

2.12 Statistical analysis

Data obtained from the experiment were expressed as mean $\pm$ standard deviation (SD). Treatment means were subjected to one-way analysis of variance (ANOVA), and where significant differences were observed, Duncan's Multiple Range Test was used to separate the means. Statistical significance was established at $P < 0.05$.

3 Results

3.1 Proximate composition of experimental diets

The proximate composition of the control and herbal-supplemented diets is presented in Table 1. Differences in nutrient composition were observed among the experimental diets following the inclusion of garlic, ginger, and neem.

Moisture content varied from 9.07% in the ginger-supplemented diet to 10.18% in the neem diet. Ash content was relatively higher in the neem (4.65%) and ginger (4.38%) diets than in the control (3.08%) and garlic (3.04%) diets.

The inclusion of the herbal additives resulted in slightly higher crude protein levels, with the neem-based diet recording the highest value (23.40%). Crude protein content in both the garlic and ginger diets was 22.00%, compared with the control diet. A similar trend was observed for crude fibre content, which increased from 7.20% in the control diet to 11.00% in the ginger-supplemented diet.

Ether extract ranged from 12.00% in the control diet to 15.00% in the ginger diet. In contrast, nitrogen-free extract decreased following herbal supplementation and was highest in the control diet (47.85%).

Table 1 Proximate composition (%) of the experimental diets

Parameter (%)	Control	Garlic (2%)	Neem (2%)	Ginger (2%)
Moisture	9.57	9.24	10.18	9.07
Ash	3.08	3.04	4.65	4.38
Crude fibre	7.20	7.47	8.80	11.00
Crude protein	20.30	22.00	23.40	22.00
Ether extract	12.00	12.41	14.29	15.00
Nitrogen-free extract	47.85	45.84	38.68	38.55

3.2 Haematological responses of *Clarias gariepinus*

The haematological characteristics of *Clarias gariepinus* fed the experimental diets are presented in Table 2. Dietary supplementation with garlic, ginger, and neem influenced several erythrocytic and leucocytic parameters.

Table 2 Haematological parameters of *Clarias gariepinus* fed experimental diets

Parameter	Control	Garlic (2%)	Ginger (2%)	Neem (2%)
PCV (%)	32.20 $\pm$ 2.96 ^{ab}	37.80 $\pm$ 2.69 ^a	30.20 $\pm$ 0.66 ^b	34.40 $\pm$ 1.91 ^{ab}
Plasma protein (g dL ⁻¹)	6.56 $\pm$ 0.45	5.96 $\pm$ 0.30	5.84 $\pm$ 0.24	6.02 $\pm$ 0.34
Hb (g dL ⁻¹)	10.72 $\pm$ 0.93 ^{ab}	12.48 $\pm$ 0.77 ^a	10.04 $\pm$ 0.28 ^b	11.36 $\pm$ 0.67 ^{ab}
WBC (cells μ L ⁻¹)	4890 $\pm$ 302 ^b	5690 $\pm$ 93 ^{ab}	5660 $\pm$ 529 ^{ab}	6750 $\pm$ 469 ^a
RBC ($\times 10^6$ cells μ L ⁻¹)	23.60 $\pm$ 4.10 ^b	51.80 $\pm$ 3.38 ^a	20.00 $\pm$ 2.30 ^b	48.00 $\pm$ 6.36 ^a
Neutrophils (%)	41.20 $\pm$ 0.58 ^b	46.40 $\pm$ 4.99 ^{ab}	44.80 $\pm$ 0.37 ^{ab}	50.00 $\pm$ 0.71 ^a
Lymphocytes (%)	50.80 $\pm$ 1.74	49.80 $\pm$ 5.02	48.80 $\pm$ 0.58	44.80 $\pm$ 0.80
Monocytes (%)	2.80 $\pm$ 0.37 ^a	2.00 $\pm$ 0.00 ^b	1.60 $\pm$ 0.24 ^b	2.00 $\pm$ 0.00 ^b
Eosinophils (%)	5.00 $\pm$ 1.00 ^a	2.60 $\pm$ 0.40 ^b	4.40 $\pm$ 0.24 ^a	4.00 $\pm$ 0.00 ^{ab}
Basophils (%)	1.00 $\pm$ 0.00	1.00 $\pm$ 0.00	1.00 $\pm$ 0.00	1.00 $\pm$ 0.00

Table notes: Values are presented as mean $\pm$ SD. Means within a row bearing different superscripts differ significantly at $P < 0.05$.

Fish fed the garlic-supplemented diet exhibited the highest packed cell volume (37.80 $\pm$ 2.69%) and haemoglobin concentration (12.48 $\pm$ 0.77 g dL⁻¹), whereas the lowest values were recorded in fish fed the ginger diet. Red