Table S1 Composition of the experimental diets.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Ingredients | Content (g/kg), air-dry basis | | | |
| RD | HFD | HSe0.3 | HSe0.6 |
| Fish meal | 50 | 50 | 50 | 50 |
| Soybean meal | 250 | 250 | 250 | 250 |
| Rapeseed meal | 160 | 160 | 160 | 160 |
| Cottonseed meal | 160 | 160 | 160 | 160 |
| Wheat flour | 170 | 170 | 170 | 170 |
| DDGS | 50 | 50 | 50 | 50 |
| Rice bran | 60 | 60 | 60 | 60 |
| Soybean oil | 10 | 50 | 50 | 50 |
| Choline chloride | 5 | 5 | 5 | 5 |
| Ca(H2PO4)2 | 20 | 20 | 20 | 20 |
| Microcrystalline cellulose | 44.9 | 4.9 | 4.9 | 4.9 |
| Vitamin mixture\* | 10 | 10 | 10 | 10 |
| Mineral mixture# | 10 | 10 | 10 | 10 |
| Se addition (mg/kg) | 0 | 0 | 0.3 | 0.6 |
| *Nutrient content* | | | | |
| Crude protein | 316 | 315 | 314 | 315 |
| Crude lipid | 43 | 84 | 84 | 85 |
| Se levels (mg/kg) | 0.08 | 0.08 | 0.38 | 0.68 |

\*Vitamin premix contains (IU/kg or mg/kg diet): vitamin A, 3,000 IU; vitamin E, 60 IU; vitamin D, 2,000 IU; vitamin C, 200 mg; thiamine, 5 mg; riboflavin, 10 mg; menadione, 10 mg; pyridoxine HCl, 10 mg; cyanocobalamin, 0.02 mg; biotin, 1 mg; calcium pantothenate, 40 mg; folic acid, 5 mg; niacin, 100 mg; inositol, 200 mg. Cellulose was used as a carrier.

#The mineral mix contained (g/kg of the total mineral): KAl(SO4), 1.59; CaCO3, 181.01; Ca(H2PO4)2, 446.01; CoCl, 0.70; MgSO4, 52.16; MnSO4•H2O, 0.70; KCl, 165.53; KI, 0.14; ZnCO3, 1.92; NaH2PO4, 136.05; Na2SeO3, 0.06; CuSO4•5H2O, 0.75; Ferric citrate, 13.38.

Table S2 Primers sequences.

|  |  |  |
| --- | --- | --- |
| Gene | Sequences of primers | Accession Number |
| *β-actin* | Forward: 5’- CGTGACATCAAGGAGAAG -3’ | M25013 |
|  | Reverse: 5’- GAGTTGAAGGTGGTCTCAT -3’ |
| *MyoD* | Forward: 5’- CTGGAGCATTACAGCGGAGA -3’ | JQ793893.1 |
|  | Reverse: 5’- GTGCGTCAGCATTTGGCG -3’ |
| *MyoG* | Forward: 5’- GGCGGCGATAACTTCTTCCA -3’ | JQ793897.1 |
|  | Reverse: 5’- TCCTCCAACCCCACTCCATT -3’ |
| *PPARα* | Forward: 5’- TCAGGATACCACTATGGAGTTCAC -3’ | FJ231987 |
|  | Reverse: 5’- TACAGCGGCGTTCACACTTG -3’ |
| *ATGL* | Forward: 5’-TCGTGCAAGCGTGTATATG -3’  Reverse: 5’- GCTCGTACTGAGGCAAATTA -3’ | HQ845211.2 |
|  |
| *LPL* | Forward: 5’- TACAGCGGCGTTCACACTTG -3’  Reverse: 5’- CTACATGAGCACCAAGACTG -3’ | FJ716100.1 |
| *HSL* | Forward: 5’- GTTCCAATCGCCAGACAGC -3’  Reverse: 5’- GAGCCAATGAGTAATCCACAGAG -3’ | HQ446238.1 |
| *PI3K* | Forward: 5’- TGCCAGACGCAAGAACGATA -3’  Reverse: 5’- TCTCTCTGTAGTCTGCCGCT -3’ | KY763989.1 |
| *AKT* | Forward: 5’- GGCTTGTGTAAGGAGGGCAT -3’  Reverse: 5’- TCTGGTGTCTGTTTCTGAGGAC -3’ | KY763985 |
| *TOR* | Forward: 5’- GCCACGCAAACTCACCATAA -3’ | JX854449 |
|  | Reverse: 5’- CGTAAGGAGGCTGGGTCATT -3’ |
| *S6K1* | Forward: 5’- TGGCTGGGGTGTTCGAC -3’ | EF373673 |
|  | Reverse: 5’- CATTGATCTGAGCCTCCTCCA -3’ |
| *4E-BP1* | Forward: 5’- CTGCTGCCTCCCTGACATTC -3’ | KT757305 |
|  | Reverse: 5’- GGGGGCTGATGCGGTTATTAT -3’ |
| *GLDH* | Forward: 5’- AGAGAGACAACGGGGAGTGG -3’ | KT861863 |
|  | Reverse: 5’- AGGCACATCTACAACTGCACA -3’ |

Table S3 Effects of nano-Se on growth parameter of on-growing grass carp.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Group | | | |
| RD | HFD | HSe0.3 | HSe0.6 |
| IBW/g | 161.4 ± 0.19 | 161.44 ± 0.69 | 160.78 ± 0.19 | 161.33 ± 0.02 |
| FBW/g | 210.00 ± 4.19 | 210.80 ± 5.36 | 211.92 ± 6.63 | 218.59 ± 4.87 |
| SGR/%/d | 0.44 ± 0.03 | 0.44 ± 0.05 | 0.46 ± 0.05 | 0.51 ± 0.04 |

IBW = initial body weight; FBW = final body weight; Specific growth rate (SGR, %/d) = 100 × [Ln final weight (g) − Ln initial weight (g)] / days.

Table S4 Fatty acid composition (mg/g dry) of on-growing grass carp muscle.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fatty acid | RD | HFD | HSe0.3 | HSe0.6 |
| C14:0 | 1.27 ± 0.16 | 1.09 ± 0.18 | 1.00 ± 0.17 | 1.15 ± 0.35 |
| C15:0 | 0.67 ± 0.05 | 0.56 ± 0.12 | 0.45 ± 0.19 | 0.41 ± 0.20 |
| C16:0 | 9.96 ± 1.04 | 11.12 ± 1.87 | 10.06 ± 0.40 | 10.00 ± 0.92 |
| C17:0 | 1.09 ± 0.10 | 0.76 ± 0.22 | 0.66 ± 0.31 | 0.85 ± 0.54 |
| C18:0 | 4.10 ± 0.26 | 4.38 ± 0.65 | 4.06 ± 0.17 | 4.03 ± 0.32 |
| C20:0 | 1.36 ± 0.11a | 0.97 ± 0.32ab | 0.83 ± 0.46ab | 0.56 ± 0.51b |
| C14:1 | 0.64 ± 0.08 | 0.44 ± 0.13 | 0.39 ± 0.19 | 0.60 ± 0.34 |
| C15:1 | 3.73 ± 0.40 | 3.76 ± 0.70 | 3.62 ± 0.12 | 3.65 ± 0.30 |
| C16:1 | 2.43 ± 0.30 | 2.19 ± 0.37 | 2.10 ± 0.10 | 2.28 ± 0.28 |
| C17:1 | 0.69 ± 0.07a | 0.52 ± 0.14ab | 0.49 ± 0.15ab | 0.45 ± 0.16b |
| C20:1 | 1.32 ± 0.09 | 1.20 ± 0.18 | 1.14 ± 0.17 | 1.28 ± 0.39 |
| C18:1*n*9t | 0.68 ± 0.10 | 0.46 ± 0.13 | 0.39 ± 0.19 | 0.53 ± 0.35 |
| C18:1*n*9c | 12.47 ± 1.97 | 14.78 ± 3.22 | 14.93 ± 1.57 | 14.30 ± 2.29 |
| EPA(C20:5*n*3) | 1.44 ± 0.76a | 0.99 ± 0.27b | 1.05 ± 0.25ab | 1.38 ± 0.48ab |
| DHA(C22:6*n*3) | 5.22 ± 0.38a | 3.04 ± 0.33c | 3.13 ± 0.14c | 4.08 ± 0.44b |
| C18:2*n*6c | 7.88 ± 1.34b | 11.41 ± 2.68a | 11.91 ± 1.98a | 11.32 ± 2.07a |
| C18:3*n*6 | 0.90 ± 0.09 | 0.70 ± 0.19 | 0.63 ± 0.29 | 0.77 ± 0.48 |
| C20:2 | 1.69 ± 0.11 | 1.36 ± 0.26 | 1.22 ± 0.35 | 1.44 ± 0.68 |
| C20:3*n*6 | 1.87 ± 0.92 | 1.44 ± 0.34 | 1.26 ± 0.42 | 1.54 ± 0.77 |
| C20:4*n*6 | 2.82 ± 0.55 | 2.24 ± 0.44 | 2.01 ± 0.35 | 2.19 ± 0.73 |
| ∑SFA | 17.64 ± 0.29b | 19.11 ± 0.66a | 17.27 ± 0.79bc | 16.36 ± 0.64c |
| ∑MUFA | 23.91 ± 0.61 | 22.83 ± 2.99 | 23.41 ± 1.32 | 21.82 ± 0.89 |
| ∑PUFA | 22.38 ± 2.31ab | 19.85 ± 1.80b | 21.23 ± 0.86b | 24.96 ± 1.02a |
| ∑*n*-3 PUFA | 6.64 ± 0.42a | 4.04 ± 0.61c | 4.19 ± 0.16c | 5.31 ± 0.53b |
| ∑*n*-6 PUFA | 14.11 ± 1.93 | 14.49 ± 1.06 | 15.82 ± 1.15 | 14.82 ± 1.05 |

Data are mean ± SDs (*n* = 3). Significant differences were indicated by different letters (*P* < 0.05). SFA = saturated fatty acids; MUFA = monounsaturated fatty acids; PUFA = polyunsaturated fatty acids.