**SUPPLEMENTARY MATERIAL**

**Supplemental Table 1.** Formulation and proximate composition of the experimental diets.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | C | CT | HC | HCT |
| *Formulation* (*%*) | | | | |
| Fish meal | 8.00 | 8.00 | 8.00 | 8.00 |
| Soybean meal | 26.00 | 26.00 | 26.00 | 26.00 |
| Rapeseed meal | 17.00 | 17.00 | 17.00 | 17.00 |
| Cottonseed meal | 17.00 | 17.00 | 17.00 | 17.00 |
| Fish oil | 2.00 | 2.00 | 2.00 | 2.00 |
| Soybean oil | 2.00 | 2.00 | 2.00 | 2.00 |
| Corn starch | 12.00 | 12.00 | 25.00 | 25.00 |
| Thiamine (mg/kg) | 0 | 1.5 | 0 | 1.5 |
| Microcrystalline cellulose | 13.00 | 13.00 | 0.00 | 0.00 |
| Calcium biphosphate | 1.80 | 1.80 | 1.80 | 1.80 |
| Premix† | 1.20 | 1.20 | 1.20 | 1.20 |
| *Proximate composition* (*% air-dry basis*) | | | | |
| Moisture | 6.96 | 6.42 | 6.85 | 6.95 |
| Crude lipid | 5.93 | 6.11 | 5.71 | 5.66 |
| Ash | 8.46 | 8.12 | 7.78 | 7.73 |
| Crude protein | 29.82 | 30.06 | 30.12 | 30.03 |
| Crude fiber | 16.97 | 18.26 | 5.68 | 5.80 |
| Nitrogen-free extract‡ | 31.86 | 31.03 | 43.75 | 43.83 |
| Energy (MJ kg-1) | 19.09 | 19.09 | 19.24 | 19.31 |

C, the control diet; CT, the C diet supplemented with 1.5 mg kg-1 thiamine; HC, the high-carbohydrate diet; HCT, the HC diet supplemented with 1.5 mg kg-1 thiamine (the same below).

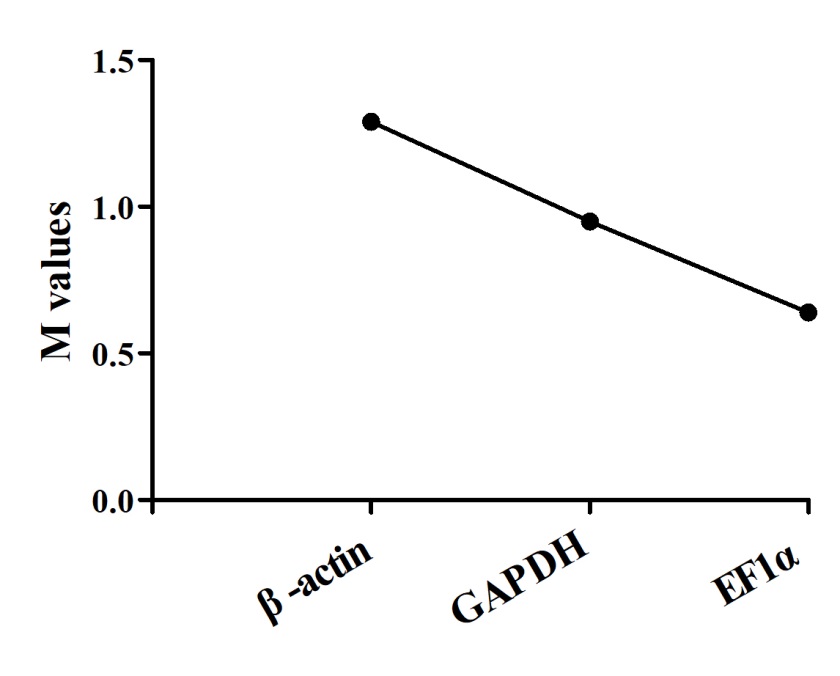
†Premix supplied the following minerals and/or vitamins (per kg): CuSO4·5H2O, 2.0 g; FeSO4·7H2O, 25 g; ZnSO4·7H2O, 22 g; MnSO4·4H2O, 7 g; Na2SeO3, 0.04g; KI, 0.026 g; CoCl2·6H2O, 0.1 g; Vitamin A, 900,000 IU; Vitamin D, 200,000 IU; Vitamin E, 4500 mg; Vitamin K3, 220 mg; Vitamin B2, 1090 mg; Vitamin B5, 2000 mg; Vitamin B6, 500 mg; Vitamin B12, 1.6 mg; Vitamin C, 5000 mg; Pantothenate, 1000 mg; Folic acid, 165 mg; Choline, 60,000 mg.

‡Calculated by difference (100 - moisture - crude protein - crude lipid - ash - crude fiber).

**SupplementalTable 2.** Nucleotide sequences of the primers used to assay gene expressions by real-time PCR.

|  |  |  |  |
| --- | --- | --- | --- |
| Target gene | Forward (5′-3 ) | Reverse (5′-3 ) | Accession  numbers or references |
| AMPKα1 | AGTTGGACGAGAAGGAG | AGGGCATACAAAATCAC | ARF07712.1 |
| AMPKα2 | ACAGCCCTAAGGCACGATG | TGGGTCGGGTAGTGTTGAG | KX061841 |
| PGC-1α | AAGGCATAAGGGTAATCGTA | GAACGAGCTGCACTTTTCCC | MH791034 |
| PGC-1β | GTGAGGAACGGGGAGATTG | AGGGGGGTGAACAGGAAAC | (46) |
| β-globin | GAATGCTCATCGTCTACCCTCA | ATGGCTGTCATCACAGTTTTGC | (47) |
| TFAM | TCCGAAAGTTAGCAGAGA | ATGAAGATGTTGAAGGCG | KT380498.1 |
| Mfn-1 | CTCCAGATGCTCATTCCCT | TTCCTTGGCTTTGGTTGTC | (46) |
| Opa-1 | CTTGTTGACTTGCCTGG | TTCATTACGGATGTGCT | (46) |
| Drp-1 | CAGAGGGACTGCGAGGTT | GGCTTGAGCAAAAGGGAA | (46) |
| Fis-1 | ATACAAGCAAAAAAGACGAT | ATACAAAATAAAAAAAGGGG | (46) |
| Mff | CCCGAGAGAATCGTAGTGG | GGCGTCTTGAGGGACAGTG | (46) |
| ND-1 | CTGACCACTAGCCGCAATA | GGAAGAAGAGGGCGAAGG | NC010341 |
| CYTB | CATACACTATACCTCCGACAT | TCTACTGAGAAGCCACCT | NC010341 |
| COX-1 | CATACTTTACATCCGCAACA | TCCTGTCAATCCACCCAC | NC010341 |
| COX-2 | AACCCAGGACCTTACACCC | CCCGCAGATTTCAGAACA | NC010341 |
| SGLT-1 | CTCCACTTGCCTGCTCA | CGGTTCCTGCTATTCCC | KM977634.1 |
| GLUT-2 | ACGCACCCGATGTGAAAGT | TTGGACAGCAGCATTGATT | KC513421.1 |
| EF1α | CTTCTCAGGCTGACTGTGC | CCGCTAGCATTACCCTCC | X77689.1 |

AMPKα1, AMP-activated protein kinase α1; AMPKα2, AMP-activated protein kinase α2;PGC-1α, peroxisome proliferator activated receptor-γ coactivator-1α; PGC-1β, peroxisome proliferator activated receptor-γ coactivator-1β;TFAM, mitochondrial transcription factor A; Mfn-1, mitofusin-1; Opa-1, optic atrophy-1; Drp-1, dynamin-related protein-1; Fis-1, fission-1; Mff, mitochondrial fission factor; ND-1, NADH dehydrogenase-1; CYTB, cytochrome B; COX-1 and 2, cytochrome c oxidase-1 and 2; SGLT-1, sodium/glucose cotransporter-1; GLUT-2, glucose transporter-2; EF1α, elongation factor 1 α.



**Supplemental Fig. 1.** The M values of reference genes in the intestine of *M. amblycephala*. The high M value indicates low expression stability, while a low M value indicates high expression stability.