

Supporting information

Synthesis and Efficacy of the N-carbamoyl-methionine copper on the growth performance, tissue mineralization, immunity and enzymatic antioxidant capacity of Nile tilapia (*Oreochromis niloticus*)

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Supporting information content:

1. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in muscle of *Oreochromis niloticus*.
2. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in liver of *Oreochromis niloticus*.
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4. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in intestine of *Oreochromis niloticus*.

Effects of different Cu sources as the experimental diets on metal elemental concentration changes in muscle of *Oreochromis niloticus*

Table S1. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in muscle of *Oreochromis niloticus*

Experimental diets	Concentration (mg/kg)			
	Cu	Zn	Fe	Mn
Blank group	3.90±0.22 ^b	20.92±2.20 ^b	23.52±6.49 ^b	1.71±0.23 ^b
CuSO ₄ group	3.47±0.14 ^a	21.91±0.17 ^b	23.06±3.95 ^b	1.10±0.06 ^a
NCM-Cu group	4.99±0.21 ^c	15.97±0.55 ^a	16.94±2.23 ^a	1.00±0.05 ^a

All the data means ±SD (n=3) in triplicate, means in the same column with different superscript letters are significantly different (P<0.05).

1. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in liver of *Oreochromis niloticus*

Table S2. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in liver of *Oreochromis niloticus*

Experimental diets	Concentration (mg/kg)			
	Cu	Zn	Fe	Mn
Blank group	113.80±21.60 ^a	51.94±2.06 ^b	315.08±7.95 ^b	3.92±0.45 ^b
CuSO ₄ group	144.57±13.73 ^b	46.55±3.78 ^b	322.15±4.29 ^b	3.30±0.32 ^a
NCM-Cu group	154.34±19.00 ^b	43.27±2.79 ^a	300.74±6.18 ^a	3.34±0.24 ^a

All the data means ±SD (n=3) in triplicate, means in the same column with different superscript letters are significantly different (P<0.05).

2. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in gill of *Oreochromis niloticus*

Table S3. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in gill of *Oreochromis niloticus*

Experimental diets	Concentration (mg/kg)			
	Cu	Zn	Fe	Mn
Blank group	5.75±0.08 ^b	69.30±4.23 ^{ab}	195.50±32.76	7.21±0.18
CuSO ₄ group	5.49±0.35 ^a	74.35±2.17 ^b	209.69±4.44	6.54±0.79
NCM-Cu group	7.18±0.05 ^c	67.99±6.89 ^a	178.16±58.57	6.94±0.65

All the data means ±SD (n=3) in triplicate SD (n=3) in triplicate, means in the same column with different superscript letters are significantly different (P<0.05).

3. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in intestine of *Oreochromis niloticus*

Table S4. Effects of different Cu sources as the experimental diets on metal elemental concentration changes in intestine of *Oreochromis niloticus*

Experimental diets	Concentration (mg/kg)			
	Cu	Zn	Fe	Mn
Blank group	7.39±0.50 ^a	74.85±1.13 ^b	129.15±2.58 ^b	15.61±0.78 ^b
CuSO ₄ group	8.29±0.36 ^b	75.13±0.55 ^b	101.57±3.48 ^a	12.29±0.07 ^a
NCM-Cu group	8.48±0.17 ^b	70.15±1.76 ^a	155.56±30.68 ^c	12.41±0.86 ^a

All the data means ±SD (n=3) in triplicate, means in the same column with different superscript letters are significantly different (P<0.05).