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Comparative Impact of *Moringa oleifera* and *Carica papaya* Leaves Powder on Some Life Stages of *Clarias gariepinus*

Barikpoa Uedeme-Naa[1]*, Awoteinm D.I. George[2]

[1]Department of Fisheries, University of Port Harcourt, Rivers State, Nigeria.
[2]Department of Fisheries and Aquatic Environment, Faculty of Agriculture, Rivers State University, Port Harcourt, Nigeria
Email: barikpoa.uedeme-naa@uniport.edu.ng

Abstract This study determined the comparative impact of *Moringa oleifera* and *Carica papaya* leaves powder on some life stages of *clarias gariepinus.* 2,400 fry of *Clarias gariepinus* fish from the same stock were randomly stocked at 200 fish per plastic aquaria at 3 treatment levels designated control (0.00), 0.10g/l, 0.20g/l , 0.30g/l each with 4 replicates representing the treatment levels. The experiment was carried out for 8 weeks. The result obtained respectively showed that after 2, 4 and 6 weeks culture period the highest survival rate: of fry in *Moringa oleifera* treated aquarium at 0.10g/l was 86.35%; of post fry was 60% and of fingerlings was 60% while with *Carica papaya* it was observed that the highest survival rates recorded at 2, 4 and 6 weeks were respectively 63.75% for fry, 57.00% for post fry and 57.00% for fingerlings at 0.20g/l when compared to the control (2 weeks – 37% survival; 4 weeks – 25% survival and 6 weeks – 20% survival). These leaves at their respective doses as prescribed by this research are therefore suitable for raising young fishes since it appears that the anti-oxidant content of these plants arrests the hydroxyl radicals within the water body which takes care of the oxidative stress generally responsible for high level mortality in fish breeding.

Keywords *Moringa oleifera*, *Carica papaya*, Hydroxyl radicals, Oxidative stress, Anti-oxidant

Introduction

Moringa oleifera is an important food commodity which have had enormous attention in terms of natural nutrition in the tropics. The leaves, fruits, flowers and immature pods of this tree are used as a nutritive vegetable in many countries, particularly in India, Pakistan, Philippines, Hawaii, and many parts of Africa [7, 13]. Moringa leaves have been reported to be a rich source of B-Carotene, protein, vitamin C, calcium, and potassium and serve as a good source of natural antioxidants [6]. It enhances the shelf life of fat containing foods due to the presence of various types of antioxidant compounds such ascorbic acid, flavonoids, phenolics and carotenoids [14, 26]. In the Philippines, it is known as "Mother's best friend" because of its utilization to increase woman's milk production and is sometimes prescribed for anaemia [16]. A number of medicinal properties have been ascribed to various parts of this highly esteemed tree. Almost all part of this plant: root, bark, leaf, fruit (pods), flowers, seeds, and seed oil have been used for various ailments in the indigenous medicine of south Asia, including the treatment of inflammation and infectious diseases along with cardiovascular, gastrointestinal, hematological and hepatorenal disorders. The high concentrations of ascorbic acid, oestrogenic substances and β-sitosterol, iron, calcium, phosphorus, copper, vitamins A, B and C, α-tocopherol, reboflavin, nicotinic acid, folic acid, pyridoxin, B-carotene, protein, and in

particular essential amino acids such as methonine, cystine, tryptophan and lysine present in moringa leaves and pods make it a virtually ideal dietary supplement [19]. Moringa leaf juice is known to have a stabilizing effect on blood pressure [27]. Notrile, mustard oil glycosides and thiocarbomate glycosides have been isolated from moringa leaves which were found to be responsible for blood pressure lowering effect [17, 18]. Aqueous leaf extracts regulate thyroid hormone and can be used to treat hyperthyroidism and exhibit an antioxidant effects.

Pawpaw (*Carica papaya*) is a popular fruit available throughout the year in the tropics. The entire different part of the papaya plants including fruit, dried leaf, stem, seeds, and roots have long been used as ingredients in alternative medicine [4, 28]. The green parts of the plants of the papaya contain carpine which is the major alkaloid of *carica papaya*, and it is also found in the seeds. The black seeds also contain chymopapain, papin, bactericidal, aglycoside, sinigrin, the enzyme myrosin and carpasemine. Papaya fruit is a good source of carbohydrate, has high levels of vitamins (A and C) and minerals such as copper and magnesium. Research made to evaluate the acute toxicity (LC_{50}) of the aqueous extract of *C. papaya* seed powder on *C. gariepinus* fingerlings showed that fish exhibited abnormal behaviours, such as erratic swimming, air gulping, restlessness, discoloration and death. The intensity of these symptoms was directly related to the concentration of toxicant in water and duration of exposure. It was observed that *C. garipinus* fingerlings showed variations in their tolerance to aqueous extracts of *C. papaya* [9]. In a higher dose, it is said to lower the pulse rate and depress the nervous system. Several authors have reported that *C. papaya* leaves (pawpaw) contributed to the growth performance of *Archantina marginata* [15]. This plant is rich in protein, vatamins A, B, C, E and minerals such as magnesium, calcium and potassium and digestive enzymes [3, 8].

Clariids are unique in their ability to survive a wide range of environmental extremes [5]. They have a highly efficient air breathing organ, which allows them to survive in oxygen depleted water [30], migrate for long distances as far as 1.2km [12] they have proved a serious threat to native populations in areas where they have been introduced because of their adaptability [12]. This species has fast growth rate and it is successful aquaculture species [31]. It is tolerant to salinity [11].

Materials and Methods

The experiment was carried out at the fishery unit of the University of Port Harcourt Demonstration Farm Choba. Fish fry were obtained from University of Port Harcourt demonstration farm. *Moringa oleifera* leaf was collected from pharmacist farm of the University of Port Harcourt while Pawpaw leaf was collected from chapel of Annunciation Catholic Church premises. These leaves were washed thoroughly with water to remove dirt, sun dried properly and ground into fine powder. The moringa and pawpaw leaves powder were added to water in aquaria at varied levels of concentrations except in control tank. 32 aquaria (12 for moringa leaf powder, 12 for pawpaw leaf powder and 4 for control) with 20 litres of water in each were stocked with 150 fry/aquarium. Water renewal was done after 3 days and work carried out for 8 consecutive weeks. The experimental design was a completely randomized design (CRD) with four treatments levels - 0.00, 0.10, 0.20 and 0.30g/l (four replicates per treatment) from fry to fingerlings. Fish were fed three times daily for 8 weeks (fry to fingerlings).

Temperature measurements was determined with a mercury-in glass thermometer, pH with 291 Mk 2 pH meter (Hannah INC. LTD, China)**,** Ammonia - Nitrogen (NH_3 - N) with the phenate method of ammonia determination [32], Conductivity with Horiba water checker (model 140. Ericson Elect Co, USA). Turbidity with a probe was inserted in water and the turbidity values obtained were read using the Horiba water checker (model 140. Ericson Elect Co, USA) by selecting turbidity on the Horiba. Dissolved Oxygen (DO) with Winkler's method [32]. Statistical Analysis was done using statistics software 8.0 for windows. Data were first tested for normality (Kolmogorov - Smirnov test) and homosesdasticity of variance (Bartetts test). When these conditions were satisfied, a two way analysis of variance (ANOVA) was employed to reveal significant differences in measured variables among control and experimental groups. When a difference was detected ($P < 0.05$), Tukey's multiple comparison test was applied to identify which treatment is significantly different.

Results and Discussion

The mean values for turbidity, conductivity, dissolved oxygen, ammonia, nitrite, pH and temperature obtained in the experimental tanks during the exposure of the different life stages of *C gariepinus* to graded levels of *Moringa*

oleifera and *Carica papaya* leaves are presented in Table 1. All the water parameters were within the acceptable range with no significant difference (P>0.05) irrespective of the leaves when compared with control (Table 1). It was observed that within 2 weeks culture period of *Clarias gariepinus* fry, at 0.10mg/l, the survival rate of *Clarias gariepinus* fry with *Moringa oleifera* leaf powder was 71.35% higher than that of *Carica papaya* while at 0.20 and 0.30mg/l, fry respectively survived at 37.50 and 10.50% in water with *Carica papaya* more than that of *Moringa oleifera* leaf powder. At this point, only 35.50% of fry survived in the control medium. After four weeks of culture period (table 3), *Clarias gariepinus* post fry survival rate was 50.00% higher in *Moringa oleifera* solution at 0.10mg/l while that of *Carica papaya* leaves powder was respectively 32.50 and 2.50% higher than that of *Moringa oleifera* at 0.20 and 0.30mg/l. The survival rate at control dropped to 25%. Table 4, shows that in the 6th week, at 0.20 and 0.30g/l of *Carica papaya*, fry survived at 33.75 and 1.25% more than that of *Moringa oleifera* leaf. *Carica papaya* at 0.10g/l was less than that of *Moringa oleifera* leaf by 51%. Control recorded 20% survival rate in the 6th week of raising fry to fingerlings.The performance difference in terms of fish survival, *C. gariepinus* fry is better raised to post fry in a culture medium with *Moringa oleifera* leaf (table 5) and transferred to a culture medium with *Carica papaya* leaf to be raised to fingerlings (table 6).The result on table 5 and 6, generally shows no significance difference (P<0.005) for *Moringa oleifera* and *Carica papaya* treatment across the various concentration (dose) level except at 0.10g/l for fry, post fry fingerling stage for the former and at 0.20g/l for the latter.

The results of the water quality of the media used in the present study are within the range reported by [21] as optimal requirement for African catfishes and did not vary significantly ($p < 0.05$) in the respective treatment levels. All were within the tolerance ranges of warm water fish species [22, 29, 32]. This suggests that the parameters did not seem to negatively influence the test fish in this study.

Moringa oleifera is an edible plant. A wide variety of nutritional and medicinal virtues have been attributed to its roots, bark, leaves, flowers, fruits and seeds [20, 23]. Dillard et al [14] reported that moringa is one of the most powerful health enhancing plants, while many things found in nature can have one or two health benefits, moringa has many. In this work, *Moringa oleifera* leaf soaked with water recorded the highest survival rate of *C. gariepinus* fry, postfry and fingerlings at 0.10g/l followed by that of *Carica papaya* at 0.20g/l. This is in agreement with the findings of [10, 24] who reported that phytochemical analysis have shown that *Moringa oleifera* leaves are particularly rich in potassium, calcium, phosphorus, iron, vitamins A and D, essential amino acids as well as such known antioxidants such as B-Carotene, Vitamin C and Flavorioids Moringa leaf is best known as an excellent source of nutrition and natural energy booster. This energy boost is not based on sugar, and so it is sustained. Moringa is also soothing. It helps in lowering blood pressure and is a sleep aid in animals. Its detoxification effect may come from moringa's ability to purify water. Moringa acts as a coagulant, attaching itself to harmful material and bacteria. It is believed that this process is taking place in the body as well. Moringa is considered to have the highest protein ratio as in soy protein. Papaya is a common human fruit, available throughout the year in the tropics. It is referred to as the "medicine tree" or "melon of health", also papaya is rich with nutrients [25]. Ismail [2] reported that it contains medicinal properties and the major active ingredients recorded include: papain, niacin, fats, chymopapain. In this study it was observed that the survival rate of fry, postfry and fingerlings at 0.10, 0.20 and 0.30g/l exceeded that of control which could be as result of its many beneficial medicinal and nutritional properties as reported by [1].

Table 1: Water quality variables (Mean ± S.D) in the experimental tanks for *Moringa oleifera* and *Carica papaya* leaves powder

Variables	**0.00mg/l**	**0.10g/l**		**0.20g/l**		**0.30g/l**	
	Control	**MO**	**CP**	**MO**	**CP**	**MO**	**CP**
Turbidity (mg/l)	1.50±0.01	1.00±1.02	3.00±0.10	2.00±0.13	1.70±2.01	2.00±0.10	2.70±1.12
Conductivity (µS/m)	32.90±1.01	38.30±2.10	37.30±1.12	50.30±1.10	49.30±0.10	60.55±1.11	61.55±0.12
Do (mg/l)	4.50±1.10	2.80±2.10	1.63 ±0.20	2.40±0.11	2.37±1.30	2.50±1.12	1.67±2.20
Ammonia (mg/l)	<0.01± 0.20	<0.01±1.20	<0.01±0.10	<0.03±0.10	<0.02±2.10	<0.04±0.10	<0.05±1.01
Nitrite (mg/l)	0.19 ±1.10	0.20±0.12	0.20±1.02	0.46±2.10	0.36±0.12	0.66±3.10	0.67±2.12
pH	6.47±2.10	6.20±3.03	6.97±1.10	6.25±1.10	6.77±2.11	6.42±0.12	7.10±2.11
Temperature (°C)	29.40±0.27	8.60±2.12	28.43±0.27	28.40±0.10	28.13±0.27	28.00±0.10	28.17±0.27

Moringa oleifera : MO and *Carica papaya:* CP

Table 2: *C. gariepinus* (fry) survival rate after 2 weeks of exposure to *Moringa oleifera and Carica papaya* leaves

g/l	*Moringa oleifera*	% control	*Carica Papaya*	% control
0.00	75.00±35.71[b]	37.50	75.00±35.71[b]	37.50
0.10	168.49±11.83[a]	86.35	30.00±4.66[c]	15.00
0.20	52.50±14.39[a]	26.25	127.50±31.98[a]	63.75
0.30	76.50±34.33[a]	38.25	97.50±17.97[a]	48.75

Table 3: *C. gariepinus* post fry survival rate after 4 weeks of exposure to *Moringa oleifera and Carica papaya* leaves powder

g/l	*Moringa oleifera*	% control	*Carica papaya*	% control
0.00	50.00+23.81[a]	25.00	50.00+23.81[a]	25.00
0.10	120.00±9.13[a]	60.00	20.00±4.56[a]	10.00
0.20	50.00+22.51[b]	25.00	115.00±21.01[a]	57.50
0.30	70.0±85.88[a]	35.00	75.00±16.20[a]	37.50

Table 4: *C. gariepinus* fingerlings survival rate after 6 weeks of exposure to *Moringa oleifera and Carica papaya* leaves powder.

g/l	*Moringa oleifera*	% control	*Carica Papaya*	% control
0.00	40.00±11.90[a]	20.00	40.00±11.90[a]	20.00
0.10	120.00±2.38[a]	60.00	18.00±2.04[c]	9.00
0.20	27.50±10.97[c]	13.75	115.00±14.77[a]	57.50
0.30	70.00±54.92[b]	35.00	72.50±8.54[b]	36.25

Table 5: *Moringa oleifera* leave treatment at different levels of exposure

Age	0.00g/l	% control	0.10g/l	% control	0.20g/l	% control	0.30g/l	% control
Fry	75.00±35.71	37.50	168.40±11.8	86.35	52.50±14.39	26.25	76.00±33.88	38.25
Postfry	50.00±23.81	25.00	120.00±1.830	60.00	50.00±22.51	25.00	70.0±85.88	35.00
Fgerlings	40.00±11.90	20.00	120.00±2.380	60.00	27.50±10.97	13.75	70.0±54.92	35.00

Table 6: *Carica papaya* leaf powder treatment at different levels of exposure

Age	0.00 g/l	% control	0.10 g/l	% control	0.20g/l	% control	0.30g/l	% control
Fry	75.00±35.71	45.46	30.00±4.56	15.00	127.50±31.98	63.75	97.50±17.97	48.75
Post fry	50.00±23.81	25.00	20.00±4.56	10.00	115.00±29.01	57.50	75.00±16.20	37.50
Fgerlings	40.00±11.90	20.00	18.00±2.04	9.00	115.25±14.77	57.50	72.50±8.54	36.25

Keys: Fingerlings – Fgerlings

Conclusion

This work has shown that *M. oleifera* and *C. papaya* leaves at different concentrations can enhance the survival of *C. gariepinus* fry, post fry and fingerlings when added directly to culture medium at recommended doses.

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