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Full Length Research Article

EFFECT OF *MOMORDICA CHARANTIA* LEAF ON WATER PARAMETERS AND SURVIVAL RATE OF *CLARIAS GARIEPINUS*

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ABSTRACT

The study is focused on the icthyotoxic activity of *Momordica charantia* leaf on African catfish, *Clarias gariepinus*, as well as its effect on water parameters. The erythrocyte count decreased from 1.80 to 1.08 while the leucocyte count increased from 4.04 to 5.91mm^3 with increase in the level of *Momordica charantia* leaf in the fish feed. There is also decrease in haemoglobin count from 6.93 to 1.17gdl^{-1} with increase in the level of the powered leaf. These observations resulted in decrease in survival rate with increased level of the leaf in the fish feed. Water parameters like pH and alkalinity increased while dissolved oxygen decreased with increase in the level of the leaf in the fish feed. The overall effect is that incorporation *Momordica charantia* leaf in fish feed decreased the survival rate of *Clarias gariepinus* and this is concentration dependent.

Key words: *Momordica charatia, Clarias gariepinus*, Water Parameters, Icthyotoxic Effect, Haematological Parameters.

INTRODUCTION

Use of chemical pesticides in control of competing species in small water bodies and to eradicate fish to control parasite etc is becoming unpopular because of their toxicity to aquatic organisms and degradation of environment (Olufayo, 2009). Biodegradable alternatives (ichthyotoxic plants) are thus preferable for removal of unwanted fish and other aquatic species from water bodies (Wang and Huffanan, 1991). Some of these botanical fish toxicants are extremely toxic to fishes. These include *Derris elliptical*, *Tephrosia, vogilli, Acacia pennata and Tetrepleura tetraptera.* Introduction of these plant extracts to the aquatic ecosystem could eventually lead to physiological stress in aquatic organisms and ultimately reduce the aquatic productivity (Warren, 1977). Many plant chemicals have been traditionally used to harvest fish all over the world (Jennes, 1967 and Morah, 1986). The best known of these plant species is *Derris elliptical* that contains rotenone which is toxic to fish. Indiscriminate abuse of these plant pesticides by using higher concentrations than necessary results in mass motality in fish ponds contaminating the fresh water bodies and affecting non-target organisms (Olufayo, 2009). Environmental factors such as pH, turbidity, alkalinity, dissolved oxygen, temperature and conductivity influence the rate of reaction of pollutants entering the water (Fabenro, 2002). The study is therefore focused on the haematological changes in *Clarias gariepinus* exposed to different levels of *Momordica charantia* leaf powder as well as its effect on water quality parameters.

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MATERIALS AND METHODS

Momordica charantia leaves were harvested form a farm land within the University of Calabar campus. They were washed and air dried for four days and powdered. The fish, *Clarias gariepinus* fingerlings, were obtained from a commercial fish farm in Calabar. Four different fish diets were formulated using Pearson's method of feed formulation to contain about 40% crude protein. This was done by incorporating, 0%, 20%, 40% and 60% of *Momordica charantia* powdered leaf to replace equal weight of soyabean fish meal. This is shown in Table 1.

Twelve aquaria were used and each of them was stocked with twenty five fingerlings. The fishes were allowed to acclimatize to the laboratory environment for one week during which period they were fed on commercial diet. They were all starved for twenty four hours prior to introduction to the experimental diet. The fishes were weighted. The aquaria were randomly allocated to the fish diets D1, D2, D3, and D4 in triplicate. The fishes were randomly distributed into the aquaria at a stocking density of twenty five fingerlings per aquarium. They were fed with the diet corresponding to 5% of their body weight for six weeks. The feeding was carried out twice daily (7.00-7.30am and 5.30-6.00pm). After six weeks five fishes, randomly selected, were sacrificed from each aquarium and subjected to haematological examination. The blood sample was collected using 2.0ml plastic syringe as described by Kori-Siakpere (1998). The region to be punctured was cleaned with tissue paper and the blood obtained from the caudal circulation.

Table 1. Ingredient composition of the formulated diets (%DM)

Ingredient ($g/100_g$)	Diet I	Diet 2	Diet 3	Diet 4
Blood meal (80%CP)	10.0	10.0	10.0	10.0
Fish meal (65%CP)	22.0	20.0	20.0	20.0
Soyabean meal (44%CP)	38.0	-	-	-
M. charantia leaf (15.4%CP)	-	43.4	48.8	54.2
Maize (10%CP)	20.0	14.4	9.2	3.8
Vegetable oil	6.0	6.0	6.0	6.0
Vitamin/mineral premix	2.0	2.0	2.0	2.0
Binder	2.0	2.0	2.0	2.0
Total	100.0	100.0	100.0	100.0

Calculated crude protein (CP) 41.02, 40.52, 40.01, 39.1

The blood sample was stored at room temperature for 25-35min in an anticoagulant test tube and stored in a refrigerator until the analysis (Clark *et al.*, 1999). The work was done in triplicate and ethylene diamine tetracetic acid (EDTA) was used as the anticoagulant. Colourimetric method was used for determination of total protein and albumin level.

The anaemic response is attributed to destruction of erythrocyte production resulting in increase in white blood cells (Clark *et al.*, 1979). The decrease in value of albumin may impede its function of transportation (Harttingh *et al.*, 1974) and this contributes to increased toxicity. The survival rate for the fish fed with the feed containing 43.3, 48.8 and 54.2% of *Momordica charantia* leaf is 93.60, 92.0 and 89.20% respectively. This clearly shows that the observed toxicity increases with increase in the proportion of *Momordica charantia* in the feed.

Table 3. shows the effect of the of *Momordica charantia* leaf in the fish feed on various water parameters. Temperature increased from 23.2 to 24.3 ^{0}C while pH increased from 6.91 to 8.50. On the other hand dissolved oxygen decreased from 8.65 to 3.80mgl^{-1} while alkalinity increased from 69.65 to 135.7mgl^{-1}. These results show that the presence of *Momordica charantia* leaf significantly affected the water quality and this effect is concentration dependent.

Table 2. Variation of haematatoglical parameters of Clarias gariepinus with the level of Momordica charantia leaf in the fish feed

Treatment Diet	Hct (%)	RBC (mm^3)	WBC (mm^3)	Hb (gdl^{-1})	Total protein (%)	Albumin level(%)
1	17.0±1.22	1.80±0.26	4.04±0.00	6.93±2.64	6.07±0.13	3.26±0.22
2	15.1±1.01	1.51±0.65	4.61±0.10	4.61±0.32	4.96±0.19	2.89±1.13
3	8.4±0.66	1.21±1.05	5.07±0.12	4.02±0.01	3.91±0.23	2.50±0.13
4	6.02±1.83	1.08±1.04	5.91±0.88	3.17±0.41	3.12±0.21	1.91±1.26

Table 3. Variation of water quality with different levels of Momordica charantia

Parameter	Treatment 1	Treatment 2	Treatment 3	Treatment 4
Temperature (^{0}C)	23.20±0.00	23.5±0.2	24.1±0.1	24.3±0.1
Dissolved oxygen (mgl^{-1})	8.65±0.1	7.9±0.03	4.9±1.1	3.8±2.2
pH	6.91±0.0	7.6±0.1	8.0±0.2	8.5±0.0
Alkalinity (mgl^{-1})	69.65±0.0	90.1±0.4	115.5+1.1	135.7±1.4

Red blood cells (RBC), white blood cells (WBC) and platelet counts were analysed using Neubaur haemocrytometer. The haematocrit (HCT) or parked cell volume (PVC) were obtained using microhaematocrit capillary tube method (Svobodva *et al*., 1991). Water quality was tested and measured fortnightly. The temperature was also measured with thermometer. The pH was taken and dissolved oxygen was also determined by APHA (2005) methods.

Table 2 shows the effect of *Momordica charantia* leaf on such haematological parameters of *Clarias gariepinus* as haematocrit (Hct), red blood cells (RBC), white blood cells (WBC), haemoglobin (Hb), total protein and albumin level. There was observed decrease in haematocrit, red blood cells, haemoglobin, total protein and albumin level with increase in the level of powdered leaf in the feed. On the other hand white blood cells increased with increase in the level of the leaf powder. The observed discrepancy in haematological parameters is because the toxicity of fish poisons increases inversely to the concentration of oxygen in water (Lloyd, 1962). Fish poisons become more toxic at low oxygen concentrations because of the increased respiratory rate thus increasing the amount of poison which the fish is exposed to (Tobar, 1990). The observed decreased in haematocrit, an anaemic response, has also been reported in *Clarias gariepinus* exposed to malachite green (Musa and Omoregie, 1999).

pH at the higher levels of *Momordica charantia* is higher than recommended for fresh water fish (Noga, 1996) indicating alkaline condition of the water. This apparently resulted in the observed decrease in the level of dissolved oxygen with corresponding increase in alkalinity.

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