

Table 2 Results of haematological parameters

Parameters	Control	Treatment A	Treatment B	Treatment C
Conc.	0 mg/25 cL	(3000 mg/25 cL)	(5000 mg/25 cL)	(7000 mg/25 cL)
PCV (%)	38.31 ^c	34.22 ^b	28.23 ^a	28.11 ^a
Hb (g/dL)	12.31 ^d	11.82 ^c	9.71 ^a	9.50 ^a
RBCs (10 ^{12/L})	3.30 ^b	3.02 ^b	2.51 ^a	2.13 ^a
WBCs (×10 ^{9/L})	15.82 ^c	14.11 ^d	13.75 ^c	10.90 ^a
HET. (%)	28.02 ^a	34.12 ^c	34.02 ^c	37.04 ^d
LYM (%)	69.03 ^c	64.03 ^b	65.10 ^b	60.11 ^a
MCV (pg)	115.15 ^c	133.33 ^b	112.80 ^a	112.33 ^b
MCH (pg)	45.24 ^d	39.33 ^c	38.80 ^b	37.27 ^a
MCHC (g/dL)	34.71 ^c	34.64 ^c	33.93 ^b	32.27 ^a

Means along each row with different superscripts are significantly ($p < 0.05$) different. The values shown are the means and the standard deviations. Conc.= concentration, PCV = packed cell volume, Hb = haemoglobin, RBCs= red blood cell counts, WBCs =white blood cell count, HET = heterophil, LYM = lymphocyte, MCH = mean cell haemoglobin, MCV = mean cell volume, MCHC = mean cell haemoglobin concentration, fL = femtolitre, pg = picogram

Gebrelibanos et al. (2014), reported that *Senna* species had been known to cause a variety of toxicities despite their many potential medicinal benefits; this has been a major concern in aquaculture production (Idowu et al., 2017), as well as a condition wherein living organisms exhibit changes in their bodily systems and manifest symptoms due to impaired physiological functions (Adedeji et al., 2017), such as aggression, loss of balance, and erratic swimming. During this experiment, it was frequently noticed that the fish responded to environmental changes as soon as the extract was added to the water body. These responses included the morphological and behavioural indicators shown in Table 1. Fish were seen gasping for breath in the tanks containing high concentrations of *S. occidentalis* ethanol leaf extract (5000 and 7000 mg/ 25 cL), and whitening of the fins and barbels were noted in the tanks with concentrations of 3000 and 7000 mg/ 25 cL; this could be due to the potency and toxicological effectiveness of the phytochemicals (alkaloids, flavonoids, tannins, glycosides, steroids, and saponin) found in the plant extracts.

The gradual changes in the haematological parameters of *C. gariepinus* juveniles recorded in this study indicate that *S. occidentalis* ethanol leaf extract affects the blood of the exposed fish. The findings showed that the values of Mean Corpuscular Volume (115.15-112.33 fL), Hemoglobin (12.31-9.50 g/dL), Red Blood Cell (3.30-2.13 × 10^{12/L}), White Blood Cell (15.82-10.90 × 10^{9/L}), Packed Cell Volume (38.31%-28.11%), and Mean Cell Hemoglobin concentration (34.71-32.27 g/dL) decreased as *S. occidentalis* concentrations increased relative to the control treatment, while Heterophils (28.02%-37.04%) increased as *S. occidentalis* concentrations increased; this could be as a result of the poisonous potentials of *S. occidentalis* ethanolic extract, which rose with an increase in extract concentration in *C. gariepinus* blood; this is in line with studies by Eriegha et al., (2017); Idowu et al., (2020), who confirmed that infected fish had lower PCV values than healthy fish and observed a similar pattern in fish exposed to toxicants. Erythrocytes serve as models for assessing toxicity-induced apoptosis, oxidative stress, and cellular damage in fish (Sakuragui et al., 2019). Thus, the altered erythrocyte morphology and indices recorded here in *C. gariepinus* indicate that *S. occidentalis* phytochemicals may promote oxidative injury or apoptotic pathways in circulating red blood cells. Moreover, a decrease in RBC, Hb, and PCV typically indicates an anemic response to toxicants, resulting from direct hemolysis. A similar decrease in Ht, RBC, and Hb was reported in *Anabas testudineus* exposed to acrylamide (Ligina et al., 2022). Also, Ko et al. (2019) reported a concentration-related decrease in Ht, Hb, and RBC of *Platichthys stellatus* intoxicated with hexavalent chromium.

Leukocyte count (WBC) and differential leukocyte count (DLC) are standard indicators of immune status in fish. Toxicants commonly alter WBC, producing leukocytosis or leukopenia (Witeska et al., 2023). In the present study, *Clarias gariepinus* exposed to *Senna occidentalis* leaf extract showed a decrease in the value of WBC, suggesting that phytochemicals from *S. occidentalis* elicit a cytotoxic suppression of leukocyte homeostasis. Thus, hematology provides sensitive, practical biomarkers for assessing plant-based toxicants and indiscriminate use of *S. occidentalis* in aquaculture.