

**NSAP****47th Annual
Conference
(JOS 2022)****CONFERENCE
PROCEEDINGS**THEME
**SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES****EFFECTS OF DIETARY SUPPLEMENTATION WITH *MANGIFERA INDICA* L.
(MANGO) KERNEL ON SOME HAEMATOLOGICAL PARAMETERS OF *CLARIAS
GARIEPINUS* (AFRICAN CATFISH) FINGERLINGS**Ahmad, M.T.¹ *and Umar, B.N.²¹Veterinary Teaching Hospital, Ahmadu Bello University, Zaria-Nigeria²Department of Veterinary Microbiology, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria-Nigeria*Corresponding Contact: mutalgsh80@gmail.com**ABSTRACT**

Different parts of Mangifera indica have been reported to possess antimicrobial, non-specific immunostimulant activity, and antioxidant effects which enhance fish performance and modulate their immunity against microbes. Therefore, this study was designed to determine the effects of M. indica kernel on some haematological parameters of Clarias gariepinus fingerlings. A total of 240 fingerlings randomly divided into four groups of 60 each were used in the study. Fish in groups A, B, C and D were fed diet containing 0, 1, 5 and 10 g/kg of mango kernel powder, respectively for 42 days. Blood samples were collected from 12 fish in each group at 20 and 40 days post-treatment, and some haematological parameters of the fish were determined using standard laboratory procedures. One-way analysis of variance with Tukey's Post-hoc was used to analyse the data. The total leukocyte counts were significantly ($P < 0.05$) higher in fish treated with mango kernel at 10 g/kg of feed 40 days post-treatment. Besides, the group that was fed the diet at 10 g/kg of feed for 40 days had higher neutrophil counts than the groups that were fed the diets at lower inclusion levels as well as the control group. Therefore, M. indica kernel can be used as feed supplement at the inclusion levels of 10 g/kg of feed in order to augment both the total and differential leukocyte counts of African catfish.

Key words: *Clarias gariepinus*; Feeding; Haematological parameters; Immunostimulants; *Mangifera indica*

INTRODUCTION

Aquaculture is one of the fastest growing animal food-producing sector around the world (FAO, 2005). Fish production is a major component of the agricultural sector and a vital source of protein to majority of Nigerians. According to Adekoya and Miller (2004), fish and fish products constitute more than 60% of the total protein intake in adults especially in rural areas. There is a complimentary large appetite for fish in Nigeria with an estimated demand of about 1.5 million metric tons of fish as at 2006 (Davies *et al.*, 2008), which has grown to 2.66 million in 2010 (CBN, 2010). These figures place Nigeria among the largest fish consumers in the world (CBN, 2010). Recently, a growing interest has emerged in using herbs in animal feeds by both researchers and feed companies (Harikrishnan *et al.*, 2011). Herbs are been used in various countries to control shrimp and fish diseases, and successful results have been reported in Mexico, India, Thailand, and Japan (Logambal and Michael, 2000).

Mangifera indica L., which belongs to the *Anacardiaceae* family, is a large evergreen tree of tropical and subtropical regions. Different parts of *Mangifera indica* have broad range of medicinal properties, such as antimicrobial (Kabuki *et al.*, 2000; Keita *et al.*, 2004), antiviral, antifungal, anti-inflammatory, anti-diarrhoeal, antioxidant activity, antitumor as well as immunomodulatory (Scartezini and Speroni, 2002; Anila and Vijayalakshmi, 2003). The mango kernel has been reported as a non-conventional feed source for improved growth and feed utilization of *Oreochromis niloticus* fingerlings (Omoregie *et al.*, 1991). However, despite the fact that mango seed kernel contains 6% protein, 11% fat, 77% carbohydrate, 2% crude fiber and 2% ash, the seeds are mostly considered to be a waste (Abdalla *et al.*, 2006). Of all the by-products of mango, mango kernel is the cheapest and readily available. Huge

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amount of mango kernel, which is not presently utilized can be use as feed additive to enhance the non-specific immunity in fish (Sahu *et al.*, 2007). Furthermore, the methanol extract of mango kernel has been established to contain varying secondary metabolites particularly flavonoids, saponins, triterpenes, tannins, and glycosides which have been shown to improve fish growth performance, and exhibit *in vitro* antimicrobial effects at different concentrations (Talba *et al.*, 2014). The present study was designed to study the effect of *Mangifera indica* kernel on some haematological parameters that are considered as indices for non-specific immunity in *Clarias gariepinus* fingerlings.

MATERIALS AND METHODS

Identification of mango species used in the study:

The mango species used in this study were identified by their leaves at Herbarium, Department of Biological Sciences, Ahmadu Bello University (ABU) Zaria, and a voucher specimen no. 1944 was then assigned.

Collection of the mango seeds, removal and processing of the kernel:

Mangifera indica seeds were collected from mango trees around ABU Samaru, Zaria. The seeds were washed repeatedly under running tap water, crushed and the kernels were removed. The kernels were air-dried at room temperature and then made into powder using mortar and pestle. The powder was preserved in an airtight polythene bag and kept in a cool dry place until used.

Water quality test:

Water quality characteristics; pH values, temperature (°C), general hardness (ppm mg/l), carbonate hardness (ppm mg/l), nitrite (NO⁻² ppm mg/l), nitrates (NO⁻³ ppm mg/l) of the water in different tanks were routinely taken using a rapid test kit (APITM Aquarium Pharmaceuticals Mars Fish care North America, inc.).

Feeding diet and grouping of fish:

Catfish fingerlings (n= 240) were used for the study, they were divided randomly into four groups of 60 fingerlings (4 weeks old). Each group was maintained in a 500-litre tank. Fish in group A were fed basal diet and served as non- treated control group, while fish in groups B, C and D were given feed containing mango kernel at 1, 5 and 10 g/kg of feed. Treatment allotment was done using complete randomised design

Collection of blood:

Blood samples were collected randomly from 12 fish in each group 20 and 40 days post-treatment. About 0.5 ml of blood was collected from the caudal vein of each fish using a caudal vein severance and through the vein using a 23-gauge needle attached to a 2 ml syringe respectively. The blood was analysed for packed cell volume (PCV), haemoglobin concentration (Hb) and white blood cells (WBC) counts.

Determination of blood parameters:

Packed cell volume was analysed by centrifuging blood samples collected from fish in all the 4 groups in a capillary tube at 400 g for 5 minutes. Haemoglobin content was analysed using cyanomethemoglobin method as described by Van Kampen and Zijlstra (1961). White blood cell count was determined using modified leishmann staining technique as described by Cheesbrough (2000) with slight modification. Briefly, after making a smear on the slides, the slides were covered with undiluted stain, and washed with water twice and allowed to stand for 10 minutes. Excess stain was washed off with tap water, air dried and observed microscopically under oil immersion. One hundred leukocytes (neutrophils, lymphocytes, monocytes, basophils and eosinophils) were counted on each slide. Total leukocytes counts were calculated using the formula below as described by Campbell (1995). TWBC/mm³ = number of cells counted $\times 10 \times 32 \times 100 / (\%H+E) \times 18$

Data analysis

All data obtained were expressed as mean $\pm$ standard error of mean and analysed using Graph pad prism Version 5.01 (San Diego, USA). One-way analysis of variance (ANOVA) with Tukey's Post-hoc was used to identify any statistical difference between groups. Statistical difference was considered significant at $p < 0.05$.



RESULTS AND DISCUSSION

Haematological parameters (PCV, Hb and WBC) of African catfish fed different doses of *M. indica* kernel for 20 days showed no statistically significant difference ($P > 0.05$) in all the parameters assayed (Table 1). At 40 days of feeding, there were significant differences ($P < 0.05$) in total leukocyte and neutrophil counts between the group fed with the experimental diet at 10g/kg inclusion levels and the remaining groups. However, the group that were fed with the diet at 5 and 10g/kg indicated lower lymphocyte count than the groups with lower inclusion levels as well as the control (Tables 2). The significant difference ($p < 0.05$) in neutrophil counts of fish treated with mango kernel at 10 g/kg of feed 40 days post-treatment is in concordance with report by Sahu *et al.*, (2007) where significant difference occurs between neutrophil counts of treated and untreated groups of *Labeo rohita* (rohu). This also supports the findings of Weeks and Warinner (1986) that increased in neutrophil could be an indicator of non-specific response, hence enhanced immune response. The WBC was significantly ($P < 0.05$) higher in fish treated with mango kernel at 10 g/kg of feed 40 days post-treatment. This result is also supported by another study (Choudhury *et al.*, 2005), who found that there was an increase in the WBC count when *L. rohita* juveniles were treated with immunostimulants like levamisole and ascorbic acid.

Table 1: Mean ($\pm$ SD) haematological parameters of African catfish (*Clarias gariepinus*) fed with different doses of *Mangifera indica* kernel at 20 days supplementation

Treatment with mango kernel at g / kg	PCV (%)	Hb (g / dl)	TP (%)	TLC ($\times 10^3/\text{mm}^3$)	Neutrophils (%)	Lymphocytes (%)	Monocytes (%)	Eosinophils (%)
0	31.00 $\pm$ 3.35	10.30 $\pm$ 1.12	5.04 $\pm$ 0.31	1.87 $\pm$ 0.02	5.20 $\pm$ 1.36	94.40 $\pm$ 1.29	0.00 $\pm$ 0.00	0.40 $\pm$ 0.25
1	35.40 $\pm$ 3.08	11.78 $\pm$ 1.02	5.80 $\pm$ 1.39	1.88 $\pm$ 0.02	5.60 $\pm$ 1.03	94.40 $\pm$ 1.03	0.00 $\pm$ 0.00	0.00 $\pm$ 0.00
5	37.20 $\pm$ 1.86	12.36 $\pm$ 0.61	6.84 $\pm$ 0.52	1.88 $\pm$ 0.02	5.80 $\pm$ 0.80	93.40 $\pm$ 0.51	0.60 $\pm$ 0.40	0.60 $\pm$ 0.40
10	39.00 $\pm$ 1.52	12.96 $\pm$ 0.51	6.86 $\pm$ 0.45	1.93 $\pm$ 0.01	8.40 $\pm$ 0.40	91.20 $\pm$ 0.49	0.40 $\pm$ 0.25	0.40 $\pm$ 0.25

PCV = packed cell volume; Hb = hemoglobin concentration; Tp = total protein; TLC = total leukocyte count.

Table 2: Mean ($\pm$ SD) haematological parameters African catfish (*Clarias gariepinus*) fed with different doses of *Mangifera indica* kernel at 40 days post supplementation

Treatment with mango kernel at g / kg	PCV (%)	Hb (g / dl)	TP (%)	TLC ($\times 10^3/\text{mm}^3$)	Neutrophils (%)	Lymphocytes (%)	Monocytes (%)	Eosinophils (%)
0	32.40 $\pm$ 2.56	10.76 $\pm$ 0.85	6.08 $\pm$ 0.26	1.85 $\pm$ 0.02	4.60 $\pm$ 0.75	95.40 $\pm$ 0.75	0.00 $\pm$ 0.00	0.00 $\pm$ 0.00
1	36.00 $\pm$ 2.06	12.02 $\pm$ 0.67	5.92 $\pm$ 0.49	1.89 $\pm$ 0.01	6.40 $\pm$ 0.51	93.60 $\pm$ 0.51	0.00 $\pm$ 0.00	0.00 $\pm$ 0.00
5	39.60 $\pm$ 1.63	13.22 $\pm$ 0.49	6.40 $\pm$ 0.45	1.90 $\pm$ 0.02	7.00 $\pm$ 1.05	92.80 $\pm$ 0.86*	0.00 $\pm$ 0.00	0.20 $\pm$ 0.20
10	38.60 $\pm$ 2.60	12.82 $\pm$ 0.87	7.20 $\pm$ 0.42	1.92 $\pm$ 0.20*	7.80 $\pm$ 0.38*	91.80 $\pm$ 0.20**	0.00 $\pm$ 0.00	0.40 $\pm$ 0.25

Superscript column wise on right hand side for particular treatment group(s) denotes significant ($P < 0.05$) difference from the control group. PCV = packed cell volume; Hb = hemoglobin concentration; Tp = total protein; TLC = total leukocyte count.



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CONCLUSION AND RECOMMENDATION

Mangifera indica kernel can be used as feed supplement at the inclusion levels of 10 g/kg of feed in order to enhance the total leukocyte counts as well as differential leukocyte counts of African catfish, *Clarias gariepinus*. However, the present study had revealed that it is only the long-term dietary administration of mango kernel at 10 g/kg that considerably increases WBC counts of African catfish fingerlings, whereas the short-term treatment had not yielded any significant change in the parameters tested.

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