2.9 Statistical analysis

Bacteriological characteristics and physiochemical analysis resulting from the experiment were subjected to one-way analysis of variance (ANOVA) using SPSS (Statistical Package for Social Sciences 2006 version 15.0). Duncan's multiple range test was used to compare differences among individual means.

3 Results

3.1 Water quality parameters of the experimental pond water

The physicochemical properties of the experimental pond water showed a pH range of 7.0~8.5, Temperature 21.3 ℃ ~33.0 ℃, and Total suspended solids 25.0~41.0 (mg/L), and there were significant differences ($p < 0.05$) among the treatments in pH, temperature and total dissolved solids (Table 1).

Table 1 Water quality parameters of the experimental pond water

1	0	2	4	6	8
Ph					
Pond 1	7.10±0.01^{a}	8.00±0.06^{b}	7.50±0.01^{ab}	7.20±0.00^{a}	8.50±0.06^{c}
Pond 2	7.40±0.03^{a}	7.20±0.00^{a}	8.00±0.04^{bc}	7.50±0.04^{ab}	7.50±0.04^{ab}
Pond 3	7.10±0.04^{a}	7.50±0.01^{ab}	8.50±0.03^{c}	7.30±0.06^{b}	8.00±0.02^{bc}
Pond 4	7.20±0.02^{a}	7.70±0.03^{ab}	7.70±0.02^{ab}	8.50±0.08^{a}	7.20±0.01^{a}
Pond 5	7.00±0.05^{a}	8.20±0.05^{b}	8.00±0.05^{bc}	7.20±0.03^{ab}	7.60±0.03^{ab}
Pond 6	7.30±0.07^{a}	8.00±0.00^{b}	7.20±0.02^{a}	7.00±0.01^{ab}	7.40±0.04^{ab}
Temperature (℃)					
Pond 1	21.30±0.02^{a}	26.60±0.00^{c}	27.90±0.03^{c}	29.70±0.08^{e}	33.00±0.09^{d}
Pond 2	25.60±0.08^{c}	27.00±0.01^{c}	25.00±0.02^{b}	26.70±0.01^{c}	27.30±0.02^{b}
Pond 3	23.70±0.04^{b}	22.00±0.04^{a}	21.60±0.01^{a}	27.20±0.07^{c}	25.20±0.03^{a}
Pond 4	30.40±0.09^{e}	28.60±0.06^{e}	22.70±0.95^{a}	24.30±0.03^{a}	29.00±0.07^{c}
Pond 5	28.50±0.06^{d}	24.90±0.05^{b}	31.20±0.09^{d}	28.20±0.06^{d}	25.00±0.05^{a}
Pond 6	25.80±0.07^{c}	27.90±0.03^{d}	22.00±0.06^{b}	25.00±0.04^{b}	27.00±0.03^{b}
Total dissolved solid (TDS) (mg/L)					
Pond 1	39.40±0.07^{e}	29.20±0.03^{c}	27.50±0.05^{b}	36.50±0.02^{f}	38.00±0.05^{c}
Pond 2	26.20±0.02^{b}	25.50±0.00^{a}	30.50±0.07^{d}	31.60±0.04^{d}	40.20±0.09^{d}
Pond 3	41.00±0.09^{e}	36.20±0.05^{f}	31.20 ±0.01^{e}	29.60±0.06^{c}	29.80± 0.01^{b}
Pond 4	30.20±0.08^{c}	27.40±0.04^{b}	28.50±0.02^{c}	24.20±0.00^{a}	30.00±0.03^{b}
Pond 5	25.00±0.05^{a}	30.00±0.01^{d}	25.60±0.04^{a}	33.00±0.03^{e}	27.50± 0.02^{a}
Pond 6	33.40±0.03^{d}	31.00±0.2 ^{e}	30.00 ± 0.06^{d}	26.20±0.01^{b}	28.00± 0.04^{a}

Means (n =2) in the same column with similar superscripts are not significantly different ($p > 0.05$)

3.2 Bacteria counts of experimental pond water and fish tissues (gill, liver and intestine)

A total of 30 water samples from the experimental fish ponds were analyzed for total bacteria counts at 0, 2, 4, 6 and 8th week and 54 fish tissues (gills, intestine, liver) from *C. gariepinus* juveniles in all the experimental ponds were analyzed for total bacteria counts at 0, 4 and 8th week. Test for the presence of presumptive *P. shigelloides* revealed that the bacterium was present in *C. gariepinus* tissues and experimental pond water. The Plesiomonas count on *C. gariepinus* tissues (gills, liver and intestine) ranges between 6.4 to 7.0 $\log_{10}$ CFU/g while the Plesiomonas count on experimental pond water ranges between 5.6 to 7.0 $\log_{10}$ CFU/mL. There was no significant difference ($p > 0.05$) in the total bacteria observed in the gill, liver and intestine and experimental pond water among the experimental groups except for experimental pond water at the 6th week who recorded significant differences ($p < 0.05$) among the groups (Table 2).

3.3 Isolation of *Plesiomonas shigelloides*

A total of 250 isolates were obtained from both the aquaculture effluent (pond water) and fish tissues (gill, liver and intestine). Morphological identification was analyzed based on the shape, texture and colour of bacteria colonies on inositol brilliant bile green agar. The microscopic cell morphology analysis of the presumptive *P.*