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Study on the haematological and biochemical parameters

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Abstract
The effects of parasites on fish include nutrient devaluation, alteration of biology and behaviour lowering of immune capability, induction of blindness, morbidity, mortality, growth and fecundity reduction and mechanical injuries depending on the parasite species and load. Haemato-biochemical indices have been employed in effectively monitoring the responses of organisms to stressors and thus its health status under such adverse conditions. The main aim is this investigating the impact of parasities on the haematological and biological parameters of selected bagrid species from Hower River Bagmati, Samastipur, Bihar

Keywords: Haematological and Biochemical Parameters

Introduction
Parasites are a serious concern to freshwater and marine fishes throughout the world, and are of particular importance in the tropics. They constitute a major limiting factor to the growth of farmed fish in Nigeria. The effects of parasites on fish include nutrient devaluation, alteration of biology and behaviour lowering of immune capability, induction of blindness, morbidity, mortality, growth and fecundity reduction and mechanical injuries depending on the parasite species and load [1-3]. Haemato-biochemical indices have been employed in effectively monitoring the responses of organisms to stressors and thus its health status under such adverse conditions. Generally, haematological tests are used to establish normal health status and to diagnose diseases caused by various factors: viz heavy metals, environmental stress, parasitic infections, genotoxic effect of pollutants, nutrition, and pollution in human and veterinary science, haematological parameters act as physiological indicators to changing External environments as a result of their relationship with metabolic levels (energetic), respiration (haemoglobin) and defence mechanisms. They also provide an integrated measure of the health status of an organism, which over time manifests in changes in weight hence, the changes associated with Haemato-biochemical parameters due to various parasites establish a database, which could be used in diseases diagnosis and in guiding the implementation of the treatment or preventive measures. Several researches on the biology, ecology and parasites of the fishes of Lower River Benue have been documented among others [4-6]. However, none of these studies accounts for the physiological impact of parasites on the fishes of the River.
This work therefore, aimed at investigating the impact of parasites on the haematological and biochemical parameters of selected bagrid species from Lower River Bagmati Samastipur, Bihar.

Material and Methods
120 fish samples comprising of 60 each of Bagrus bayad and Bagrus docmak of different sizes were purchased from Wadata Market, Makurdi, Benue State. The fins, gills and skins (external surfaces) of the fish samples were brushed into a petri-dish containing normal saline and examined with a hand lens for the presence of ectoparasites. Scrapings from the skin, fins and gills of each fish were taken and smeared on glass slides for examination of any parasite. Fish gills were dissected out and each gill filament and arch was examined with a hand lens for the presence of any parasitic cysts. The fishes were dissected to expose the viscera. The visceral cavities and organs were examined for endoparasites. The guts were removed and placed in petri dishes and the contents of the guts were flushed with normal saline into beakers and then shaken in order to loosen mucus and other intestinal debris.

After centrifugation and decanting of the supernatant, parasites were recovered from the residue. Recovered parasites were mounted on slides and viewed under light microscope and identified to species level. All recovered parasites were counted and recorded.

Haematological and biochemical assay of the fish samples

From the 120 fish samples that were bought, blood samples were collected from the caudal peduncle and heart of the gently sacrificed fish samples using 2ml plastic syringe and needle treated with anti-coagulant as described. The blood samples for haematological studies were preserved in EDTA embedded bottles while that of enzymes; Aspartate amino transaminase (AST), Alanine aminotransferase (ALT) and alkaline phosphatase (ALP), Creatinine and Urea analysis were preserved in heparinised bottles. Packed cell volume (PCV) was determined using Hawsley micropillary tubes and centrifuged for 5 minutes. Red blood cells (RBC), white blood cells (WBC), haemoglobin (Hb) and packed cell volume (PCV) were analysed according to the methods. The heparinised blood samples were centrifuged at 300 rpm for 10 minutes and the serum collected for analysis. AST and ALT, ALP, urea and creatinine were analysed to the methods.

Result and Discussion

The present study are shown in Table 1. Out of the 120 fish samples comprising of 60 each of Bagrus bayad and Bagrus docmak used, 145 (60.42%) fish samples comprising of 67 (46.21%) samples of Bagrus bayad and 78 (53.79%) samples of Bagrus ducmack were not infested with any parasite while 95 (39.58%) fish samples comprising of 52 (54.74%) samples of Bagrus bayad and 43 (45.26%) samples of Bagrus docmak were infested with 389 different parasites belonging to one species of protozoan (Tricodina acuta) found on the gills and skin of their fish hosts, two species of Cestode (Diphilobothrium latum and Hymenolepis nana), two species of Nematode (Capillaria philipinensis and Eustrongylids excisus), all which were found in the intestine and stomach of their fish hosts ; while Bagrus bayad accounted for 207 (53.21%) of the total parasites, Bagrus docmak recorded 182 (46.79%) parasites. Bagrus bayad had higher prevalence (43.33%) but lower intensity (3.98) than Bagrus dockmak with 35.83% prevalence and 4.23 intensity, respectively.

Table 1: Fish samples comprising of Bagrus bayad and Bagrus docmak

Fish species	No. of fish examined	No. (%) of fish infested	No. (%) of parasites recovered	No. (%) of fish not infested	Parasitic Prevalence	Parasitic intensity
B. bayad	60	52 (54.74)	207 (53.21)	67 (46.21)	43.33	3.98
B. docmak	60	43 (45.26)	182 (46.79)	78 (53.79)	35.83	4.23
Total	120	95 (39.58)	389 (100)	145 (100)		

Results of the mean haemo-biochemical parameters of Bagrus bayad and Bagrus docmak used for the study are shown in Table 2.

Haematological parameters such as red blood cell (RBC) of 5.76±0.93 and packed cell volume (PCV) of 31.58±3.94 were higher in B. docmak than B. bayad with lower RBC and PCV of 5.74±0.97 and 31.23±3.83, respectively. Conversely, Haemoglobin concentration (Hb) of 9.21±1.27 and white blood cell of 4.38±1.83 were higher in B. bayad than B. docmak with mean Hb and WBC of 9.21±1.27 and 4.25±1.75, respectively. Biochemically, while the mean alkaline phosphatase (ALP) of 64.76±6.50, creatinine (1.34±0.17), and Urea (31.73±3.92) were higher in B. bayad than B. docmak, mean aspartate amino transaminase (AST) of 84.67±6.36 and alanine aminotransferase (ALT) of 112.22±10.04 were higher in B. docmak than B. bayad of the mean haemological and biochemical parameters of infected and uninfected B. bayad and B. docmak used for the study are shown in Table 3

Table 2: Mean haemato logical and biochemical parameters of B. bayad and B. docmak from Lower River Benue

Parameters	Fish species		P-value
	B. bayad	***B. docmak***	
RBC (Cells/mm^3)	5.74±0.97	5.76±0.93	0.99
PCV (%)	31.23±3.83	31.58±3.94	0.95
HB (g/dl)	9.21±1.27	8.99±1.10	0.90
WBC (Cells/mm^3)	4.38±1.83	4.25±1.75	0.96
AST (U/L)	84.54±6.57	84.67±6.36	0.99
ALT (U/L)	111.69±10.43	112.22±10.04	0.97
ALP (U/L)	64.76±6.50	64.62±4.31	0.98
CRT (U/L)	1.34±0.17	1.33±0.19	0.99
UREA (U/L)	31.73±3.92	31.39±2.53	0.90

Table 3: Mean haemological and biochemical parameters of infected and uninfected *B. bayad* and *B. docmak* from Lower River Benue

Parameters	Fish species/health status					
	B. bayad		P-value	***B. docmak***		P-value
	Infected	Uninfected		Infected	uninfected	
RBC (Cells/mm3)	4.08±0.08	7.40±0.04	0.01	4.17±0.01	7.35±0.35	0.01
PCV (%)	24.60±0.01	37.86±0.30	0.00	24.77±0.02	38.39±0.61	0.00
HB (g/dl)	7.04±0.01	11.38±0.52	0.01	7.09±0.01	10.89±0.14	0.01
WBC (Cells/mm3)	$1.21\pm0.01\times10^2$	$7.55\pm0.05\times10^1$	0.00	$1.22\pm0.01\times10^2$	$7.29\pm0.29\times10^1$	0.02
AST (U/L)	95.93±0.08	73.16±0.03	0.00	95.68±0.33	73.66±0.35	0.00
ALT (U/L)	129.75±0.25	93.64±0.37	0.00	129.60±0.50	94.85±0.26	0.00
ALP (U/L)	76.01±0.09	53.52±0.49	0.00	76.00±1.00	52.96±0.05	0.00
CRT (U/L)	1.64±0.02	1.04±0.02	0.00	1.66±0.05	1.33±0.19	0.01
UREA (U/L)	38.50±0.50	24.96±0.34	0.00	37.60±0.60	24.49±0.04	0.00

Haematologically, RBC, Hb and WBC were higher in the infected samples of both species than the uninfected counterparts. Nonetheless, it was observed that the mean WBC was higher in the infected B. bayad ($1.21\pm0.01\times10^2$) and B. docmak ($1.22\pm0.01\times10^2$) than the uninfected samples of B. bayad ($7.55\pm0.05\times10^1$) and B. docmak ($7.29\pm0.29\times10^1$), respectively. However, there was significant difference ($p<0.05$) in the haematological parameters of infected and uninfected samples of fish species used for the study. Biochemically, infected samples of both species recorded higher AST, ALT, ALP, Creatinine and Urea than the uninfected counterparts of the fish species.

The present study showed that parasitic infection alters haematological parameters of B. bayad and B. docmak. Parasites caused reduction in RBCs, Hb and Hct. some studies demonstrated a reduction in RBC, Hb and Hct in relation to parasitism. Nevertheless, other studies showed that parasites as a stressor stimulate the primary stages of stress and affect haematocrit. Parasitic infection stimulates releasing catecholamine, which can mobilize red blood cells from spleen or induce red blood cell swelling as a result of fluid shift into the intracellular compartment (Wells and Webber) [7-10]. WBCs play a great role during parasitic infestation by stimulating the haemopoietic tissues and the immune system by producing antibodies and chemical substances working as defense against infection (Lebelo *et al*.) [11].

The values of WBCs were higher in infected fish compared to uninfected samples. The increase of serum WBCs has been well known as immune response to variety of infections. Therefore, the increase or elevation of WBCs in infected samples B. bayad and B. docmak may be a response of cellular immune system to parasitic infection. The activity of the serum ALP in the parasite infected bagrid species of the Lower River Benue showed a significant increase when compared to the uninfected fishes.

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