**Table S1.** Composition and nutrient content of basal diet (g kg-1)

|  |  |  |  |
| --- | --- | --- | --- |
| Ingredients |  | Nutrients contente |  |
| Fish meal | 170.0 | Crude protein | 387.8 |
| Casein | 10.0 | Crude lipid | 71.0 |
| Gelatin | 10.0 | Crude ash | 145.2 |
| Corn starch | 168.3 | ω-3 | 15.2 |
| α-starch | 30.0 | ω-6 | 13.9 |
| Fish oil | 26.0 | Available phosphorus | 14.8 |
| Soybean oil | 210.0 |  |  |
| Monocalcium phosphate | 40.0 |  |  |
| Vitamin premix a | 10.0 |  |  |
| Ile premix b | 120.0 |  |  |
| Mineral element premix c | 20.0 |  |  |
| Crystal amino acid premix d | 170.0 |  |  |
| Choline chloride (50%) | 10.0 |  |  |
| Ethoxy quinoline (30%) | 0.5 |  |  |
| Cellulose | 5.0 |  |  |
| Xanthophy II | 0.2 |  |  |
| Total | 1000.0 |  |  |

a The premix provides vitamin for a kilogram of diet: D, L-α-tocopherol acetate (500 g kg-1), 53.600 g; menadione (230 g kg-1), 0.217 g; retinyl acetate (50,0000 IU g-1), 8.063 g; cholecalciferol (50,0000 IU g-1), 0.100 g; thiamin nitrate (900 g kg-1), 0.111 g; riboflavine (800 g kg-1), 1.125 g; pyridoxine hydrochloride (810 g kg-1), 0.370 g; cyanocobalamin (10 g kg-1), 0.100 g; niacin (990 g kg-1), 3.143 g; folic acid (960 g kg-1), 0.521 g; meso-inositol (990 g kg-1), 52.323 g; D-biotin(20 g kg-1), 5.0 g; calcium-D-pantothenate (900 g kg-1), 1.667 g; ascorhyl acetate (930 g kg-1), 86.022 g. All ingredients were diluted with corn starch to 1 kg.

b The premix provides Ile, glycine, and corn starch for a kilogram of diet 1 to 7: L-Ile 0.000, 20.833, 41.667, 62.500, 83.333, 104.167, 125.000 g; glycine 89.777, 74.814, 59.851, 44.888, 29.926, 14.963, 0.000 g; corn starch 910.223, 904.353, 898.482, 892.612, 886.741, 880.871, 875.000 g, respectively.

c The premix provides mineral for a kilogram of diet: FeSO4·7H2O (300 g kg-1 Fe), 13.333 g; CuSO4·5H2O (250 g kg-1 Cu), 1.300 g; ZnSO4·7H2O (345 g kg-1 Zn), 13.043 g; MnSO4·H2O (318 g kg-1 Mn), 4.717 g; KI (38 g kg-1 I), 1.447 g; NaSeO3 (10 g kg-1 Se), 1.000 g. All ingredients were diluted with CaCO3 to 1 kg.

d The premix provides crystal amino acid for a kilogram of diet: lysine (780 g kg-1), 125.204 g; methionine (990 g kg-1), 60.071 g; tryptophan (980 g kg-1), 11.723 g; arginine (997 g kg-1), 116.491 g; histidine (997 g kg-1), 27.508 g; threonine (980 g kg-1), 163.764 g; leucine (985 g kg-1), 20.824 g; phenylalanine (996 g kg-1), 17.364 g; valline (992 g kg-1), 11.302 g; cystine (999 g kg-1), 11.432 g. All ingredients were diluted with corn starch to 1 kg.

e Crude protein, crude fat, crude ash, and Ile contents were measured. Available phosphorus, ω-3 and ω-6 contents calculated according to NRC (2011).

**Table S2.** The primers and annealing temperature (AT) used for real-time quantitative PCR.

|  |  |  |  |
| --- | --- | --- | --- |
| Gene name | Primer sequences (5′-3′) | AT (°C) | Genebank ID |
| CuZnSOD-QF | TCACTTCAACCCCCACAACA | 63.3 | KX455916.1 |
| CuZnSOD-QR | CGGCAGTCACATTACCCAGAT |  |  |
| CAT-QF | ACACCGATGAGGGAAACTGG | 58.0 | KX455919 |
| CAT-QR | GTGGATGAAGGACGGGAACA |  |  |
| GPX1a-QF | GTGAATGGGAAAGACGCTC | 61.7 | MG773203 |
| GPX1a-QR | GCACACAGGACTCCAGATGA |  |  |
| GST-QF | CGGATGGGAAATGGAACG | 58.0 | XM\_027154055.1 |
| GST-QR | GGATAATGCTCCTGACTCAACC |  |  |
| GCLC-QF | GACAAACGGAGGAAGGAGG | 58.2 | KX455918 |
| GCLC-QR | TCATCAGGAAAGAAGAGGGACT |  |  |
| Keap1-QF | GCATCCTCTTCACCTGTCT | 61.7 | MG773201 |
| Keap1-QR | CGTGTAGGCGAACTCTATC |  |  |
| Nrf2-QF | CGGAACAAGATGGAGAAGCC | 64.0 | KX455917 |
| Nrf2-QR | ACAGGGAGGAATGGAGGGA |  |  |
| IGF1-QF | ATCTGGGTAATGTGACTGCCGA | 56.8 | KX434878 |
| IGF1-QR | TTCATCATCTCCGCCCTTGC |  |  |
| IGF2-QF | GTGGAGGAATGCTGTTTTCGGAG | 61.4 | JN378897 |
| IGF2-QR | AACTTTCTGGAGCGGAGGATGG |  |  |
| IGF1R-QF | ACACCGATGAGGGAAACTGG | 56.6 | MG773202 |
| IGF1R-QR | GTGGATGAAGGACGGGAACA |  |  |
| PCNA-QF | GTTGATGGACTTGGATGTGGA | 60.1 | MK281343 |
| PCNA-QR | CGTTGCTGGTTTGGGAGA |  |  |
| Myf5-QF | CTCCAGTCCTTCATCATCCACC | 64.9 | MK253547 |
| Myf5-QR | CACTCGCACTCTGACCTTCGT |  |  |
| MyoD-QF | CCTAATCAGAGGCTTCCCA | 55.5 | HM363525 |
| MyoD-QR | TCACCGCTGTATTGTTCCA |  |  |
| MyoG-QF | TACTTTTTCCCCGAACAGC | 57.6 | HQ246723 |
| MyoG-QR | TCCAGTCCTACATTGCCAGA |  |  |
| MRF4-QF | CAGACTGTCAGAGGACGGGG | 52.8 | MK281342 |
| MRF4-QR | CAGCCTTCTCTTTGGTGGGA |  |  |
| MyHC-QF | GCAATGAAGGAGAACTATG | 60.0 | MK440319 |
| MyHC-QR | TCACACTTTCCTCAGCGT |  |  |
| MSTN-QF | ACGCCACTACCGAGACCG | 64.6 | DQ767967 |
| MSTN-QR | CTCAATACCCCAGTTTGTTTCC |  |  |
| PI3K-QF | GTGAATGGGAAAGACGCT | 62.6 | MG773208 |
| PI3K-QR | GCACACAGGACTCCAGATGA |  |  |
| AKT-QF | ACACGACCGCTTGTGCTTC | 61.7 | KX131157.1 |
| AKT-QR | TCCGTCCGTTATGCCCTCT |  |  |
| TOR-QF | GACAAACGGAGGAAGGAGG | 58.2 | MG773199 |
| TOR-QR | TCATCAGGAAAGAAGAGGGACT |  |  |
| S6K1-QF | GCAAACTGAATCTCCCACCC | 61.7 | MG773195 |
| S6K1-QR | AGGCTTGAAAGGCGGCTC |  |  |
| 4EBP-QF | ACGCCACCCAGTTGCCTA | 62.6 | MG773207 |
| 4EBP-QR | GGATGCTTTTGCTGCCGAC |  |  |
| FOXO3a-QF | GACTTCCGCTCTCGCACTAA | 60.5 | MK562423 |
| FOXO3a-QR | ATCATCAGCAACCTCATCCACT |  |  |
| MAFBX-QF | AACCTCTGTCACTACCACTTCACT | 54.8 | MK812970 |
| MAFBX-QR | GGTCGCTGTACTGCTCTTTATG |  |  |
| MURF-1-QF | CCGTTTTGAGGTGGTGCT | 53.6 | MK756118 |
| MURF-1-QR | TGTTCTCCAGTTGTTGCTTGTA |  |  |
| 18S-QF | CCTGAGAAACGGCTACCACATCC | 57.1 | KP938527 |
| 18S-QR | AGCAACTTTAATATACGCTATTGGAG |  |  |
| β-actin-QF | CCTAAAGCCAACAGGGAAAA | 59.0 | EU161066 |
| β-actin-QR | ATGGGGCAGAGCATAACC |  |  |