented with 0% *T. tetraptera* fruit powder; $T_{0.3}$ = feed supplemented with 0.3% of *T. tetraptera* fruit powder; $T_{0.4}$ = feed supplemented with 4% *T. tetraptera* fruit powder; $T_{0.5}$ = feed supplemented with 0.5% *T. tetraptera* fruit powder of *T. tetraptera*; In = initial number; Fn = final number; p = probability. IN = Initial number; FN = Final number; IW = Initial weight; FI = Feed intake; SR = Survival rate; LW = Live weight; AWG = Average weight gain; ADWG = Average daily weight gain; SGR = specific growth rate; FCR = feed conversion ratio; K = condition factor; TL = total length; SL = standard length.

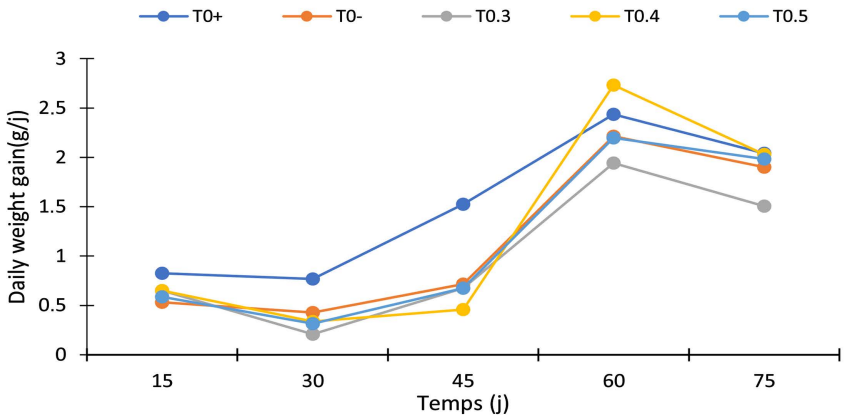

Figure 3. Evolution of the average weight gain of *Clarias gariepinus* juveniles depending on the period. T_{0+} = imported feed; T_{0-} = feed supplemented with 0% *T. tetraptera* fruit powder; $T_{0.3}$ = feed supplemented with 0.3% of *T. tetraptera* fruit powder; $T_{0.4}$ = feed supplemented with 4% *T. tetraptera* fruit powder; $T_{0.5}$ = feed supplemented with 0.5% *T. tetraptera* fruit powder of *T. tetraptera*; d = days.

3.5. Feed Conversion Ratio

The observation in **Figure 4** which presents the evolution of the feed conversion ratio of juveniles of *Clarias gariepinus* fed with food supplemented with *T. tetraptera* fruit powder during the period shows a sawtooth evolution for all treatments. This during the lowest mean value (1.28 ± 0.01) was recorded with the treatment fed with imported feed and the highest (1.86 ± 0.10) was recorded with the treatment supplemented with 0.3% of this spice. However, when comparing treatments having been supplemented with the powder of this spice, the treatment supplemented with 0.4% of *T. tetraptera* ($T_{0.4}$) made it possible to record the lowest feed conversion ratio (1.69 ± 0.02).

3.6. Specific Growth Rate

Figure 5, which shows the evolution of the specific growth rate of juveniles of *Clarias gariepinus* fed with feed supplemented with *T. tetraptera* fruit powder throughout the period, shows a sawtooth evolution for all treatments with a peak at the 60th day. The highest specific growth rate (3.64 ± 0.79) was observed on subjects fed imported feed (T_{0+}) followed by the specific growth rate (3.37 ± 0.85) of subjects fed a the feed supplemented with 0.4% ($T_{0.4}$) of *T. tetraptera* and the lowest specific growth rate (3.10 ± 0.81) was obtained with the subjects fed the feed supplemented with 0.3% ($T_{0.5}$) of *T. tetraptera*.

3.7. Conditioning Factor K

The evolution of the conditioning factors k of the juveniles of *Clarias gariepinus* fed with feed supplemented with *T. tetraptera* fruit powder is shown in **Figure 6**. We observe a sawtooth evolution with a value of 2, 14 ± 0.5 highest observed in subjects fed feed supplemented with 0.4% *T. tetraptera* fruit powder ($T_{0.4}$) and a body weight index of 1.75 ± 0.39 the least high obtained in subjects fed food without supplement (T_{0-}).

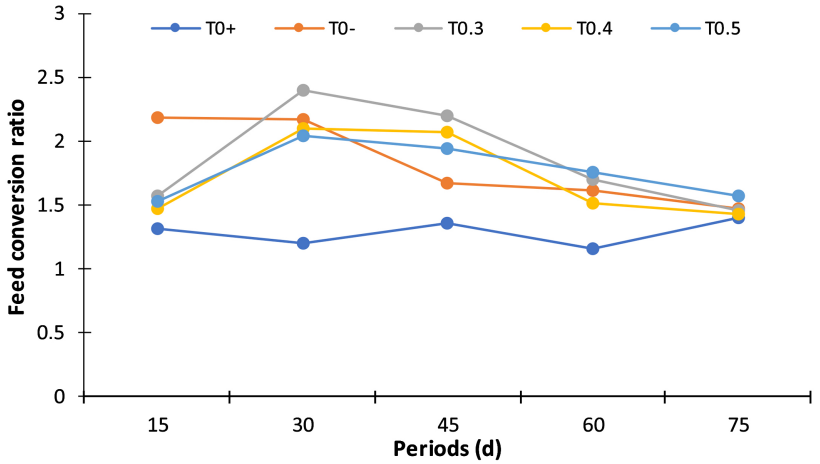

Figure 4. Evolution of feed conversion ratio of juvenile *Clarias gariepinus* depending on the period. T_{0+} = imported feed; T_{0-} = feed supplemented with 0% *T. tetraptera* fruit powder; $T_{0.3}$ = feed supplemented with 0.3% of *T. tetraptera* fruit powder; $T_{0.4}$ = feed supplemented with 4% *T. tetraptera* fruit powder; $T_{0.5}$ = feed supplemented with 0.5% *T. tetraptera* fruit powder of *T. tetraptera*; d = days.

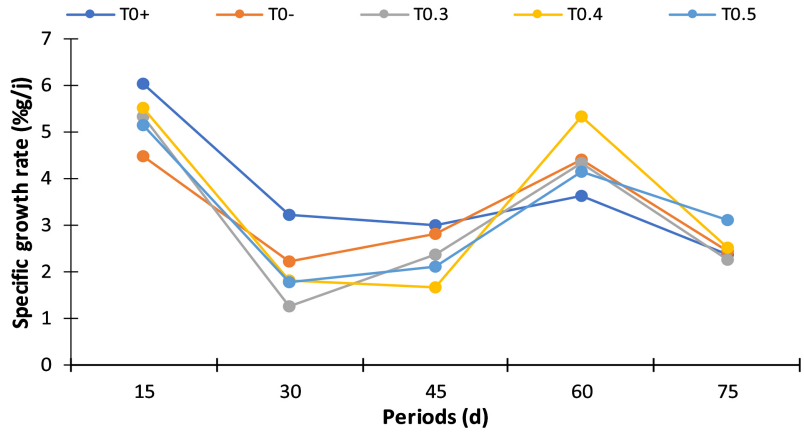

Figure 5. Evolution of the specific growth rate of juveniles of *Clarias gariepinus* depending on the period. T_{0+} = imported feed; T_{0-} = feed supplemented with 0% *T. tetraptera* fruit powder; $T_{0.3}$ = feed supplemented with 0.3% of *T. tetraptera* fruit powder; $T_{0.4}$ = feed supplemented with 4% *T. tetraptera* fruit powder; $T_{0.5}$ = feed supplemented with 0.5% *T. tetraptera* fruit powder of *T. tetraptera*; d = days.

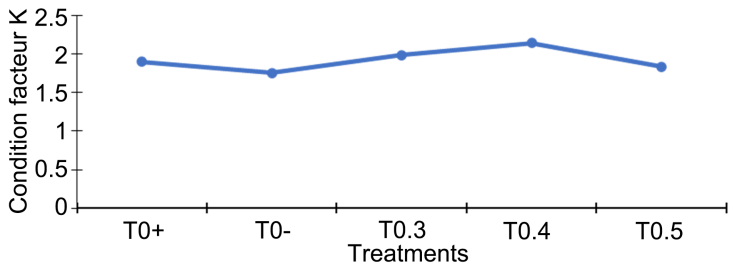

Figure 6. Condition factor K as a function of treatments. T_{0+} = imported feed; T_{0-} = feed supplemented with 0% *T. tetraptera* fruit powder; $T_{0.3}$ = feed supplemented with 0.3% of *T. tetraptera* fruit powder; $T_{0.4}$ = feed supplemented with 4% *T. tetraptera* fruit powder; $T_{0.5}$ = feed supplemented with 0.5% *T. tetraptera* fruit powder of *T. tetraptera*.

3.8. Discussion

Survival rates recorded range from 84.44 ± 8.39 to 96.44 ± 3.5. These values are all higher (35% to 68.4%) than that obtained by [21] after 17 days of rearing in happas as well as that of [22] obtained in a metal tank (78%) based on the comparison of the sound of rice and peanut meal. Furthermore, these rates corroborate with those obtained (89% to 92%) by [23] as well as those of [24] (89 ± 5.0 to 95 ± 5.0) in their studies carried out in unfertilized and fertilized ponds. chicken droppings and pig manure on juveniles of *Clarias gariepinus* pond. The differences in mortality observed between these authors are due to stress, handling and overeating polluting the living environment.

The average weights are between 120.93 ± 67.20 and 81.73 ± 50.42 g. These values are comparable to those obtained (103.25 ± 5.47 and 120.07 ± 4.56) by [24] in unfertilized ponds and fertilized with pig manure respectively.

Weight gains vary from 74.73 ± 50.42 to 113.93 ± 67.20 g. These values are comparable to those obtained (96.61 ± 3.6 and 112.5 ± 2.47) by [24] in an unfertilized pond fertilized with chicken droppings. Furthermore, these results are much higher than those obtained (18.3 g) by [25] in a pond on the effects of *allium sativium* on the zootechnical performances of *Clarias gariepinus* for 6 weeks. These variations could be attributed to the quality of the food and the duration of breeding.

The average daily gains obtained from all treatments vary between 1.51 ± 0.89 g to 0.99 ± 0.67 g. These values are all lower (2.97 g; 3.6 g and 3.3 g) than those obtained by [24] in unfertilized ponds and fertilized with chicken droppings and pig manure. However, the daily gain (0.99 ± 0.67 to 1.51 ± 0.89) corroborates with those obtained (1.29 ± 0.22) by [23]. These variations between authors may be due to the conditions of breeding, the quality of the feed as well as the physico-chemical parameters of the environment.

The specific growth rates obtained are between 3.64 ± 0.79 and 3.10% ± 0.81%. These rates are all significantly higher than those with the local feed composed of 34.77% and largely much lower than those observed (11.44 ± 4.8) by [23]. However, these results corroborate with those obtained (3.6) by [22] comparing the sound of rice to peanut meal on Clarias.

The consumption index observed on all these treatments (1.28 ± 0.01; 1.76 ± 0.20; 1.86 ± 0.10; 1.69 ± 0.02; 1.74 ± 0.12) are all higher (0.81 ± 0.15) than those obtained by [23] respectively. However, all these indices are lower (1.9) than [25]. The difference in indices could be due to the growing medium, feed quality and water parameters.

The condition factors K, the coefficients obtained fluctuate from 1.75 ± 0.39 to 2.14 ± 0.15. These values are all higher (0.88 ± 0.02) than those obtained by [22] as well as those obtained (0.79 and 0.83) by [26].

4. Conclusion

In summary, the study on the supplementation of *T. tetraptera* powder in the

diet of juveniles of *Clarias gariepinus*, shows that the food supplemented with 0.4% four-sided fruit powder (*T. tetraptera*) has generated the highest survival rate and the most relevant growth performance.

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Conflicts of Interest

No conflicts of interest regarding the publication of this paper.

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